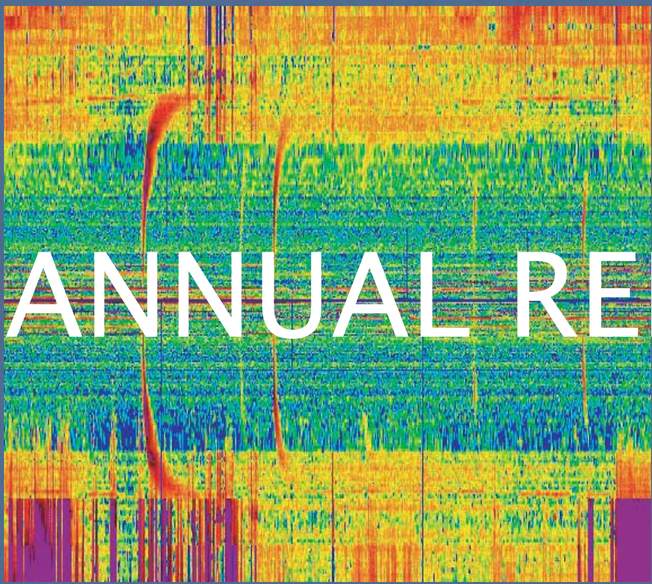
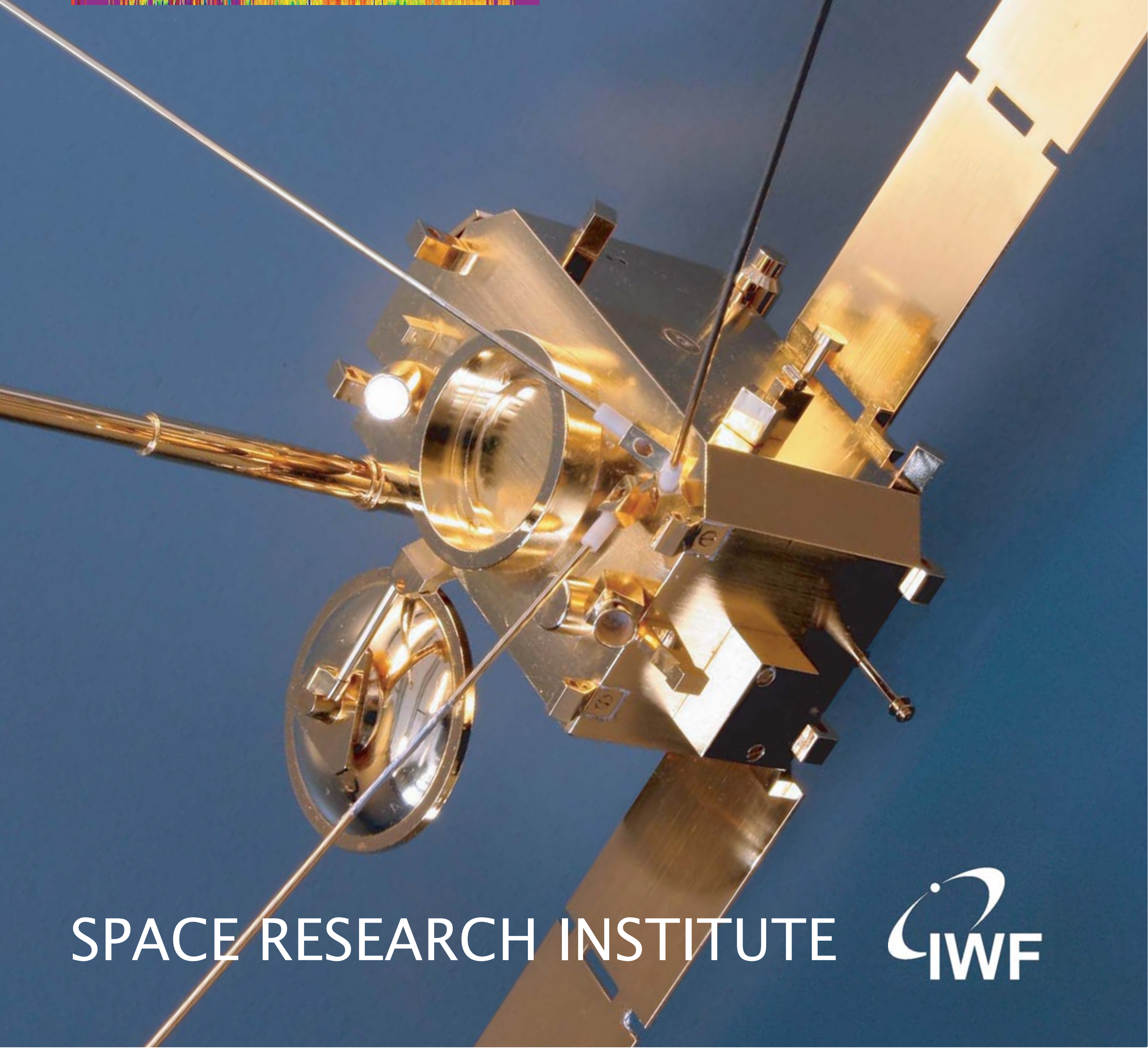
Austrian Academy of Sciences

ANNUAL REPORT 2006





SPACE RESEARCH INSTITUTE

ANNUAL REPORT 2006

SPACE RESEARCH INSTITUTE GRAZ
AUSTRIAN ACADEMY OF SCIENCES

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Cover Image:

On 25 October 2006 NASA's STEREO A and B spacecraft were successfully launched. This picture shows the rheometry model (see Sect. 4.1) used by IWF. The inset panel is a power spectrum from the SWAVES experiment with the data from the "Ahead" and "Behind" spacecraft with a type III radio burst (image taken from the NASA STEREO website).

Table of Contents

1 Introduction

The Space Research Institute (Institut für Weltraumforschung, IWF) of the Austrian Academy of Sciences (Österreichische Akademie der Wissenschaften, ÖAW) understands itself as a focus of Austrian space activities. It cooperates closely with space agencies all over the world, with universities located in Graz, and with numerous other national and international institutions. A particularly intense cooperation exists with the European Space Agency (ESA). IWF participates in various interplanetary missions as well as in missions dedicated to the exploration of our own planet Earth and its neighbourhood:

- *Cassini* is orbiting Saturn and exploring its system.
- *Cluster*, the four-spacecraft mission is still working well and gathering data. The mission has been extended until 2009.
- *Double Star*, the Chinese-European magnetospheric mission, is taking data in good collaboration with the *Cluster* mission, and the mission has been extended until late 2007.
- *Rosetta* is on its way to comet 67P/Churyumov-Gerasimenko.
- *Venus Express* arrived at Venus on 11 April, and explores the space environment around the planet.
- *STEREO* was launched on 25 October, and the WAVES experiment has already observed solar radio bursts.
- *COROT* was launched on 27 December (Fig. 1.1), and will search for extra-solar planets and analyze the oscillation modes of stars.

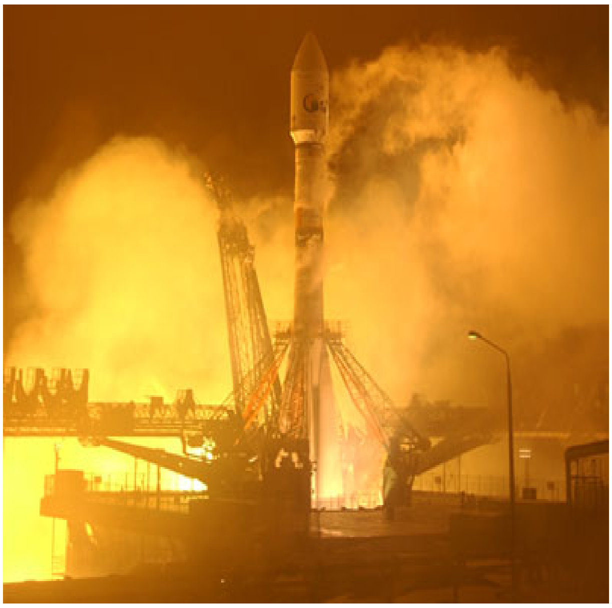

Fig. 1.1: The launch of the COROT spacecraft from Baikonur on 27 Dezember.

- *GOCE* will determine the structure of the terrestrial gravitational field to better understand the Earth's interior, to map ocean currents, and to contribute to a unification of regional height systems.
- *THEMIS* will fly five identical microsatellites to probe the causal relationship in the chain of processes called magnetospheric substorm and the origin of the aurora. Its planned launch date is in February 2007.
- *BepiColombo* will investigate in detail the innermost planet Mercury, using two orbiters: one with instruments specialized for magnetospheric studies, and the other for remote sensing of the planet.
- *MMS* will carry out 3D measurements, using four identically equipped spacecraft, to explore the acceleration processes that govern the dynamics of the Earth's magnetosphere.

Highlights in 2006 were the successful arrival and launches of several spacecraft. On 11 April *Venus Express* arrived at Venus (Fig. 1.2 shows the Venus Orbit Insertion event at IWF, see Sect. 7.6). On 25 October STEREO was launched from Cape Canaveral, USA, and on 27 December COROT was launched from Baikonur.

Fig. 1.2: The VOI event in the atrium of IWF.

IWF, of course, is also very much engaged in analyzing data from these and other space missions. This analysis is supported by theory, simulation, and laboratory experiments. Moreover, at the Lustbühel Observatory in Graz, one of the most accurate laser ranging stations of the world is operated. Its data are used to determine the orbits of more than 30 satellites. Also located at Lustbühel Observatory is a system of antennas used to test new radio wave equipment. Finally, a network of nine permanent GPS stations is operated by IWF to monitor geodynamical movements in Austria and its vicinity.

Scientific highlights in 2006 were, amongst others:

- the SLR team at Lustbühel has determined for the first time the spin parameters of several satellites in detail using the Satellite Laser Ranging method (see Sect. 2.3);
- Cluster has measured for the first time the fine structure of the Earth's magnetotail current sheet during reconnection (see Sect. 3.2);
- at Venus the first observations of ion cyclotron waves were made in the foreshock region by Venus Express (see Sect. 4.3);
- and the first detection of SEDs (Saturn Electrostatic Discharges) from the ground (see Sect. 4.5) has been performed.

Last but not least, IWF also hosted two international conferences with about 30 and 75 participants from five continents.

IWF structure and funding

IWF is structured into three departments:

- Experimental Space Research
  (Head: Prof. Dr. Wolfgang Baumjohann)
- Extraterrestrial Physics
  (Head: Prof. Dr. Helmut O. Rucker)
- Satellite Geodesy
  (Head: Prof. Dr. Hans Sünkel)

Its managing director is Prof. Dr. Wolfgang Baumjohann.

The bulk of financial support for the research comes from ÖAW. Substantial support is also provided by other national institutions, the Austrian Research Promotion Agency (Österreichische Forschungsförderungsgesellschaft, FFG), the State of Styria, the Austrian Science Fund (Fonds zur Förderung der wissenschaftlichen Forschung, FWF), and by the Austrian Academic Exchange Service (Österreichischer Akademischer Austauschdienst, ÖAD) and its partner institutions in other countries. Last but not least, European institutions like ESA and the European Union contribute substantially.

2 Solid Earth

Earth sciences are concerned with the investigation of the state and the dynamic behaviour of the Earth system and strive to predict global changing processes. In order to understand the Earth it is very useful to watch the blue planet from space.

Satellite-based measurements are the most practical and cost-effective techniques for producing observations over a wide range of spatial and temporal scales.

Satellite geodesy comprises the observational and computational techniques which allow geodetic problems to be solved by means of artificial Earth orbiting satellites. The objectives of satellite geodesy at the IWF are in particular:

- Determination of the Earth's gravity field;
- Measurement and modeling of regional and local geodynamical phenomena;
- Precise tracking of geodetic and low Earth orbiting satellites by means of satellite laser ranging;
- Analysis of the measured data.

2.1 Gravity Field

The Earth's gravity field is the sum of the gravitational and centrifugal force, with the first being the response to the Earth's interior density distribution and the latter caused by its rotation. A major advancement in the knowledge of our planet's gravity field on a global scale has already been achieved by the dedicated satellite missions *CHAMP* and *GRACE,* and the forthcoming *GOCE* mission will deliver even new revolutionary insights.

GOCE

In the framework of ESA's Living Planet Programme the satellite mission *GOCE (Gravity field and steady-state Ocean Circulation Explorer)* strives for a high-accuracy, high-resolution model of the Earth's static gravity field (see Fig. 2.1 for an image of the satellite). *GOCE* is based on a sensor fusion concept, i.e. the satellite's orbit information is exploited, applying satellite-to-satellite tracking in high-low mode (hl-SST) using GPS. This delivers the long and medium wavelengths of the Earth's gravity field. An on-board gradiometer, flown for the first time, will provide the detailed structure of the gravity field through satellite gravity gradiometry (SGG).

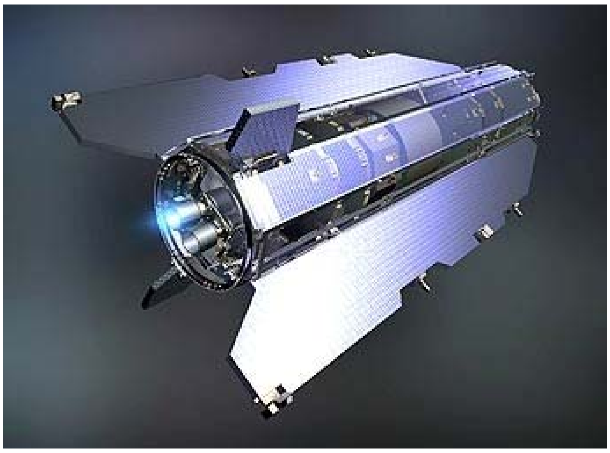

Fig. 2.1: Artists impression of the GOCE satellite

Data Processing

An operational hardware and software system for the scientific processing (Level 1b to Level 2) of *GOCE* data has been set up by the European GOCE Gravity Consortium EGG-C. One key task of this software system is the processing of a spherical harmonic Earth's gravity field model and the corresponding full variance-covariance matrix from the precise *GOCE* orbit (SST data) and the SGG data. This key component is operated by the *GOCE* team Graz, which is a close co-operation of IWF with the Institute of Navigation and Satellite Geodesy of the Graz University of Technology (TU Graz). A rigorous solver approach is implemented, which solves the huge linear equation systems using parallel software and hardware facilitating "Scientific Supercomputing" on a PC cluster of TU Graz.

Gravity Field Core Solver

A numerical case study based on the data of an ESA *GOCE* end-to-end simulation, an optimum gravity field solution complete to degree/order (d/o) 200 has been computed to demonstrate the full processing chain of the timewise gravity field solver.

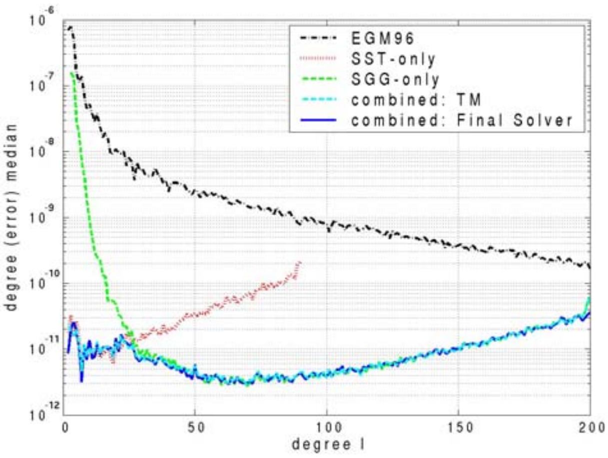

Fig. 2.2: Degree error median for diverse GOCE gravity field solutions (d/o 200 model).

The first component of the solver consists of the SST processor, based on the energy integral principle, which uses the kinematic orbit data. A solution up to d/o 90 has been computed to deliver the long wavelength part (see Fig. 2.2 for the SST degree error statistics, red curve).

The SGG processor operates on the calibrated gravity gradients, which are directly related to the unknown potential coefficients, resulting in the linear observation model for all tensor components. Fig. 2.2 again depicts the solution in terms of the corresponding degree error median (d/o 200, green curve).

Finally, the SST and SGG normal equations are superposed applying an optimum weighting of the individual data types. The ill-posedness of the normal equations due to the polar data gaps is managed by applying a Spherical Cap Regularization. To fulfil the goal of a *GOCE*-only solution an independent SST-only solution with d/o 50 was used as the stabilizing function. The overall combined solution is shown in Fig. 2.2. (blue curve).

The output of the processing is the coefficient solution and a full variance-covariance matrix, complete to d/o 200. In order to prove the plausibility of this matrix, rigorous covariance propagation was performed to propagate the coefficient errors to geoid height errors on a global grid. Fig. 2.3 shows the specific error structure of this field. Compared with the amplitude of absolute geoid height errors their statistical error estimates match quite well, proving consistency of this numerical closed-loop case study.

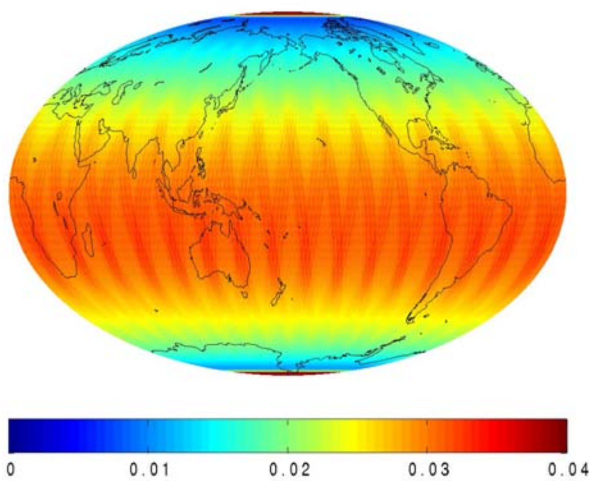

Fig. 2.3: Geoid height standard deviations [m] at degree 200, propagated from the full variance-covariance matrix of the gravity field coefficients).

In addition to the core solver, also an independent solution of the long wavelength part of gravity coefficients coming from SST observation is developed as a validation and backup solution. It is based on a different approach from the energy integral, performing the direct numerical integration of the variational equations of the satellite orbit. Its performance is however hampered by its numerical integration effort for the relatively big number of satellite partials to compute. Therefore it is adapted to work in parallel on a local computer cluster to speed up processing time. It has been tested so far and promising results are obtained. Its advantage is however, that no orbit-velocity information is necessary. This strengthens the SST solution and it is useful to have one solution dependent on orbit positions only, in order to avoid possible inaccuracies and availability of velocities. *GOCE* gravity field solutions for the long wavelength part will be independently validated applying SLR techniques. The hardware of the SLR station Lustbühel is currently being upgraded for tracking very low orbiting satellites like *GOCE*, and the corresponding software is developed.

2.2 Geodynamics

The contributions to geodynamics by the Department of Satellite Geodesy can be divided into two parts. First it contributes to the monitoring, improving and creating of ITRF (International Terrestrial Reference Frame) the most precise reference system for positioning. Secondly, mainly velocity models for tectonic units in some parts of the Earth are derived. The focus lies on three areas, Austria and its surroundings (Eastern Alps), Central Europe between the Baltic and the Mediterranean Sea and the Near East with parts of the Indian Ocean, Africa and Central Asia.

Reference Frames

The recent realization of ITRF2005 (released in October 2006) used refined results derived from the products of analysis centres regarding the behaviour of permanently observing stations for the first time. To reach sub-centimetre precision a permanent monitoring of all stations is needed, determining and applying sudden changes of coordinates (jumps), caused by equipment changes, local weather or tectonic events. The institute's contribution consists of the delivering of GPS and SLR data of some Austrian stations to the international community with Graz as one of the about 50 fundamental stations in the world. The work on GPS data is mainly restricted to the European part of the reference frame of the regional organization EUREF (European Reference Frame), which deals with about 150 permanent GPS stations, five of them belonging to IWF. More important, a group under the "trademark" of OLG (Observatory Lustbühel Graz) is maintaining the second largest data centre for GPS permanent stations in Europe, ranking among the first ten in the world. The number of available GPS stations is about 200 public ones and additionally 80 national, and international stations are kept for own usage and projects. OLG is also in the top three of the 16 analysis centres of EUREF providing results at a weekly basis to monitor the reference system. About 30 stations are monitored for outliers, jumps and other probable misbehaving, which might distort the reference frame.

Tectonic Movements

Deriving velocities from the coordinates of GPS permanent stations would be easy, if there were no other sources of disturbances. It requires separating the overlays, which are effects of equipment, atmosphere and other influences. A combination of the results between 2000 and 2006 and a reprocessing of the years 2000 and 2001 (because the extended area was not covered in the beginning) yielded velocities of the main plates (Anatolian, Arabian and Aegean) with a precision of about 2 mm/year in the lateral extensions. This is compliant to more than 90% with the MIT results which were unfortunately published three months before the intended publication.

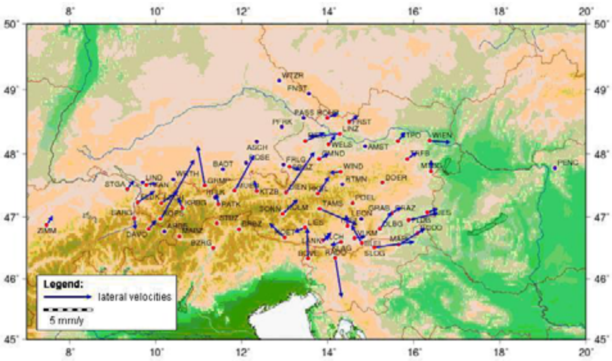

Fig. 2.4: Residual velocities of GPS permanent stations of AMON (lateral).

Whereas in the Near East results can be interpreted very quickly, intra-plate movements of 1-5 mm/yr need more time. The largest vectors in Fig. 2.4 show only local movements independent from the tectonics.

CERGOP-2/Environment

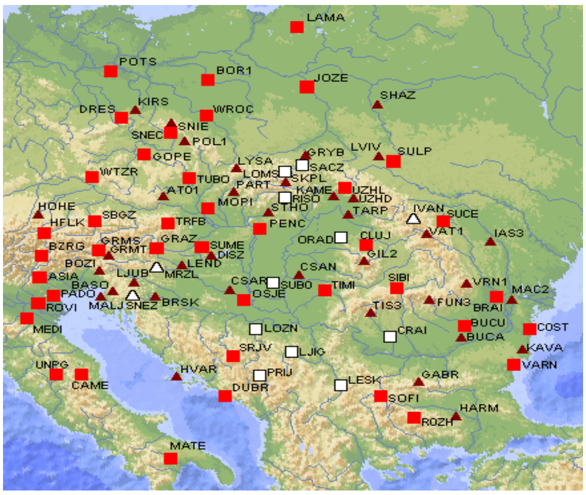

Fig. 2.5: Station distribution: red squares (permanent), red triangles (epoch), white squares (planned)

The third project year ended in March 2006, a prolongation until end of July 2006 was accepted. The aim of this EU project was the establishment, maintenance and monitoring of a reference frame for current geodynamic research and later hazard mitigation. Local investigations in seismic active regions of Eastern Europe supplemented the overall objectives. The final output is a time varying velocity field to be used as a backbone for geodynamic research during the next six years, i.e. allocation of sudden velocity changes to explain the nature of the underlying forces and the energy transfer leading to seismic events and earthquakes. Thirteen countries, covering 15 % of the European area, combined with the Central European Initiative (mainly the Central and East-European region) contributed to this project coordinated by AAS.

2.3 Satellite Laser Ranging

SLR-Technology

The Graz kHz SLR facility - fully operational since 2006 - is still the only kHz SLR station worldwide, but other stations such as Herstmonceux (GB), TIGO, Wettzell (GER) and SLR2000 (USA) are now also changing to kHz tracking, and several other stations will follow in the near future.

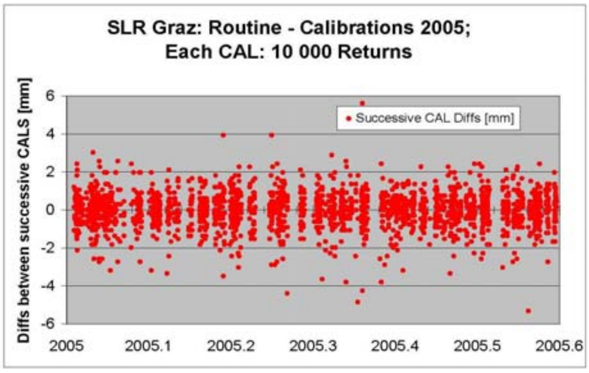

Fig. 2.6: Differences between successive kHz calibration values

The main reasons to upgrade an SLR station to kHz ranging are not only the dramatic increase of returns per pass and per normal point with a consequent improvement of the accuracy far into the sub-mm range, but especially the stability of the system. Compared to the previous flash-lamp pumped 10 Hz laser the new Solid State Diode Pumped Laser (SSDPL) shows a significantly improved stability (Fig. 2.6) as indicated by the differences between successive calibrations, which most times are less than 1-2 mm (inclusion or elimination is determined in post-processing).

Another major advantage of this new system is the very short pulse length of 10 ps together with the high repetition rate, allowing identification and to separation of echoes from single retro-reflectors. This makes it further possible to determine the spin parameters for several spinning satellites.

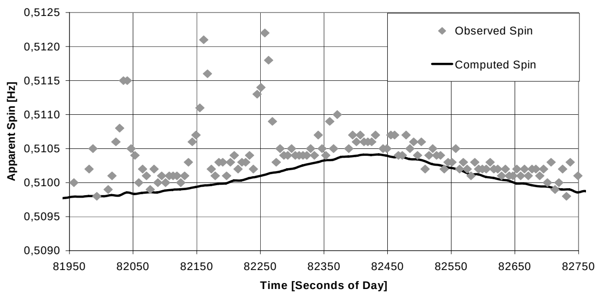

Fig. 2.7: Apparent spin velocity changes of AJISAI as observed from the ground laser station.

For *AJISAI* the spin rate and its slow-down was determined with high accuracy. The spin direction of *AJISAI* can also be determined by means of the apparent spin effect (shown in Fig. 2.7), which reveals a clockwise spin motion.

The identification of a different number (3-12) of retro-reflectors per revolution allows an accurate frequency analysis and yielded a spin rate of about 0.5 Hz and a slow-down of 8×10^{-3} Hz/yr for *AJISAI*.

Fig. 2.8: Laser retro-reflectors onboard of GP- B.

For other satellites like *Gravity Probe-B (GP-B)* which carries 8 reflectors in a ring-formation (Fig. 2.8) and needs 77.5 seconds for full revolution this computation is more difficult. Due to its lower orbit, the contribution of the apparent spin increases, and is already changing the apparent spin significantly, thus spoiling the accuracy in any frequency analysis. A new method was developed to compare the results of a complete simulation with the actual data of selected passes (Fig. 2.9).

This method allows determination of even such a long inertial spin period with an accuracy of about 1 second, and the spin direction (*GP-B* is spinning CW when looking straight into its retro-reflectors). In addition, using echoes of the ninth central corner cube, the spin axis orientation for several *GP-B* passes could also be determined with an accuracy of a few degrees.

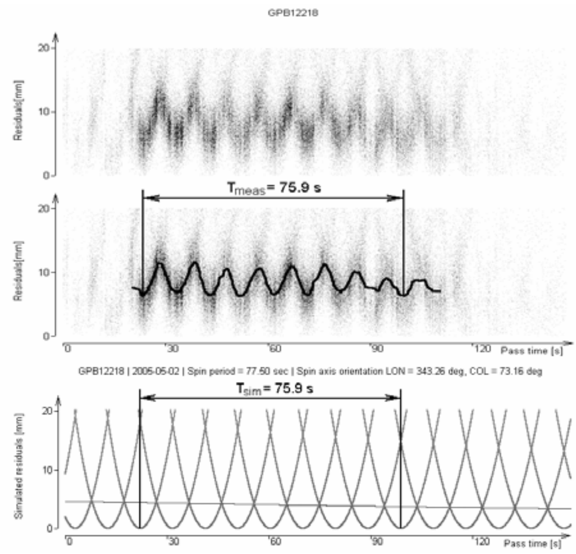

Fig. 2.9: Comparision of actual GP-B data with a complete simulation.

Even more difficult was the determination of *LAGEOS-1* spin parameters. The spin period increased to about several thousand seconds during the last 30 years. Apart of kHz SLR there is now no other method to measure its rotational motion. Again the method of simulation and comparison with the measured data was used, which shows clearly visible tracks from individual corner cubes or groups of them. By a simulation of the whole pass with all parameters (Earth rotation, satellite orbit, satellite spin, retro orientation, retro effective reflectance functions, etc.) it was possible to determine the spin period (about 6000 seconds, ±5 %), spin direction, and spin axis orientation (Fig. 2.10).

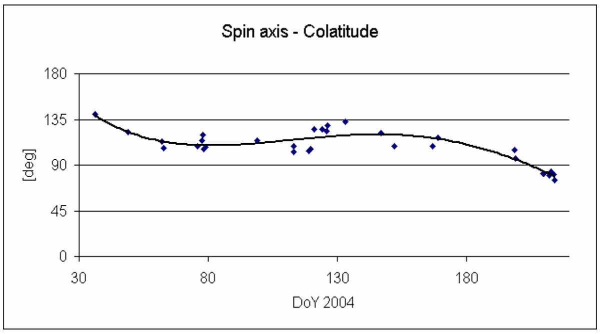

Fig. 2.10: Colatitude of Lageos-1 spin axis during a 6 months period.

kHz SLR in Graz opened up also other applications: Backscatter images of the transmitted laser beam at night time are processed to derive atmospheric seeing values along the path of the laser beam in real time (Fig. 2.11).

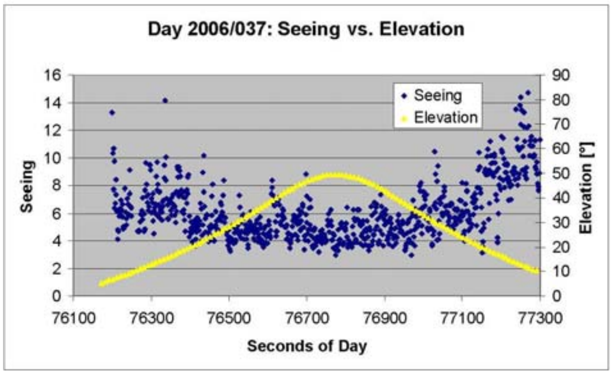

Fig. 2.11: Correlation of the tracked elevation with the seeing values derived from the kHz laser image.

2.4 Demeter

The relationship between the seismic event occurrence and the VLF and ELF emissions as recorded by the *DEMETER/ICE* experiment is investigated. By introducing the so-called 'spectral method' the VLF/ELF activity level for each half-orbit of the micro-satellite can be estimated. A 'VLF-index' parameter can be defined which shows the activity of the domi nant observed components, i.e., the hiss and the chorus emissions (Fig. 2.12). The advantage of such method is discussed, and the way to link it to the occurrence of the seismic events is analyzed. The detrended fluctuation analysis (DFA) method is applied to ground-based ULF magnetic field data. The aim is to separate between seismic-related ULF signals and magnetospheric ones prior to moderate earthquakes (5 < M < 5.5) which occurred in the Adriatic region in November 2004. A data set (August 2004 to February 2005) is studied for the fractal dimension behaviour of both Z and H components of the magnetic field in day and night conditions using one hour intervals. This analysis combined with simultaneous *DEMETER* observations will lead, in the near future, to an explanation of how pre-seismic ULF signals are related to seismic events.

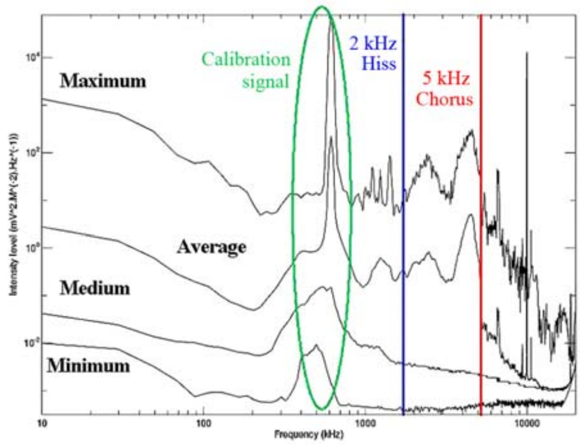

Fig. 2.12: Plasmaspheric components observed by the DEMETER/ICE experiment on 15 November 2004, between 2230 and 2300 UT.

3 Near-Earth Space

The physics of the Earth's space environment is dominated by the interaction between the solar wind and the terrestrial magnetic field. The structures that are created in this interaction are the bow shock, in which the supersonic solar wind is decelerated, a transition layer called the magnetosheath, the magnetopause (the boundary of the magnetosphere), and the magnetosphere itself, where the magnetic field from the Earth's dipole is dominating. In principle all these structures are magnetoplasmas, i.e., electrically charged particles (ions and electrons), where electric and magnetic fields dominate the physical processes.

3.1 Missions

In near-Earth space physics IWF is deeply involved in the *Cluster* mission, which was launched in 2000 and still yields a wealth of new and exciting data. The data from the recently launched *Double Star* mission corroborates the *Cluster* data. In addition, *THEMIS* is ready to be launched in mid February 2007. IWF is presently involved in building instruments for another magnetospheric mission, *MMS*.

Cluster

The four *Cluster* spacecraft, launched in 2000, are still in operation, taking data while circling the Earth in polar orbits. By now, the spacecraft have made observations in the Earth's magnetotail at several different separation distances, varying from 500 km to 10,000 km. This ESA mission has now officially been extended until the end of 2009. Many new results come out of this mission, and now combined with the Chinese-European *Double Star* mission an extra dimension is added to the investigation of the magnetotail.

All of the *Cluster* high resolution data and other allied products will be archived in a new database called the *Cluster Active Archive (CAA)*, which is being established and will be maintained by ESA. The instrument team in IWF is currently processing and preparing data to be archived in *CAA*. A web interface of *CAA* has been completed and became accessible to the wider science community since mid 2006.

Double Star

Within the *Double Star Project (DSP)*, two satellites are observing the Earth's magnetosphere on near-equatorial and polar orbits. The TC-1 and TC-2 spacecraft, launched in 2004 and 2005, have had their initial one year missions extended until the end of 2006. Further extension until late 2007 was approved by ESA and waiting for approval from the Chinese agency.

IWF participates in this mission with two experiments, *DSP-ASPOC to* control the electric potential of the equatorial spacecraft, and *DSP-FGM* to measure the magnetic field on both satellites. IWF is also Co-Investigator for the European *PEACE, HIA* and *STAFF* instruments and various Chinese experiments. IWF further provides two core services for the exchange of data: *European Double Star Data Distribution System (EDDS)* and the *Austrian Double Star Data Centre (ADC)*.

THEMIS

The NASA mission *THEMIS (Time History of Events and Macroscale Interactions during Substorms)* is designed to explore the origin of magnetic storms and auroral phenomena. *THEMIS* will be launched in February 2007 and fly five identical micro-satellites through different regions of the magnetosphere.

Fig. 3.1: Five Themis spacecraft mounted to the probe carrier during a test of the launch configuration.

IWF participates in *THEMIS* by providing science support. It has also contributed to the mission concept design as well as the instrument development of the fluxgate magnetometer *FGM*, which has been developed under the leadership of TU Braunschweig (TUBS). In 2006, all five probes including FGM were made ready for launch (Fig. 3.1).

MMS

The next multi-spacecraft mission in which IWF is involved is the NASA *MMS (Magnetospheric Multiscale)* mission, consisting of four identically equipped spacecraft flying at closer separation distances than the *Cluster* spacecraft. *MMS* will carry out 3D measurements to explore the acceleration processes that govern the dynamics of the Earth's magnetosphere.

IWF takes the lead for the spacecraft potential control and participates in the electron beam instrument as well as in the magnetometer *DFG with ASIC (Application Specific Integrated Circuit)* based sensor electronics. MMS is due for launch in 2013.

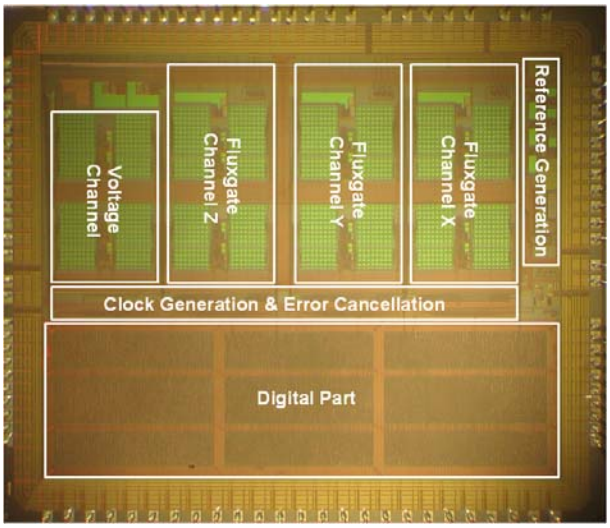

Fig. 3.2: Chip photograph of the magnetometer ASIC.

3.2 Physics

A fleet of spacecraft within the terrestrial magnetosphere and in near-Earth interplanetary space, like *Cluster*, *Double Star*, *Geotail*, and *Interball,* provides an enormous amount of data representing the plasma and magnetic field behaviour in this region. Data were analyzed and various theoretical models were developed to describe the physical processes responsible for the formation of structures and phenomena in near-Earth space.

Solar Wind

Evolution of Magnetic Clouds: About every third Coronal Mass Ejection (CME) manifests itself in interplanetary space as a Magnetic Cloud (MC). Generally, *in-situ* observations show a striking rotation of the magnetic field vector and very low plasma-β besides other varying signatures. For the first time, the interplanetary evolution of MC parameters is investigated by fitting a force-free model to a large dataset consisting of 130 MCs. Observations are provided by *Helios, Wind*, *Voyager*, *Pioneer* and other spacecraft.

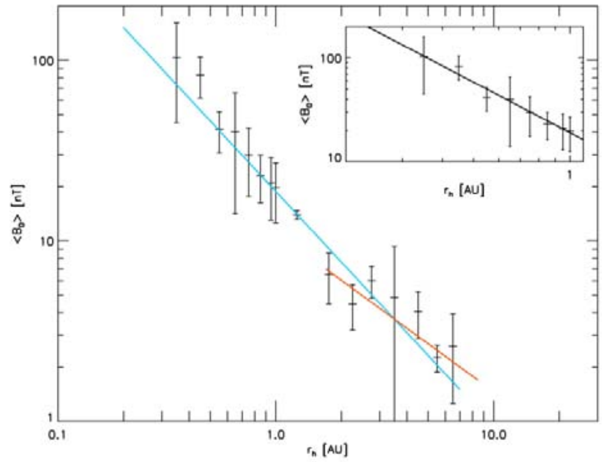

Fig. 3.3: Central magnetic field strength of force-free modelled Magnetic Clouds vs. heliospheric distance r_h. The inset shows a fit for the inner heliosphere (< 1 AU).

It was found that the maximum magnetic field strength inside MCs scales with heliospheric distance as rh-1.64 for distances < 1 AU, and the average diameter of MCs increases quasi-linearly. This agrees well with predictions from a self-similar expanding flux-rope model, which assumes a central field strength described by a power law rh-1.84 and a linearly increasing diameter. It can also explain the kink in the profile around 2 AU in Fig. 3.3.

Magnetotail

The interaction of the solar wind and its dynamical processes with the Earth's magnetosphere finds its culmination in the dynamics of the Earth's magnetotail. This stretched magnetic field structure, behind the Earth with respect to the Sun, intermediately stores the energy input from the solar wind. Any changes in the latter may release the stored energy explosively, with the grandeur of the northern lights, or aurora, as a result.

At IWF, one of the main research areas is the study of this dynamics of the Earth's magnetotail, with special interest in the transport processes and the current sheet in the tail. A current sheet represents a general form of boundary between different plasmas in space. Instabilities and dissipative processes, being developed in current sheets, define the evolution of the larger scale system, e.g. the magnetotail. The current sheets at the Earth's magnetopause and in the magnetotail are most readily available for direct probing, and therefore natural plasma laboratories.

Data from the four *Cluster* and two *Double Star* satellites are at the center of interest. Theoretical modeling, relevant to observations is done, which combined with data analysis and theory gives new insight into magnetotail dynamics.

Thin current sheet during reconnection: Detailed structure of thin current sheets and their evolution during reconnection is studied when *Cluster* experienced several rapid current-sheet crossings within a couple of ion gyro times. Based on four-point observations with a tetrahedron scale of about 200 km, the thickness and fine structures of the thin current sheet could be quantified, as shown in Fig. 3.4.

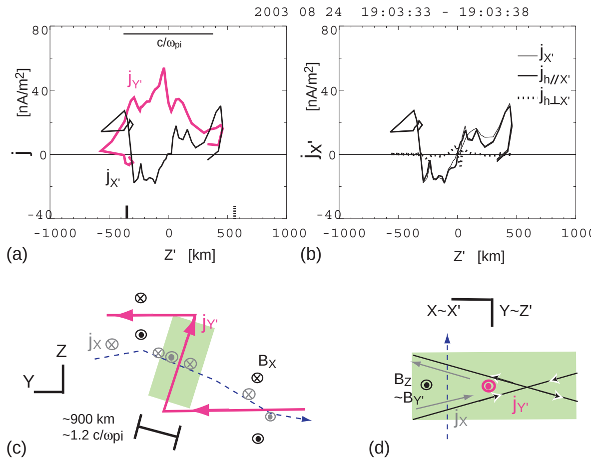

Fig. 3.4 Thin current sheet observations. (a) Current density profile in jy and jx. (b) Jx Components relative to the magnetic field. Illustration of the current sheet in Y-Z plane (c) and in X-Y plane (d). See more details in the text .

Multiple peaks are identified in the tail current density j_y profile accompanied with negative (positive) j_x in the northern (southern) hemisphere (Panel a). The j_x current mainly flows parallel to the ambient magnetic field (Panel b). The current sheet was extremely titled as illustrated in (Panel c). Its unique profile suggests that the Hall-current signatures for a magnetotail reconnection with a strong guide field were detected for the first time.

Contribution of BBFs to dipolarization: One of the most dynamic phenomena during a substorm are the bursty bulk flows (BBFs) in the magnetotail and the reduction of the cross-tail current in the inner magnetosphere. The orbits of *Cluster* and *Double Star* are designed to allow large-scale multi-point observations. Such simultaneous observations of the inner magnetosphere and the near-Earth tail are essential to study how these two key regions are linked in terms of fast flow and magnetic field dipolarization.

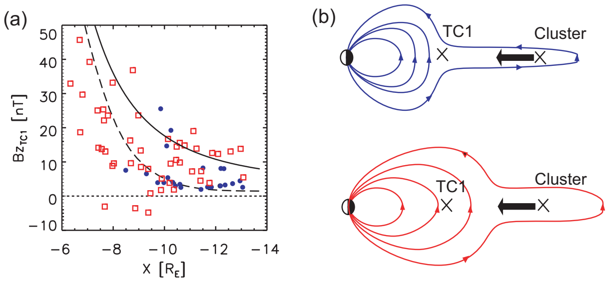

Fig. 3.5: (a) 5-min averages of TC1 B_Z before the dipolarization/BBFs against X position of TC1 in case of the dipolarization events (blue circles) and the non-dipolarization events (red rectangles). (b) Tail configuration for events when TC1 observed dipolarization (upper panel) and no clear dipolarization (lower panel).

The relationship between BBFs observed at *Cluster* and dipolarization observed at TC1 is surveyed. The *Cluster* BBF events are then separated into two types, depending on whether TC1 observes dipolarization in the inner magnetosphere at the same time. The main result is that the TC1 pre-event B_Z has mainly a stretched field configuration (lower curve in Fig. 3.5 (a)) in the TC1 dipolarization events (blue circles) and a more dipolar configuration (upper curve) in the TC1 non-dipolarization events (red rectangles). This suggests that the earthward BBF penetration is controlled by the initial configuration of the inner magnetospheric magnetic field as shown in Fig. 3.5 (b).

Determination of the reconnected flux: The process of magnetic reconnection leads to the occurrence of reconnected flux, which can be seen as one of the most important parameters. Analytical solutions for impulsive reconnection in a time-dependent model make the determination of the reconnected flux possible by integrating B_Z over time when the distance Δx and Δz between the spacecraft and the reconnection site is known.

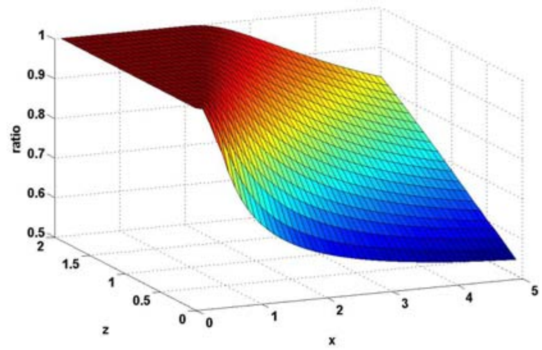

Fig. 3.6 Ratio between the maximum B_Z to the entire variation of B_Z and its dependence on ΔX and ΔZ.

The distance Δx can be determined from the model by analyzing magnetic field B_Z perturbations, typically bipolar B_Z structures that are asymmetric with respect to the time axis The degree of asymmetry depends on the distance from the reconnection site i.e. Δx is determined from the variation of B_Z and Δz is known from a magnetotail model (Fig. 3.6). Thus the reconnected flux can be determined by evaluating magnetic field B_Z signals and integrating them over time.

Spatial structure of turbulence: Recent laboratory results supported by numerical simulations indicate that large-scale gradients imposed on a turbulent velocity field induce anisotropic and intermittent fluctuations of the small-scale scalar fields. Accordingly, the probability density function (PDF) of the anisotropic small-scale scalar field (e.g. magnetic field magnitude) is skewed with asymmetric tails and is also leptokurtic (peaked). *Cluster* multipoint magnetic and plasma measurements allowed for the first time to see the difference between boundary and non-boundary fluctuations (Fig. 3.7). The scale evolution of 3rd (skewness) and 4th (kurtosis) statistical moments confirmed the effect of large-scale gradients on small-scale magnetic fluctuations.

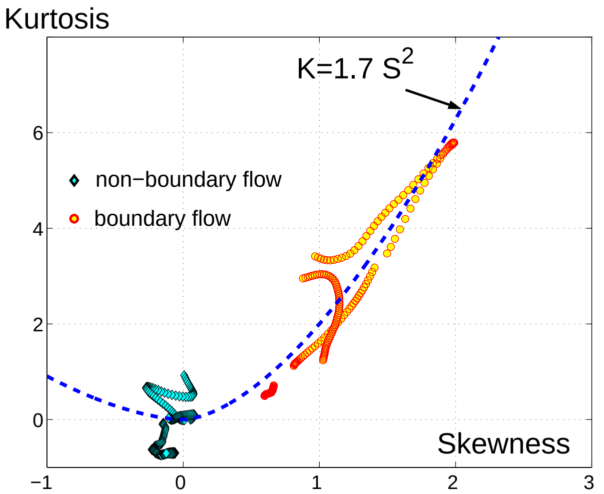

Fig. 3.7: Quadratic relationship between skewness and kurtosis

The simultaneous increase of skewness and kurtosis near flow boundaries provides evidence for the existence of non-local coupling. Large-scale boundaries or gradients in the plasma sheet can directly affect field fluctuations near the ion-gyrofrequency, just the opposite of what one could expect in turbulent cascades where the successive generations of small-scale structures lose information of the large-scale structure of the flow.

Local structure of the magnetotail current sheet: The important features of a current sheet, defining its stability, are the ratio of the sheet half-thickness to the ion gyro-radius, normal and guide magnetic fields, and the current sheet structure (distributions of the plasma density, temperature, and electric current density along the sheet normal).

Multi-point measurements on-board the *Cluster* spacecraft provide a possibility to probe the local current sheet structure and to estimate its scales during episodes of rapid flapping of the sheet. *Fig. 3.8* shows the vertical profiles of the current density reconstructed from the four-point magnetic field measurements during 78 rapid crossings of the magnetotail current sheet in 2001.

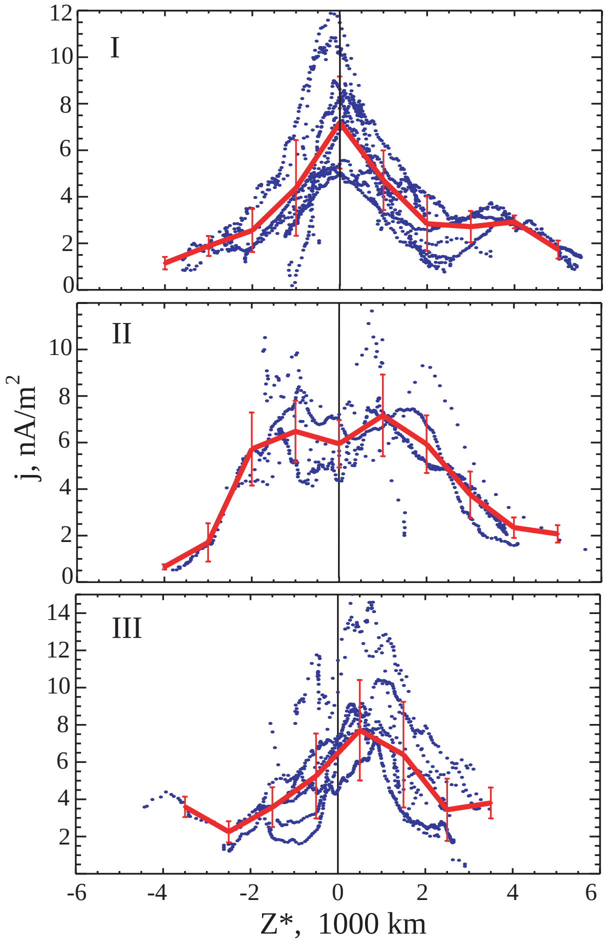

Fig. 3.8: Vertical profiles of the electric current density in flapping current sheets.

The reconstructed profiles exhibit three classes of the current sheet structure: Central single peak (I), bifurcated (II), and asymmetric (III). The half-thicknesses of these structures vary in the range of 3 - 10 gyroradii. The normal magnetic field at the neutral sheet is on average 0.2 and the guide (current aligned) field is about 0.5 of the total field jump during the current sheet crossing. All of the observed current sheets are found to be embedded into a thicker plasma sheet and are far from the simple Harris-type equilibrium.

Auroral Kilometric Radiation

The terrestrial auroral kilometric radiation (AKR) is a strongly polarized variable electromagnetic emission. It is generated at frequencies between 20 and 1000 kHz in the Earth's magnetosphere from sources located along auroral field lines at altitudes from 2000 to

19000 km above the Earth. It is emitted near the local gyro-frequency of electrons in low-density source cavities, which are identified with acceleration regions characterized by upward directed parallel electric fields.

Polarization properties of AKR: Data provided by the *Polrad* polarimeter onboard *Interball-2* (August 1996 – January 1999) have been used to investigate AKR. On the basis of 198 AKR events it has been statistically demonstrated that the AKR is fully circularly polarized. The errors of measurement and the numerical instabilities of the applied mathematical routines can explain small portions of linear polarization in AKR.

New investigations of the AKR source location and dynamics (Fig. 3.9) have been performed using already established procedures of direction finding with three orthogonal antennas. The analysis of the AKR source locations in various parts of the magnetosphere allows to judge about the operation of the electron-cyclotron maser under different magnetospheric conditions.

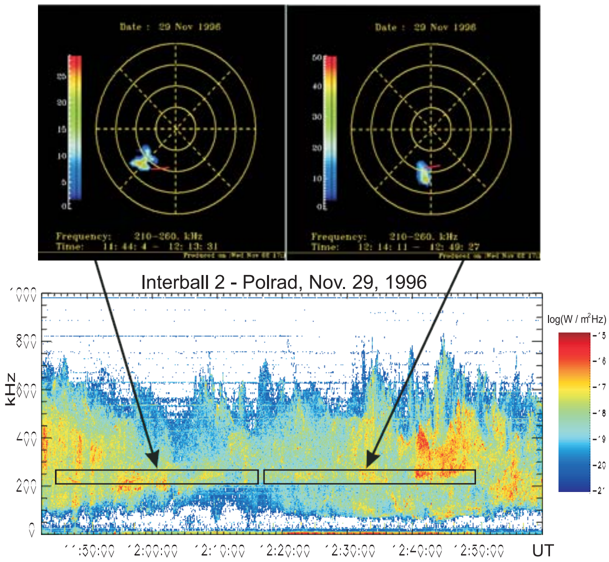

Fig. 3.9: Example of localization of the AKR sources. Top panel presents the calculated AKR source positions in MLT- invLat coordinates for the selected time interval and frequency range (black rectangles in the bottom panels). Bottom panel shows the dynamic spectra of the AKR intensity.

4 Solar System

IWF is engaged in many missions, experiments and corresponding data analysis addressing solar system phenomena. The physics of the Sun, and the solar wind, its interaction with solar system bodies, and various kinds of planetary atmosphere/surface interactions are under investigation.

4.1 Sun

The Sun is a strong source of radio waves. IWF investigates these emissions, as well as the complex dynamics near the Sun's surface.

STEREO

Analysis of the STEREO/WAVES antenna system: The *WAVES* experiment onboard the *STEREO* spacecraft (launched on 25 October 2006) is dedicated to the measurement of the non-thermal radio spectrum from the solar environment, receiving from a few kHz up to about 16 MHz. Three orthogonal monopole antennas, each 6 meters long, are employed. With this configuration direction finding is also possible (i.e. the determination of the direction and the polarization state of incident radio waves).

For the evaluation of the *SWAVES* data the receiving properties of the antennas, influenced by the spacecraft body, have to be known accurately. These properties are represented by the so-called effective length vectors. A detailed analysis of the whole antenna-spacecraft system was performed, consisting of the antennas themselves and the spacecraft body. For this purpose electrolytic tank measurements with a scale model (scale 1:20, see cover picture) were applied and wire-grid modelling applying two different electromagnetic computer codes. The final results of these different approaches agree within 1.5 deg in effective directions and some percent in effective lengths (Fig. 4.1).

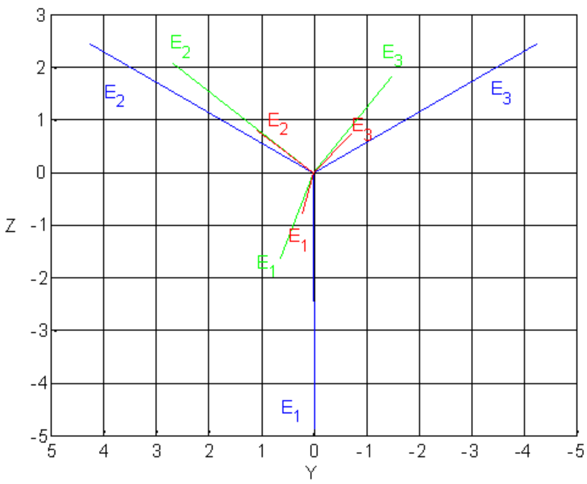

Fig. 4.1: Mechanical antennas (blue) of SWAVES antenna elements and their effective length vectors for open ports (green) and ports loaded with base capacitances (red). View is -X in the spacecraft reference frame.

In order to achieve such a high accuracy a careful modelling was essential, which was improved gradually by comparing the results of the different methods. Additionally, a new technique for the compensation of inexact antenna radii modelling was developed. Unrealistic radii have to be used for several reasons (in wire-grids because of the thin wire assumption of certain computer programs; in rheometry models for directional stability of antenna rods). The developed technique enables the correction of the antenna capacitance matrices, finally giving very accurate effective length vectors for loaded antennas (where base capacitances are included). The resulting effective length vectors are illustrated in Fig. 4.1 in comparison with the antenna rods.

Physics

Study of solar prominence oscillations damping mechanisms: Collisions between ions and neutrals are known to be an efficient energy dissipation mechanism, responsible for strong damping of MHD waves in partially ionised plasmas. The relevance of this mechanism in the damping of small amplitude prominence oscillations was evaluated. It has been shown that the presence of neutrals in the prominence plasma mostly affects the fast wave damping. The strongest damping takes place in a medium with a strong magnetic field, low density and low ionisation fraction.

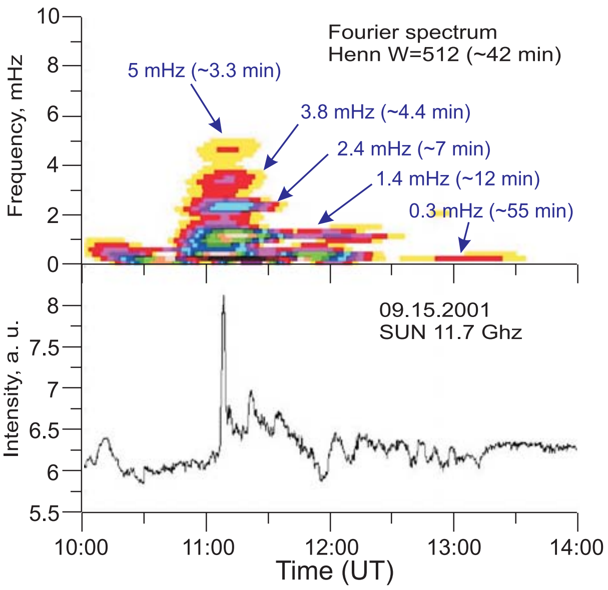

Fig. 4.2: Dynamic spectrum of long period modulation and microwave intensity profile before and after the flare on Sep. 15, 2001.

Microwave diagnostics of dynamical processes in solar active regions: Long-periodic modulations of solar microwave radiation were analysed using the "sliding window" Fourier analysis method. The dynamic spectra of these modulating signals (Fig. 4.2) make it possible to infer the physical and dynamical conditions in solar active regions and related groups of coronal magnetic loops. Using this method, 3-12 min damped post-flare kink- and sausage-mode oscillations of large and small loops and 55-min long-lived oscillations related to solar seismology processes, were detected.

4.2 Mercury

Mercury is the planet nearest to the Sun. It is a significantly dense planet, which suggests a large iron core and possesses a weak global magnetic field. The European/Japanese mission *BepiColombo* to Mercury will explore the planet in detail.

BepiColombo

The satellite mission *BepiColombo* to Mercury, the planet closest to the Sun, is not only the first big joint European-Japanese satellite project, it is also the first time that two spacecraft – *Magnetospheric (MMO*, Fig. 4.3) and *Planetary Orbiter (MPO)* – are simultaneously flying to this innermost planet. *BepiColombo* is scheduled for launch in 2013.

IWF is the lead institution for the magnetometer aboard the Japanese *MMO (MERMAG-M)* while for the *MPO* magnetometer *(MERMAG-P)* IWF is responsible for the overall technical management.

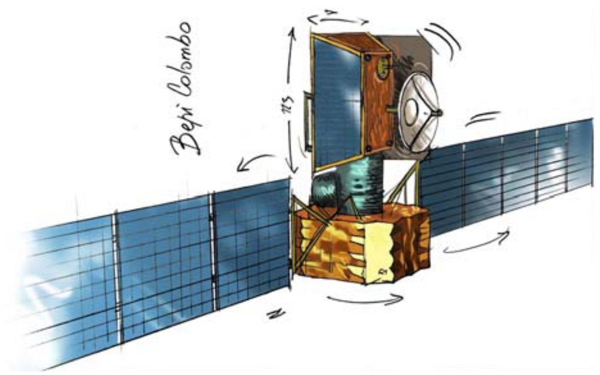

Fig. 4.3: An artist's impression of one of the BepiColombo spacecraft.

IWF also leads the building of a particle analyzer for ESA's *MPO*. The instrument *PICAM* (Fig. 4.4), which is part of the *SERENA* instrument suite, is an ion mass spectrometer operating as an all-sky camera for ions in the energy range up to 3 keV in the environment of Mercury.

In 2006, the definition of the magnetometers as well as of PICAM has been finalized.

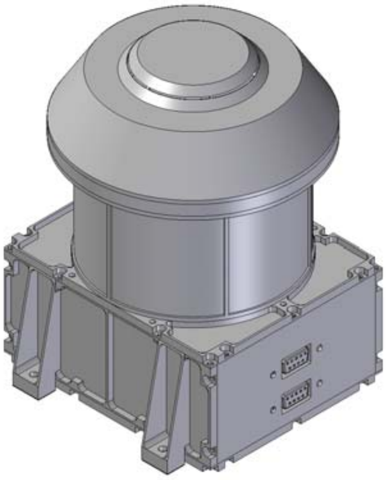

Fig. 4.4: The Planetary Ion Camera (PICAM) for MPO

Physics

Mercury 3-D Exosphere modeling: A 3-D exosphere model was developed which can use the geochemical composition based on fits of simulated ground based vis-NIR spectra of Mercury's surface. This surface corresponds of a mixture of 75% plagioclase and 25% of pyroxene with 0.1% submicroscopic iron particles (SMFe) and 30 µm grain size (1.2% FeO). For ion sputter exosphere simulations, the so-called TRIM code is connected to the exosphere model. This code is a part of the Stopping and Range of Ions in Matter (SRIM) program. The program calculates via a Monte Carlo method the stopping and range of ions (10 eV – 2 GeV / amu) into matter by using a full quantum mechanical treatment of ion-atom collisions. TRIM accepts complex targets made of compound materials with up to eight layers, each of different materials. Energy and ejection angle distributions of the particles are modelled at the surface with the emission process determining the actual distribution functions. The 3-D exosphere model follows the trajectory of each particle by numerical integration until the particle hits Mercury's surface again or escapes from the calculation domain. By using a large set of these trajectories, bulk parameters of the exospheric gas are derived. Fig. 4.5 shows first results of the 3-D simulations (cut through the equator) for sputtered Ca atoms from Mercury's surface.

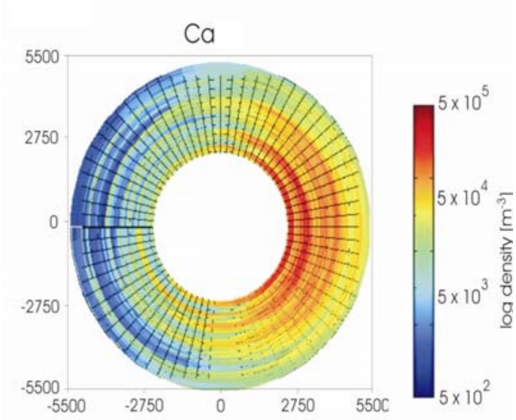

Fig. 4.5: Exospheric density distribution of sputtered Ca atoms as a function of altitude.

Substorms at Mercury: Although *Mariner 10* observed some magnetic signatures which can be associated with substorms, the actual existence of substorms at Mercury is still a debated issue.

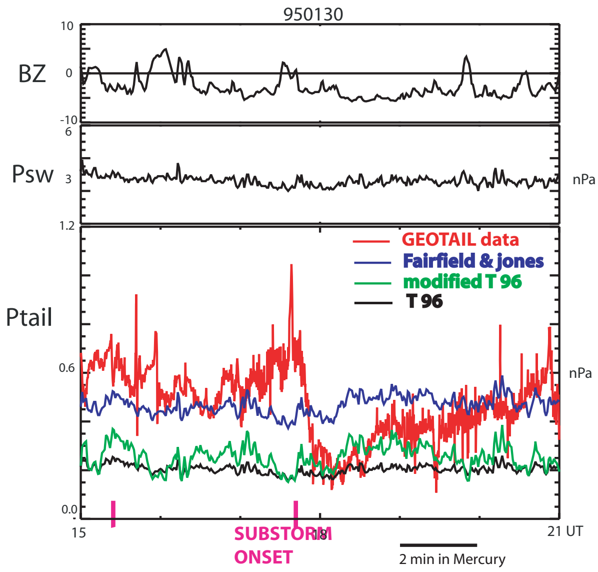

Fig. 4.6: Solar wind observations (two upper panels) and expected response of Mercury magnetotail (bottom panel) in case there is substorm (red trace) and without substorm (other traces).

The direct response to solar wind changes may produce similar magnetic field perturbations. The expected observations at Mercury are compared and contrasted for cases with and without substorms. Fig. 4.6 shows a comparison of the total pressure of Mercury's tail based on *Geotail* data (in the Earth's magnetotail but at a location similar to the up-coming *MMO* spacecraft; red trace) and empirical models applied to Mercury which take into account only the direct solar wind response (other traces).

4.3 Venus

Venus, the second planet from the Sun is now under great scrutiny after the arrival of *Venus Express*.

Venus Express

Venus Express, ESA's first mission to Venus, was launched successfully on 9 November 2005 in Baikonur. IWF takes the lead on one of the seven payload instruments, the magnetometer *VEX*-MAG. The *Venus Express* magnetometer MAG measures the magnetic field vector with a cadence of 128 Hz. It maps the magnetic properties in the magnetosheath, the magnetic barrier, the ionosphere, and the magnetotail. It is instrumented to identify the plasma boundaries between the various plasma regions and to study the solar wind interaction with Venus' atmosphere.

Fig. 4.7: An artist's impression of Venus Express in its orbit around the planet.

On 11 April 2006, the *Venus Express* spacecraft was successfully inserted into a Venus orbit (Fig. 4.7) and captured by the gravity of Venus. The magnetometer was switched on 12 April and the instrument performs nominally. On 4 June, *Venus Express* started nominal operation. Continuous data have been obtained. Data processing preparation for the magnetic field measurements is undertaken. A neural network algorithm has been built to automatically recognize patterns of disturbed magnetic field caused by spacecraft stray fields. Various models, with the help of spacecraft housekeeping data, have been built to remove the spacecraft field disturbances. The first version of cleaned data was issued to the science community on 17 November 2006.

Physics

First results from Venus Express: Renewed interest in the topic of the solar wind interaction with the planet Venus has been generated with the *Venus Express* mission. Although Venus has no internal magnetic dynamo, an induced magnetic field plays a major role in shielding the planet's atmosphere from erosion by the solar wind. The current understanding of the solar wind interaction with Venus is derived from measurements at solar maximum when the ionosphere and the induced magnetosphere are well developed. *Venus Express* observations at solar minimum, with improved instrumentation and new orbital trajectory, will improve the understanding of the interaction of the solar wind with the Venus atmosphere also for different circumstances.

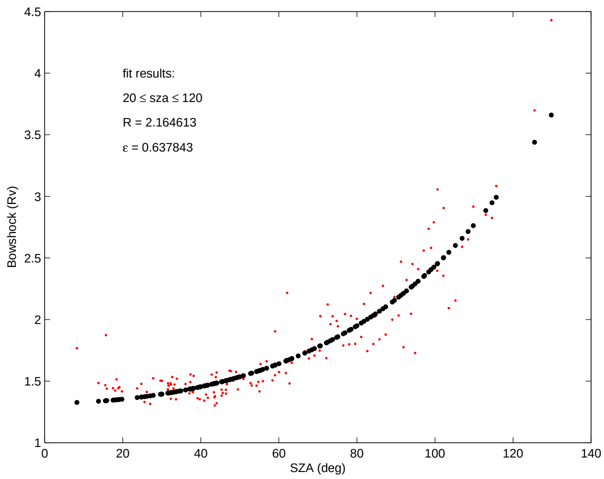

Fig. 4.8: A fit of the Venus Express bowshock crossings with respect to the solar zenith angle.

Preliminary results are deduced from the magnetic field measurements using the dual-sensor magnetometer on board *Venus Express*. It is found that the bow shock stands off from the planet at a distance only slightly inside of the position at solar maximum (Fig. 4.8). Nevertheless, the ionosphere appears to be completely magnetized and the ionopause location is much lower than that at solar maximum. The near magnetotail appears to be toroidal with near complete wrapping of the interplanetary magnetic field around the planet. These results indicate that the Venus interaction at solar minimum resembles that at solar maximum when the solar wind pressure dominates the ionospheric pressure.

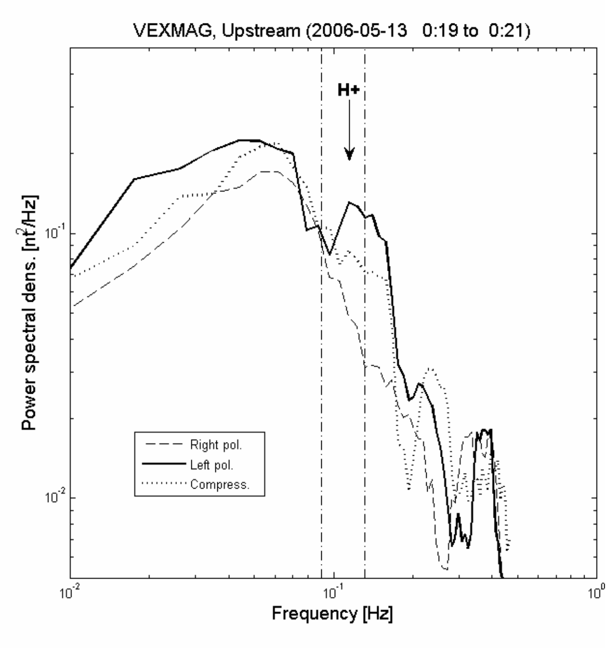

Fig. 4.9: Power spectrum of magnetic field data, showing enhanced power at the local proton cyclotron frequency at times where the SC is upstream of the Venus bow shock.

Furthermore, the appearance of proton cyclotron waves in the solar wind was detected for the first time (Fig. 4.9). The magnetometer detected left-hand polarized waves at the local proton cyclotron frequency already upstream of the Venus bow shock. These waves are interpreted as being generated by pick-up ions, due to ionization of exospheric hydrogen and subsequent acceleration by the solar wind electric field. This result shows that also at Venus pick-up processes are already taking place at large upstream distance from the planet.

The escape of particles is an important key towards understanding the Venus atmospheric composition and evolution over the lifetime of the solar system. The new observations prove that in addition to thermal escape also pick-up processes from the extended exosphere by the on-streaming solar wind play a significant role in removing hydrogen from the atmosphere.

The Kelvin-Helmholtz instability at Venus: When the solar wind is diverted around the ionosphere of Venus, a relative velocity shear between the solar wind and the ions in the ionosphere exists. Due to this velocity shear, the Kelvin-Helmholtz (KH) instability can arise. Considering a finite thickness of the boundary layer between the solar wind and the ionosphere, across which both the velocity and the density change, the growth rates of the Kelvin-Helmholtz instability are calculated for different solar wind and ionospheric conditions in the vicinity of Venus.

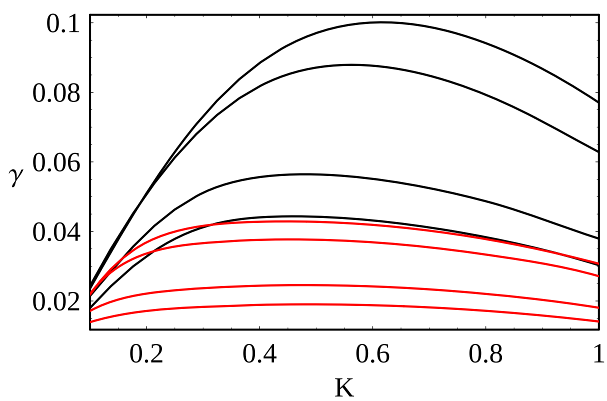

Fig. 4.10: Normalized growth rates γ as a function of the normalized wave number K. Black lines are the results for a ionospheric density of 10^3 cm^{-3}, red lines are for a density of 10^4 cm^{-3}. The two upper black/red curves are for high, the two lower black/red curves are for low solar activity.

The results show on the one hand that the growth rates are larger for high solar activity than for low activity and on the other hand that a denser ionosphere decreases the growth rates substantially (red curves in Fig. 4.10). Comparing the characteristic instability growth times with the wave propagation times, we see that KH waves are able to grow and possibly break, which causes a turbulent boundary and can lead to the detachment of plasma clouds. Observations at Venus show wave-like structures at the boundary between the solar wind and the ionosphere and plasma clouds in the magnetosheath above this boundary.

Exosphere temperature influence by hot atoms: The discrepancies were studied between Venusian exospheric temperature determinations from topside plasma scale heights and from electron distributions near the ionospheric maximum. The reason seems to lie in the fact that thermal and photochemical equilibrium applies only at altitudes below 170 km, whereas topside scale heights are derived for much higher altitudes where they are modified by transport processes and where local thermodynamic equilibrium (LTE) conditions are violated.

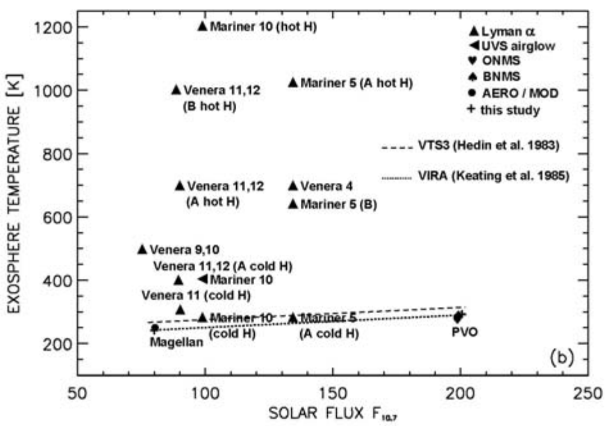

Fig. 4.11: Exospheric daytime temperature estimations based on the data of various missions during the solar cycle for Venus. Only Chapman-fits through the ionospheric electron peak give similar exobase temperature values as observed by PVO.

Moreover, from simulating the energy density distribution of photochemically produced moderately energetic H, C and O atoms, as well as CO molecules, it is argued that exospheric temperatures inferred from Lyman-α dayglow and UV airglow observations (Fig. 4.11) result in too high values. The reason is that these energetic neutral atoms are transformed via charge exchange processes, and may contribute to the observed neutral hot gas planetary coronae.

4.4 Jupiter

Jupiter, the largest planet of our solar system, is a strong source of radio emissions. Some of these are generated by an interaction with the satellite Io, others also by the interaction of the solar wind with the strong Jovian magnetic field.

Modulation lanes in decametric radiation spectra: Intriguing kinds of modulations present in the Jovian dynamic spectra are the so called “modulation lanes”: groups of lanes with alternating high and low intensity, drifting in the frequency-time plane. These features can exhibit different drifts (positive, negative) and comprise an average drift rate of 100 kHz/s. The classical modulation lanes generally cover the whole frequency range and the usual frequency spacing between adjacent modulation lanes is approximately 100 – 300 kHz. The modulation depth (i.e. the intensity variation) is a few dB. The sign of drift shows a very strong dependence on the Jovian Central Meridian Longitude (CML) and this is the essential argument in favor of the suggestion that this modulation effect takes place in the Jovian magnetosphere.

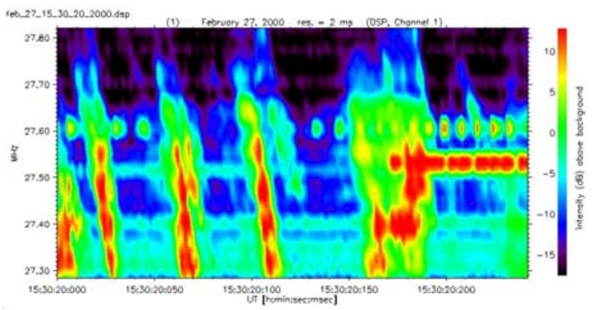

Fig. 4.12: Modulation lanes in the radio spectrum from Jupiter observed from ground stations.

While modulation lanes intersect Jovian S-burst emission (Fig. 4.12), new specific case studies revealed one of the many localizations of the origin of this phenomenon, as field-aligned magnetospheric density inhomogeneities near the magnetic shell of Amalthea.

4.5 Saturn and Titan

In 2006 *Cassini* has continued its investigation of the Saturnian system and has made several flybys of the moon Titan and various others like Enceladus and Tethys. After the successful landing of the European *Huygens* probe on Saturn's largest moon Titan, the data of the various experiments are now being processed and interpreted.

IWF is strongly involved in the *Radio and Plasma Wave Science Experiment (RPWS)* onboard the *Cassini* orbiter as well as the *Huygens Atmospheric Structure Instrument (HASI)*, the *Aerosol Collector and Pyrolyser (ACP)*, and the *Surface Science Package (SSP)* aboard *Huygens*.

Physics

Ground-based observations of SEDs at Saturn: During the *Voyager 1* and *2* flybys at Saturn in the early 80s of the last century Saturn Electrostatic Discharges (SEDs) have been detected as a radio phenomenon caused by huge lightning storms in the Saturnian atmosphere. These short-lived radio bursts comprise a wide frequency band from a few MHz up to the maximum detectable frequency of the *Cassini Radio and Plasma Wave Science experiment (RPWS)* experiment.

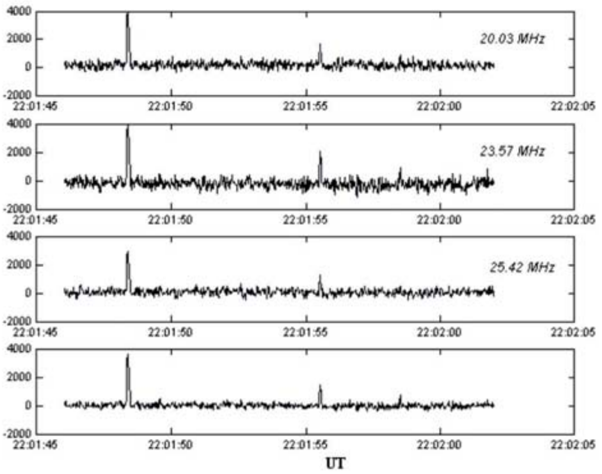

Fig. 4.13: Ground based UTR-2 observations of SEDs.

The *RPWS* could again successfully observe this phenomenon. Embedded within atmospheric storm systems differentially rotating with Saturn, several atmospheric systems with corresponding lightning have been detected with various rotational periodicities.

Since the first spacecraft detection of SEDs strong emphasis has been laid on the observational verification from Earth, given the fact that both frequency and flux density (between 100 and 1000 Jy) would enable a corresponding detection. The new implementation of state-of-the-art backend facilities (*Digital Spectro Polarimeter, DSP*, a joint Austrian-French development) at the world-largest decametric radio telescope UTR-2 at Kharkov (Ukraine) made the detection of Saturn SEDs possible in early 2006 (Fig. 4.13).

Saturn Kilometric Radiation: Within the frame of the *RPWS/CASSINI* experiment several topics were investigated. The spectral and temporal evolutions of long periodic modulations of the Saturnian Kilometric Radiation (SKR) and near-Saturn solar wind parameters were analyzed using "sliding window" Fourier transform and nonlinear Wigner-Ville methods. The observed modulations (Fig. 4.14) may be related to influences of particular Saturn's moons on the SKR generation, solar wind parameter variations, as well as internal dynamic processes in Saturn's magnetosphere.

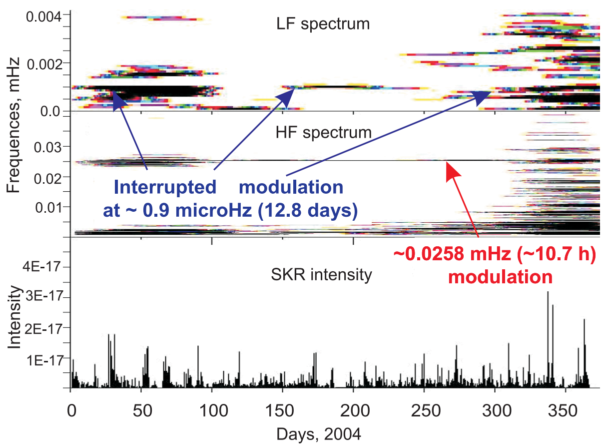

Fig. 4.14: Example of the long periodic modulation lines of SKR. The ~10.7 hour and ~12.8 days lines are shown.

A statistical study of SKR spectra using different types of envelope spectra has been performed to derive the high and low frequency limits of the radiation and their variation. The *RPWS* full polarization measurement capability allows a separate analysis of the northern and southern radio sources.

The release of the *Huygens* probe in the beginning of the Saturn orbital tour requires a new in-flight calibration of the *RPWS* antennas. New antenna calibration analysis uses solar type III bursts.

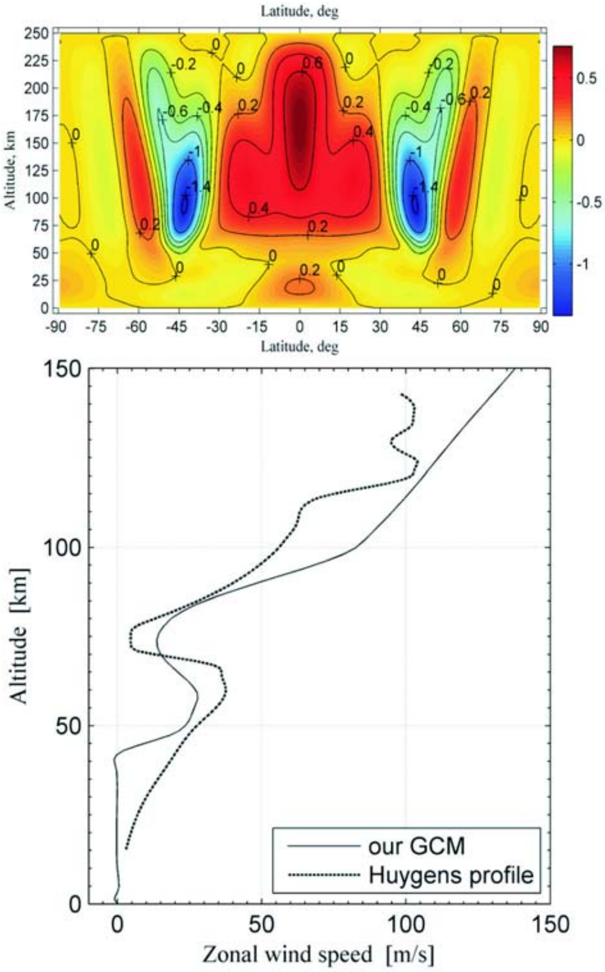

Fig. 4.15: Upper panel: Vertical wind component at 164° E as derived from the GCM. Lower panel: The dotted line shows the zonal wind height profile derived from the Huygens Doppler Wind Experiment. The solid line depicts the zonal wind height profile derived from the GCM at latitude 7.3° N and longitude 164° E, corresponding to the atmospheric entry point of the Huygens probe.

Titan 3-D circulation modeling: A 3-D General Circulation Model (GCM) to Titan's atmosphere was applied which differs from traditional models in that respect that the hydrostatic equation is not used and all three components of the neutral gas velocity are obtained from the numerical solution of the Navier-Stokes equation. The GCM uses a predescribed temperature field in the model region avoiding the complex simulation of radiative transfer based on the energy equation. The wind speeds obtained from the GCM correspond well with data obtained during the *Huygens* probe descent through Titan's atmosphere as shown in Fig. 4.15.

Chemical evolution in Titan's atmosphere and surface: The *Huygens* probe provided data on the composition of Titan's atmosphere and surface. These were taken as initial conditions in an experimental laboratory setup at the University of Innsbruck.

A simulation of chemical processes under the given conditions, involving lightning bolts showed that, in addition to the production of higher hydrocarbons, the inclusion of water ice in the reaction scenario leads to oxygen containing compounds which include several basic molecules relevant for the formation of, e.g., amino acids. Thus the chemistry on Titan's surface may produce C-H-O-N compounds under completely different atmospheric conditions compared to those assumed for the primordial earth.

4.6 Comets

Rosetta

ESA's *Rosetta* probe continues its journey to comet Churyumov-Gerasimenko, where it will arrive in 2014 to investigate the evolution of the comet during its approach to the Sun from an orbiter and by a landing module which will be dropped onto its nucleus. Under the leadership of IWF an atomic force microscope *MIDAS* was built. Furthermore, the institute has built parts of the mass spectrometer *COSIMA*, parts of the two magnetometers *RPC-MAG* and *ROMAP* on both orbiter and lander, and participated in developing and building the penetrometer *MUPUS*, which will measure the heat conduction and elasticity of the cometary surface.

Regular check-outs of the payload and the spacecraft are scheduled during the cruise phase. Two check-outs without real-time contact were carried out in March and August 2006, followed by an "active" check-out in December with the possibility for real-time telemetry reception and commanding of critical activities. No problems were reported. In parallel, format and contents of the archive data sets have been reviewed, and first data of ground and cruise phase measurements have been delivered to the archive.

4.7 Exoplanets

Exoplanets, i.e., planets around stars other than our Sun, have become a new and exciting research topic since their discovery in the late 1990s. Many have been found now (approximately 200), it started with “super Jupiters” in close orbits around their star, but as techniques improved, smaller and more distant planets have been observed.

COROT

In co-operation with the Institute for Astronomy, University of Vienna, IWF contributes to the French space telescope *COROT* (Convection, Rotation and Planetary Transit, Fig. 4.16).

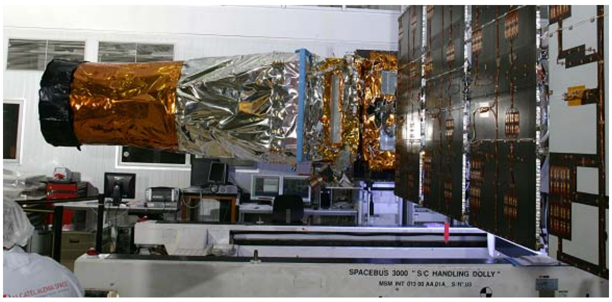

Fig. 4.16: The COROT instrument integrated with the PROTEUS platform (Photo CNES).

The scientific goal is the investigation of dynamic processes in the interior of stars and the search and survey of extrasolar planets. In both areas, astroseismology and exoplanetology, the variation of the brightness of stars is the key parameter. The determination of these variations is done by high precision photometry, with a resolution better than 10 ppm. In astroseismology, the amplitude and frequency of brightness variations is used to derive the oscillation mode and, furthermore, to determine the physical and chemical processes in the interior. Variations in the brightness can be caused by bypassing planets, too. To distinguish variations due to oscillations from bypassing planets, spectral analysis in the red and blue zone is performed.

IWF developed and built the so-called extractor *BEX* (Boîtiers Extracteur), a computer system with dedicated pre-processors for the selection and classification of image data. The in-house developed pre-processors allow the identification of pixels, which are part of predefined image areas. The essential technology is hardware supported data mining under the constraints for real-time operation.

The first half of 2006 was dedicated to tests with the integrated payload. Due to problems with the new launcher Soyuz 2-1b, the COROT launch planned for July was shifted to December 2006.

Physics

CME-Hot Jupiter interaction: To study the mass-loss effects of colliding stellar Coronal Mass Ejections (CMEs) on the atmospheres of Hot Jupiter’s for the first time, the exoplanet HD209458b ($r = 1.43r_{Jup}$, $M = 0.69M_{Jup}$), which orbits a 4.0 – 5.0 Gyr old Sun-like star at a distance of about 0.045 AU, is taken as an example. The results show that the colliding dense CME plasma at 0.045 AU can compress the magnetospheric stand-off distance of short periodic Hot Jupiters down to the heights at which the ionization and pick-up of the planetary neutral atmosphere by the CMEs plasma flow take place (Fig. 4.17). The atmospheric mass loss is calculated with a numerical test particle model. Using the observed solar CME occurrence rate and assuming the same for the host star, the possible total mass loss rates of HD209458b, over its lifetime can be estimated. It is found that under different estimated values of expected magnetic moments, HD209458b could have lost from 0.2 up to several times its present mass. Because it is doubtful that HD209458b could have lost mass of more than its present value, these results may be considered as an indication that this planet, and similar Hot Jupiters, should have intrinsic magnetic fields which are strong enough to balance the dense CME plasma flow at sufficiently high planetocentric distances.

Hot Jupiters with weaker magnetic moments should be highly eroded or may even not survive the interaction of their atmospheres with the dense CME plasma flux. It is expected that such lower mass bodies or remaining cores of short-periodic gas giants should be observed at close stellar distances during the CoRoT mission.

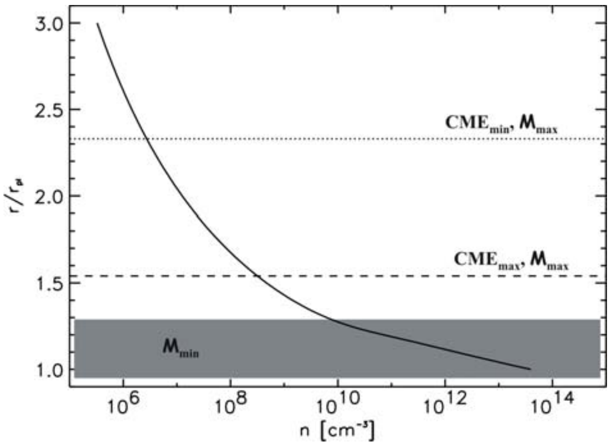

Fig. 4.17: Neutral hydrogen density profile of the upper atmosphere of HD209458b. The dotted and dashed lines mark the magnetopause stand-off distance corresponding to the minimum and maximum CME plasma densities respectively, and the maximum expected magnetic moment M_{max} = 0,1 M_{Jup}.

5 Engineering & Testing

Instruments onboard spacecraft are exposed to harsh environments, e.g., vacuum, large temperature ranges, radiation and high mechanical loads during launch. Furthermore, these instruments are expected to be highly reliable, providing full functionality over the entire mission time, which could last for even more than ten years.

5.1 Test Facilities

Vacuum Chambers

Large Vacuum Chamber: This large size vacuum chamber features a stainless steel body and door with a horizontal cylindrical configuration, a vision panel, two turbo molecular pumps (500 litres/s each) and a dry scroll forepump (500 litres/min), see Fig. 5.1. A vacuum chamber pressure of 10^{-7} mbar can be achieved. The cylinder has a diameter of 650 mm and a length of 1650 mm. During shutdown the chamber is vented with nitrogen. Electrical feed-through to the experiments is provided by sub-D connectors as well as light wave conductor plugs. A target manipulator inside the chamber allows for computer-controlled rotation of the target around three mutually independent perpendicular axes. The vacuum chamber is enclosed by a permalloy layer for magnetic shielding. In order to enable the baking of structures and components to outgass volatile products and unwanted contaminations, the chamber is equipped with a heater placed symmetrically around the circumference.

Thermal Vacuum Chamber: This thermal vacuum chamber is fitted with a turbo pumping system which allows quick change-over of components. The test chamber supports a temperature range between -90 °C up to +140 °C at a pressure level of 10^{-6} mbar. The vertically oriented cylindrical chamber allows a maximum experiment diameter of 410 mm and a maximum experiment height of 320 mm. The system is equipped with a turbo molecular pump, a dry scroll forepump (300 litres/min), and an ion getter pump (500 litres/s). A thermal plate is installed in the chamber which is used for the thermal cycling of electronic boxes and other components. Nitrogen is used for cooling and venting. Several electrical feed-throughs are installed (1 x 37-pin sub D connector, 1 x 61-pin sub D connector, 2 x Space Wire; 2 x 8-pin connectors).

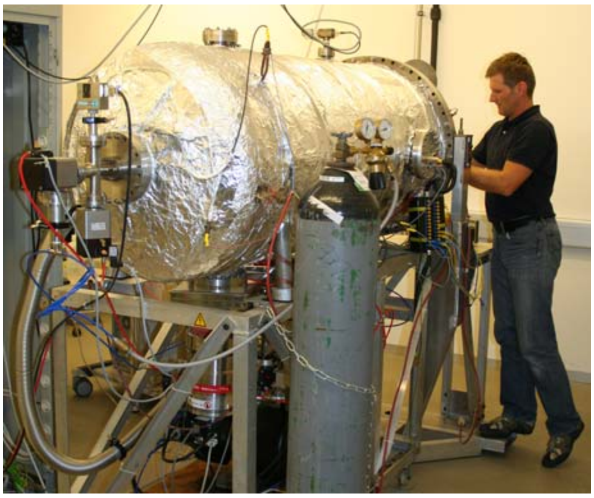

Fig. 5.1: Large Vacuum Chamber

Small Size Vacuum Chamber: This is a manually controlled, cylindrical vacuum chamber (dimensions: 160 mm diameter, 300 mm length) for small electronic components or printed circuit boards. The system features a turbo molecular pump and an oil lubricated rotary vane fore pump. A pressure level of 10^{-10} mbar can be achieved. Installed electrical feed-troughs are a 19-pin circular connector and 4+10 high voltage connectors.

Temperature Test Chamber: The temperature test chamber allows to verify the resistance of the electronic components and circuits to all temperature conditions that occur under natural conditions. The chamber has a test space of 190 litres and is equipped with a powerful 32-bit control and communication system. The temperature ranges from -40 degrees to +180 degrees Celcius.

Chamber Surface Laboratory: dedicated to surface science research, LN2 cooled. Diameter 40 cm, height 40 cm with extensions to 80, and 120 cm. Two rotary vane pumps, one turbo-molecular pump, min. pressure 10^{-5} mbar.

Sample chamber: dedicated to the measurement of sample electrical permittivity. One rotary vane pump, min. pressure 10^{-3} mbar, 8µ particle filter.

Other Facilities

Clean Bench: The laminar flow clean bench is a work bench which has its own filtered air supply. It provides product protection by ensuring that the work in the bench is exposed only to HEPA-filtered air (HEPA = High Efficiency Particulate Air). The clean bench is class B certified according to the EG-GMP regulations. The internal dimensions are 1.18 x 0.60 x 0.56 meters.

Vapour Phase Soldering Machine: The vapour phase soldering machine IBL SLC304 for in-line use is suitable for mid size volume production. The maximum board size is 340 x 300 x 80 millimetres. Vapour phase soldering, also known as VP soldering, or vapour phase reflow, is currently the most flexible, simplest and most reliable method of soldering. It is ideally suited for all types of SMD components and base materials. It allows processing of all components without the need of any complicated calculations or having to maintain temperature profiles.

Clean Room: Class 10.000 (according to U.S. Federal Standard 209e) certified laboratory with a total area of 30 square metres. The laboratory is used for flight hardware assembling and testing and accommodates up to 6 engineers.

Penetrometry Test Stand: A penetrometry test facility designed to measure mechanical soil properties, like bearing strength, is available since January 2004.

UV Exposure Facility: The UV exposure facility is capable to produce radiation between 200-400 nm (UV-A, B, C).

Magnetometer Calibration: A three-layer magnetic shielding made from mu-metal is used for all basic magnetometer performance and calibration tests. The remaining DC field in the shielding is < 10 nT and the remaining field noise is < 2 pT/√Hz at 1 Hz. A special coil system allows the generation of a 3-D field vector with an absolute value of up to +/-30.000 nT around the sensor under test.

Temperature Test Facility: With the IWF temperature test facility magnetic field sensors can be tested over an extended temperature range from -170 °C up to +220 °C in a low field and low noise environment. Liquid nitrogen is the base substance for the regulation which is accurate to +/-0.1°C. A magnetic field of up to +/-100.000 nT can be applied to the sensor during the test cycles.

5.2 New Instruments

Magnetometer Chip: An instrument front-end ASIC (Application Specific Integrated Circuit) for magnetic field sensors (fluxgate principle) has been developed by IWF in cooperation with the Fraunhofer Institute for Integrated Circuits in order to reduce instrument size, mass and power consumption while increasing the radiation tolerance at the same time.

In 2006, the second version of the chip (0.35 µm CMOS process from Austria Microsystems) was designed and manufactured. The noise level in the magnetic field channels could be further reduced so that it is now below 10 pT/√Hz for frequencies above 1 Hz (Fig. 5.2). The shaped quantization noise above 100 Hz, which is typical for sigma-delta modulator based digitization, is filtered out by the decimation filters in the digital part of the chip.

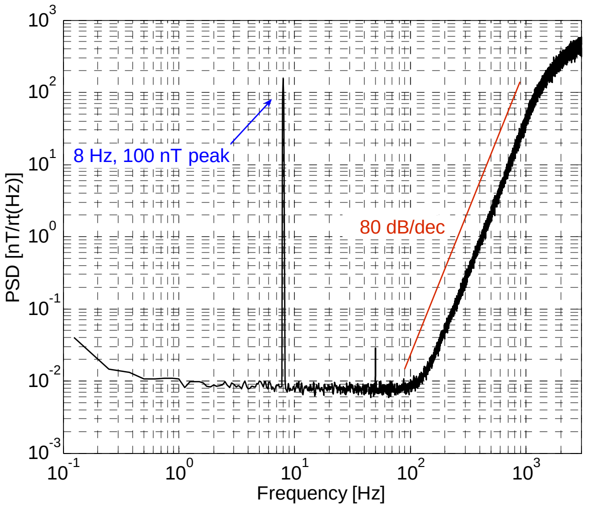

Fig. 5.2: Power spectral density (PSD) of one of the three magnetic field channels

Flexible EGSE Platform: The development of flight hardware requires dedicated test equipment to simulate and verify the instrument interfaces to spacecraft and sensors.

A flexible Electrical Ground Support Equipment (EGSE) platform usable for several applications was developed, a General Purpose EGSE (GP-EGSE), Fig. 5.3. After the analysis of typical EGSE applications, a stand-alone device with standard interfaces, USB and Ethernet, was build, to communicate with a computer. The present design is built around the XILINX VIRTEX-II XC2V2000, providing space for logic design up to an equivalent gate count of two million system gates.

Four connectors provide 148 digital I/O lines interfacing to application specific daughter boards with necessary interface drivers or analogue circuitries. To facilitate the logic design, the 16-bit full duplex FIFO based data interface is provided as VHDL code. The driver routines at the PC side and a basic LabView application for configuration and operation of the GP-EGSE are provided too.

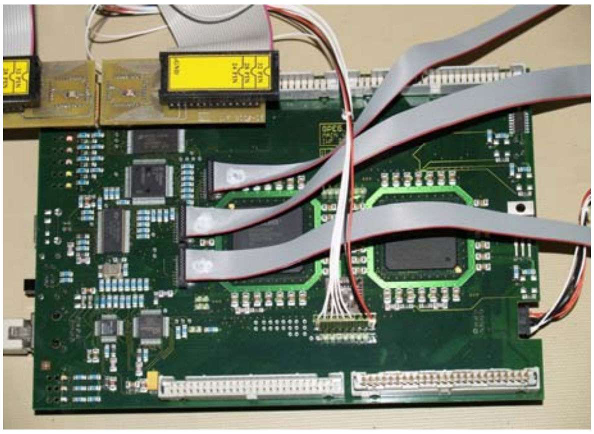

Fig. 5.3: Photograph of the GP-EGSE board

8085 VHDL CORE: In the course of the controller developments for the projects BepiColombo/PICAM and MMS/ASPOC a synthesisable 8085 VHDL microprocessor core has been developed by IWF. Although the core module was primarily intended for use in an ACTEL RTAX1000 FPGA it can be easily implemented in any other FPGA device. For the core's functional verification debug hardware and software have been developed in parallel.

The implementation of a test interface enables access to all internal 8085 registers. Together with appropriate debug hardware this feature offers a valuable debug function during programme design. The core emulates almost all instruction codes of Intel's original 8085 microprocessor. Furthermore the user can select which instructions should be implemented and can so reduce the required FPGA resources. The core's programme code can be run either in FPGA-internal or external RAM. Four hardware interrupts (RST and Trap) as well as all software interrupts are supported. The resource usage for an ACTEL RTAX1000S FPGA is 14 %

of the combinational cells and 6 % of the sequential cells.

Melting Probe: Major work was devoted to the development of a first prototype of a melting probe in the frame of an ESA contract. The probe is a 6 cm diameter and 22 cm long device of cylindrical shape. It consists of three compartments: an ogive-shaped tip made of brass, a central part containing the steering and measurement electronics, and a rear part where the tether is stored. Temperature sensors are distributed inside the probe both in the vicinity of the heater foils (which are installed in the tip and along the cylindrical mantle) and inside the electronics and cable compartments. After preliminary tests in a vacuum environment, an ice penetration test was performed in September 2006 in the big space simulator at DLR Köln. shows the probe melted into the ice after completion of the test. It is planned to continue this activity over the next two years, in the course of which another prototype with improved performance will be built and tested.

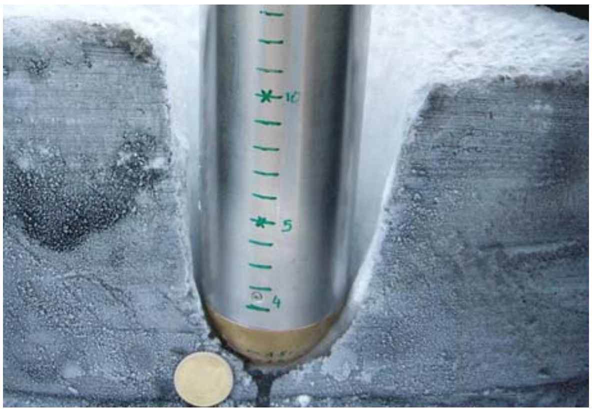

Fig. 5.4: Melting probe in an ice sample after completion of an ice penetration test under cryo-vacuum conditions.

Mutual Impedance Measurements: In order to characterize the electrical properties of iron rich minerals as they occur at the surface of Mars an impedance spectrometer, which enables to measure the permittivity and impedance of such materials, was used. Part of the measurements was carried out under vacuum or low atmospheric pressure conditions. This database was then used to continue the work on a mutual impedance instrument which was inherited from ESA.

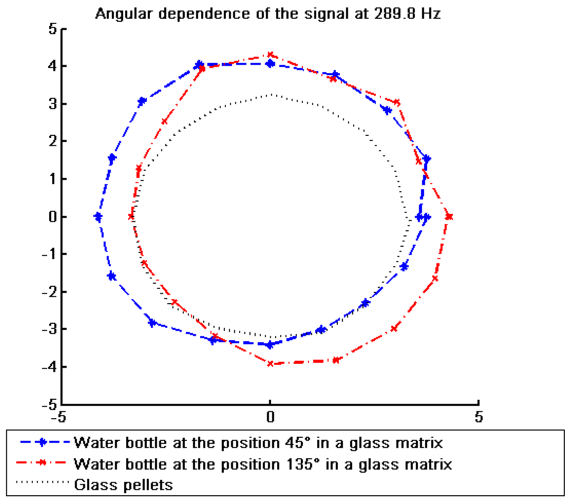

Fig. 5.5: Results of the impedance measurements

The instrument can detect inclusions of, e.g., water rich minerals embedded in other materials (see Fig. 5.5: Results of the impedance measurements). An improved version of this method is proposed as part of the HP3 instrument for the “Geophysical Package” on the EXOMARS mission.

Rheometry principles: Rheometry is a method to study antenna properties on the basis of electrolytic tank measurements. Although this technique is well established, several improvements have been achieved at IWF recently. They involve the determination of error influences and the measurement of antenna capacitances and surface impedances. The measurement of self- and mutual antenna capacitances enables one to determine the antenna effective length vectors for the loaded antenna. So a complete analysis of spaceborne electric field sensors (monopoles) for the quasi-static frequency range is achieved on the basis of the rheometry technique.

6 Publications & Talks

6.1 Refereed Articles

Amm, O., R. Nakamura, H.U. Frey, Y. Ogawa, M. Kubyshkina, A. Balogh, H. Rème: Substorm topology in the ionosphere and magnetosphere during a flux rope event in the magnetotail, *Ann. Geophys.*, **24**, 735–750 (2006)

Arkhypov, O.V., H.O. Rucker: Ultra low frequencies phenomena in Jovian decametric radio emission, *Astron. Astrophys.*, **452**, 347–350 (2006)

Asano, Y., R. Nakamura, A.V. Rounov, W. Baumjohann, C. McIlwain, G. Paschmann, J. Quinn, I. Alexeev, J.P. Dewhurst, C.J. Owen, A.N. Fazakerley, A. Balogh, H. Rème, B. Klecker: Detailed analysis of low-energy electron streaming in the near-Earth neutral line region during a substorm, *Adv. Space Res.*, **37**, 1382–1387 (2006)

Baumjohann, W., A. Matsuoka, K.H. Glassmeier, C.T. Russell, T. Nagai, M. Hoshino, T. Nakagawa, A. Balogh, J.A. Slavin, R. Nakamura, W. Magnes: The magnetosphere of Mercury and its solar wind environment: Open issues and scientific questions, *Adv. Space Res.*, **38**, 604–609 (2006)

Bhattacharjee, A., W. Baumjohann, Z. Pu: Editorial, *J. Geophys. Res.*, **111**, A07000 (2006)

Cao, J.B., Y.D. Ma, G. Parks, H. Rème, I. Dandouras, R. Nakamura, T.L. Zhang, Q. Zong, E. Lucek, C.M. Carr, Z.X. Liu, G.C. Zhou: Joint observations by Cluster satellites of bursty bulk flows in the magnetotail, *J. Geophys. Res.*, **111**, A04206 (2006)

Carr, C., P. Brown, T.L. Zhang, Ö. Aydogar, W. Magnes, U. Auster, A. Balogh, T. Beek, H.-U. Eichelberger, K.-H. Fornacon, E. Georgescu, J. Gloag, H. Liao, M. Ludlam, R. Nakamura, H. O´Brien, T. Oddy, I. Richter: The Double Star magnetic field investigation: Overview of instrument performance and inital results, *Adv. Space Res.*, **38**, 1828–1833 (2006)

Deng, X.H., R.X. Tang, H. Matsumoto, J.S. Pickett, A.N. Fazakerley, H. Kojima, W. Baumjohann, A. Coates, R. Nakamura, D.A. Gurnett, Z.X. Liu: Observations of electrostatic solitary waves associated with reconnection by Geotail and Cluster, *Adv. Space Res.*, **37**, 1373–1381 (2006)

Engwall, E., A.I. Eriksson, M. André, I. Dandouras, G. Paschmann, J. Quinn, K.M. Torkar: Low-energy (order 10eV) ion flow in the magnetotail lobes inferred from spacecraft wake observations, *Geophys. Res. Lett.*, **33**, L06110 (2006)

Engwall, E., A.I. Eriksson, M. André, I. Dandouras, G. Paschmann, J. Quinn, K.M. Torkar: Correction to "Low-energy (order 10 eV) ion flow in the magnetotail lobes inferred from spacecraft wake observations", *Geophys. Res. Lett.*, **33**, L14102 (2006)

Eriksson, A.I., M. André, B. Klecker, H. Laakso, P.-A. Lindqvist, F. Mozer, G. Paschmann, A. Pedersen, J. Quinn, R. Torbert, K.M. Torkar, H. Vaith: Electric field measurements on Cluster: comparing the double-probe and electron drift techniques, *Ann. Geophys.*, **24**, 275–289 (2006)

Erkaev, N., A. Mezentsev, H.K. Biernat: Influence of the interplanetary magnetic field on the solar wind flow about planetary obstacles, *Space Sci. Rev.*, **122**, 209–219 (2006)

Erkaev, N.V., V.A. Shaidurov, V.S. Semenov, H.K. Biernat, D. Heidorn: Dissipation of Alfvén wave pulses propagating along dipole magnetic tubes with reflections at the ionosphere, *Adv. Space Res.*, **37**, 576–580 (2006)

Falkovich, I.S., A.A. Konovalenko, N.N. Kalinichenko, M.R. Olyak, A.A. Gridin, I.N. Bubnov, A. Lecacheux, H.O. Rucker: Variations of parameter of solar wind stream structure outside 1 AU in 2003–2004, *Radiophys. Radioastron.*, **11**, 31–41 (2006)

Fischer, G., M.D. Desch, P. Zarka, M.L. Kaiser, D.A. Gurnett, W.S. Kurth, W. Macher, H.O. Rucker, A. Lecacheux, W.M. Farrell, B. Cecconi: Saturn lightning recorded by Cassini/RPWS in 2004, *Icarus*, **183**, 135–152 (2006)

Fischer, G., W. Macher, D.A. Gurnett, M.D. Desch, A. Lecacheux, P. Zarka, W.S. Kurth, M.L. Kaiser: Discrimination between Jovian radio emissions and Saturn electrostatic discharges, *Geophys. Res. Lett.*, **33**, L21201 (2006)

Friedrich, M., G. Egger, K.M. Torkar: First results of the polar cap ionosphere based on EISCAT Svalbard and Heiss Island rocket data, *Adv. Space Res.*, **37**, 1097-1101 (2006)

Friedrich, M., K.M. Torkar, G.A. Lehmacher, C.L. Croskey, J.D. Mitchell, E. Kudecki, M. Milla: Rocket and incoherent scatter radar common-volume electron measurements of the equatorial lower ionosphere, *Geophys. Res. Lett.*, **33**, L08807 (2006)

Golovchanskaya, I.V., A. Kullen, Y.P. Maltsev, H.K. Biernat: Ballooning instability at the plasma sheet-lobe interface and its implications for polar arc formation, *J. Geophys. Res.*, **111**, A11216 (2006)

Grard, R., M. Hamelin, J.J. López-Moreno, K. Schwingenschuh, I. Jernej, G.J. Molina-Cuberos, F. Simoes, R. Trautner, P. Falkner, F. Ferri, M. Fulchignoni, R. Rodrigo, H. Svedhem, C. Béghin, J.-J. Berthelier, V.J.G. Brown, M. Chabassière, J.M. Jeronimo, L.M. Lara, T. Tokano: Electric properties and related physical characteristics of the atmosphere and surface of Titan, *Planet. Space Sci.*, **54**, 1124-1136 (2006)

Gubchenko, V.M., H.K. Biernat, M.L. Khodachenko, H.O. Rucker, V.V. Zaitsev: On the formation of three types of e.m. elements in a current-carrying plasma with double flows, *Adv. Space Res.*, **37**, 1295-1300 (2006)

Gubchenko, V.M., H.K. Biernat, M.L. Khodachenko, H.O. Rucker, V.V. Zaitsev: Reply to the comment on the paper "On the formation of three types of e.m. elements in a current-carrying plasma with double flows", *Adv. Space Res.*, **38**, 1898-1899 (2006)

Gubchenko, V.M., V.V. Zaitsev, H.K. Biernat, M.L. Khodachenko, H.O. Rucker: On the 3D kinetic approach to solar streamer modelling, *Central Europ. Astrophys. Bull.*, **30**, 113-130 (2006)

Hegedüs, M., G. Kovács, K. Módos, G. Rontó, H. Lammer, C. Panitz, A. Fekete: Exposure of phage T7 to simulated space environment: The effect of vacuum and UV-C radiation, *J. Photochem. Photobiol. B: Biol.*, **82**, 94-104 (2006)

Israel, G., C. Szopa, F. Raulin, M. Cabane, H.B. Niemann, S.K. Atreya, S.J. Bauer, J.-F. Brun, E. Chassefière, P. Coll, E. Condé, D. Coscia, A. Hauchecorne, P. Millian, M.J. Nguyen, T. Owen, W. Riedler, R.E. Samuelson, J.-M. Siguier, M. Steller, R. Sternberg, C. Vidal-Madjar: Astrochemistry: Complex organic matter in Titan's aerosols? (Reply), *Nature*, **444**, E6-E7 (2006)

Kaufmann, E., N.I. Kömle, G. Kargl: Laboratory simulation experiments on the solid-state greenhouse effect in planetary ices, *Icarus*, **185**, 274-286 (2006)

Keika, K., M. Nosé, P.C. Brandt, S. Ohtani, D.G. Mitchell, E.C. Roelof: Contribution of charge exchange loss to the storm time ring current decay: IMAGE/HENA observations, *J. Geophys. Res.*, **111**, A11512 (2006)

Khodachenko, M.L., A.G. Kislyakov, H.O. Rucker, V.V. Zaitsev, S. Urpo: Microwave diagnostics of dynamic processes and oscillations in groups of solar coronal magnetic loops, *Space Sci. Rev.*, **122**, 137-148 (2006)

Khodachenko, M.L., H.O. Rucker, A.G. Kislyakov, V.V. Zaitsev, S. Urpo: Electrodynamic processes in the solar magnetic loops and their relation to the low-frequency modulations of solar microwave emissions, *Central Europ. Astrophys. Bull.*, **30**, 97-112 (2006)

Khodachenko, M.L., H.O. Rucker, R. Oliver, T.D. Arber, A. Hanslmeier: On the mechanisms of MHD wave damping in the partially ionized solar plasmas, *Adv. Space Res.*, **37**, 447-455 (2006)

Kolb, C., J.A. Martín-Fernández, R. Abart, H. Lammer: The chemical variability at the surface of Mars: Implication for sediment formation and rock weathering, *Icarus*, **183**, 10-29 (2006)

Kulikov, Y.N., H. Lammer, H.I.M. Lichtenegger, N. Terada, I. Ribas, C. Kolb, D. Langmayr, R. Lundin, E.F. Guinan, S. Barabash, H.K. Biernat: Atmospheric and water loss from early Venus, *Planet. Space Sci.*, **54**, 1425-1444 (2006)

Lammer, H., H.I.M. Lichtenegger, H.K. Biernat, N.V. Erkaev, I.L. Arshukova, C. Kolb, H. Gunell, A. Lukyanov, M. Holmstrom, S. Barabash, T.L. Zhang, W. Baumjohann: Loss of hydrogen and oxygen from the upper atmosphere of Venus, *Planet. Space Sci.*, **54**, 1445-1456 (2006)

Lammer, H., Y.N. Kulikov, H.I.M. Lichtenegger: Thermospheric X-ray and EUV heating by the young Sun on early Venus and Mars, *Space Sci. Rev.*, **122**, 189–196 (2006)

Leubner, M., W. Baumjohann, A. Chian: Advances in space environment research: Preface, *Space Sci. Rev.*, **122** (2006)

Leubner, M.P., Z. Vörös, W. Baumjohann: Nonextensive entropy approach to space plasma fluctuations and turbulence, *Adv. Geosci.*, **2**, 43–64 (2006)

Lichtenegger, H.I.M., L. Iorio, B. Mashhoon: The gravitomagnetic clock effect and its possible observation, *Ann. Phys.*, **15**, 868–876 (2006)

Litvinenko, G.V., A. Lecacheux, H.O. Rucker, A.A. Konovalenko, B.P. Ryabov, V.E. Shaposhnikov, V.V. Vinogradov, V. Taubenschuss, Modulation effects on dynamic spectra of sporadic Jovian decameter emission, Radiophys. Radioastron., **11**, 325–347 (2006)

Mingalev, I.V., V.S. Mingalev, O.V. Mingalev, B. Kazeminejad, H. Lammer, H.K. Biernat, H.I.M. Lichtenegger, K. Schwingenschuh, H.O. Rucker: First simulation results of Titan's atmosphere dynamics with a global 3-D non-hydrostatic circulation model, *Ann. Geophys.*, **24**, 2115–2129 (2006)

Molina-Cuberos, G.J., J.A. Morente, B.P. Besser, J.A. Portí, H.I.M. Lichtenegger, K. Schwingenschuh, A. Salinas, J. Margineda: Schumann resonances as a tool to study the lower ionospheric structure of Mars, *Radio Sci.*, **41**, RS1003 (2006)

Morente, J.A., J.A. Portí, B.P. Besser, A. Salinas, H.I.M. Lichtenegger, E.A. Navarro, G.J. Molina-Cuberos: A numerical study of atmospheric signals in the Earth-ionosphere electromagnetic cavity with the Transmission Line Matrix method, *J. Geophys. Res.*, **111**, A10305 (2006)

Nakamura, R., W. Baumjohann, A.V. Rounov, Y. Asano: Thin current sheets in the magnetotail observed by Cluster, *Space Sci. Rev.*, **122**, 29–38 (2006)

Nakamura, R., W. Baumjohann, Y. Asano, A.V. Rounov, A. Balogh, C.J. Owen, A.N. Fazakerley, M. Fujimoto, B. Klecker, H. Rème: Dynamics of thin current sheets associated with magnetotail reconnection, *J. Geophys. Res.*, **111**, A11206 (2006)

Penz, T.: Reconstruction of reconnection: Theoretical considerations and application to Cluster data, *Planet. Space Sci.*, **54**, 834–835 (2006)

Penz, T., V.S. Semenov, V.V. Ivanova, H.K. Biernat, V.A. Sergeev, R. Nakamura, I.V. Kubyshkin, I.B. Ivanov, M.F. Heyn: A reconstruction method for the reconnection rate applied to Cluster magnetotail measurements, *Adv. Space Res.*, **37**, 1388–1393 (2006)

Penz, T., V.S. Semenov, V.V. Ivanova, M.F. Heyn, I.B. Ivanov, H.K. Biernat: Green's function of compressible Petschek-type magnetic reconnection, *Phys. Plasmas*, **13**, 052108 (2006)

Petrukovich, A.A., T.L. Zhang, W. Baumjohann, R. Nakamura, A.V. Rounov, A. Balogh, C. Carr: Oscillatory magnetic flux tube slippage in the plasma sheet, *Ann. Geophys.*, **24**, 1695–1704 (2006)

Rounov, A.V., R. Nakamura, W. Baumjohann: Multi-point study of the magnetotail current sheet, *Adv. Space Res.*, **38**, 85–92 (2006)

Rounov, A.V., V.A. Sergeev, R. Nakamura, W. Baumjohann, S. Apatenkov, Y. Asano, T. Takada, M. Volwerk, Z. Vörös, T.L. Zhang, J.-A. Sauvaud, H. Rème, A. Balogh: Local structure of the magnetotail current sheet: 2001 Cluster observations, *Ann. Geophys.*, **24**, 247–262 (2006)

Russell, C.T., R.J. Strangeway, T.L. Zhang: Lightning detection on the Venus Express mission, *Planet. Space Sci.*, **54**, 1344–1351 (2006)

Sergeev, V.A., D.A. Sormakov, S. Apatenkov, W. Baumjohann, R. Nakamura, A.V. Rounov, T. Mukai, T. Nagai: Survey of large-amplitude flapping motions in the midtail current sheet, *Ann. Geophys.*, **24**, 2015–2024 (2006)

Sitnov, M.I., M. Swisdak, P.N. Guzdar, A.V. Rounov: Structure and dynamics of a new class of thin current sheets, *J. Geophys. Res.*, **111**, A08204 (2006)

Takada, T., R. Nakamura, W. Baumjohann, K. Seki, Z. Vörös, Y. Asano, M. Volwerk, A.V. Rounov, T.L. Zhang, A. Balogh, G. Paschmann, R.B. Torbert, B. Klecker, H. Rème, P. Puhl-Quinn, P. Canu, P.M.E. Décréau: Alfvén waves in the near-PSBL lobe: Cluster observations, *Ann. Geophys.*, **24**, 1001–1013 (2006)

Takada, T., R. Nakamura, W. Baumjohann, Y. Asano, M. Volwerk, T.L. Zhang, B. Klecker, H. Rème, E.A. Lucek, C. Carr: Do BBFs contribute to inner magnetosphere dipolarizations: Concurrent Cluster and Double Star observations, *Geophys. Res. Lett.*, **33**, L21109 (2006)

Taubenschuss, U., H.O. Rucker, W.S. Kurth, B. Cecconi, P. Zarka, M.K. Dougherty, J.T. Steinberg: Linear prediction studies for the solar wind and Saturn kilometric radiation, *Ann. Geophys.*, **24**, 3139-3150 (2006)

Terasawa, T., M. Oka, K. Nakata, K. Keika, M. Nosé, R.W. McEntire, Y. Saito, T. Mukai: Cosmic-ray-mediated interplanetary shocks in 1994 and 2003, *Adv. Space Res.*, **37**, 1408-1412 (2006)

Titov, D.V., H. Svedhem, D. Koschny, R. Hoofs, S. Barabash, J.-L. Bertaux, P. Drossart, V. Formisano, B. Häusler, O. Korablev, W.J. Markiewicz, D. Nevejans, M. Pätzold, G. Piccioni, T.L. Zhang, D. Merritt, O. Witasse, J. Zender, A. Accomazzo, M. Sweeney, D. Trillard, M. Janvier, A. Clochet: Venus Express science planning, *Planet. Space Sci.*, **54**, 1279-1297 (2006)

Titov, D.V., H. Svedhem, D. McCoy, J.P. Lebreton, S. Barabash, J.L. Bertaux, P. Drossart, V. Formisano, B. Haeusler, O.I. Korablev, W. Markiewicz, D. Neveance, M. Petzold, G. Piccioni, T.L. Zhang, F.W. Taylor, E. Lellouch, D. Koschny, O. Witasse, M. Warhaut, A. Acomazzo, J. Rodrigues-Cannabal, J. Fabrega, T. Schirmann, A. Clochet, M. Coradini: Venus Express: Scientific goals, instrumentation and scenario of the mission, *Cosmic Res.*, **44**, 334-348 (2006)

Torkar, K.M., A. Fazakerley, W. Steiger: Active spacecraft potential control: Results from the Double Star project, *IEEE Trans. Plasma Sci.*, **34**, 2046-2052 (2006)

Treffer, M., N.I. Kömle, G. Kargl, E. Kaufmann, S. Ulamec, J. Biele, A. Ivanov, O. Funke: Preliminary studies concerning subsurface probes for the exploration of icy planetary bodies, *Planet. Space Sci.*, **54**, 621-634 (2006)

Treumann, R.A., C.H. Jaroschek, R. Nakamura, A.V. Rounov, M. Scholer: The role of the Hall effect in collisionless magnetic reconnection, *Adv. Space Res.*, **38**, 101-111 (2006)

Ulyanov, O.M., V.V. Zakharenko, A.A. Konovalenko, A. Lecacheux, C. Rosolen, H.O. Rucker: Detection of individual pulses from pulsars BO809+74 in the decameter wavelengths, *Radiophys. Radioastron.*, **11**, 113-133 (2006)

Vaisberg, O.L., A.V. Leibov, V.N. Smirnov, L.A. Avanov, J.-J. Berthelier, K.M. Torkar, F. Leblanc, V.F. Babkin, V.A. Grishin, W. Baumjohann, P. Escoubet: Imaging mass-spectrometer of ions for studying near-planetary plasma, *Cosmic Res.*, **44**, 202-208 (2006)

Villante, U., M. Vellante, P. Francia, M. DeLauretis, A. Meloni, P. Palangio, B. Zolesi, M. Pezzopane, M. Förster, T.L. Zhang, W. Magnes, P. Nenovski, I. Cholakov, V. Wesztergom: ULF fluctuations of the geomagnetic field and ionospheric sounding measurements at low latitudes during the first CAWSES campaign, *Ann. Geophys.*, **24**, 1455-1468 (2006)

Vörös, Z., M.P. Leubner, W. Baumjohann: Cross-scale coupling-induced intermittency near interplanetary shocks, *J. Geophys. Res.*, **111**, A02102 (2006)

Vörös, Z., W. Baumjohann, R. Nakamura, M. Volwerk, A.V. Rounov: Bursty bulk flow driven turbulence in the Earth's plasma sheet, *Space Sci. Rev.*, **122**, 301-311 (2006)

Westall, F., C.E.J. de Ronde, G. Southam, N. Grassineau, M. Colas, C. Cockell, H. Lammer: Implications of a 3.472-3.333 Ga-old subaerial microbial mat from the Barberton greenstone belt, South Africa for the UV environmental conditions on the early Earth, *Philos. Trans. R. Soc. London, B: Biol. Sci.*, **361**, 1857-1875 (2006)

Yahnin, A.G., I.V. Despirak, A.A. Lubchich, B.V. Kozelov, N.P. Dmitrieva, M.A. Shukhtina, H.K. Biernat: Indirect mapping of the source of the oppositely directed fast plasma flows in the plasma sheet onto the auroral display, *Ann. Geophys.*, **24**, 679-687 (2006)

Yahnin, A.G., I.V. Despirak, A.A. Lubchich, B.V. Kozelov, N.P. Dmitrieva, M.A. Shukhtina, H.K. Biernat: Relationship between substorm auroras and processes in the near-earth magnetotail, *Space Sci. Rev.*, **122**, 97-106 (2006)

Zaitsev, V.V., V.E. Shaposhnikov, H.O. Rucker: Dependence of the Io-related decametric radio emission of Jupiter on the central meridian longitude and Io's "active" longitudes, *Astron. Astrophys.*, **454**, 669-676 (2006)

Zhang, T.L., H.I.M. Lichtenegger, J.K. Shi, X. Wang, H. Lammer: Hot oxygen corona at mars and its effect on solar wind deceleration, *Chin. Lett. Phys.*, **23**, 2338–2340 (2006)

Zhang, T.L., W. Baumjohann, M. Delva, H.-U. Auster, A. Balogh, C.T. Russell, S. Barabash, M. Balikhin, G. Berghofer, H.K. Biernat, H. Lammer, H.I.M. Lichtenegger, W. Magnes, R. Nakamura, T. Penz, K. Schwingenschuh, Z. Vörös, W. Zambelli, K.-H. Fornacon, K.-H. Glassmeier, I. Richter, C. Carr, K. Kudela, J.K. Shi, H. Zhao, U. Motschmann, J.-P. Lebreton: Magnetic field investigation of the Venus plasma environment: Expected new results from Venus Express, *Planet. Space Sci.*, **54**, 1336–1343 (2006)

Zhang, T.L., W. Baumjohann, R. Nakamura, A.V. Rounov, M. Volwerk, Y. Asano, Z. Vörös, H.-U. Eichelberger, V. Sergeev, J.K. Shi, A. Balogh: A statistical survey of the magnetotail current sheet, *Adv. Space Res.*, **38**, 1834–1837 (2006)

6.2 Proceedings & Book Chapters

Amm, O., R. Nakamura, H.U. Frey, Y. Ogawa, M. Kubyshkina, A. Balogh, H. Rème: Substorm topology in the ionosphere and magnetosphere during a flux rope event in the magnetotail, *ESA SP*, **598**, P8.4 (2006)

Asano, Y.: Japanische Weltraum-Science Fiction. In: *Science Fiction und Weltraum*, Eds. Besser, B.P., M. Volwerk, Universitätsbibliothek Graz, Graz, 51–54 (2006)

Asano, Y., R. Nakamura, A.V. Rounov, W. Baumjohann, T. Takada, I. Shinohara, A. Balogh, B. Klecker, H. Rème: Formation of the thin current sheets in substorms and its relation to magnetic reconnection. In: *Proc. 8th Int. Conf. Substorms*, Eds. Syrjäsuo, M., E. Donovan, University of Calgary, Calgary, 7–11 (2006)

Berciano-Alba, A., P. Borges-da-Silva, H. Eichelberger, F. Giovacchini, M. Godolt, G. Hasinger, M. Lerchster, V. Lusset, F. Mattana, Y. Mellier, M. Michalowski, C. Monteserin-Sanchez, F. Noviello, C. Persson, A. Santovincenzo, P. Schneider, M. Zhang, L. Östman: DEMON: A proposal for a satellite-borne experiment to study Dark Matter and Dark Energy. In: *Space Telescopes and Instrumentation II: Ultraviolet to Gamma Ray*, SPIE, **6266**, 626633, Orlando (2006)

Besser, B.P.: Fahrt in den Weltraum. In: *Science Fiction und Weltraum*, Eds. Besser, B.P., M. Volwerk, Universitätsbibliothek Graz, Graz, 9–21 (2006)

Besser, B.P., H.I.M. Lichtenegger, H.-U. Eichelberger, K. Schwingenschuh, J.A. Morente, K. Mocnik: Numerical simulation and experimental simulator for extremely low frequency wave propagation in the Earth-ionosphere cavity: An educational approach. In: *12th Int. IGTE Symp. Num. Field Calc. in Electr. Eng.*, IGTE, TU Graz, Graz, 100–103 (2006)

Boudjada, M.Y., A. Lecacheux, S. Sawas, A. Stangl, W. Voller: Spectral study of solar type III decametric bursts. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 401–408 (2006)

Boudjada, M.Y., P.H.M. Galopeau, H.O. Rucker: Study of the modelled occurrence variability of the Jovian decametric emissions. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 169–174 (2006)

Desch, M.D., G. Fischer, M.L. Kaiser, W.M. Farrell, W.S. Kurth, A. Lecacheux, C.C. Porco, A.P. Ingersoll, U. Dyudina: Cassini RPWS and imaging observations of Saturn lightning. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 103–110 (2006)

Dorovskyy, V.V., V.N. Melnik, A.A. Konovalenko, H.O. Rucker, E.P. Abranin, A. Lecacheux: Observations of Solar S-bursts at the decameter wavelengths. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 383–390 (2006)

Erkaev, N.V., A.V. Shaidurov, H.K. Biernat: Propagation of the Alfvén waves generated by interaction of Titan with the magnetospheric plasma. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 143–150 (2006)

Fischer, G., H.O. Rucker: Man-made radio emissions recorded by Cassini/RPWS during Earth flyby. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 299–306 (2006)

Fischer, G., W. Macher, M.D. Desch, M.L. Kaiser, P. Zarka, W.S. Kurth, W. Farrell, A. Lecacheux, B. Cecconi, D.A. Gurnett: On the intensity of Saturn lightning. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 123–132 (2006)

Fomin, B.F., T.L. Kachanova, M.L. Khodachenko, N.K. Belisheva, H. Lammer, A. Hanslmeier, H.K. Biernat, H.O. Rucker: Prediction of solar flaring and CME activity by means of conceptual modelling (COMOD) technology for the reconstruction of complex systems, *ESA SP*, **588**, 381–384 (2006)

Galopeau, P.H.M., M.Y. Boudjada, H.O. Rucker: Jovian active longitude: a parametric study. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 161–168 (2006)

Grießmeier, J.-M., A. Stadelmann, H. Lammer, N. Belisheva, U. Motschmann: The impact of galactic cosmic rays on extrasolar earth-like planets in close-in habitable zones, *ESA SP*, **588**, 305–309 (2006)

Grießmeier, J.-M., U. Motschmann, M. Khodachenko, H.O. Rucker: The Influence of Stellar Coronal Mass Ejections on Exoplanetary Radio Emission. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 571–580 (2006)

Gubchenko, V.M., H.K. Biernat, M.L. Khodachenko, H.O. Rucker: On the 3D kinetic modeling of a magnetotail/solar streamer by a plasma flow over magnetic dipole and toroid. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 441–156 (2006)

Haslinger, C., G. Stangl: Geodynamics of the Balkan Peninsula. In: *Geodynamics of Balkan peninsula*, Eds. Milev, G., Warsaw University of Technology, Warsaw, 1–8 (2006)

Hausleitner, W., G. Kirchner, E. Cristea: On the determination of AJISAI's spin parameters from Graz kHz-SLR data. In: *Physics of Auroral Phenomena, Proc. XXIX Annual Seminar, Apatity*, Kola Science Centre, Russian Academy of Science, Apatity, 88–91 (2006)

Hausleitner, W., G. Kirchner, R. Pail, S. Krauss, H. Goiginger: Improved kHz-SLR tracking techniques and orbit quality analysis for LEO-Missions. In: *Proc. 3rd GOCE User Workshop*, ESA, Noordwijk, 4 (2006)

Horbury, T., P. Louarn, M. Fujimoto, W. Baumjohann, L.G. Blomberg, S. Barabash, P. Canu, K.-H. Glassmeier, H. Koskinen, R. Nakamura, C.J. Owen, T. Pulkkinen, A. Roux, J.-A. Sauvaud, S.J. Schwartz, K. Svenes, A. Vaivads: Cross-Scale: A multispacecraft mission to study cross-scale coupling in space plasmas, *ESA SP*, **598**, P7.5 (2006)

Jeszenszky, H., K.M. Torkar, G. Laky: The instrument ASPOC and the Cluster Active Archive, *ESA SP*, **598**, P6.6 (2006)

Kargl, G., A. Zöhrer, N.I. Kömle, A.J. Ball, T.J. Ringrose, M.D. Paton, K.R. Atkinson, M.C. Towner, K.L. Kapper: The detection of small-scale structures in planetary surface materials with ground-penetrating instruments, *ESA SP*, **607**, P6.8 (2006)

Khodachenko, M.L., H.O. Rucker, A.G. Kislyakov, V.V. Zaitsev, S. Urpo: Dynamic Processes in Groups of Solar Coronal Magnetic Loops Observed in Microwaves. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 431–440 (2006)

Khodachenko, M.L., J.-M. Grießmeier, I. Ribas, H. Lammer, F. Selsis, M. Leitner, T. Penz, A. Hanslmeier, H.K. Biernat, H.O. Rucker: Habitability of Earth-like exoplanets under the action of host stars intensive CME activity, *ESA SP*, **588**, 279–282 (2006)

Khodachenko, M.L., T.D. Arber, J.L. Ballester, H.K. Biernat, M. Goossens, A. Hanslmeier, A. Hood, H. Lammer, V.M. Nakariakov, R. Oliver, E. Poedts, B. Roberts, H.O. Rucker, J. Rybak, R. Fay-Siebenbürgen: Solar / heliospheric dynamics and magnetism, *ESA SP*, **588**, 379–380 (2006)

Kiehas, S.A., I.V. Kubyshkin, V.S. Semenov, T. Penz, H.K. Biernat, R. Nakamura: Determination of reconnection parameters based on the time-history of nightside flux transfer events. In: *Proc. 6th Int. Conf. "Problems of Geocosmos"*, Eds. Troyan, V.N., V.S. Semenov, M.V. Kubyshkina, St. Petersburg State University, St. Petersburg, Russia, 75–78 (2006)

Konovalenko, A., H.O. Rucker, A. Lecacheux, V.N. Melnik, I.S. Falkovich, N.N. Kalinichenko, M.R. Olyak, A.V. Megn, S.L. Rasjlpvslij, V.A. Shepelev, S.V. Stepkin, D.V. Muha, M.A. Sidorchuk, O.M. Ulyanov, B. Thide, Y.V. Tokarev, A.N. Karashtin, V.V. Koshevoj, A.B. Lozynskij, A.I. Brazhenko: Utilizing existing decameter radio telescopes as pathfinders towards LOFAR - LWA - LOIS science and technology. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 507-518 (2006)

Korovinskij, D.B., V.S. Semenov, N.V. Erkaev, H.K. Biernat: Theoretical model of steady-state magnetic reconnection in collisionless incompressible plasma. In: *Proc. 6th Int. Conf. "Problems of Geocosmos"*, Eds. Troyan, V.N., V.S. Semenov, M.V. Kubyshkina, St. Petersburg State University, St. Petersburg, Russia, 104-107 (2006)

Kulikov, Y.N., H. Lammer, H.I.M. Lichtenegger, T. Penz, H.K. Biernat: Solar radiation and particle induced effects on the early martian atmosphere and loss. In: *Physics of Auroral Phenomena, Proc. XXIX Annual Seminar, Apatity*, Kola Science Centre, Russian Academy of Science, Apatity, 229-233 (2006)

Laky, G.: Stanislaw Lem. In: *Science Fiction und Weltraum*, Eds. Besser, B.P., M. Volwerk, Universitätsbibliothek Graz, Graz, 23-30 (2006)

Lammer, H., E. et al.: Towards real comparative planetology: Synergies between solar system science and the Darwin mission, *ESA SP*, **588**, 233 - 240 (2006)

Lammer, H., T. Penz, N.K. Belisheva, Y.N. Kulikov, H.K. Biernat: Prerequisites for the Evolution of Life on Exoplanets. In: *Life as We Know It*, Ed. Seckbach, J., Springer, Berlin, 413-429 (2006)

Lammer, H., Y.N. Kulikov, H.I.M. Lichtenegger: A comperative study of the influence of the active sun on the evolution of the atmospheres of Earth and Venus. In: *Proc. 6th Int. Conf. "Problems of Geocosmos"*, Eds. Troyan, V.N., V.S. Semenov, M.V. Kubyshkina, St. Petersburg State University, St. Petersburg, Russia, 121-126 (2006)

Langmayr, D., N.V. Erkaev, H.K. Biernat: Influence of the ion flow direction on the modified two stream instability. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 317-324 (2006)

Langmayr, D., N.V. Erkaev, H.K. Biernat: Numerical investigation of bifurcations of solar wind parker solutions. In: *Proc. 6th Int. Conf. "Problems of Geocosmos"*, Eds. Troyan, V.N., V.S. Semenov, M.V. Kubyshkina, St. Petersburg State University, St. Petersburg, Russia, 131-134 (2006)

Langmayr, D., N.V. Erkaev, H.K. Biernat: On the influence of the fluid electrons on the Ion Weibel instability. In: *Proc. 6th Int. Conf. "Problems of Geocosmos"*, Eds. Troyan, V.N., V.S. Semenov, M.V. Kubyshkina, St. Petersburg State University, St. Petersburg, Russia, 127-130 (2006)

Lichtenegger, H.I.M.: Reisen durch Raum und Zeit. In: *Science Fiction und Weltraum*, Eds. Besser, B.P., M. Volwerk, Universitätsbibliothek Graz, Graz, 39-49 (2006)

Lichtenegger, H.I.M., J.A. Morente, B. Besser, J.A. Portí, A. Salinas, H.K. Biernat: On the altitude dependence of Schumann resonance frequencies. In: *Physics of Auroral Phenomena, Proc. XXIX Annual Seminar, Apatity*, Kola Science Centre, Russian Academy of Science, Apatity, 133-136 (2006)

Litvinenko, G.V., H.O. Rucker, U. Taubenschuss, A.A. Konovalenko, A. Lecacheux, V.V. Vinogradov, V.E. Shaposhnikov: Investigation of the Jovian S-emission dynamic spectrum features. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 183-192 (2006)

Macher, W., D. Plettemeier, H.O. Rucker, G. Fischer: Wire-Grid simulations of the Mars Express/MARSIS antenna system. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 483-490 (2006)

Melnik, V.N., A.A. Konovalenko, H.O. Rucker, E.P. Abranin, V.V. Dorovskyy, A. Lecacheux, A.A. Stanislavskyy: Sporadic solar radio emission at decameter wavelengths. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 375-382 (2006)

Morente, J.A., B.P. Besser, J.A. Portí, H.I.M. Lichtenegger, A. Salinas, E.A. Navarro, G.J. Molina-Cuberos, M. Rodríguez-Sola, C. Blanchard: Redes de líneas de transmisíon para la simulacíon computacional de cavidades electromagnéticas: Estudio de los modos TEr y TMr en la atmósfera de la

Tierra. In: *Proc. XXI Simp. Nac. URSI*, URSI España, Madrid, 1372–1375 (2006)

Morente, J.A., J.A. Portí, B.P. Besser, H.I.M. Lichtenegger, A. Salinas, E.A. Navarro, G.J. Molina-Cuberos, C. Blanchard: Transmission line meshes for computational simulation of electromagnetic modes in the Earth's atmosphere. In: *12th Int. IGTE Symp. Num. Field Calc. in Electr. Eng.*, IGTE, TU Graz, Graz, 104–109 (2006)

Nakamura, R., T. Takada, W. Baumjohann, M. Volwerk, T.L. Zhang, Y. Asano, A.V. Rounov, Z. Vörös, E. Lucek, C. Carr, B. Klecker, H. Rème, O. Amm: Fast flow, dipolarization, and substorm evolution: Cluster/Double Star multipoint observations. In: *Proc. 8th Int. Conf. Substorms*, Eds. Syrjäsuo, M., E. Donovan, University of Calgary, Calgary, 197–202 (2006)

Nakamura, R., W. Baumjohann, A.V. Rounov, Y. Asano: Tail reconnection and plasma sheet fast flows, *ESA SP*, **598**, P9.1 (2006)

Oswald, T., W. Macher, G. Fischer, H.O. Rucker, J.-L. Bougeret, M.L. Kaiser, K. Goetz: Numerical analysis of the STEREO WAVES antennas: First results. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 475–482 (2006)

Ottacher, H.: Abenteuer Wissenschaft. In: *Science Fiction und Weltraum*, Eds. Besser, B.P., M. Volwerk, Universitätsbibliothek Graz, Graz, 31-37 (2006)

Owen, C.J., A.N. Fazakerley, S.J. Schwartz, T.S. Horbury, W. Baumjohann, R. Nakamura, P. Louarn, J.-A. Sauvaud, A. Vaivads, A. Roux, O. Lecontel: Multi-point, multi-scale investigations of fundamental plasma processes in the Earth's magnetosphere, *ESA SP*, **588**, 185–192 (2006)

Pail, R., B. Metzler, B. Lackner, T. Preimesberger, E. Höck, W.-D. Schuh, H. Alkathib, C. Boxhammer, C. Siemens, M. Wermuth: GOCE gravity field analysis in the framework of HPF: Operational software system and simulation results. In: *Proc. 3rd GOCE User Workshop*, ESA, Noordwijk, 8 p. (2006)

Penz, T., C.J. Farrugia, V.V. Ivanova, V.S. Semenov, S.W.H. Cowley, H.K. Biernat, K.W. Ogilvie, R. Torbert: Reconstruction of the reconnection electric field at the dayside magnetopause during FTE activity. In: *Proc. 6th Int. Conf. "Problems of Geocosmos"*, Eds. Troyan, V.N., V.S. Semenov, M.V. Kubyshkina, St. Petersburg State University, St. Petersburg, Russia, 151–154 (2006)

Penz, T., V.S. Semenov, M.F. Heyn, V.V. Ivanova, I.B. Ivanov, H.K. Biernat, C.J. Farrugia, F.T. Gratton: Wave structures excited in compressible Petschek-type magnetic reconnection. In: *Physics of Auroral Phenomena, Proc. XXIX Annual Seminar, Apatity*, Kola Science Centre, Russian Academy of Science, Apatity, 57–60 (2006)

Petrukovich, A.A., T.L. Zhang, W. Baumjohann, R. Nakamura, A.V. Rounov, A. Balogh: Slipping deformation of the plasma sheet magnetic structure. In: *Physics of Auroral Phenomena, Proc. XXIX Annual Seminar, Apatity*, Kola Science Centre, Russian Academy of Science, Apatity, 108-111 (2006)

Petrukovich, A.A., W. Baumjohann, R. Nakamura, A.V. Rounov, A. Balogh: Oscillations of flux tube slippage in the quiet plasma sheet, *ESA SP*, **598**, P4.12 (2006)

Rounov, A.V., I.O. Voronkov, Y. Asano, R. Nakamura, W. Baumjohann, M. Volwerk, T. Takada, Z. Vörös, T.L. Zhang, A. Vaivads, S. Haaland, H. Rème, A. Balogh: Cluster observations during pseudo-breakups and substorms. In: *Proc. 8th Int. Conf. Substorms*, Eds. Syrjäsuo, M., E. Donovan, University of Calgary, Calgary, 269–274 (2006)

Rucker, H.O.: Was haben wir im Weltraum zu suchen? In: *Montagsakademie, Band 2*, Leykam, Graz, 143–160 (2006)

Semenov, V.S., S.A. Dyadechkin, I.V. Kubishkin, H.K. Biernat: Mechanism of relativistic formation and generation of synchrotron radiation. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 457–466 (2006)

Sergeev, V.A., A.V. Rounov, W. Baumjohann, R. Nakamura, T.L. Zhang, S. Apatenkov, A. Balogh, H. Rème, J.-A. Sauvaud: Cluster results on the magnetotail current sheet structure and dynamics, *ESA SP*, **598**, P9.2 (2006)

Sergeev, V.A., M. Kubyshkina, W. Baumjohann, R. Nakamura, A.V. Rounov, Z. Vörös, T.L. Zhang, K.-H. Glassmeier, J.-A. Sauvaud, P. Daly, V. Angelopoulos, H. Frey, H. Singer: Magnetic reconnection and current disruption in the inner magnetosphere – a case study. In: *Proc. 8th Int. Conf. Substorms*, Eds. Syrjäsuo, M., E. Donovan, University of Calgary, Calgary, 275–278 (2006)

Shaposhnikov, V.E., V.V. Zaitsev, H.O. Rucker: Origin of active longitudes in Jovian decametric radio emission. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 153–160 (2006)

Shi, J.K., T.L. Zhang, Z.W. Cheng, Z.X. Liu, R. Nakamura, C. Carr, A. Balogh: Field aligned current observed by Cluster, *ESA SP*, **598**, P4.16 (2006)

Sidorchuk, K.M., A.A. Konovalenko, V.N. Melnik, H.O. Rucker, G. Fischer, A. Lecacheux, E.P. Abranin, M.A. Sidorchuk, A.A. Stanislavsky, O.M. Ulyanov, V.V. Zakharenko, I.N. Bubnov: Search of non-thermal radio emission from planets and stars at decameter wavelength. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 581–588 (2006)

Stangl, G., C. Bruyninx: Recent monitoring of crustal movements in the eastern Mediterranean. The use of GPS measurements. In: *The Adria Microplate: GPS Geodesy, Tectonics and Hazards*, Eds. Pinter, N., G. Grenerczy, J. Weber, S. Stein, D. Medak, Springer, Dordrecht, 169–181 (2006)

Takada, T., R. Nakamura, W. Baumjohann, Y. Asano, M. Volwerk, T.L. Zhang, B. Klecker, H. Rème, E.A. Lucek, C. Carr: BBFs deceleration and its relationship to magnetospheric configuration: Cluster and Double Star TC1 observation. In: *Proc. 6th Int. Conf. "Problems of Geocosmos"*, Eds. Troyan, V.N., V.S. Semenov, M.V. Kubyshkina, St. Petersburg State University, St. Petersburg, Russia, 190–193 (2006)

Taubenschuss, U., H.O. Rucker, S. Kurth, B. Cecconi, M.D. Desch, P. Zarka, M.K. Dougherty, J.T. Steinberg: External control of Saturn kilometric radiation. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 51–60 (2006)

Taubenschuss, U., H.O. Rucker, W. Macher: Jupiter S-burst polarization measurements using the waveform receiver. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 175–182 (2006)

Thomas, N., W. Baumjohann, H. Boehnhardt, E. Chassefiere, G. Cremonese, K.-H. Glassmeier, M. Roos-Serote, H.O. Rucker, F.W. Taylor: A multi-disciplinary investigation of the Jovian system, *ESA SP*, **588**, 225–231 (2006)

Volwerk, M.: Astrobiologie und Science Fiction. In: *Science Fiction und Weltraum*, Eds. Besser, B.P., M. Volwerk, Universitätsbibliothek Graz, Graz, 55–64 (2006)

Volwerk, M., Z. Vörös, T. Takada, W. Baumjohann, R. Nakamura, A.V. Rounov: Cluster measurements of ULF pulsations in the Earth's magnetotail, *ESA SP*, **598**, P4.19 (2006)

Voronkov, I.O., A.V. Rounov, A. Koustov, K. Kabin, M. Meurant, E. Donovan, C. Bryant, E. Spanswick: Features of magnetosphere-ionosphere coupling during breakups and substorm onsets inferred from multi-instrument alignment. In: *Proc. 8th Int. Conf. Substorms*, Eds. Syrjäsuo, M., E. Donovan, University of Calgary, Calgary, 319–324 (2006)

Zaitsev, V.V., V.E. Shaposhnikov, H.O. Rucker: On possible escape of electron cyclotron maser radiation from active regions in the solar corona. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 339–348 (2006)

Zarka, P., B. Cecconi, L. Denis, W.M. Farrell, G. Fischer, G.B. Hospodarsky, M.L. Kaiser, W.S. Kurth: Physical properties and detection of Saturn's lightning radio bursts. In: *Planetary Radio Emissions VI*, Eds. Rucker, H.O., W.S. Kurth, G. Mann, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 111–122 (2006)

Zöhrer, A., G. Kargl: Finite Element Modelling of Penetration Tests into Martian analogue Materials, ESA SP, **607**, P5.6 (2006)

6.3 Books & Special Issues

Besser, B.P., M. Volwerk (Eds.): Science Fiction & Weltraum. Weltraumthemen in der Science Fiction-Literatur an ausgewählten Beispielen, Universitätsbibliothek, Graz, 66 pages (2006)

Leubner, M., W. Baumjohann, A. Chian (Eds.): Advances in Space Environment Research (Space Sci.

Rev., 122, 1-4), Springer, Amsterdam, 337 pages (2006)

Rucker, H.O., W.S. Kurth, G. Mann (Eds.): Planetary Radio Emissions VI, Verlag der Österreichischen Akademie der Wissenschaften, Wien, 610 pages (2006)

6.4 Other Publications

Macher, W., T. Oswald, H.O. Rucker, G. Fischer: STEREO-WAVES antennas: Reception properties in the quasi-static frequency range, IWF-Report 178, 54 pages (2006)

Oswald, T.H., H.O. Rucker, W. Macher, G. Fischer, U. Taubenschuss: Aspekte des "Direction Finding", IWF-Report 173, 42 pages (2006)

Stangl, G.: Auswertung GPS-Kampagne Italien 2005 - Teil 2, Technical report, 4 pages (2006)

Taubenschuss, U., H.O. Rucker, W. Macher, T. Oswald: IDL programs written for Cassini/RPWS data - a technical report, IWF-Report 176, 41 pages (2006)

Taubenschuss, U., W. Macher, H.O. Rucker: Error analysis in linear prediction, IWF-Report 177, 12 pages (2006)

6.5 Invited Talks

Asano, Y., R. Nakamura, A.V. Rounov, W. Baumjohann, T. Takada, I. Shinohara, A. Balogh, B. Klecker, H. Reme: Formation of the thin current sheets in substorms and its relation to the magnetic reconnection, *8th Int. Conf. Substorms*, Banff, Canada, Mar 2006.

Baumjohann, W.: Cosmic Vision, *Cross-Scale Community Meeting*, London, United Kingdom, Sep 2006.

Baumjohann, W.: Introduction to Cross-Scale, *Cross-Scale Community Meeting*, London, United Kingdom, Sep 2006.

Baumjohann, W.: Overview of Mercury´s dynamic magnetosphere, *ISSI Mercury Workshop*, Bern, Switzerland, Jun 2006.

Baumjohann, W.: Weltraumforschung made in Graz, *ÖPG Jahrestagung 2006*, Graz, Austria, Sep 2006.

Baumjohann, W., S. Schwartz: The cross-scale mission, *Symp. "Future Perspectives of Space Plasma and Particle Instrum. and Int. Collaborations"*, Tokyo, Japan, Nov 2006.

Besser, B.P.: Geschichte der österreichischen Raumfahrt, *Deutscher Luft- und Raumfahrtkongress 2006*, Braunschweig, Germany, Nov 2006.

Lammer, H.: Particle release from Mercury´s surface and exospheric response during CME events, *ISSI Mercury Workshop*, Bern, Switzerland, Jun 2006.

Lammer, H.: The stellar radiation and plasma interaction with Hot Jupiters, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Lammer, H., F. Selsis, C. Eiroa, M. Fridlund: Planets under extreme stellar conditions, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Lammer, H., M.L. Khodachenko, Y.N. Kulikov, H.I.M. Lichtenegger, N. Terada, T. Penz: Atmospheric erosion caused by stellar coronal plasma flows on terrestrial exoplanets within close-in habitable zones of low mass stars, *Int. TPF/Darwin Workshop: Star Planet Interactions and Implications for Habitability*, Pasadena, USA, Nov 2006.

Lammer, H., Y.N. Kulikov, H.I.M. Lichtenegger: Long-term planetary evolution: Solar radiation and particle induced effects on the early Martian atmosphere and loss, *Kiruna Mars Workshop*, Kiruna, Sweden, Feb 2006.

Nakamura, R.: Magnetic reconnection and Cross-Scale, *Cross-Scale Community Meeting*, London, United Kingdom, Sep 2006.

Nakamura, R.: Substorms, reconnection, tail, *ISSI Mercury Workshop*, Bern, Switzerland, Jun 2006.

Nakamura, R., T. Takada, M. Volwerk, W. Baumjohann, T.L. Zhang, Y. Asano, A.V. Rounov, Z. Vörös, C. Carr, A. Balogh, E. Lucek, B. Klecker, H. Rème, O. Amm: Fast flow, dipolarization and substorm evolution: Cluster/Double Star multipoint observations, *8th Int. Conf. Substorms*, Banff, Canada, Mar 2006.

Nakamura, R., V. Angelopoulos, W. Baumjohann, E. Donovan: Scientific objectives and opportunities during the THEMIS mission, *EGU General Assembly 2006*, Wien, Austria, Apr 2006.

Nakamura, R.: How should ICS evolve? *8th Int. Conf. Substorms*, Banff, Canada, Mar 2006.

Pesec, P., I. Fejes: CERGOP-2/ENVIRONMENT, Summary of the third year, *EGU General Assembly 2006*, Wien, Austria, Apr 2006.

Rounov, A.V., R. Nakamura, Y. Asano, W. Baumjohann: Cluster observations of magnetic recon-

nection in the magnetotail, *6th Int. Conf. "Problems of Geocosmos"*, St. Petersburg, Russian Federation, May 2006.

Rounov, A.V., Y. Asano, W. Baumjohann, M. Kuznetsova, R. Nakamura, A. Petrukovich, V.A. Sergeev, M.I. Sitnov, T.L. Zhang: Dynamic structure of the magnetotail current sheet observed by Cluster, *EGU General Assembly 2006*, Wien, Austria, Apr 2006.

Rounov, A.V., et al.: Cluster observations during pseudo-breakups and substorms, *8th Int. Conf. Substorms*, Banff, Canada, Mar 2006.

Rounov, A.V., et al.: Dynamic structure of the magnetotail current sheet observed by Cluster, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Vörös, Z., R. Nakamura, W. Baumjohann, A.V. Rounov, M. Volwerk, Y. Asano, T. Takada, T.L. Zhang, A. Balogh, B. Klecker: Reconnection and bursty bulk flow related statistics in the Earths plasma sheet, *Meeting "Dynamical Processes in Space Plasmas"*, Ein Bokek, Israel, May 2006.

Vörös, Z., W. Baumjohann, M. Leubner, R. Nakamura: Cross-scale couplings in turbulent space plasmas, *EGU General Assembly 2006*, Wien, Austria, Apr 2006.

Vörös, Z., W. Baumjohann, R. Nakamura, M. Volwerk, A.V. Rounov: Turbulence in the Earths plasma sheet, *Conf. "The physics of solar wind magnetosphere coupling"*, Puerto Vallarta, Mexico, Nov 2006.

Vörös, Z., W. Baumjohann, R. Nakamura, M. Volwerk, A.V. Rounov, T. Takada, Y. Asano, E. Lucek, H. Reme: Turbulence in the Earths plasma sheet, *Sixth Int. Workshop on Nonlinear Waves and Turbulence in Space Plasmas*, Fukuoka, Japan, Oct 2006.

Zhang, T.L.: Magnetic field investigations of Venus Express: Expected new results, *Chapman Conference "Exploring Venus as a Terrestrial Planet"*, Key Largo, USA, Feb 2006.

Zhang, T.L.: Solar wind interaction with Venus: Venus Express magnetic field experiment initial results, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Zhang, T.L.: Solar wind interaction with the induced magnetosphere of Venus, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Zhang, T.L., M. Volwerk: Study of waves in the magnetotail region with Cluster and DSP, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Zhang, T.L., et al.: Solar wind interaction with Venus: Venus Express magnetic field experiment initial results, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

6.6 Oral Presentations

Asano, Y., R. Nakamura, M. Fujimoto, I. Shinohara, A.V. Rounov, W. Baumjohann, T. Takada, K. Torkar, C.J. Owen, A. Fazakerley, B. Klecker, A. Balogh, H. Rème: Electron dynamics around the X line observed by the Cluster multi-satellite observations, *Japan Geoscience Union Meeting 2006*, Makuhari, Japan, May 2006.

Besser, B.P.: Historical development of meteorology and geophysics at the University of Graz, 56. *Jahrestagung der Österreichischen Physikalischen Gesellschaft*, Graz, Austria, Sep 2006.

Besser, B.P.: Schumann or FitzGerald resonances on Titan? ISSI Team Meeting, *Titan's Ground-Ionosphere Cavity after Huygens*, Bern, Switzerland, Nov 2006.

Boudjada, M.Y., P. Nenovski, K. Schwingenschuh, J.-J. Berthelier, E. Cristea, M. Vellante, M. Parrot, H.O. Rucker, F. Lefeuvre, P. Pesec, W. Magnes, M. Stachel, W. Voller: ICE experiment onboard DEMETER micro-satellite: Spectral method as a tool to characterize the activity of the VLF/ELF emissions, *First DEMETER Symposium*, Toulouse, France, Jun 2006.

Delva, M.: The Venus Express mission and FPGA-based flight electronics for its magnetometer, Katholieke Hogeschool Sint-Lieven, Gent, Belgium, Mar 2006.

Delva, M.: Unter den Wolken der Venus, Pädag. Inst. Kärnten, Klagenfurt, Austria, Jan 2006.

Delva, M., T.L. Zhang, C.T. Russell, H.Y. Wei: Wave observations upstream of the Venus bowshock from the Venus Express magnetic field instrument, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Haslinger, C., G. Stangl: The CERGOP2 database after the project – EU project CERGOP2/Environment work package 1, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Haslinger, C., G. Stangl: The times series of the permanent CERGOP stations - First velocity estimations of the non-EPN sites, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Hausleitner, W.: AJISAI spin parameter determination using Graz kHz satellite laser ranging data, *29th Annual Apatity Seminar "Physics of Auroral Phenomena"*, Apatity, Russian Federation, Feb 2006.

Hausleitner, W.: Satellite Laser Ranging - A powerful technique for satellite geodesy, TUG Graz, Graz, Austria, Jun 2006.

Kargl, G.: Detection of small-scale structures with ground-penetrating instruments, PSSRI, The Open University, Milton Keynes, United Kingdom, Feb 2006.

Kargl, G., A. Zöhrer: Reconstruction of grain size distributions in granular and regolith soil with ground penetrating instruments, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Kargl, G.: Penetrometry measurements as a key to surface properties, Physikalisches Institut, Universität Bern, Bern, Switzerland, May 2006.

Kargl, G., A. Zöhrer, K.R. Atkinson, N.I. Kömle: The detection of small scale structures in planetary surface materials with ground penetrating instruments, *2nd Int. Workshop on Penetrometry in the Solar System*, Graz, Austria, Sep 2006.

Kargl, G., Titan, Graz in Space, KFU Graz, Sept 2006.

Karlsson, R.L., W. Macher, U. Taubenschuss, H.O. Rucker, et al.: In-flight calibration of the Cassini Radio and Plasma Wave Science (RPWS) antennas after the Huygens probe release, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Karlsson, R.L., The Cassini radio and plasma wave science instrument, Graz in Space, KFU Graz, Sept 2006.

Kaufmann, E.: Energy balance in transparent planetary ices, PSSRI, The Open University, Milton Keynes, United Kingdom, Feb 2006.

Kaufmann, E., N.I. Kömle, G. Kargl: Energy balance in ice layers - the solid-state greenhouse effect at the Mars polar caps, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Kaufmann, E., G. Kargl, N.I. Kömle, J. Biele, S. Ulamec, J. Romstedt, M. Engelhardt: Alternate methods to penetrate ice layers, *2nd Internat. Workshop on Penetrometry in the Solar System*, Graz, Austria, Sep 2006.

Khodachenko, M.L., H.O. Rucker, A.G. Kislyakov, V.V. Zaitsev, S. Urpo: Manifestation of the magnetic loop parameters and dynamic features in the low-frequency modulations of solar microwave radio emissions, *Int. Heliophysical Year European General Assembly*, Paris, France, Jan 2006.

Khodachenko, M.L., A.G. Kislyakov, H.O. Rucker: Oscillations of solar coronal magnetic loops in microwaves. Analysis of intensity modulations in solar microwave bursts, *Int. Workshop "MHD waves and oscillations in solar magnetic structures"*, Palma de Mallorca, Spain, May 2006.

Khodachenko, M.L.: Amateur astronomer possible contribution in the coordinated observations of Jupiter and Saturn, Coordinated Observations of Jupiter and Saturn; *EUROPLANET N3 Strategic workshop*, Liege, Belgium, Jul 2006.

Khodachenko, M.L., A.G. Kislyakov, H.O. Rucker, M. Panchenko: Modulations in SKR. Fourier-Wigner-Ville test analysis of Cassini data, Coordinated Observations of Jupiter and Saturn; *EUROPLANET N3 Strategic workshop*, Liege, Belgium, Jul 2006.

Khodachenko, M.L.: N3 support activities for SMART-1, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Khodachenko, M.L., A.G. Kislyakov, M. Panchenko, H.O. Rucker: Long-periodic modulations of SKR and the near Saturn solar wind plasma environment - possible planetary and solar effects, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Khodachenko, M.L., H. Lammer: Extreme plasma environment/events around Mercury's orbit, *Workshop "Hermean Environment Working Group"*, Padova, Italy, Sep 2006.

Khodachenko, M.L., The Sun - challenge for scientists, Graz in Space, KFU Graz, Sept 2006.

Kömle, N.I.: THermal conductivity measurements and their evaluation, The Open University, Milton Keynes, United Kingdom, Feb 2006.

Kömle, N.I.: Heat conduction in planetary surface layers, Harbin Institute of Technology (HIT), Harbin, China, Jul 2006.Kömle, N.I.: Physical properties of lunar regolith, Harbin Institute of Technology (HIT), Harbin, China, Jul 2006.

Kömle, N.I.: The activity of comets: Theory, laboratory experiments, and space missions, Harbin Institute of Technology (HIT), Harbin, China, Jul 2006.

Kömle, N.I., E. Hütter, E. Kaufmann: Penetrometry in the Solar System: A review of future applications and missions, *2nd Int. Workshop on Penetrometry in the Solar System*, Graz, Austria, Sep 2006.

Kömle, N.I., E. Kaufmann, G. Kargl: Development of thermal conductivity sensors for lunar and planetary regoliths, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Lammer, H., H.I.M. Lichtenegger, Y.N. Kulikov, M.L. Khodachenko, J.-M. Grießmeier, N. Terada, I. Ribas: On atmospheric erosion of Earth-like exoplanets induced by stellar radiation and plasma in close-in habitable zones, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Lammer, H., Y.N. Kulikov, H.I.M. Lichtenegger, N. Terada: Atmospheric and water loss from early Venus, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Lammer, H., Die Evolution der Venusatmosphäre, Graz in Space, KFU Graz, Sept 2006.

Leitner, M., C.J. Farrugia, H.K. Biernat, R. Schwenn, K.W. Ogilvie, A.B. Galvain, H. Matsui: Inner heliospheric evolution of interplanetary magnetic clouds, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Lichtenegger, H.I.M., H. Lammer, C. Kolb: Particle release from Mercury´s surface and exospheric response during CME events, *Workshop "Hermean Environment Working Group"*, Padova, Italy, Sep 2006.

Lichtenegger, H.I.M., J.A. Morente, B.P. Besser: On the altitude dependence of Schumann resonance frequencies, *29th Annual Apatity Seminar "Physics of Auroral Phenomena"*, Apatity, Russian Federation, Feb 2006.

Magnes, W., D. Fischer, A. Valavanoglou, G. Fremuth: Design of a radiation hard and low power 16-bit digital-to-analog converter based on sigma-delta modulation, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Nakamura, R.: Fast flows and field-aligned currents, *ISSI Team meeting, Transient processes and localized structures in the magnetotail*, Bern, Switzerland, Feb 2006.

Nakamura, R.: Ionosphere-magnetosphere coupling of fast flows/flux ropes in the Earth`s magnetotail: Summary of Europlanet N3 Cluster Ground-based Coordination Workshop, *12th Cluster workshop*, Saariselkä, Finland, Sep 2006.

Nakamura, R., et al.: M-I coupling of bursty bulk flows, *EUROPLANET N3 Strategic Workshop Cluster Ground-based Coordination Workshop, Graz*, Austria, Aug 2006.

Nakamura, R., The Cluster mission: Four-point observation in space, Graz in Space, KFU Graz, Sept 2006.

Nakamura, R.: Earth s magnetotail and aurorae signatures, *EUROPLANET N3 Strategic Workshop Comparative Planetary Aurorae, 2nd Strategic Workshop on Saturn's Aurorae*, London, United Kingdom, Nov 2006.

Niedermayr, A., G. Kargl, F. Simoes, R. Trautner: Measurements of the dielectric properties of Martian soil analog materials with mutual impedance probe as a mole-type instrument, *2nd Int. Workshop on Penetrometry in the Solar System*, Graz, Austria, Sep 2006.

Oswald, T.H., W. Macher, H.O. Rucker: On the calibration of spacecraft antennas, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Oswald, T.H., Antennen auf Raumflugkörper, Graz in Space, KFU Graz, Sept 2006.

Penz, T., D. Langmayr, H. Lammer, Y.N. Kulikov, H.K. Biernat, N.V. Erkaev: Revisiting Titan´s exosphere and atmospheric evolution after Huygens, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Rounov, A.V., R. Nakamura, Y. Asano, W. Baumjohann: Cluster observations of magnetic reconnection in the magnetotail, *6th Int. Conf. "Problems of Geocosmos"*, St. Petersburg, Russian Federation, May 2006.

Rounov, A.V., Y. Asano, R. Nakamura, W. Baumjohann, V.A. Sergeev, S. Apatenkov, J.A. Sauvaud: Local structure and dynamics of the magnetotail current sheet: Cluster observations, *6th Int. Conf. "Problems of Geocosmos"*, St. Petersburg, Russian Federation, May 2006.

Rounov, A.V., et al.: Substorm current sheet dynamics, *EUROPLANET N3 Strategic Workshop*

Cluster Ground-based Coordination Workshop, Graz, Austria, Aug 2006.

Rucker, H.O., M.L. Khodachenko: EUROPLANET (European Planetology Network): Coordinated ground-based and spacecraft observation activity, *Int. Heliospheric Year European General Assembly*, Paris, France, Jan 2006.

Rucker, H.O., Faszination Weltraumforschung, Festvortrag Physik-Olympiade Steiermark, Graz, April 2006.

Rucker, H.O.: Was haben wir im Weltraum zu suchen? Universität Graz, Graz, Austria, May 2006.

Rucker, H.O.: Exploration of the planets and moons of our solar system (5 lectures), CERN, Genf, Switzerland, Jun 2006.

Rucker, H.O.: Saturn kilometric radiation as monitor for the solar wind? *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Rucker, H.O.: Non-thermal radio emission fundamentals: A database for methods, tools, references and open problems, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Rucker, H.O., Cassini/Huygens im Saturn-System, Graz in Space, KFU Graz, Sept 2006.

Rucker, H.O., EUROPLANET – Koordinierte Planetologie in Europa, Graz in Space, KFU Graz, Sept 2006.

Schwingenschuh, K.: First in-situ observations of electrical phenomena in the atmosphere of Titan: Evidence of lightning? *ISSI Team meeting, Titan's Ground-Ionosphere Cavity after Huygens*, Bern, Switzerland, Mar 2006.

Schwingenschuh, K.: PWA-HASI observations of impulsive events: Lightning or artefacts? *ISSI Team meeting, Titan's Ground-Ionosphere Cavity after Huygens*, Bern, Switzerland, Nov 2006.

Schwingenschuh, K., et al.: In-situ observations of electric field fluctuations and impulsive events during the descent of the Huygens probe in the atmosphere of Titan, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Stangl, G.: Report from the ICG Meeting – Summary and Actions, *EUREF*, Frankfurt/Main, Germany, Nov 2006.

Stangl, G.: The potential of the 365 AD tsunami – Limitations by ancient sources, geodynamics and sub-marine topography, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Stangl, G., C. Haslinger: OLG monitoring of the Eastern Mediterranean and Arabia – velocitiy estimations of permanent GPS stations, *WEGENER Symposium 2006*, Nice, France, Sep 2006.

Stangl, G., C. Haslinger: The first Austrian velocity field derived from GPS, *EUREF Symposium 2006*, Riga, Latvia, Jun 2006.

Stangl, G., C. Haslinger, S. Krauss: OLG LAC report 2003-2006, *EPN LAC Workshop 2006*, Padova, Italy, Mar 2006.

Takada, T., R. Nakamura, T.L. Zhang, Y. Asano, W. Baumjohann, B. Klecker, A. Balogh, C.M. Carr: Dipolarization propagation properties observed by Cluster and Double Star TC1, *6th Int. Conf. "Problems of Geocosmos",* St. Petersburg, Russian Federation, May 2006.

Takada, T., R. Nakamura, T.L. Zhang, Y. Asano, W. Baumjohann, B. Klecker, H. Rème, A. Balogh, C.M. Carr: Dipolarization propagation properties observed by Cluster and Double Star TC1, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Takada, T., R. Nakamura, T.L. Zhang, Y. Asano, W. Baumjohann, B. Klecker, H. Rème, A. Balogh, C.M. Carr, H.U. Frey: The relationship between fluctuating plasma sheet and substorm development: Cluster and Double Star TC1 case study, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Takada, T., et al.: Cluster/DSP conjunction studies: BBFs, dipolarization and PS dynamics, *EUROPLANET N3 Strategic Workshop Cluster Ground-based Coordination Workshop*, Graz, Austria, Aug 2006.

Taubenschuss, U., H.O. Rucker, W.S. Kurth, B. Cecconi, P. Zarka, M.K. Dougherty, J.T. Steinberg: Linear filtering of Saturn kilometric radiation and the solar wind, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Torkar, K.M., P.-A. Lindqvist, P.M.E. Décréau, I. Dandouras, A.N. Fazakerley, H. Kahn, H. Laakso, H. Jeszenszky: Estimation of plasma density from the actively controlled Cluster spacecraft potential, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Valavanoglou, A., W. Magnes, H. Hauer, M. Oberst, H. Neubauer, W. Baumjohann, P. Falkner: Magne-

tometer Front-end ASIC (MFA), *AMICSA 2006*, Xanthi, Greece, Oct 2006.

Voller, W.: Bad Astronomy, Urania, Graz, Austria, Oct 2006.

Voller, W.: Die veränderliche Sonne, Planetarium Stuttgart, Stuttgart, Germany, Nov 2006.

Volwerk, M., K.H. Glassmeier, W. Baumjohann, T. Takada, R. Nakamura, B. Klecker, H. Reme, T.L. Zhang, E. Lucek: Kelvin-Helmholtz waves in the Earth's magnetotail, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Volwerk, M., et al.: Pi2 observations by Cluster and 210M, *EUROPLANET N3 Strategic Workshop Cluster Ground-based Coordination Workshop*, Graz, Austria, Aug 2006.

Vörös, Z., W. Baumjohann, R. Nakamura, A.V. Rounov, M. Volwerk: Evidence for transitory turbulence in the Earth´s plasma sheet, *6th Int. Conf. "Problems of Geocosmos"*, St. Petersburg, Russian Federation, May 2006.

Weingrill, J.: Amateur Astronomers activities in Austria, *Joint EUROPLANET N3 and N4 Workshop on Amateur Astronomer Coordinated Observations in Support of VEX*, Graz, Austria, Jun 2006.

Weingrill, J.: Astrometrie, Urania, Graz, Austria, Nov 2006.

Weingrill, J.: Campaigns at the Observatory Lustbühel, *Wiss. Jahrestagung der ÖGAA*, Innsbruck, Austria, Apr 2006.

Weingrill, J.: Einführung in die Astronomie, Kepler Gymnasium, Graz, Austria, Oct 2006.

Zhang, T.L., G. Berghofer, M. Delva, W. Zambelli, W. Magnes, H.-U. Auster, K.-H. Fornacon, C. Carr: Venus Express magnetometer investigation: Instrument description and status report, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Zhang, T.L., M. Delva, W. Baumjohann, C.T. Russell, H. Auster, C. Carr, S. Barabash, M. Balikhin, K. Kudela: Venus bow shock location at solar minimum observed by Venus Express, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

6.7 Posters

Amerstorfer, U., N.V. Erkaev, D. Langmayr, H.K. Biernat: On Kelvin-Helmholtz instability around unmagnetized planets including a finite boundary layer, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Asano, Y., R. Nakamura, A.V. Rounov, T. Takada, W. Baumjohann, A. Balogh, B. Klecker, H. Rème: Property of the cross-tail current sheet variation during substorms observed by Cluster, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Asano, Y., R. Nakamura, M. Fujimoto, I. Shinohara, C.J. Owen, A. Fazakerley, T. Takada, A.V. Rounov, W. Baumjohann, T. Nagai, E.A. Lucek, H. Rème: Multipoint observations of plasma distributions around the X line, *Symp. "Future Perspectives of Space Plasma and Particle Instrum. and Int. Collaborations"*, Tokyo, Japan, Nov 2006.

Asano, Y., R. Nakamura, M. Fujimoto, I. Shinohara, C.J. Owen, A.N. Fazakerley, T. Takada, A.V. Rounov, W. Baumjohann, T. Nagai, E.A. Luceck, H. Rème: Spatial signature of electron distributions around the X line, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Baumjohann, W., R. Nakamura: Convection in the Earth´s magnetotail, *8th Int. Conf. Substorms*, Banff, Canada, Mar 2006.

Besser, B.P., H.I.M. Lichtenegger, H.-U. Eichelberger, K. Schwingenschuh, J.A. Morente, K. Mocnik: Numerical simulation and experimental simulator for extremely low frequency wave propagation in the Earth-ionosphere cavity: An educational approach, *12th Int. IGTE Symp. Num. Field Calc. in Electr. Eng.*, Graz, Austria, Sep 2006.

Boudjada, M.Y., H.K. Biernat, C. Kolb, H. Lammer, N.I. Kömle, P. Nenovski, M. Blümel, A. Zöhrer, K. Schwingenschuh, G. Kargl, E. Cristea, H.O. Rucker: Laboratory tests as tools to reproduce seismic electromagnetic phenomena, *First DEMETER Symposium*, Toulouse, France, Jun 2006.

Boudjada, M.Y., P.H.M. Galopeau, H.O. Rucker, A. Lecacheux, W.S. Kurth, D.A. Gurnett, U. Taubenschuss, J.T. Steinberg, S. Johnson, W. Voller: Relationship between the solar wind and the upper frequency limit of the Saturn kilometric radiation, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Cristea, E.: RA-2 bias determination using a transponder, *Symp. "15 Years of Radar Altimetry"*, Venice, Italy, Mar 2006.

Cristea, E., G. Kirchner, W. Hausleitner: AJISAI spin parameters determination using Graz kHz Satellite Laser Ranging data, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Cristea, E., P. Pesec, W. Hausleitner, P. Moore: Height transfer from land to sea using a transponder, *EGU General Assembly 2006*, Wien, Austria, Apr 2006.

Fischer, G., M.D. Desch, P. Zarka, W. Macher, A. Lecacheux, D.A. Gurnett, W.S. Kurth, M.L. Kaiser, H.O. Rucker: The discrimination between Jovian emission and SEDs, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Hausleitner, W., G. Kirchner, R. Pail, S. Krauss, H. Goiginger: Improved kHz-SLR tracking techniques and orbit quality analysis for LEO-Missions, *GOCE User Workshop 2006*, Frascati, Italy, Nov 2006.

Hausleitner, W., et al.: Satellite Geodesy – Made in Graz, *Physics of Auroral Phenomena, Proc. XXIX Annual Seminar, Apatity*, Apatity, Russian Federation, Feb 2006.

Khodachenko, M.L., A.G. Kislyakov, H.O. Rucker, V.V. Zaitsev, S. Urpo: Detection of solar coronal magnetic loop oscillations in microwaves, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Khodachenko, M.L., H. Lammer, H.I.M. Lichtenegger, M. Leitner, T. Penz, D. Langmayr, H.K. Biernat, H.O. Rucker: The importance of magnetospheric protection of Hot Jupiters against ion loss caused by CMEs, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Khodachenko, M.L., T. Oswald, W. Macher, H.O. Rucker: On the effect of space plasma upon the receiving characteristics of spacecraft antennas, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Kiehas, S.A., I.V. Kubyshkin, V.S. Semenov, H.K. Biernat, T. Penz: Determination of reconnected flux via remote sensing, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Kolb, C., H.I.M. Lichtenegger, H. Lammer, P. Dobnikar, D. Koschny, V. Mangano, P. Wurz, A. Milillo, S. Orsini, K.M. Torkar: Modelling of sputtering at the surfaces of Mercury and the Moon: on the interplay of depletion and refreshing rates, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Kömle, N.I., E. Kaufmann, G. Kargl: Development of thermal conductivity sensors for lunar and planetary regoliths, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Kömle, N.I., G. Kargl, K. Seiferlin: New concepts for thermal measurements on airless bodies, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Lammer, H., H.I.M. Lichtenegger, C. Kolb, P. Dobnikar, V. Mangano, A. Mura, P. Wurz, A. Milillo, S. Orsini, K. Torkar: Implications of Mercury's surface composition on 3-D exosphere modelling, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Lammer, H., M.L. Khodachenko, H.I.M. Lichtenegger, J.-M. Grießmeier, H.K. Biernat, H.O. Rucker: Atmospheric erosion of weakly magnetized Hot Jupiters, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

Leitner, M., C.J. Farrugia, V.A. Osherovich, J. Fainberg, H.K. Biernat, R. Schwenn, K.W. Ogilvie: Variations of the magnetic and plasma kinetic energy densities, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Lichtenegger, H.I.M., H. Lammer, C. Kolb, V. Mangano, A. Mura, P. Wurz, A. Milillo, S. Orsini, K.M. Torkar, D. Koschny, T. Takada: Modelling of Mercury's surface composition and its implications for the exosphere, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Lichtenegger, H.I.M., H. Lammer, E. Kallio, A. Mura, P. Wurz, A. Millilo, K.M. Torkar, S. Livi, S. Barabash, S. Orsini: The role of CMEs in the refilling of Mercury's exosphere, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

Lichtenegger, H.I.M., J.A. Morente, B.P. Besser: On the possible altitude dependence of Schumann resonance frequencies, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Muehlbachler, S., D. Langmayr, N.V. Erkaev, A.T.Y. Lui, P.W. Daly, H.K. Biernat: Cluster observations showing the indication of the formation of a modified-two-stream instability in the geomagnetic tail, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Nakamura, R., W. Baumjohann, A.V. Rounov, Y. Asano, A. Balogh, C.J. Owen, B. Klecker, H. Rème, A.N. Fazakerley: Dynamics of the thin current sheets during a reconnection event observed by Cluster, *EGU General Assembly 2006*, Wien, Austria, Apr 2006.

Nakamura, R., Y. Asano, W. Baumjohann, A.V. Rounov, C.J. Owen, A. Fazakerley, M. Fujimoto, I.

Shinohara, B. Klecker, H. Rème, E. Lucek: Observation of thin current sheets during magnetotail reconnection with a presence of a guide field, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Oswald, T.H., W. Macher and H.O. Rucker, Calibration of the NASA/STEREO/WAVES antenna system, NAWI-Fakultätstag, KFU Graz, Nov 2006.

Oswald, T., W. Macher, G. Fischer, H.O. Rucker, U. Taubenschuss, J.L. Bougeret, A. Lecacheux, M.L. Kaiser, K. Goetz: Antenna calibration of the STEREO/WAVES antennas in the frequency range of the fixed frequency receiver, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Oswald, T., W. Macher, G. Fischer, H.O. Rucker, J.L. Bougeret, A. Lecacheux, M.L. Kaiser, K. Goetz: Various methods of calibration of the STEREO/SWAVES antennas, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Oswald, T., W. Macher, G. Fischer, H.O. Rucker, U. Taubenschuss, J.L. Bougeret, A. Lecacheux, M.L. Kaiser, K. Goetz: Antenna calibration of the STEREO/WAVES antennas in the frequency range of the fixed frequency receiver, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Oswald, T., H.O. Rucker, W. Macher: Aspects of the RPW antennas of SOLAR ORBITER, *Second Solar Orbiter Workshop*, Athens, Greece, Oct 2006.

Panchenko, M., J. Hanasz, H.O. Rucker: Observational evidence of the absence of the linear wave polarization in AKR, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Panchenko, M., M.L. Khodachenko, A.G. Kislyakov, H.O. Rucker: Analysis of long-periodic modulations of SKR and solar wind parameters, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

Penz, T., A. Ciaravella, N.V. Erkaev, D. Langmayr, C. Cecchi-Pestellini, Y.N. Kulikov, H. Lammer, G. Micela, H.K. Biernat: Stellar radiation induced mass loss from short-periodic gas giants: Modelling of long-time thermal evaporation, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

Penz, T., C.J. Farrugia, V.V. Ivanova, V.S. Semenov, H.K. Biernat, S.W. Cowley, L.M. Kistler, R. Torbert, M. Panchenko: A two-spacecraft study of transient magnetopause reconnection: model results and comparison with in situ and ionospheric observations, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Penz, T., D. Langmayr, H. Lammer, Y.N. Kulikov, H.K. Biernat, N.V. Erkaev: Revisiting Titan's exosphere and atmospheric evolution after Huygens, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Penz, T., V.S. Semenov, M.F. Heyn, V.V. Ivanova, I.B. Ivanov, H.K. Biernat: Wave structures excited in compressible Petschek-type magnetic reconnection, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Rucker, H.O., W. Macher, T. Oswald, et al.: Considerations of Solar Orbiter electric antenna modelling, *Second Solar Orbiter Workshop*, Athens, Greece, Oct 2006.

Rucker. H.O., M. Khodachenko, R. Nakamura, H. Lammer, EUROPLANET – The European planetology network, NAWI-Fakultätstag, KFU Graz, Nov 2006.

Schwingenschuh, K., P. Nenovski, M. Vellante, M. Boudjada, M. Chamati, U. Villante, H. Rucker, E. Cristea, V. Wesztergom, P. Pesec, M. Stachel, W. Voller, W. Magnes: Data analyses of ground-based ULF magnetic field measurements from SEGMA array during DEMETER observations of seismic events in the Adriatic region, *First DEMETER Symposium*, Toulouse, France, Jun 2006.

Schwingenschuh, K., R. Hofe, T. Tokano, J.J. Lopez-Moreno, R. Grard, P. Falkner, R. Trautner, M. Hamelin, F. Simoes, I. Jernej: Electric field observations during the descent of the HUYGENS probe: Evidence of lightning in the atmosphere of Titan, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Torkar, K.M., A.N. Fazakerley, A. Lahiff, W. Steiger: The effect of active spacecraft potential control on three-dimensional measurements of electron distributions on board Double Star TC-1, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Treffer, M., N.I. Kömle, G. Kargl, E. Kaufmann: Thermal probes for investigating planetary ice sheets, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

Volwerk, M., R. Nakamura, T. Uozumi, W. Baumjohann, T. Takada, B. Klecker, A. Balogh, K. Yumoto: Pi2 observations by Cluster in the magnetotail, *EGU General Assembly 2006*, Wien, Austria, Apr 2006.

Vörös, Z., R. Nakamura, W. Baumjohann, A.V. Rounov, M. Volwerk, D. Jankovicova, A. Balogh, B. Klecker: Reconnection and bursty bulk flow-associated turbulence in the Earth´s plasma sheet, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Zhang, T.L., J.K. Shi, Z.W. Cheng, J.G. Guo, C.T. Russell, Z. Voeroes, W. Baumjohann: Solar cycle 23 variations in the interplanetary magnetic field at 1.0 AU, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Zhang, T.L., M. Volwerk, R. Nakamura, T. Takada, W. Baumjohann, J.K. Shi, Z.W. Cheng, J.G. Guo: Double Star TC-2 observation of field aligned currents in the nightside magnetosphere, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

6.8 Co-Authored Presentations

Amm, O., A. Aikio, H.U. Frey, R. Nakamura, H. Vanhamäki: Analysis of mesoscale ionospheric substorms signatures, *8th Int. Conf. Substorms,* Banff, Canada, Mar 2006.

Apatenkov, S., V. Sergeev, M. Kubyshkina, R. Nakamura, W. Baumjohann, I. Alexeev, A. Fazakerley, H. Frey, P.W. Daly, S. Muhlbacher, J.-A. Sauvaud, A.V. Rounov, N. Ganushkina, T. Pulkkinen, G.D. Reeves: Multi-satellite observation of plasma injection/dipolarization in the inner magnetosphere, *8th Int. Conf. Substorms*, Banff, Canada, Mar 2006.

Atkinson, K.R., A.J. Ball, A. Hagermann, G. Kargl, M.R. Leese, R.D. Lorenz, T.J. Ringrose, M.C. Towner, J.C. Zarnecki: Examining the surface mechanical properties of Titan at the huygens landing site through penetrometry, *2nd Int. Workshop on Penetrometry in the Solar System*, Graz, Austria, Sep 2006.

Becker, M., A. Caporali, R. Drescher, G. Grenerczy, C. Haslinger, J. Hefty, G. Stangl, M. Figurski,T. Liwosz: Central European intraplate velocity update results of 12 years of CEGRN GPS data, *WEGENER Symposium 2006*, Nice, France, Sep 2006.

Belisheva, N.K., H. Lammer, H.K. Biernat, T.L. Kachanova, I.V. Kalashnikova: Possible psycho-physiological consequences of human long-term space missions, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Belisheva, N.K., H.K. Biernat, H. Lammer, I.V. Getselev: Relation of reverse geomagnetic polarity to biological evolution, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Belisheva, N.K., H. Lammer, H.K. Biernat, T.L. Kachanova, I.V. Kalashnikova: Possible psycho-physiological consequences of human long-term space missions, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Bérces, A., G. Kovács, H. Lammer, C. Kolb, G. Rontó: Life and the solar UV environment on early Earth, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Berciano-Alba, A., P. Borges-da-Silva, H. Eichelberger, F. Giovacchini, M. Godolt, G. Hasinger, M. Lerchster, V. Lusset, F. Mattana, Y. Mellier, M. Michalowski, C. Monteserin-Sanchez, F. Noviello, C. Persson, A. Santovincenzo, P. Schneider, M. Zhang, L. Östman: DEMON: A proposal for a satellite-borne experiment to study Dark Matter and Dark Energy, *Conf. "Space Telescopes and Instrumentation 2006"*, Orlando, USA, May 2006.

Boesswetter, A., S. Simon, U. Motschmann, T. Bagdonat, H. Lammer: Three-dimensional hybrid simulations of the evolution of the Martian plasma environment, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Brazhenko, A.I., V.N. Melnik, A.A. Konovalenko, E.P. Abranin, V.V. Dorovskyy, R.V. Vashchishin, A.V. Frantsuzenko, H.O. Rucker, A. Lecacheux: Polarization of drifting pairs at decameter waves, *XXVIth General Assembly of IAU*, Prague, Czech Republic, Aug 2006.

Brown, P., S.J. Schwartz, H.-U. Auster, C.M. Carr, K.-H. Fornacon, K.-H. Glassmeier, T. Horbury, R. Nakamura, H. O´Brien, T.L. Zhang: A magnetometer design for the Kua-Fu mission, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Cao, J., Y. Ma, G. Parks, H. Rème, I. Dandouras, R. Nakamura, T. Zhang, Q. Zong, E. Lucek, C. Carr, Z. Liu, G. Zhou: The bursty bulk flows in the magnetospheric tail, *2006 Western Pacific Geophysics Meeting*, Peking, China, Jul 2006.

Carr, C., S. Schwartz, T. Horbury, K.-H. Glassmeier, H.-U. Auster, T.L. Zhang, R. Nakamura: Investigations with the magnetometers on KuaFu, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Carr, C.M., T.S. Horbury, S. Bale, W. Baumjohann, B. Bavassano, D. Burgess, P. Cargill, N. Crooker, G. Erdos, L. Fletcher, R. Forsyth, J. Giacalone, K.-H. Glassmeier, T. Hoeksema, M. Goldstein, V. Nakariakov, M. Lockwood, M. Maksimovic, E. Marsch, W. Matthaeus, N. Murphy, P. Riley, C. Russell, S. Schwartz, A. Szabo, M. Thompson, R. Vainio, M. Velli, R. Walsh, R. Wimmer-Schweingruber, G. Zank: A magnetometer for Solar Orbiter, *Second Solar Orbiter Workshop*, Athens, Greece, Oct 2006.

Chassefière, E., B. Langlais, F. Leblanc, C. Sotin, S. Barabash, V. Dehant, M. Dougherty, H. Lammer, M. Mandea, S. Vennerstrom: MEMO: Mars Escape and Magnetic Orbiter, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

Chen, Y., X.H. Deng, R.X. Tang, Y.H. Hu, J.F. Wang, X.M. Zhou, R. Nakamura, W. Baumjohann, A. Balogh, R. Rème: Reconstruction of flux transfer events from Cluster data, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Cheng, Z.W., J.K. Shi, T.L. Zhang, Z.X. Liu, E. Lucek: The density of field-alligned currents at the plasma sheet boundary: Cluster observation, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Deng, X., R. Tang, Z. Yuan, M. Zhou, S. Li, Y. Pang, J. Pickett, M. Andre, A. Fazakerley, W. Baumjohann, A. Vaivads, R. Nakamura, Z. Liu: The microphysics of collisionless reconnection, *2006 Western Pacific Geophysics Meeting*, Beijing, China, Jul 2006.

Deng, X.H., J.S. Pickett, W. Baumjohann, N. Cornilleau-Wehrlin, P. Decreau, A.N. Fazakerley, O. Santolik, A. Vaivads, J. Buchner, M. Andre, H. Rème, P.W. Daly, C. Carr, C.Y. Tu, Z.X. Liu: The microphysics of collisionless reconnection, *Symp. "Future Perspectives of Space Plasma and Particle Instrum. and Int. Collaborations"*, Tokyo, Japan, Nov 2006.

Deng, X.H., R.X. Tang, Z.G. Yuan, M. Zhou, S.Y. Li, Y. Pang, W. Baumjohann, T.L. Zhang, H. Rème, C.M. Carr: Joint observations of reconnection at dayside magnetopause by TC1 and Cluster and compared with computer simulations, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Deng, X.H., Z.W. Ma, R.X. Tang, J.S. Pickett, M. Andre, A.N. Fazakerley, W. Baumjohann, A. Vaivads, R. Nakamura, Z.X. Liu: The microphysics and structure of reconnection by observations of Cluster and TC1 and computer simulations, *Matsumoto-Symposium*, Kyoto, Japan, Mar 2006.

Dorovskyy, V.V., V.N. Melnik, A.A. Konovalenko, E.P. Abranin, H.O. Rucker, A. Lecacheux: Solar U- and J-bursts at the frequencies 10-30 MHz, *XXVIth General Assembly of IAU*, Prague, Czech Republic, Aug 2006.

Dyadechkin, S.A., V.S. Semenov, H.K. Biernat, T. Penz: A comparison of magnetic flux tube and cosmic string behavior in Kerr metric, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Ekenback, A., M. Holmstrom, H. Lammer, F. Selsis, H.I.M. Lichtenegger: The hydrogen energetic neutral atom environment of Hot Jupiters, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

Erkaev, N.V., D. Langmayr, H. Lammer, F. Selsis, H.K. Biernat: Roche lobe effects on the atmospheric loss of Hot Jupiters, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Fedorov, A., S. Barabash, J. Sauvaud, T.L. Zhang, R. Lundin, C. Ferrier, C. Mazelle: A comparative analysis of the Venus and Mars magnetotail ion flows. First data from the IMA (ASPERA-4, Venus Express) mass spectrometer compared with Mars Express, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Fujimoto, M., S. Schwartz, T. Horbury, P. Louarn, W. Baumjohann: Cross-Scale: a multi-spacecraft mission to study cross-scale coupling in space plasmas, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Fulchignoni, M., F. Ferri, C. Colombatti, J.C. Zarnecki, A.M. Harri, R. Grard, M. Hamelin, K. Schwingenschuh, J.J. Lopez-Moreno, F. Angrilli: The characteristics of Titan's atmosphere by the Huygens Atmospheric Structure Instrument (HASI) measurements, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Galopeau, P.H.M., M.Y. Boudjada, A. Lecacheux: High and low frequency limit of SKR from Cassini/RPWS, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

Galopeau, P.H.M., M.Y. Boudjada, H.O. Rucker: Parametric study of theoretical location of Io-controlled Jovian decameter radio sources, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Georgescu, E., H.-U. Auster, P. Brown, C.M. Carr, H. Eichelberger, K.-H. Fornacon, J. Gloag, T.L. Zhang: Use of Double Star (TC-1) magnetic field measurements in multi-spacecraft studies, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Grieger, B., F. Leblanc, M. Fränz, H. Lammer, T. Siili, T. Tokano: A science case on atmospheric circulation, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Grießmeier, J.-M., A. Stadelmann, H. Lammer, L. Grenfell, B. Patzer, P. von Paris, U. Motschmann: The impact of galactic cosmic rays on extrasolar earth-like planets in close-in habitable zones, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

Grygorczuk, J., M. Banaszkiewicz, G. Kargl, N.I. Kömle: Determination of the tensile strength of cometary nucleus from hammering progress, *2nd Int. Workshop on Penetrometry in the Solar System*, Graz, Austria, Sep 2006.

Gubchenko, V.M., H.K. Biernat, M.L. Khodachenko, H.O. Rucker: Dipole and toroidal sources and kinetic description of the far regions of the 3D tails and solar streamers formed by Maxwellian plasma flows, *29th Annual Apatity Seminar "Physics of Auroral Phenomena"*, Apathity, Russian Federation, Feb 2006.

Gubchenko, V.M., H.K. Biernat, H.O. Rucker: Kinetic description of the far regions of the 3d tails/streamers formed by coupling of the external maxwellian plasma flows with magnetic dipole and toroid at active region, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Gunell, H., H. Nilsson, U.V. Amerstorfer, E. Carlsson, et al.: Indications of plasma instabilities near Mars, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Gunell, H., H. Nilsson, U.V. Amerstorfer, E. Carlsson, C. Grima, et al.: Plasma instabilities near Mars, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Guo, J.G., J.K. Shi, T.L. Zhang, Z.X. Liu, A. Fazakerley, H. Rème, I. Dandouras, E. Lucek: Statistical survey of the mid-altitude cusp location: Cluster observation, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Hamelin, M., C. Béghin, V.J.G. Brown, R. Grard, I. Jernej, J.J. Lopez-Moreno, K. Schwingenschuh, F. Simoes, R. Trautner, G.J. Molina-Cuberos: Mutual impedance probe measurements of the electrical conductivity of the atmosphere of Titan with the PWA-HASI instrument on board the HUYGENS Probe, 3*6th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Hamelin, M., et al.: Conductivity and electron density in Titan's atmosphere as deduced from Mutual Impedance measurements by the PWA-HASI instrument on HUYGENS, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Hefty, J., M. Becker, T. Liwosz, R. Drescher, A. Caporali, G. Stangl, G. Grenerczy, C. Haslinger, S. Kraus, R. Kratochvil: Analysis of CEGRN 2005 as the eighth of CERGOP observing campaigns, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Hefty, J., M. Becker, A. Caporali, R. Drescher, G. Grenerczy, S. Krauss, T. Liwosz, L. Gerhatova, R. Kratochvil, g. Stangl: Long-term densification of terrestrial reference frame in Central Europe as the results of Central Europe regional geodynamics project 1994-2006, *IAG Symposium Geodetic Reference Frames GRF2006*, Munich, Germany, Oct 2006.

Hilchenbach, M., A. Remizov, H. Krüger, H. Bönhardt, H. Rosenbauer, I. Szemerey, H.-U. Auster, K.-H. Glassmeier, K.-H. Fornacon, I. Apathy, G. Berghofer, W. Baumjohann, K. Schwingenschuh, W. Magnes: Plasma and magnetic field monitor (PMFM) for Cosmic DUNE, *Cosmic Dune Workshop*, Noordwijk, Netherlands, Feb 2006.

Hvizdos, L., T.L. Zhang, K. Kudela, M. Delva, Z. Vörös, M. Balikhin, S. Pope: Detection of the spacecraft stray magnetic field: an approach based on dual sensor measurements for VEX, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Iorio, L., H.I.M. Lichtenegger: On the gravitomagnetic phenomena generated by orbital motions, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Jankovicova, D., Z. Vörös: The role of anisotropy and intermittency in solar wind/magnetosphere coupling, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Jarvinen, R., S. Barabash, T.L. Zhang, A. Fedorov, E. Kallio, I. Sillianpää, P. Janhunen: Hybrid modelling of the plasma interaction between Venus and the solar wind, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Jarvinen, R., S. Barabash, T.L. Zhang, I. Sillanpää, E. Kallio, P. Janhunen: Hybrid modelling of the plasma interaction between Venus and the solar wind, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

Kletzing, C.A., W. Kurth, M. Acuna, R. Tobert, R. Thorne, V. Jordanova, S. Bounds, C. Smith, O. Santolik, R. Pfaff, D. Rowland, G. Hospordarsky, W. Baumjohann, R. Nakamura: The Electric and Magnetic Field Instrument Suite with Integrated Science (EMFISIS) on the Radiation Belt Storm Probes, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Konovalenko, A.A., H.O. Rucker, A. Lecacheux, I.S. Falkovich, N.N. Kalinichenko, I.N. Bubnov, M.R. Olyak, A.I. Brazhenko, R.V. Vashchishin: Interplanetary scintillation method at the decameter wavelenghts, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Konovalenko, A.A., A.A. Stanislavsky, E.P. Abranin, V.V. Dorovskyy, V.N. Melnik, M.L. Kaiser, H.O. Rucker, A. Lecacheux: Comparative analysis of solar observations to a strong absorption on background of sporadic radio emission from the Sun, *XXVIth General Assembly of IAU*, Prague, Czech Republic, Aug 2006.

Konovalenko, A.A., A. Lecacheux, H.O. Rucker, G. Fischer, E.P. Abranin, N.N. Kalinichenko, I.S. Falkovich, K.M. Sidorchuk: Ground-based decameter wavelength observations of Saturn electrostatic discharges, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Korovinskiy, D., V.S. Semenov, N.V. Erkaev, H.K. Biernat, T. Penz: A theoretical model of steady-state magnetic reconnection in a collisionless incompressible plasma based on the Grad-Shafranov equation solution, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Kral, L., M. Nemec, I. Prochazka, K. Hamal, G. Kirchner, F. Koidl, Y. Fumin: Ground to space atmospheric turbulence monitoring by satellite laser ranging, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Kucharski, D., G. Kirchner: Spin determination of Lageos-1 from kHz laser observations, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Kulikov, Y.N., H. Lammer, H.I.M. Lichtenegger, T. Penz, H.K. Biernat: Solar radiation and particle induced effects on the early Martian atmosphere and loss, *29th Annual Apatity Seminar "Physics of Auroral Phenomena"*, Apatity, Russian Federation, Feb 2006.

Leitzinger, M., P. Odert, A. Hanslmeier, I. Ribas, A.A. Konovalenko, M. Vanko, H. Lammer, M.L. Khodachenko, H.O. Rucker: Highly energetic activity phenomena of main sequence stars, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Litvinenko, G.V., H.O. Rucker, A. Lecacheux, A.A. Konovalenko, V.V. Vinogradov, V.E. Shaposhnikov, U. Taubenschuss: Modulation effects in the Jovian sporadic decameter emission, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Litvinenko, G.V., H.O. Rucker, A. Lecacheux, A.A. Konovalenko, V.V. Vinogradov, V.E. Shaposhnikov, U. Taubenschuss: New high sensitive investigation of the modulation effects in the sporadic Jovian DAM emission, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Liu, D.D., X.H. Deng, K. Yuan, Y. Chen, R.X. Tang, J.F. Wang, R. Nakamura, W. Baumjohann, A. Balogh, N. Cornilleau-Wehrlin: Multi-scale analysis of turbulence in the Earth's Plasma sheet, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Maksimovic, M., S.D. Bale, A. Vaivads, V. Krassnoselskikh, T. Chust, M. Balikhin, K. Goetz, P. Gough, P. Travnicek, J. Soucek, H.O. Rucker: A radio and plasma wave experiment for the solar orbiter mission, *Second Solar Orbiter Workshop*, Athen, Greece, Oct 2006.

Mann, G., H.O. Rucker: Observations of solar activity by the radiospectrometer aboard the solar orbiter, *Second Solar Orbiter Workshop*, Athens, Greece, Oct 2006.

Matsui, H., R.B. Torbert, W. Baumjohann, H. Kucharek, S.J. Schwartz, C.G. Mouikis, L.M. Kistler, A. Balogh, G. Paschmann: Oscillation of electron counts at 500 eV downstream of the quasi-perpendicular bow shock, *AGU 2006 Joint Assembly*, Baltimore, USA, May 2006.

Matsuoka, A., W. Baumjohann: The magnetic field experiment for BepiColombo MMO, *Symp. "Future Perspectives of Space Plasma and Particle In-*

strum. and Int. Collaborations", Tokyo, Japan, Nov 2006.

Meister, C.-V., B.P. Besser, V.V. Lebedeva: Recent problems of magnetosheath physics, *12th Int. Workshop on the Physics of Non-Ideal Plasmas*, Darmstadt, Germany, Sep 2006.

Melnik, V.N., H.O. Rucker, A.A. Konovalenko, B.P. Rutkevych, V.V. Dorovsky, E.P. Abranin, A. Lecacheux: Type III-like bursts in the frequency range 18-30 MHz, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Melnik, V.N., H.O. Rucker, A.A. Konovalenko, N.V. Shevchuk, E.P. Abranin, V.V. Dorovskyy, A. Lecacheux: Observations of Solar Spikes in the Decameter Range, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Melnik, V.N., A.A. Konovalenko, H.O. Rucker, A. Lecacheux: Sporadic Decameter Radio Emission of the Sun, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Melnik, V.N., A.A. Konovalenko, H.O. Rucker, A. Lecacheux: Sporadic radio emission of the Sun in the decameter range, *XXVIth General Assembly of IAU*, Prague, Czech Republic, Aug 2006.

Melnik, V.N., A.A. Konovalenko, B.P. Rutkevich, H.O. Rucker, V.V. Dorovsky, E.P. Abranin, A. Lecacheux, A.I. Brazhenko: Decameter type III-like bursts, *XXVIth General Assembly of IAU*, Prague, Czech Republic, Aug 2006.

Melnik, V.N., H.O. Rucker, A.A. Konovalenko, N.V. Shevchuk, A.P. Abranin, V.V. Dorovskyy, A. Lecacheux: Properties of solar spikes at decameter wavelengths, *XXVIth General Assembly of IAU*, Prague, Czech Republic, Aug 2006.

Melnik, V.N., H.O. Rucker, A.A. Konovalenko, A. Lecacheux, I.S. Falkovich: Study of solar-terrestrial connections in the highlight of simultaneous observations with STEREO and UTR-2, URAN, NDA ground-based radio telescopes, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Moestl, C., M. Leitner, C.J. Farrugia, Q. HU, H.K. Biernat, C.W. Smith: The November 20,2003 magnetic cloud: Comparison of two models, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Moore, T.E., J.L. Burch, R.B. Torbert, K. Torkar, et al.: Solving magnetospheric acceleration, reconnection and turbulence, *Symp. "Future Perspectives of Space Plasma and Particle Instrum. and Int. Collaborations"*, Tokyo, Japan, Nov 2006.

Morente, J.A., B.P. Besser, J.A. Portí, H.I.M. Lichtenegger, A. Salinas, E.A. Navarro, G.J. Molina-Cuberos, M. Rodríguez-Sola, C. Blanchard: Redes de líneas de transmisíon para la simulacíon computacional de cavidades electromagnéticas: Estudio de los modos TEr y TMr en la atmósfera de la Tierra, *XXI Simp. Nac. URSI*, Oviedo, Spain, Sep 2006.

Morente, J.A., J.A. Portí, B.P. Besser, H.I.M. Lichtenegger, A. Salinas, E.A. Navarro, G.J. Molina-Cuberos, C. Blanchard: Transmission line meshes for computational simulation of electromagnetic modes in the Earth's atmosphere, *12th Int. IGTE Symp. Num. Field Calc. in Electr. Eng.*, Graz, Austria, Sep 2006.

Motschmann, U., J.M. Griessmeier, S. Preusse, J. Büchner, E. Kührt, G. Mann, H. Lammer, H.O. Rucker: Magnetospheres of extrasolar planets, *4th Planet Formation Workshop*, Heidelberg, Germany, Mar 2006.

Mouikis, C., L. Kistler, M. Lessard, H. Matsui, R. Nakamura, B. Klecker, H. Rème, I. Dandouras: CLUSTER observations of Pi1B pulsations in the earths magnetotail during substorm onsets, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Odert, P., M. Leitzinger, A. Hanslmeier, H. Lammer, M.L. Khodachenko, I. Ribas, M. Vanko, A.A. Konovalenko, H.O. Rucker: Activity of M-type stars - effects on planetary habitability, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

Orsini, S., S. Livi, K. Torkar, S. Barabash, A. Milillo, P. Wurz, A.M. Di Lellis: BepiColombo MPO SERENA: A novel instrument package to study neutral and ionized particle populations in the environment of Mercury, *Symp. "Future Perspectives of Space Plasma and Particle Instrum. and Int. Collaborations"*, Tokyo, Japan, Nov 2006.

Pail, R., B. Metzler, E. Höck, W.-D. Schuh, M. Wermuth: GOCE gravity field analysis in the framework of HPF: Software architecture, data flow and products, *3rd GOCE User Workshop*, Frascati, Italy, Nov 2006.

Petrukovich, A.A., T.L. Zhang, W. Baumjohann, R. Nakamura, A.V. Runov, A. Balogh: Slipping deformation of the plasma sheet magnetic structure, *29th Annual Apatity Seminar "Physics of*

Auroral Phenomena", Apatity, Russian Federation, Feb 2006.

Petrukovich, A.A., W. Baumjohann, R. Nakamura, A.V. Rounov, A. Balogh: Magnetotail plasma sheet thinning and stretching: Cluster observations, *Symp. "Future Perspectives of Space Plasma and Particle Instrum. and Int. Collaborations"*, Tokyo, Japan, Nov 2006.

Pope, S.A., T.L. Zhang, M.A. Balikhin, K. Kudela, L. Hvizdos, H. Alleyne: An automated approach to the removal of spacecraft generated magnetic fields from Venus Express magnetic field data, *EGU General Assembly 2006*, Wien, Austria, Apr 2006.

Pope, S.A., T.L. Zhang, M. Balikhin, M. Delva, H. Alleyne: A Systems Identification based approach to the detection of spacecraft generated interference in Venus Express magnetometer data, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Pope, S.A., T.L. Zhang, M. Balikhin, M. Delva, K. Kudela, L. Hvizdos, H. Alleyne: An automated approach to the removal of spacecraft generated magnetic interference from Venus Express magnetic field data, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Rosc, J.B., W. Macher, H.O. Rucker: Rheometry measurements for LF antenna calibration for operation in space, *Europ. Planet. Sci. Congr. 2006*, Berlin, Germany, Sep 2006.

Russell, C.T., T.L. Zhang, H. Wei, R.J. Strangeway, M. Delva: Venus Express observations of ionospheric whistler-mode waves: Evidence of planetary-wide lightning occurrence, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Russell, C.T., T.L. Zhang, H.Y. Wei, M. Delva: The Venus electromagnetic wave environment as observed by Venus Express, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Russell, C.T., T.L. Zhang, H.Y. Wei, M. Delva: The Venus electromagnetic wave environment as observed by Venus Express, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

Sauvaud, J., S. Barabash, C. Mazelle, T.L. Zhang, R. Lundin, A. Fedorov, C. Ferrier, A. Coates: Plasma regimes around Venus: VEX insight on the boundary separating solar and planetary plasmas, *AGU Fall 2006 Meeting*, San Francisco, USA, Dec 2006.

Schwartz, S., T. Horbury, P. Louarn, M. Fujimoto, W. Baumjohann, L. Blomberg, S. Barabash, P. Canu, K.-H. Glassmeier, H. Koskinen, R. Nakamura, C. Owen, T. Pulkkinen, A. Roux, J.A. Sauvaud, K. Svenes, A. Vilavads: Cross-Scale: a multi-spacecraft mission to study cross-scale coupling in space plasmas, *EGU General Assembly 2006*, Wien, Austria, Apr 2006.

Seiferlin, K., M. Heimberg, M. Thomas, N. Kömle, G. Kargl: Thermal conductivity measurements of analogs of consolidated Martian soil, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Sergeev, V., M. Kubyshkina, S. Apatenkov, A.V. Rounov, W. Baumjohann, R. Nakamura, T.L. Zhang, H.-U. Eichelberger, A. Fazakerley, C. Owen, J.-A. Sauvaud, P. Daly, J. Cao, H. Frey, E. Georgescu, K.-H. Glassmeier, K.-H. Fornacon, H. Singer, G. Reeves, E. Donovan, I. Mann: Relationship of magnetic reconnection and injections/dipolarizations, *8th Int. Conf. Substorms*, Banff, Canada, Mar 2006.

Shaposhnikov, V.E., V.V. Zaitsev, H.O. Rucker, G.V. Litvinenko: Modulation lanes polarization features of Jovian decametric radio emission, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Shaposhnikov, V.E., V.V. Zaitsev, H.O. Rucker, G.V. Litvinenko: Polarization of "modulation lanes" as a probe for diffractive models of Jovian decametric radio emission, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Shen, C., Z. Liu, C. Escoubet, C.M. Carr, H. Rème, A. Fazakerley, I. Dandouras, T.L. Zhang, S. Wang, Q. Shi: Surveys on magnetospheric plasmas based by DSP exploration, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Shi, J.K., Z.W. Cheng, T.L. Zhang, R. Nakamura, Z.X. Liu: Case study on field aligned current observed by Cluster in the storm times, *EGU General Assembly 2006*, Wien, Austria, Apr 2006.

Shi, J., J.G. Guo, T.L. Zhang, Z.X. Liu, A. Fazakerley, H. Rème, I. Dandouras, E. Lucek: The correlations of particles density with geomagnetic activity and solar dynamic pressure in cusp region, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Shi, J.K., Z.W. Cheng, T.L. Zhang, M. Dunlop, R. Nakamura, Z.X. Liu, E. Lucek: An investigation on field-aligned current at plasma sheet boundary layers in the storm time, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Shi, J., Z. Cheng, T. Zhang, Z. Liu: Properties of FAC observed by Cluster during storm times, *2006 Western Pacific Geophysics Meeting*, Beijing, China, Jul 2006.

Shi, J.K., M.N. Qureshi, T.L. Zhang, K.M. Torkar, Z.X. Liu: A model for nonlinear electrostatic solitary waves observed by Cluster and Double Star, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Shi, J.K., Z.W. Cheng, J.G. Guo, T.L. Zhang, C.M. Carr, Z.X. Liu: Field-aligned currents observed by Double Star TC-2 in polar region, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Svedhem, H., D. Titov, S. Barabash, J.-L. Bertaux, P. Drossart, V. Formisano, B. Häusler, W.J. Markiewicz, G. Piccioni, T.L. Zhang: Venus Express first results - An overview, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Tang, R.X., X.H. Deng, Y. Pang, M. Andre, A. Vaivads, W. Baumjohann, R. Nakamura, A.N. Fazakerley, J.S. Pickett, Z.X. Liu: Study of structure and instability of current sheet by observations of Cluster and TC1 and computer simulations, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Titov, D.V., H. Svedhem, S. Barabash, J.-L. Bertaux, P. Drossart, V. Formisano, B. Häusler, W.J. Markiewicz, G. Piccioni, T.L. Zhang: Venus Express: First months of science operations in orbit, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Tolstykh, Y.V., V.S. Semenov, M.F. Heyn, H.K. Biernat, T. Penz: A relativistic Petschek-type model of magnetic reconnection, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Trautner, R., J.J. Lopez-Moreno, K. Schwingenschuh, M. Hamelin, F. Simoes, R. Grard, G.J. Molina-Cuberos, I. Jernej, R. Hofe, V. Brown: A proposed sensor suite for the investigation of electric and acoustic phenomena in the Venusian atmosphere, *EGU General Assembly 2006*, Wien, Austria, Apr 2006.

Trautner, R., M. Hamelin, R. Grard, K. Schwingenschuh, J.J. Lopez-Moreno, G.J. Molina-Cuberos, F. Simoes, I. Jernej, P. Falkner: Conductivity measurements in Titan´s atmosphere by the HASI-PWA MI probe on board of Huygens, *EGU General Assembly 2006*, Wien, Austria, Apr 2006.

Vaisberg, O., J.-J. Berthelier, K. Torkar, F. Leblanc, J. Woch, L. Avanov, V. Smirnov, D. Delcourt, W. Baumjohann, A. Skalski, P. Escoubet, J. Burch, D. McComas, J. Cravens, P. Wurz, V.D. Myagkikh, A.A. Shamanov, K. Szego, G. Koinash: Panoramic imaging mass-spectrometer for planetary studies, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

Verigin, M., G. Kotova, T.L. Zhang, M. Tatrallyay, J. Slavin, T. Gombosi, K. Kabin: Venusian ionopause and bow shock anisotropy and variations influenced by IMF, solar wind, and UV-flux, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Voronkov, I., A.V. Rounov, A. Koustov, K. Kabin, M. Meurant, E. Donovan, C. Bryant, E. Spanswick: Features of magnetosphere-ionosphere coupling at breakups and onset inferred from in situ and ground-based multi-instrument alignment, *8th Int. Conf. Substorms*, Banff, Canada, Mar 2006.

Wang, X., J. Shi, T.L. Zhang, H. Lichtenegger: Hot Oxygen Corona at Mars and Its Effect on Solar Wind Deceleration, AOGS 2006, Singapore, Singapore, Jul 2006.

Whitby, J.A., P. Wurz, U. Rohner, H. Lammer, C. Kolb, P. Dobnikar: A new model of the lunar exosphere, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Wurz, P., A. Galli, H. Lammer, H.I.M. Lichtenegger, R. Lundin, S. Barabash, A. Grigoriev, M. Holmström, A. Fedorov, et al.: The Martian hydrogen exospheric density profile measured with ASPERA-3/NPD, *EGU General Assembly 2006*, Vienna, Austria, Apr 2006.

Yan, G.Q., C. Shen, Z.X. Liu, C.M. Carr, H. Rème, T.L. Zhang: A statistical study on correlations between plasma sheet and solar wind based on DSP explorations, *36th COSPAR Scientific Assembly*, Beijing, China, Jul 2006.

Zaitsev, V.V., V.E. Shaposhnikov, H.O. Rucker: Factors controlling the occurrence of the Jovian decametric radio emission, *Europ. Planet. Sci. Congr.*, Berlin, Germany, Sep 2006.

7 Teaching & Workshops

7.1 Lecturing

IWF members are actively engaged in teaching at three universities. In summer 2006 and in the current winter term 2006/2007 the following lectures are given:

KFU Graz

Plasma Physics (Biernat)

Solar-terrestrial Relationship (incl. Space Weather) (Biernat)

Space Physics and Aeronomy (Biernat, Rucker)

Magnetism and Terrestrial Magnetic Field (Biernat)

Ionospheres of Earth and Planets (Biernat)

Introduction to Planetology (Kömle)

Ice and Fire in the Solar Systen (Kömle)

Data Processing in Geophysics and Space Physics (Nakamura)

Meaurement Methods in Space Physics and Aeronomy 1 (in-situ measurements)(Rucker)

Meaurement Methods in Space Physics and Aeronomy 2 (remote sensing) (Rucker)

Cosmic Rays (Rucker)

TU Graz

Advanced Space Plasma Physics (Baumjohann)

Digital Audio Techniques (Magnes)

Information Techniques (Magnes)

Applied Space Physics (Riedler)

HF Techniques 2 (Riedler)

Active Plasma Experiments in Space (Torkar)

JKU Linz

Mathematics for Students of Computer Sciences in Economics I+II (Hausleitner)

Advanced Course

The two-years post-graduate university course Space Sciences in cooperation with both KFU Graz and TU Graz leads to the internationally acknowledged Master of Science (MSc) “Space Sciences.” Several members of IWF are lecturers of this inter-university course led by H.O. Rucker.

7.2 Theses

Besides lecturing, members of the Institute are supervising Diploma, Master and Doctoral Theses. In 2006, the following theses have been completed:

Cristea, E.: Calibration of satellite radar altimeters and height transfer using a dedicated transponder, Doctoral Thesis, Graz University of Technology, 144 pages (2006).

Fessel, M. Über eine mögliche Verletzung des schwachen Äquivalenzprinzips in der Allgemeinen Relativitätstheorie, Diploma Thesis, Graz University of Technology, 101 pages (2006)

Fischer, D.: Design study of a low noise and radiation tolerant sigma-delta digital-to-analog converter for space application, Diploma Thesis, Graz University of Technology, 101 pages (2006).

Grießmeier, J.-M.: Aspects of the magnetosphere-stellar wind interaction of close-in extrasolar planets, Doctoral Thesis, Technical University Braunschweig, 179 pages (2006).

Taubenschuss, U.: “The Linear Prediction Theory applied to Cassini data”, Master Thesis, ULG “Space Sciences,” 68 pages (2006)

Zambelli, W.: Development of the microcontroller software for the magnetometer VEX-MAG aboard ESA´s Venus Express mission, Diploma Thesis, Graz University of Technology, 146 pages (2006).

7.3 Science Meetings

From 5 to 10 February and from 27 November to 1 December ISSI Team Meetings on "Transient Processes and Localized Structures in the Magnetotail: Analysis, Modelling and Theory", were held in Bern, Switzerland, with approximately 15 participants from Austria, France, Finland, Germany, Japan, Norway, Russia and UK. This meeting was organized by R. Nakamura.

An ISSI Team Meeting on “The evolution of habitable planets” was held in Bern, Switzerland, from 20 to 22 February 2006 with 20 participants from Austria, Germany, France, Italy, USA, The Netherlands, Russia and Switzerland. This meeting was organized by H. Lammer.

From 12 to 15 September IWF hosted the UN/Austria/ESA Symposium on "Space Applications for Sustainable Development" with approximately 75 participants from all over the world.

From 25 to 28 September the second “International Workshop on Penetrometry in the Solar System” took place at IWF, Graz. Approximately 30 participants from 8 countries participated. This workshop was organized by G. Kargl and N. Kömle.

Within the framework of EUROPLANET, several Science Meetings with 10 to 30 participants have been organized and co-organized by IWF’s EUROPLANET N3 Graz team (H.O. Rucker, M. Khodachenko, H. Lammer, R. Nakamura):

- “Coordinated Observation of SMART-1 low altitude operation and impact“ at ESTEC, the Netherlands;
- “Atmospheres/exospheres and their dynamics/composition on Venus and Mars” in Vienna, Austria;
- “Amateur astronomer coordinated observations in support of Venus Express and SMART-1” at IWF Graz, Austria;
- “Coordinated observations of Jupiter together with New Horizons Pluto Express Jupiter fly-by” in Liege, Belgium;
- “Workshop on Ionosphere-Magnetosphere Coupling of Fast Flows/Flux Ropes in the Earth’s Magnetotail" at IWF Graz, Austria;
- “Meteor orbit determination (MOD)”, at Rhoden, the Netherlands;
- “2nd Workshop on Comparative Aurorae” at UCL, London, UK.

In addition: G. Kargl organised a session about “Space Instrumentation” at the EGU meeting in Vienna; G. Kirchner organized a session on “kHz SLR" at the 15th International Laser Ranging Workshop in Canberra; R. Nakamura organised the session “Substorms and other magnetotail phenomena” at the 12th Cluster Workshop held in Saariselkä, Finland; H.O. Rucker organized the sessions “Planetary Radio Emissions” at the Europlanet Science Congress (Berlin) and “Solar and Heliospheric Radio Emissions” at the General Assembly of the European Geosciences Union (Vienna); H. Lammer convened the session “Comparative exospheres: From the upper atmospheres of Solar System gas giants to extra-solar Hot Jupiters” and the session “Biomarkers on extrasolar Earth-like planets and the early atmosphere of Earth” at the Europlanet Science Congress (Berlin).

7.4 Project Meetings

Besides several project meetings with less than ten participants, 7 larger meetings with international participation were organized at or by IWF/ÖAW in 2006.

On 30 and 31 March, the Cassini RPWS Team Meeting took place at ASA (Vienna) with 20 participants including people from France, Sweden, UK, USA, and Austria.

On 22 and 23 May 2006, a project meeting on EUROPLANET was held at Paris with 12 participants (France, Germany, Austria, Finland) reporting on N3 activities (coordination of ground-based and space-based observations).

From 27 to 28 June 2006 a PICAM Team Meeting with 11 participants from Austria, France, Germany, Hungary and The Netherlands was held at IWF.

A VEX Team Meetings has been held at IWF, from 28 to 31 August 2006, with approximately 10 participants from Austria, Germany and the UK.

7.5 Awards

In 2006 the planetary naming committee of the International Astronomical Union (IAU) has named an asteroid (21109) after Prof. Hans Sünkel. Six staff members of IWF received a NASA award in recognition of their excellent work on the THEMIS project. Also twelve staff members were awarded recognition for their contributions for Venus Express by ESA.

Furthermore: Wolfgang Baumjohann was elected as a member of the Space Science Advisory Committee of ESA; Helmut O. Rucker was elected as member of the Commission for Astronomy of ÖAW; H. Lammer was elected as a member of the Solar System Working Group of ESA.

7.6 Public Outreach

From 19 January to 23 March IWF organized a book exhibition at the Karl-Franzens-University Library. The topic was "Science Fiction & Weltraum". A catalogue with several essays was published.

On 11 April, approximately 150 interested persons visited the Venus Orbit Insertion (VOI) event at IWF. Popular scientific lectures were held, and during a live connection with the operating centre in Darmstadt the guests could experience the anxiety of the technicians at mission control as Venus Express went behind the planet. After a few minutes the spacecraft appeared sound and well again on the receivers.

On 7 and 8 September, a 2-days lecture series „Graz in Space 2006 - Aktuelle Weltraumforschung" has been presented at the Karl-Franzens University Graz with 18 presentations of lecturers from Space Research Institute and other institutions. This event was organized and led by H.O. Rucker.

On 7 October IWF participated in the "Lange Nacht der Physik" during the "Lange Nacht der Museen" at BRG Kepler. Staff members of IWF gave presentations on space missions to Venus and Mars.

On 23 October, Günter Kargel, and on 6 December, Konrad Schwingenschuh organized a "Teacher's vocational training" at IWF. Up to 15 participants were given lectures on "Space Research - National/International" and "Planetary probes investigating the atmosphere and surface of comets, moons and planets in our solar system."

On 27 December, more than 150 space enthusiasts visited IWF to witness the launch of the *COROT* spacecraft from Baikonur. Several popular scientific lectures were given and a direct connection with the launch site was used to show the spectacle of the lift-off of a Soyous Fregat rocket. Included into the event was a children's competition of making cardboard models of the *COROT* spacecraft.

8 Personnel

Amerstorfer, Ute, Mag. (P, part. DOC-FFORTE)
Arsov, Kirčo, Dr. (S)
Aydogar, Özer, Mag. Dipl.-Ing. (E)
Baumjohann, Wolfgang, Prof. (E)
Berghofer, Gerhard, Ing. (E)
Besser, Bruno P., Dr. (E)
Biernat, Helfried K., Prof. (P)
Boudjada, Mohammed Y., Dr. (P)
Chwoika, Rudolf (S)
Crailsheim, Hartwig (E)
Cristea, Elena, Dr. (S)
Delva, Magda, Dr. (E)
Eichelberger, Hans U., Dipl.-Ing. (E, BMVIT)
Fischer, David, Dipl.-Ing. (E, ESA)
Flock, Barbara, Mag. (A)
Fremuth, Gerhard, Dipl.-Ing. (E)
Giner, Franz, Dipl.-Ing. (E)
Graf, Christian, Ing. (S)
Grill, Claudia (A)
Hagen, Christian (E)
Hasiba, Johann, Dipl.-Ing. (E, ASAP)
Haslinger, Cornelia, Dipl.-Ing. (S)
Hausleitner, Walter, Dr. (S)
Höck, Eduard, Dipl.-Ing. (S)
Jernej, Irmgard, Ing. (E, on maternity leave)
Jeszenszky, Harald, Dipl.-Ing. (E)
Kargl, Günter, Dr. (P)
Karlsson, Roger, Dr. (P)
Kaufmann, Erika, Dr. (P)
Keika, Kunihiro, Dr. (E)
Khodachenko, Maxim L., Dr. (P, FWF)
Kirchner, Georg, Dr. (S)
Koidl, Franz, Ing. (S)
Kögler, Gerald (A)
Kömle, Norbert I., Univ.-Doz. (P)
Kürbisch, Christoph, Ing. (E)
Laky, Gunter, Dipl.-Ing. (E)
Lammer, Helmut, Dr. (P)
Lichtenegger, Herbert I.M., Dr. (E)
Macher, Wolfgang, Dr. (P)
Magnes, Werner, Dr. (E)
Močnik, Karl, Dr. (E)
Nakamura, Rumi, Dr. (P)
Neukirchner, Sonja, Ing. (E)
Nischelwitzer-Fennes, Ute, Ing. (E)
Oswald, Thomas, MSc (P)
Ottacher, Harald, Mag. Dipl.-Ing. (E)
Panchenko, Mykhaylo, Dr. (P, Oelzelt)
Pešec, Peter, Dr. (S)
Pfister, Harald, Dipl.-Ing. (E, ESA)
Rieger, Sonja, Mag. (FH) (A)
Rounov, Andrei V., Dr. (E)
Rucker, Helmut O., Prof. (P)
Scherr, Alexandra, Mag. (A, on maternity leave)
Schwingenschuh, Konrad, Dr. (E)
Slamanig, Herwig, Dipl.-Ing. (A, BMBWK)
Stachel, Manfred, Dipl.-Ing. (E, part. ESA)
Stangl, Günter, Dipl.-Ing. (S, BEV)
Steller, Manfred B., Dr. (E)
Stieninger, Reinhard, Ing. (E)
Sucker, Michael, Dipl.-Ing. (S)
Sünkel, Hans, Prof. (S, BMBWK)
Takada, Taku, Dr. (E, ESA)
Tatschl, Florian (E, ESA)
Torkar, Klaus M., Prof. (E)
Valavanoglou, Aris, Dipl.-Ing. (E)
Voller, Wolfgang G., Mag. (P)
Volwerk, Martin, Dr. (E, MPE)
Vörös, Zoltán, Dr. (E)
Wallner, Robert, Ing. (E)
Weingrill, Jörg (S, P)
Zambelli, Werner, Dipl.-Ing. (E)
Zehetleitner, Sigrid (A)
Zhang, Tie-Long, Dr. (E)

As of 31 December 2006

E: Experimental Space Research, P: Extraterrestrial Physics, S: Satellite Geodesy, A: Administration.

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