**Examples of use of IDL SPEDAS code for EFW**

**Spin-fit electric field field and related data**

The spin-fit electric field and related data are saved in the L3 data. Below are some example IDL codes for loading the commonly used data including the spin-fit E field, the EFW density calibrated according to the upper-hybrid line, and the spacecraft potential. We note that in order to ensure backward compatibility, the L2 spin-fit data is kept. However, because the L2 data only contains a subset of the variables in L3, we strongly encourage users to use the L3 data instead of L2.

; Set the time and probe for loading data.

time\_range = ['2013-01-01','2013-01-03']

probe = 'a'

; Load the spin-fit data.

rbsp\_efw\_read\_l3, time\_range, probe=probe

prefix = 'rbsp'+probe+'\_efw\_'

vars = prefix+[$

 ; The spin-fit E field with E\_spinaxis = 0.

'efield\_in\_corotation\_frame\_spin-fit\_mgse', $

; The spin-fit E field with E\_spinaxis calculated from E dot B = 0,

; when B is away from the spin plane by >15 deg.

'efield\_in\_corotation\_frame\_spin-fit\_edotb\_mgse', $

; The spacecraft potential.

'spacecraft\_potential', $

; The EFW density calibrated according to the upper-hybrid line.

'density', $

; The ephemeris data.

'position\_gse', 'velocity\_gse', 'mlt', 'mlat', 'lshell', 'orbit\_num' ]

; Plot the variables.

tplot, vars, trange=time\_range

**Survey E field and related data**

The survey-mode electric fields are saved in the L2 esvy\_despun and vsvy data.

; Set the time and probe for loading data.

time\_range = ['2013-01-01','2013-01-03']

probe = 'b'

; Load the L2 data.

rbsp\_efw\_read\_l2, time\_range, probe=probe, datatype='esvy\_despun'

rbsp\_efw\_read\_l2, time\_range, probe=probe, datatype='vsvy-hires'

prefix = 'rbsp'+probe+'\_efw\_'

vars = prefix+[$

; The E field in mGSE.

'efield\_mgse', $

; The single-ended probe potential.

'vsvy', $

; The flags.

'efw\_qual' ]

; Plot the variables.

tplot, vars, trange=time\_range

**Burst data**

Here are some example IDL codes to load the burst electric and magnetic field, with preliminary calibrations.

; Set the time and probe for loading data.

time\_range = ['2013-06-10/05:57:20','2013-06-10/05:59:40']

probe = 'b'

; Load the burst data.

rbsp\_efw\_read\_burst\_efield, time\_range, probe=probe, datatype='vb1', coord='mgse'

rbsp\_efw\_read\_burst\_bfield, time\_range, probe=probe, datatype='mscb1', coord='mgse'

prefix = 'rbsp'+probe+'\_efw\_'

vars = prefix+[$

; The E and B fields in mgse.

['eb1','mscb1']+'\_mgse' ]

; Plot the variables.

tplot, vars, trange=time\_range

**Supporting data**

Here are some example IDL codes to load the bias current, to rotate the electric field from the UVW or mGSE to the GSE coordinate.

; Set the time and probe for loading data.

;time\_range = ['2018-10-08/02:00','2018-10-08/03:30']

time\_range = ['2013-03-17/09:55','2013-03-17/10:05']

probe = 'b'

; Other settings.

uvw = ['u','v','w']

xyz = ['x','y','z']

rgb = [6,4,2]

tplot\_options, 'labflag', -1

prefix = 'rbsp'+probe+'\_efw\_'

; Rotate E field from mGSE to GSE.

rbsp\_efw\_read\_l3, time\_range, probe=probe

e\_mgse\_var = prefix+'efield\_in\_corotation\_frame\_spin-fit\_mgse'

get\_data, e\_mgse\_var, times, e\_mgse

store\_data, e\_mgse\_var, limits={*ytitle*:'[mV/m]', *labels*:'mGSE E'+xyz, *colors*:rgb}

; Require to set probe when the rotation involves mgse and uvw.

e\_gse = cotran(e\_mgse, times, 'mgse2gse', probe=probe)

store\_data, prefix+'e\_gse', times, e\_gse, limits={*ytitle*:'[mV/m]', *labels*:'GSE E'+xyz, *colors*:rgb}

; Rotate E field from UVW to GSE.

rbsp\_efw\_read\_l2, time\_range, probe=probe, datatype='e-hires-uvw'

e\_uvw\_var = prefix+'e\_hires\_uvw'

get\_data, e\_uvw\_var, times, e\_uvw

e\_uvw[\*,2] = 0

store\_data, e\_uvw\_var, limits={*labels*: 'E'+uvw, *colors*:rgb}

; Require to set probe when the rotation involves mgse and uvw.

e\_gse = cotran(e\_uvw, times, 'uvw2gse', probe=probe)

store\_data, prefix+'e\_gse2', times, e\_gse, limits={*ytitle*:'[mV/m]', *labels*:'GSE E'+xyz, *colors*:rgb}

; Plot data.

options, prefix+'bias\_current', 'labels', string(findgen(6)+1,format='(I0)')

vars = prefix+[$

; The bias current.

'bias\_current', $

; E fields in various coords.

'efield\_in\_corotation\_frame\_spin-fit\_mgse', $

'e\_hires\_uvw', 'e\_gse', 'e\_gse2' ]

tplot, vars, trange=time\_range