

Appendix D: Processing Data Files Using MATLAB

Two Matlab functions for processing data are provided on the instrument USB card. They are also available from the 'Software and Downloads' tab on the LISST-200X webpage. The processing is split into two steps: (1) reading in and applying corrections to raw data files (.RBN) and (2) inverting the corrected scattering to a particle size distribution.

The same results can be achieved by processing data files using the LISST-SOP200X software. However, the following functions allow Matlab users to write their own processing and plotting code.

The first function is used to read in raw data from an RBN file. The function will import the data, apply the necessary corrections, and return the corrected data in a structure. The syntax is as follows:

```
RBNdata = getscat_L200X(datafile)
```

'Datafile' is the path to a binary .RBN file downloaded from a LISST-200X.

Optionally, you may specify a different clean water background file (.BGT) as a second argument. The data will then be corrected using the specified background file instead of the background contained in the RBN file.

```
RBNdata = getscat_L200X(datafile,backgroundFile)
```

'RBNdata' is a structure with the following fields:

Field	Description
cscat	Corrected scattering
date	Timestamp in Matlab datenum
transmission	Optical transmission
depth	Depth in meters
temperature	Temperature in degrees Celsius
estMeanDiameter	Estimated Sauter mean diameter (um)
estTotalConc	Estimated total concentration (uL/L)
Lp	Transmitted laser power (mW)
Lref	Laser power reference (mW)
analog1	Analog input 1

analog2	Analog input 2
supplyVolts	Supply voltage (V)
humidity	Internal instrument relative humidity (%)
accelXYZ	Accelerometer X, Y, and Z
raw	Raw data as it appears in the RBN file
factory_bkgrd	The factory background (corrections applied to aux data)
bkgrd	User collected background (corrections applied to aux data)
ambientLight	Counts of ambient light removed from ring values
config	Structure containing various instrument information
dcal	Ring area coefficients
Ta	Vector to convert cscat to estimated total area concentration
Tv	Vector to convert cscat to estimated total volume concentration

The second function inverts the corrected scattering to a particle size distribution. The syntax is as follows:

```
[vd, dias] = invert_L200X(Cscat, Random, Sharpen, ShowProgressBar)
```

The first argument is the corrected scattering (**cscat**) from the structure returned from 'getscat_L200X.' The following three arguments are set to zero or one.

Random – If set to 1, the randomly shaped particle matrix is used to invert the data. If set to zero, the spherical particle matrix is used. See Appendix G: Spherical and Random Shape Particle Models for more information.

Sharpen – If set to 1, the function checks the width of the size distribution and increases the number iterations if the size distribution is wide (recommended).

ShowProgressBar – If set to 1, a progress bar will display the processing status.

The function will return the volume distribution in uL/L (**vd**) and the midpoint of each size bin in microns (**dias**).