

Fine-scale Hydrodynamic Forcing of Food Supply to Benthic Communities – Case Studies from Atlantic Seamounts and Cold-Water Coral Mounds

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Seamounts and cold-water coral mounds are widespread deep-sea features that provide habitats for unique benthic communities and locally enhance organic matter flux driven by interactions with ocean currents. These interactions generate fine-scale hydrodynamic phenomena like Taylor caps, internal waves, and turbulent mixing, which increase vertical transport of organic matter and enhance food availability in otherwise food-limited environments. We present results from high-resolution hydrodynamic models that integrate detailed bathymetry with basin-scale and tidal forcing to examine near-bottom currents and physical drivers of food delivery to filter and suspension feeders across Atlantic seamounts and coral mounds. Our findings reveal strong links between large-scale ocean currents, internal tide dynamics, and benthic faunal distribution. We identify key physical oceanographic indicators, such as internal wave dynamics and energy dissipation rates, as potential proxies for food supply and particle encounter rates in future species distribution and habitat suitability models. Overall, we aim to advance our understanding of the bio-physical coupling that sustains deep-sea biodiversity and provides a foundation for predicting the distribution of vulnerable species and ecosystems under changing environmental conditions.