

Stress-induced seamount formation at ridge-transform intersections

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ABSTRACT

Our current understanding of thermal and physiographic gradients at the ridge suggests that hotspot (or buoyant melt) will be directed to the center of ridge segments and away from the ridge-transform intersections (RTIs). However, hotspots located at RTIs can be found on almost every spreading ridge across the planet. Finite element models are used to demonstrate that increasing transform strength dramatically increases extensional stresses at RTIs. Several models are presented that suggest that increased extensional stress at RTIs may result in adiabatic melting, thinning of the lithosphere, and consequently a change in the physiographic and thermal gradient at the ridge. Whether this change results in the formation of a hotspot, the propagation of the ridge, or the formation of a new weak transform is dependent on a variety of factors. However, it appears that hotspot formation at RTIs may be the result of lithospheric processes rather than deep-seated mantle plumes.