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TITLE: Geological and biological heterogeneity of the Aleutian margin (1965?4822m)

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ABSTRACT:

Geological, biological and biogeochemical characterization of the previously unexplored margin off Unimak Island, Alaska between 1965 and 4822 m water depth was conducted to examine: (1) the geological processes that shaped the margin, (2) the linkages between depth, geomorphology and environmental disturbance in structuring benthic communities of varying size classes and (3) the existence, composition and nutritional sources of methane seep biota on this margin. The study area was mapped and sampled using multibeam sonar, a remotely operated vehicle (ROV) and a towed camera system. Our results provide the first characterization of the Aleutian margin mid and lower slope benthic communities (microbiota, foraminifera, macrofauna and megafauna), recognizing diverse habitats in a variety of settings. Our investigations also revealed that the geologic feature known as the "Ugamak Slide" is not a slide at all, and could not have resulted from a large 1946 earthquake. However, sediment disturbance appears to be a pervasive feature of this margin. We speculate that the deep-sea occurrence of high densities of *Elphidium*, typically a shallow-water foraminiferan, results from the influence of sediment redeposition from shallower habitats. Strong representation of cumacean, amphipod and tanaid crustaceans among the Unimak macrofauna may also reflect sediment instability. Although some faunal abundances decline with depth, habitat heterogeneity and disturbance generated by canyons and methane seepage appear to influence abundances of biota in ways that supercede any clear depth gradient in organic matter input. Measures of sediment organic matter and pigment content as well as C and N isotopic signatures were highly heterogeneous, although the availability of organic matter and the abundance of microorganisms in the upper sediment (1?5 cm) were positively correlated. We report the first methane seep on the Aleutian slope in the Unimak region (3263?3285 m), comprised of clam bed, pogonophoran field and carbonate habitats. Seep foraminiferal assemblages were dominated by agglutinated taxa, except for habitats above the seafloor on pogonophoran tubes. Numerous infaunal taxa in clam bed and pogonophoran field sediments and deep-sea "reef" cnidarians (e.g., corals and hydroids) residing on rocks near seepage sites exhibited light organic $\delta^{13}\text{C}$ signatures indicative of chemosynthetic nutritional sources. The extensive geological, biogeochemical and biological heterogeneity as well as disturbance features observed on the Aleutian slope provide an attractive explanation for the exceptionally high biodiversity characteristic of the world's continental margins.

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