

# Laboratory and Field Evaluations of the LISST-100 Instrument For Suspended Particle Size Determinations

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## Abstract

Advances in technology have resulted in a new instrument that is designed for *in-situ* determination of particle size spectra. Such an instrument that can measure undisturbed particle size distributions is much needed for sediment transport studies. The LISST-100 (Laser *In-Situ* Scattering and Transmissometry) uses the principle of laser diffraction to obtain the size distribution and concentration of suspended material in 32 size classes logarithmically spaced between 1.25 and 250 micrometers. This paper describes a laboratory evaluation of the ability of LISST-100 to determine particle sizes using suspensions of single size, artificial particles. Findings show the instrument is able to determine particle size to within about 10 percent with increasing error as particle size increases. The instrument determines volume (or mass) concentration using a volume conversion factor  $C_v$ . This volume conversion factor is theoretically a constant. In the laboratory evaluation  $C_v$  is found to vary by a factor of about three over the particle size range between 5-200 micrometers. Results from field studies in South San Francisco Bay show that values of mass concentration of suspended marine sediments estimated by LISST-100 favorably with estimates from optical backscatterance sensors if an appropriate value of  $C_v$ , according to mean size, is used and the assumed average particle (aggregate) density is carefully chosen. Analyses of size distribution of suspended materials in South San Francisco Bay over multiple tide cycles suggest the likelihood of different sediment because of different size characteristics during flood and ebb cycles.

## Keywords:

laser in-situ scattering and transmissometry (LISST), particle size distribution, total suspended solids concentration, San Francisco Bay, California