The Gulf of California and Mexican Volcanic Belt

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It has been suggested that mantle plumes underlie the mouth of the Gulf of California and the Mexican volcanic belt (Figure 1). Rifting began in the Gulf around 5.5 Ma with seafloor spreading beginning around 3.5 Ma. The notion of a Gulf Mouth hotspot derives from models that propose plumes to be the cause of continental break-up. Volcanism in the Mexican volcanic belt occurred from about 16 Ma to the present and includes subalkaline and alkaline magmas. The presence of a plume has been inferred from beliefs that alkaline volcanism is diagnostic of plume activity, and possible west-east age progressions [*Moore et al.*, 1994]. Whether volcanism in both regions could be attributed to a single plume has not been addressed. The argument presented here is that there is no evidence and no requirement for any plumes in the region.

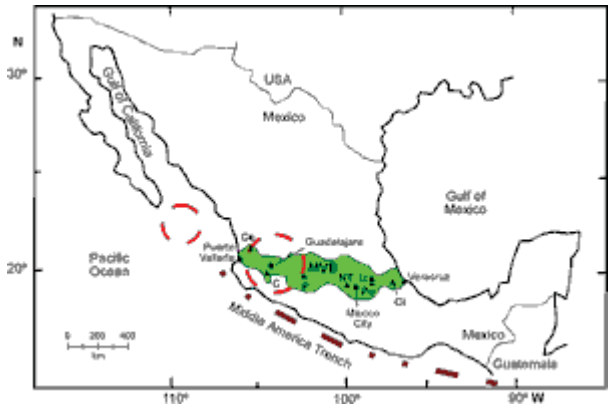

Figure 1: The Mexican Volcanic Belt (MVB) and regions where plumes have been proposed (dashed red circles). Major volcanoes are shown by filled triangles: C = Colima; Ce = Ceboruco; P = Paricutín; NV = Nevado de Toluca; Po = Popocatépetl; Iz = Iztaccíhuatl; Ci = Citlaltépetl (Pico de Orizaba).

The arrival of a plume is predicted to cause uplift, enhanced magmatism and distinct geochemical signatures. A Deep Sea Drilling Project transect (Legs 64 and 65) sampled the basaltic volcanism in the Gulf Mouth region. The basalts are MORB-like with no evidence for excessive magma production, and isotopic compositions can be explained in terms of normal mantle heterogeneity with some contamination of melts during the early stages of rifting by interaction with the continental mantle [*Smith*, 1999].

In the Mexican volcanic belt, there is no evidence for uplift, regular age progressions are not well developed, and an extensional tectonic regime exists all along the belt [*Sheth et al.*, 2000; *Verma*, 2002]. The location and orientation of the belt is also inconsistent with a relationship to subduction of the Cocos plate [*Verma*, 2002]. Rather, the association of alkaline and subalkaline volcanism can be explained as a result of a rifting induced by

large-scale plate interactions, leading to melting of a heterogeneous continental mantle section [*Sheth et al.*, 2000].

References

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