

Forearc Basin Analysis of the Late Jurassic-Early Cretaceous Eugenia Formation; New Mapping and Provenance Analysis in the Northern Vizcaino Peninsula, Baja California Sur

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ABSTRACT

The Late Jurassic-Early Cretaceous Eugenia Formation represents an enigmatic part of the Vizcaino Peninsula forearc stratigraphy. Eugenia sub-basins on the Vizcaino Peninsula are broadly correlative to the Jurassic forearc rocks of California and northern Baja California. Previous workers have interpreted the Eugenia Formation as proximal deposits of the Sierra San Andres volcanic arc complex on the Vizcaino Peninsula. This interpretation fails to explain the presence of subalkaline pillow lava interbedded in the Eugenia Formation indicating syndepositional rifting of the basin, nor does it reconcile the chemical disparity between evolved volcanic-plutonic clasts and the more mafic rocks of the Sierra San Andres arc. Further, previously undocumented continentally derived quartzite clasts in conglomerate beds, which in the Eugenia range up to boulder size, have no obvious source on the Vizcaino Peninsula. U/Pb data from conglomerate igneous clasts show contamination of continentally derived zircons. The presence of these continentally derived materials conflicts with models that interpret the Vizcaino as part of an island arc terrane accreted to the North American margin in the Early Cretaceous.

New mapping within the Eugenia block has refined basic structural and stratigraphic details. The basic structure is a highly faulted anticlinorium cored by Eugenia strata, flanked unconformably by the overlying Aptian-Albian Peforada Fm, and is cut by dense arrays of normal faults that extend into upper Valle Group strata. Intra- and inter-formational unconformities, Middle-Late Jurassic and Aptian-Albian pillow lava, and intrusive plugs with a zircon U/Pb age of 153.4 Ma suggests that extensional faulting and igneous activity occurred episodically within the forearc from Late Jurassic into late Early Cretaceous time. A thick ~500-600m turbiditic sediment package beneath a ~156 Ma tuff bed, and the existence of an angular unconformity within this strata could extend the age of sedimentation in the Eugenia block into pre-Late Jurassic time. An abrupt facies change in Eugenia block sedimentation from predominantly sandy turbidites to coarse-grained channelized breccias and conglomerates containing outsized megaclasts up 13m across is interpreted to coincide with inception of major basement faulting and proximal forearc basin volcanic activity associated with the Tres Cabezas volcanic plug and Tithonian pillow lavas. Granodiorite plutonic clasts with zircon U/Pb ages of 148-150 Ma document rapid unroofing and erosion of the Late Jurassic arc. Exhumation was likely expedited by extensional tectonics and associated large detachments documented in the region. Development of Riedel shears along NW trending Eugenia block bounding faults, and normal fault parallel translation of the Eugenia block coast line in conjunction with low amplitude long wavelength folds, suggest that Late Jurassic- Early Cretaceous faults were reactivated within a right lateral transpressional system in Miocene time.

Keywords: Basin analysis, marine volcanoclastics, forearc rifting, ophiolite, pillow basalt, debris flows, zircon U/Pb dating.