Laser In Situ Scatterometer and Transmissometer-based Particle Size Distributions (LISST PSDs) from sinking materials collected from sediment traps at Station ALOHA in June 2019 onboard R/V Kilo Moana cruise KM1910

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Project
» EAGER Collaborative Research: Early career chief scientist training for biological and chemical oceanographers (Chief Sci KM1910)

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Coverage

Spatial Extent: **Lat**:22.75 **Lon**:-158
Temporal Extent: 2019-06 - 2019-06

Methods & Sampling

Particle size distribution (PSD) measurements were made in June 2019 at Station ALOHA (22.75°N, 158°W) in the North Pacific Subtropical Gyre aboard the R/V Kilo Moana (KM1910). PDSs were measured using the Laser In Situ Scatterometer and Transmissometer 100X (Type B, Sequoia Scientific Inc., hereafter LISST) which uses laser diffraction in an approximately 100 ml sample volume to estimate the PSD via inversion into 32 logarithmically spaced particle size classes.

Sinking PSDs were measured from material captured in sediment traps. The standard Hawaii Ocean Time-series (HOT, https://hahana.soest.hawaii.edu/hot/) traps and sampling protocol were used, which includes a 335 µm prefilter to remove zooplankton swimmers. Two sediment trap deployments were sampled: one 81 hr deployment beginning 16-June-2019 and one 73 hr deployment beginning 21-June-2019. For each, trap arrays were deployed at 75, 150, and 300 meter depths. Each array had 12 traps at each depth. On the second deployment one trap per depth was capped and used as a blank so that there were a total of 69 trap measurements (two deployments and three depths, 11 or 12 traps each). After recovery, from each trap a 125 ml split of the trap solution was taken for LISST and IFCB processing. Sinking PSDs were then measured from the LISST in discrete chamber mode. Twenty diffraction measurements were made from each sample before draining each sample back into the 125 ml split bottle; this process was repeated in triplicate, totaling 60

LISST measurements per sediment trap. Trap solution was used as a blank for all LISST measurements.

Addtional details on sampling strategy and procedures can be found in Cael & White (2020).

Data Processing Description

Data were analyzed using the standard spherical particle inversion provided by the LISST manufacturer.

Matlab Code used to analyze all LISST data and to reproduce results of Cael and White (2020) are provided. Detailed information on LISST processing can be found in White et al. (2015).

Raw data are provided in their original formats (.asc, .log, and .psd). Processed data are provided in Matlab format and are divided into subfolders.

- The 'LISST' folder contains all of the LISST data and code used to process data and reproduce the analysis and figures of Cael and White (2020).
- The 'raw_data' folder contains all the .asc, .log, and .psd files or .dat files for all of the LISST scans used in the paper (direct outputs of the instrument after samples/scans are run), as well as calibration and ring area files necessary for the LISST inversion, and blank samples collected (applied as in Cael and White, 2020).
- The 'sed_trap_mat_files' folder contains processed data used in subsequent analyses and includes the individual suspended samples' PSDs.
- The 'code' folder includes all code used to process the data using Matlab and make key figures in the paper. 'lisst_process_traps.m' shows how raw data were converted into PSDs. 'getscat.m', 'invert.p', and 'vdcorr.m' are the LISST manufacturer proprietary code used to invert data and calculate the PSDs using Matlab.

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Supplemental Files

File
LISST sediment trap PSD file list filename: LISST_sediment_trap_PSD_files.pdf (Portable Document Format (.pdf), 131.81 KB) MD5:363d71861c0c76134fa30db342bb217f List of supporting files and descriptions for LISST sediment trap PSDs from KM1910 cruise

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Parameters

Parameters for this dataset have not yet been identified

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Niskin bottle
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

Dataset-specific Instrument Name	Laser In Situ Scatterometer and Transmissometer 100X (LISST Type B, Sequoia Scientific Inc.)
Generic Instrument Name	Sequoia Scientific Laser In-Situ Sediment Size Transmissometer
Dataset-specific Description	Particle Size Distribution measurements were made using the Laser In Situ Scatterometer and Transmissometer 100X (Type B, Sequoia Scientific Inc.). The LISST uses laser diffraction in an approximately 100 ml sample volume to estimate the PSD via inversion into 32 logarithmically spaced particle size classes.
Generic Instrument Description	A self-contained unit which measures the scattering of LASER light at a number of angles. This primary measurement is mathematically inverted to give a grain size distribution, and also scaled to obtain the volume scattering function. The size distribution is presented as concentration in each of the grain-size class bins. Optical transmission, water depth and temperature are recorded as supporting measurements. The Sequoia LISST 100-X series instruments are available in two range sizes: 1.25-250 microns (Type B) and 2.5-500 microns (Type C).

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Deployments

KM1910

Website	https://www.bco-dmo.org/deployment/841636
Platform	R/V Kilo Moana
Report	https://datadocs.bco-dmo.org/docs/305/Chief_Sci_KM1910/data_docs/matt_church_EAGER_cruise_plan_06_17_2019.pdf
Start Date	2019-06-15
End Date	2019-06-24
Description	NSF Chief Scientist Training Cruise. For more information, see Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/KM1910 (cruise DOI: 10.7284/908380)

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Project Information

EAGER Collaborative Research: Early career chief scientist training for biological and chemical oceanographers (Chief Sci KM1910)

Coverage: Station ALOHA (22.75N, 158W), North Pacific Ocean

NSF Award Abstract:

Intellectual Merit
The PIs request funds to provide training in leading and organizing research cruises to early career researchers in the areas of Biological and Chemical Oceanography. Participants in this training program would be introduced to pre-cruise planning and logistics, receive training in commonly used oceanographic sampling equipment, and conduct shipboard measurements during a 10-day oceanographic cruise to the North Pacific Subtropical Gyre (NPSG). The goal of this training program is to prepare early career scientists for leading and participating in interdisciplinary oceanographic research at sea.

Broader Impacts
The proposed program addresses the broader impacts criteria successfully. The research cruise and follow-up reports and publications focus on interdisciplinary questions important for advancing the field. Given the rapid changes that oceanic systems are undergoing, it is important to have a cadre of junior scientists who are adept at managing interdisciplinary collaborations and conducting research at sea. The PIs are considering ways to connect with diverse audiences in recruiting participants. The impact on early career oceanographers will be very strong. This will create an experience that will be a major impact on the careers of the trainees, especially if they stay in the oceanography field.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1911990

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