

Aspoc Iphot correction and density estimation

All Scripts

- edionoff
- Collect_fpi_data
- Collect_data
- Photocurve
- Density_estimate

Detailed Description

- Edionoff: this script reads edi data to extract the times where edi was operating. Aspoc photocurrent reconstruction can only be done when edi is not operating as it interferes with the dependence of aspoc current and spacecraft potential.

Consider setting the time interval adequate, as it takes a lot of time for reading long period data. (>6 months). The times where edi was operating are saved as a asci text file in the chosen folder. The script collect_data then uses this times to remove bad data.

Keywords: t_start: give start time in spedas notation
 t_end: give end time in spedas notation
 probe: set probe (only on at a time!)
 fileSAVE: output directory for the .txt files
 local_data_dir: mms data directory
 append: set this to true if you want to add to already existing edionoff.txt file

- Collect_data: this script has to run always before running any following programs. It loads edp (spacecraft potential) and aspoc data for all mms spacecraft. If a density estimation of a timerange with no aspoc data is wanted, run this script as well to get spacecraft potential data.

The script makes new folder in output_dir named collected_data if not existing and there it save the parameters as vsciaspb_data.sav

Parameters description: tasp*: time for aspoc data
 iasp*: aspoc current
 tvsc*: time for edp data
 vsc*: edp s/c potential data
 q* : quality parameter for data removal
 bi*: edp data bitmask for data removal

Keywords: local_data_dir: mms data directory
 datestart: give start time in spedas notation
 datestop: give end time in spedas notation

edionoff_dir: directory of edionof .txt files made from edionoff script
output_dir: directory where the output vsciaspb_data.sav is saved

- Collect_fpi_data: if the comparison of fpi density with reconstructed density or/and the calculation of photocurrent with fpi temperatures is wanted this script loads fpi data for the set interval and saves the needed parameters.

Only run this script if fpi data is needed.

Output_dir of collect_fpi_data and collect_data has to be the same!

Saves parameters as fpi_data.sav

Parameters description: tne*: time of fpi electron density data

ne*: fpi electron density

ner*: error of fpi electron density

tTe*: time for fpi electron temperature data

Te*: fpi electron temperature data

tni*: time for fpi ion density data

ni*: fpi ion density data

nir*: error of fpi ion density

tTi*: time for ion temperature data

Ti*: ion temperature data

Keywords: local_data_dir: mms data directory
output_dir: directory where the output fpi_data.sav is saved
datestart: give start time in spedas notation
datestop: give end time in spedas notation

- Photocurve: This script loads all the data in the collected data folder and interpolates to same frequency. It uses the initial_parameters to find a fit for s/c potential and Photo current. The scatterplots of each mms s/c data with the regression parameters are saved as png in output_dir. After fitting the density is calculated using the fitting parameters. The density comparison plots are saved as png as well.

Keywords: collected_data_dir: data directory of output data of previous scripts
output_dir: directory where all the plots are saved
initital_parameters: give initial parameters for mpfitfun
this should be [Io1_mms1, Vo1_mms1, Vo2_mms1, Vo3_mms1] as it fits 3 parts

- Density_estimate: Calculates the density from edp data using the fitting parameters given. Some temperature estimation has to be given for the density calculation as there is no fpi data. The script makes plots of the density calculated with all different temperatures given. The density data is saved in output directory as vsc_densities.sav

Parameters description: dens_data_mms*: array containing time in the first column and

reconstructed density in the other columns,
calculated according to given temperatures in
temp parameter

Keywords: temp: array containing the estimated temperatures
collected_data_dir: data directory of output data of previous scripts
output_dir: directory where the output vsc_densities.sav is saved
fit*: fitting parameters for each mms spacecraft of the photocurve script,
input as [a,b,c,d,e,f] double or float

Examples

- Getting fitting parameters for 2016-06-08 until 2016-06-12:

```
datestart='2016-06-08'  
datestop='2016-06-12'  
local_data_dir='M:\spedas\mms\'
```

```
COLLECT_DATA, datestart= datestart, datestop= datestop, local_data_dir= local_data_dir,  
output_dir='C:\data'
```

```
COLLECT_FPI_DATA, datestart= datestart, datestop= datestop, local_data_dir=  
local_data_dir, output_dir='C:\data'
```

```
PHOTOCURVE, collected_data_dir='C:\data', initial parameters=[70.d, 1.5, 5., 11.],  
output_dir='C:\fit'
```

- Reconstruct density for the time interval 2017-07-11 with no fpi data:

```
datestart='2017-07-11'  
datestop='2017-07-11'  
local_data_dir='M:\spedas\mms\'
```

```
COLLECT_DATA, datestart= datestart, datestop= datestop, local_data_dir= local_data_dir,  
output_dir='C:\data'
```

```
DENSITY_ESTIMATE, temp=[1e3, 1e4], fit1=[70, 1, 7, 10, 22, 4], collected_data_dir='C:\data',  
output_dir='C:\density'
```