Supplemental Text S1

Physical and hydrodynamic properties of deep sea mining-generated, abyssal sediment plume in the Clarion Clipperton Fracture Zone (eastern-central Pacific)

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Text S1. Supplemental materials and methods

Samples preparation and experimental conditions

An aliquot of approximately 0.5 g from every sediment core layer (i.e., 1 cm) was weighed on a fine-scale balance and dried at 105 °C to constant mass in an oven. The difference in mass before and after the drying procedure was used to determine the initial water content. Based on the wet / dry weight (d_w) calculation, a sediment stock solution with a final concentration of 5 g L^{-1} (d_w) was prepared. The suspension was stirred (1250 rpm) multiple times for 30 min. Total disaggregation was confirmed when particle size distribution did not change over time using the LISST-100X.

Instrumentation use for suspended particle size detection

LISST-100 X

A LISST-100 type C (**L**aser **I**n **S**itu **S**cattering and **T**ransmissometry; Sequoia Scientific) was used for the detection of smaller particle sizes (i.e., < 500 μm). The principle of laser diffraction, use and mathematical model for data analysis are detailed in Agrawal and Pottsmith (2000). The LISST-100X provides particle volume concentration (μL L^{-1}) measured in 32 logarithmically spaced size bins ranging from 2.5 to 500 μm. A small volume flow through chamber (Sequoia Scientific) was mounted reducing the optical path length to 1 cm and extending the measurable suspended sediment limit concentration of the laser. The scattering pattern of the instrument was inverted using the random shape model (Agrawal et al., 2008).

Digital floc camera configuration

Larger particle sizes (i.e., > 70 μm) and their concentrations where estimated by image analysis. Floc images were captured using a DFK 23UX174 (1920 x 1200 pixels at 54 fps; The Imaging Source) camera mounted with a TEC-M55MPW telecentric lens (Computar) and 15-mm extension tube. The resolution of the set up was calibrated with a 1-mm ruler (Thor labs A1L3S2) and the depth of field was estimated with a 45° depth of field target (Edmund Optic 54-440). The resulting field of view produced was 1.53 cm x 0.96 cm (8 μm/pixel) for a 2-mm depth of field.

The minimum number of pixels defining the smallest particle resolution may vary from 1 pixel up to a standard rule of 9 pixels (Mikkelsen et al., 2004; Maggi et al., 2007; Smith and Friedrichs,

2015). The minimum particle size used in this study was based on the ISO regulation (13322-1:2014) for image analysis with a particle made of at least 10 pixels.

Since a high shutter speed (min 1/1000 s) was required, a strong Light source was necessary for high image quality. Thus, a square open LED bar light (OPT-LIM11222, Opto Engineering) was used, ensuring optimum illumination conditions. The set-up allows a bright 360° illumination, used as back illumination with or without a white filter for all experiments.

Sediment particle size distribution

A suspended sediment concentration of approximately 60 mg L^{-1} was prepared from the stock solution. This effective concentration allows the LISST-100X laser transmission to be ± 60 % and represent an appropriate number of particles to be visualized by the camera.

The camera was facing towards the measuring chamber, consisting of two coated glasses of 20 x 18 cm which were separated by a 2-mm thick silicone grid, forming six isolated measuring columns. With this configuration, all the particles flowing through the measuring chamber were in the field of view of the camera. Images were captured vertically, starting from the lower part of the column to ensure that bigger particles were measured.

Volume concentrations detected between the two instruments in each of the overlapping size bins differed in orders of magnitude. Therefore, a correction formula was applied to the Digital Floc Camera values, separately for each sample. The correction factors applied, corresponded to the slope and intercept of a linear regression between the Digital Flocculation Camera and the LISST (Table S3). For each sample, the maximum number of consecutive overlapping size bins giving a significant linear relationship was used for calculations, always excluding from the bigger size bins and downwards when necessary.

Settling column description

Made of a square 4-cm cross section and 50-cm high bore silica glass, the column can be mounted either on a LISST-100X or used separately for higher size aggregates (Figure S3). An outer 6-cm square cross-section column running with a cooling fluid (distilled water + 20 % ethanol) was maintained at fix temperature of 1.5 °C by a cooler system. This way, a drastic

reduction of temperature gradient in the column is provided, avoiding the formation of convection cells.

The settling column was first filled with the same water used during the aggregation experiments and was left standing for several hours. For minimizing evaporation at air-water interface, the column was closed with a lid (Johnson et al., 1996; Ploug et al., 2010).

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