# IWF spacecraft potential toolkit explanation of the routines.

These routines require spedas to be installed and the mpfit functions for idl

Spinrem.pro :script to bin the spacecraft potential data by spacecraft phase angle and to fit a model (supersine.pro) to the medians of the binned data. Note needs many spins to produce a model, i.e. several minutes. Takes file fittedparameters as initial guesses for mpfit, then overwrites them with the new values. Note that good initial guesses are required for mpfit to work or it may converge to a local minima of the chi squared.

Supersine.pro : function, returns result from a superposition of 20 sine waves, used with spinrem to remove the spin

Envelope\_calc.pro: function to return the envelope of the AC HMFE data

Polycurve1.pro :function to return second order polynomial used in sc\_potential\_corr.pro

Photocurve\_local.pro: calculates the photoelectron parameters by fitting the photocurve. May give warning if the range of potentials is small.

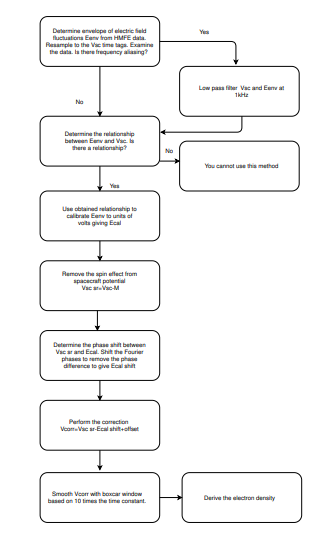
Doubleexp.pro: double exponential function used to fit the photocurve

Sc\_potential\_corr.pro: function to perform the electric field correction and reproduce several figures in Roberts et al. 2020 JGR

FIttedspinParameters.sav: file containing guesses for the fitting of the spin harmonics. Used in spinrem.pro, and then it is overwritten with parameters for your interval

Guide to SC\_Potential\_Corr.

Large AC electric fields can enhance the photoelectron emission from the spacecraft. This affects the spacecraft potential. Should the electron density be derived from this perturbed potential, it will be incorrect and you will see fluctuations in the electric field rather than the ambient density. The script SC\_potential\_corr makes a correction to this. The method is explained in the flow chart. A more detailed discussion of the method and the underlying physics is found in Roberts et al. 2020 JGR.



If you have any questions or encounter any problems with the data you can contact Owen Roberts owen.roberts at oeaw.ac.at