Observations and Measurements

Field Names List

Parameter	Description	Units
deploy_date	Date of deployment; yyyy/mm/dd	unitless
depth	The nominal depth of the NBST. During the July 2013 deployment the NBSTs were programmed to hold depth within +/-25 m of the measurement depth while in subsequent deployments this band was narrowed to +/-10 m.	meters
deploy_lat	Latitude of the deployment	decimal degrees
deploy_lon	Longitude of the deployment	decimal degrees
recover_lat	Latitude of the point of recovery	decimal degrees
recover_lon	Longitude of the point of recovery	decimal degrees
deploy_length	Days between deployment of NBST and tube lid closure	days
no_replicates	Number of tubes averaged to obtain mean TC and TN flux measurements at a single depth	number
TC_f	Total carbon flux of the sinking fraction operationally defined as particles	milligrams of carbon per square meter per day
TC_f_err	Total carbon flux error; Uncertainties are propagated from the standard deviation of the process blanks from the five cruises (0.2 mg C) and the standard deviation or range of the two or three TC measurements per NBST deployment: TC_f_err = (STD tubes^2 + STD blanks^2)^1/2 / deployment length / trap area; For depths with only two replicate analyses the range of the TC fluxes measured in each tube is used in place of STDtubes in the above equation.	milligrams of carbon per square meter per day
		milligrams of nitrogen

N_f	Total nitrogen flux of the sinking fraction operationally defined as particles	per square meter per day
N_f_err	Total nitrogen flux error; Uncertainties are propagated from the standard deviation of the process blanks from the five cruises (0.006 mg N) and the standard deviation or range of the two or three TN measurements per NBST deployment. TN_f_err = (STD tubes^2 + STD blanks^2)^1/2 / deployment length / trap area; For depths with only two replicate analyses the range of the TN fluxes measured in each tube is used in place of STDtubes in the above equation.	milligrams of nitrogen per square meter per day
TC_f_swimmer	Total carbon flux of the >350-um screened fraction presumed to be zooplankton that actively entered the trap. Calculated as for 'total carbon flux' above using a >350-um process blank of 0.05 +/- 0.04 mg C.	milligrams of carbon per square meter per day
TC_f_err_swimmer	Swimmer total carbon flux error; Calculated for the >350-um screened fraction as for 'total carbon flux error' above using a >350-um process blank standard deviation of 0.04 mg C.	milligrams of carbon per square meter per day
N_f_swimmer	Total nitrogen flux of the >350-um screened fraction presumed to be zooplankton that actively entered the trap. Calculated as for 'total nitrogen flux' above using a >350-um process blank of 0.005 +/- 0.003 mg N.	milligrams of nitrogen per square meter per day
N_f_err_swimmer	Swimmer total nitrogen flux error; Calculated for the >350-um screened fraction as for 'total nitrogen flux error' above using a >350-um process blank standard deviation of 0.003 mg N.	milligrams of nitrogen per square meter per day
	Flux particle size distribution magnitude and slope parameters (parameter names ‘A’, ‘B’): Particles imaged in each gel at the same magnification were identified, enumerated and measured using an analysis macro created using ImageJ software. Using this macro, images were processed by 1) converting images to greyscale, 2) removing background, 3) adjusting brightness/contrast to a	

A	consistent degree, 4) thresholding using the “Intermodes” technique, 5) filling holes, and 6) measuring particles. Particles imaged from the same field of view but different focal planes were grouped together and the equivalent spherical diameter (ESD) of each particle was calculated based on the measured two-dimensional surface area. Particles were divided into 26 base-2, log-spaced size classes ranging from 1 um to 8192 um based on their ESD. Counting error was calculated as the square root of the number of particles counted in each size category. Size classes with 4 or fewer counted particles (≥50% error) were excluded from analysis. The abundance of particles in each size bin was calculated by normalizing the number of particles counted by the size bin width and by the percentage of the gel surface counted. The optimal magnification to calculate the abundance of a particle size category was defined as the magnification where the observed abundance most closely followed a power-law distribution. The abundance of 11–45 um particles was quantified at 63× magnification, the abundance of 45–128 um particles was quantified at 16× magnification, and the abundance of >128 um particles was quantified at 7× magnification. Three samples had slightly different size detection limits at each magnification and required different size ranges to quantify a power law distribution of particle abundance. For the 200-m sample collected in August, optimal particle size ranges were 11–64 um (63×), 64–90 um (16×), and >90 um (7×). For the 500-m samples collected in October and March, the optimal size ranges were 11–45 um (63×), 45–64 um (16×), and >64 um (7×). The particle abundance of all five gel trap process blanks were measured and averaged together, and the average was subtracted from the particle abundance measured in each gel trap sample. Particle number flux was calculated by dividing blank-subtracted particle abundance by the trap deployment time. The slope of each particle size distribution (B) was calculated by fitting the observations of particle number flux (Num_f) to a differential power law size distribution model (Jackson et al., 1997), Num_f(ESD) = A(ESDr) × (ESD/ESDr)–B where A(ESDr) equals the number flux of particles in the reference size category ESDr (here 300	unitless

	um). B indicates the slope of the power law function; higher values have steeper slopes and a higher proportion of small particles relative to large particles. The “optim” function in R (R. Development Core Team, 2008) was used to find the least-squares, best-fit values of A(ESDr) and B describing particle number fluxes measured in each gel trap.	
B	Flux particle size distribution magnitude and slope parameters (parameter names ‘A’, ‘B’): Particles imaged in each gel at the same magnification were identified, enumerated and measured using an analysis macro created using ImageJ software. Using this macro, images were processed by 1) converting images to greyscale, 2) removing background, 3) adjusting brightness/contrast to a consistent degree, 4) thresholding using the “Intermodes” technique, 5) filling holes, and 6) measuring particles. Particles imaged from the same field of view but different focal planes were grouped together and the equivalent spherical diameter (ESD) of each particle was calculated based on the measured two-dimensional surface area. Particles were divided into 26 base-2, log-spaced size classes ranging from 1 um to 8192 um based on their ESD. Counting error was calculated as the square root of the number of particles counted in each size category. Size classes with 4 or fewer counted particles (≥50% error) were excluded from analysis. The abundance of particles in each size bin was calculated by normalizing the number of particles counted by the size bin width and by the percentage of the gel surface counted. The optimal magnification to calculate the abundance of a particle size category was defined as the magnification where the observed abundance most closely followed a power-law distribution. The abundance of 11–45 um particles was quantified at 63× magnification, the abundance of 45–128 um particles was quantified at 16× magnification, and the abundance of >128 um particles was quantified at 7× magnification. Three samples had slightly different size detection limits at each magnification and required different size ranges to quantify a power law distribution of particle abundance. For the 200-m sample collected in August, optimal particle size ranges were 11–64 um (63×), 64–90 um (16×), and >90 um (7×). For the 500-m	unitless

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zoop_conc	Zooplankton concentration; Recognizable zooplankton presumed to have actively entered the gel traps were counted manually in 40 fields of view at 32_ magnification on the stereomicroscope. The number of individuals counted was normalized by the percentage of gel surface counted and divided by the total surface area of the gel (0.0095 m^2).	individuals per square meter
zoop_conc_err	Zooplankton concentration error; Calculated as the square root of the number of individuals counted normalized by the percentage of gel surface counted and divided by the total surface area of the gel (0.0095 m^2).	individuals per square meter
zoop_f	Zooplankton flux; The zooplankton concentration calculated above was divided by the deployment length to yield flux.	individuals per square meter per day
zoop_f_err	Zooplankton flux error; Calculated as the square root of the number of individuals counted normalized by the percentage of gel surface counted and divided by the total surface area of the gel (0.0095 m^2) and the deployment length.	individuals per square meter per day