Calibrated near-forward volume scattering function obtained from the LISST particle sizer

MATLAB source code for calibrating the LISST to give VSF

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LISST-VSF MATLAB code lives at: http://misclab.umeoce.maine.edu/code/lisstvsf.html

This document is a brief introduction to the provided source code for calibration of the LISST particle sizer to give near-forward volume scattering function. All code assumes the LISST to be a type-B instrument, if not the case then readpscat.m and plots_results_calibratedvsf.m would need to be changed.

To be useful, you'll need to analyze beads with your particular LISST instrument. We used beads manufactured by Duke Scientific (http://www.dukescientific.com). The process is described in the Optics Express paper. The procedure and how to use the provided MATLAB code is summarized below:

(1) Start by taking a zscat and leave the clean water in the small volume chamber.
(2) Then, assuming you're using a dropper-tipped bottle of microspheres, such as Duke Cat. # 4202A, simply add drops of bead suspension to the LISST sample volume, stirring and taking a data file (e.g. beads_2um_1.LOG) for each addition. Make sure that the LISST-SOP software is saving data as raw output (.LOG).
(3) Next, you'll need to create Mie-derived expected VSFs for the beads you're working with (run_miemonte.m).
(4) Define the data files and matching Mie files to be used in the calibration (see runlist.xls).
(5) Do the calibration regressions for the detector rings using run_lisstcalrings.m.
(6) Examine results using the plots_results_* scripts.

PLEASE NOTE – This code is a work in progress. Be ready for some time investment to make it all work, and please share constructive comments, ideas, and modifications to the source with the author (wayne.slade@gmail.com) such that he make this code more useful for the entire ocean optics community!

This source code uses the Mastering MATLAB Toolbox, available at http://www.eece.maine.edu/mm/MM6/tbx.html

Source Code Files

fastmie.m – Calculates angular scattering matrix and efficiencies using Mie theory
integral.m – Numerical integration routine (uses MM toolbox)
mievsf_normgauss.m – Normalized VSF and cp for Gaussian size distribution
readpscat.m – Reads raw data from LISST .LOG file, giving you a matrix of pscat and cp
ringavgbeta.m – Integrates Mie VSF over ring angles

run_lisstcalrings.m – Determines calibration factors based on LISST bead runs and expected Mie-derived VSF
run_miemonte.m – Calculates Mie VSF and attenuation for bead suspensions

plots_lisstcounts.m – Figure 3(b), useful to see if your counts are bigger than zscat
plots_results_lisstcalrings.m – Figure 4(a)-4(e), check results of regression after running run_lisstcalrings
plots_results_calibratedvsf.m – Figure 5, plots calibrated VSF once chi are found from run_lisstcalrings; can specify any bead and Mie data

Other Files

runlist.xls – Specifies bead runs and Mie data to use to derive calibration coefficient
mm6tbx.zip – Mastering MATLAB Toolbox

Versions and Modifications

30 Mar 206 – Thrown to the wolves…