

Unmixing foraminiferal assemblages: Polytopic vector analysis applied to Yakataga

Formation sequences in the offshore Gulf of Alaska

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ABSTRACT

The Yakataga Formation contains mudstones, sandstones, and diamictites that represent fluctuating marine and glaciomarine deposition in the Gulf of Alaska since the latest Miocene. These rocks contain distinctive benthic foraminiferal assemblages that provide insight into the depositional, structural, and climatic history of the northeastern Pacific Ocean. Qualitative analyses of benthic foraminiferal distribution patterns have been used previously to define eight stratigraphic sequences in the offshore Yakataga Formation. Results of multivariate quantitative methods are presented here to provide additional insight into the nature of foraminiferal faunas and to demonstrate the potential for using quantitative methods in sequence biostratigraphy. Cluster and polytopic vector analyses of 158 samples from the offshore Yakataga Formation indicate distinct mixtures of foraminiferal faunas within the samples. Polytopic vector analysis suggests that samples contain mixtures of seven end members representing the neritic through bathyal environments: EM1: *Elphidium excavatum clavatum* biofacies (inner neritic); EM2: *Epistominella pacifica* biofacies (upper bathyal and middle bathyal); EM3: sharp-margined *Cassidulina* spp. biofacies (outer neritic); EM4: round-margined *Cassidulina* spp. biofacies (outer neritic); EM5: *Cassidulina californica* biofacies (outer neritic); EM6: *Uvigerina* ex gr. *peregrina* biofacies (upper to middle bathyal); and EM7: *Haplophragmoides* spp. biofacies (outer neritic through upper bathyal). Identification of several outer neritic biofacies indicates heterogeneity within this environment, probably due to differences in substrates and nutrient levels. Mixing of biofacies is primarily due to downslope transport of faunas across the shelf and slope and may also be the result of constriction of environmental zones due to advances of the tidewater glacier margins across the shelf.