Submarine Volcaniclastic Units Associated with Intraoceanic Magmatic Arcs: Using Compositional Modes from Modern Backarc Basins (Izu-Bonin, Mariana) to Evaluate an Ancient Jurassic Example from Baja California (Gran Canon Formation)

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Studies of modern intraoceanic magmatic arcs indicate that associated backarc basins are characterized by successions of pyroclastic/volcaniclastic sediments produced predominantly during submarine eruptions. These basins best preserve the evolutionary history of the largely submerged magmatic arc. The composition, texture and morphology of volcaniclastic debris in these deposits provides information on the nature of the source eruptions, magma chemistries, and sediment transport histories. We use actualistic models created from petrographic data collected from modern analogues such as the Sumisu Rift and Mariana Basin to evaluate an ancient intraoceanic-backarc basin sequence, the Jurassic Gran Canon Formation (GCF), Baja California, Mexico. Modal petrographic analyses used in this comparison are based on point (500) counts of 32 GFC samples. These are compared with published data sets for the Sumisu Rift, a nascent backarc basin associated with the Izu-Bonin Arc (Ocean Drilling Program Sites 788, 790, and 791), and the more mature Mariana backarc region (Deep Sea Drilling Project Sites 450, 451, and 453). In each of these studies, counted volcanic clast categories were subdivided according to degree of crystallization, crystal mineralogy, texture, and glass composition (color). Trends in proportions of clasts with vitric, microlitic, lathwork, and felsitic textures as well as composition (mineralogy and glass color) were evaluated. The GCF exhibits mafic, felsic and mixed petrofacies, with some textural attributes (e.g., crystal and felsitic lithic content) linked to proximal vs. distal facies. An upsection trend from blocky to vesicular shards in the mafic petrofacies likely reflects an increase in magmatic explosivity with volcano growth and shallowing. Evolutionary trends in the compositional modes of GCF units suggest that two periods of arc extension and rifting are recorded in the GCF.