



Tracing abyssal food supply back to upper-ocean processes over a 17-year time series in the northeast Pacific

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ABSTRACT: Detrital aggregates episodically deposited on the seafloor represent an underestimated food source to deep-sea communities. A 17-yr time-series study was conducted from 1990 to 2006 in the abyssal northeast Pacific (Sta. M, 4100 m in depth) to evaluate the importance of this food source and its temporal relationship to water column and surface ocean processes. Detrital aggregates appeared on the seafloor from June through December, with the highest peaks in 1990, 1994, 2001, and 2002 reaching a maximum density of 23 m⁻² in fall 2001. A total of 15,816 aggregates were measured, most less than 20 cm² in area and with a mode of 9 cm². Density of detrital aggregates was highly correlated with particulate organic carbon (POC) flux at 600 and 50 m above the bottom ($p < 0.001$) with no time lag. Export flux of organic carbon from the euphotic zone was significantly correlated with aggregate density, lagged earlier by 1-4 months ($p \leq 0.001$). Zooplankton displacement volume was significantly correlated with POC flux ($p = 0.023$) and with detrital aggregate density ($p = 0.028$) on the seafloor when lagged earlier by ≤ 1 month. The Bakun upwelling index computed for the region around Sta. M was significantly correlated with detrital aggregate density when lagged earlier by 2-5 months ($p < 0.001$). A strong correlation exists between surface ocean processes and abyssal food supply, including POC flux and detrital aggregates. This direct coupling through the entire water column must be considered in resolving the marine carbon cycle.

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