

## Help on module derive\_background:

### NAME

derive\_background

### AUTHOR

Katie Whitman

### FILE

operational-sep/derive\_background.py

### DATA

```
__email__ = 'kathryn.whitman@nasa.gov'  
__maintainer__ = 'Katie Whitman'
```

### VERSION

V0.1

### FUNCTIONS

#### **create\_histogram(flux, energy\_bin, iteration)**

: Take a list of flux with time and generate a histogram of the values.  
NaN values are removed prior to creating histogram.  
The histogram is created with bins extending from the min flux to the max flux and equally spaced in log space.  
Estimate the mean by averaging the bin centers weighted by the frequency. Calculate the variance and take the square root to estimate sigma. Return the mean and sigma.

#### **define\_hist\_bins(flux)**

: Takes a 1D numpy array of flux and defines a set of histogram bins between the min and max flux values equally spaced in log space.

#### **derive\_background(str\_startdate, str\_enddate, str\_bgstartdate, \n str\_bgenddate, experiment, flux\_type, model\_name, user\_file, \n showplot, saveplot, options)**

: Derive the background using fluxes in the time period between background start and end dates specified by the user. Derive the mean background value along with an expected level of variation (sigma) in the background. Make two separate arrays containing 1) background flux, 2) background-subtracted SEP fluxes.  
The fluxes will be separate by selecting fluxes above and below mean + Nsigma\*sigma. The value of Nsigma is specified in

library/global\_vars.py.

Return the background and background-subtracted SEP flux arrays along with a date array. The fluxes and dates will extend from BGStartDate to SEPEndDate. The fluxes will be numpy arrays and the dates are a list.

### **iterate\_background(fluxes, energy\_bins)**

: Bin fluxes into histograms to calculate the background mean and sigma. Exclude fluxes above and below mean  $\pm 3\sigma$  and recalculate mean and sigma. Use these values as the final estimates of the background flux and the expected level of variability in the background.

### **plot\_fluxes(experiment, flux\_type, options, fluxes, dates, energy\_bins, means, sigmas, saveplot)**

: Plot fluxes with time for all of the energy bins on the same plot. The estimated mean background levels are plotted as dashed lines. Zero values are masked, which is useful when making plots of the background and SEP flux separately.

### **remove\_above(flux, val)**

: Remove any flux above a specific value, val.

### **remove\_below(flux, val)**

: Remove any flux below a specific value, val.

### **remove\_none(flux)**

: Takes 1D array of flux and removes None values.  
None values in a list are converted to NaN values in a numpy array.  
So check for NaN and remove.

### **remove\_zero(flux)**

: Takes 1D array of flux and removes zero values.

### **separate\_sep\_and\_background(fluxes, dates, means, sigmas)**

: Take the input fluxes, separate them into arrays containing the background flux and SEP flux. Values above mean + Nsigma\*sigma are considered SEP flux while values below are considered the background. Perform a background subtraction on the SEP flux by subtracting the

mean background value.

The input flux array is a numpy array, but the output will be a list for flexibility.

Nsigma is specified in library/global\_vars.py.