

What's driving what?

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Abstract:

What's driving what: An active asthenosphere driving a passive lithosphere, or the other way around? Important clues are obtained from looking at the origin and movement of oceanic plateaus and their transformation into accreted terranes, their impact on arc volcanism, the opening of back arc basins, etc. By and large these processes tend to be more consistent with the notion that plate mechanics and the mechanics of plate interactions control what we call plate tectonics, not asthenospheric processes.

This is supported by (a) At convergent plate boundaries - the way oceanic plateaus influence processes when they dock at plate boundaries (e.g., volcanism, mountain buildings); (b) At divergent plate boundaries - the general migration of ridges relative to the asthenosphere suggest that associated so called "hot spots" must also be moving relative to the asthenosphere; (c) Back arc basins - the extensional episodic opening of back arc basins within compressional/convergent settings suggest that it is the strength and cohesiveness of the plate that control this divergent process. The asthenosphere is responding passively; and (d) At transform boundaries - big bends, and bending of major plate boundary faults systems (e.g., San Andreas at the transverse ranges, Dead Sea transform at the Lebanon Mountains) suggest that it is their weakness that controls the behavior of the boundary, not the underlying asthenosphere.