

Submarine canyons: important pathways for organic matter from shelf to deep ocean

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Submarine canyons create immense conduits for lateral transport of particulate matter from shelf to deep ocean. The existing paradigm is that at the present sea level high-stand, most canyons are relatively inactive in terms of matter transport. To determine which processes affect organic matter (OM) dispersal and deposition, moored observatories were deployed, suspended matter from the water column and sediment samples were collected along the eastern branch of Whittard Canyon. A mid canyon permanent nepheloid layer between 1200-2300m water depth was observed, related to active resuspension of OM by tidal currents during peaks in current speed when the tidal flow was directed up canyon. Long term measurements showed that significant amounts of particulate matter were transported by intermittent gravity flows, resulting in the large volume transport of matter as shown by elevated mass and organic carbon fluxes. Some events were characterized by fluorescence peaks, indicating supply of fresh OM, likely providing an important food supply mechanism to the deep-sea fauna. Analysis of surface sediments showed that the canyon head is characterized by low concentrations of fresh OM, while the lower reaches of the canyon show highest concentrations of degraded OM being the ultimate deposition sites. Whittard Canyon is an active system being a pathway and sink for organic matter, emphasizing the important role of submarine canyons in the marine carbon cycle.