IUGG 29th Gen. Assy., Boulder, Colorado. July 1995. Abstracts p. A472

A Straightness Mechanism for MORs: a new View of Ocean Plate Genesis and Evolution.

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The straightness and associated segmentation of mid-ocean ridge axes has long defied explanation. The solution appears to require that some long-held tenets be abandoned. Let the mantle "upwelling zone" below MOR axes be visualised as a narrow, almost vertical-sided crack extending to 50km+, widening out at depth. The crack stabilises in width by continuous wall accretion from (partially segregated?) primary magma rising up it. Consequently: (1) the rate of accretion onto each wall of the crack depends on the rate of heat extraction laterally, so any concave surface will accrete faster than the convex one facing it, making the crack become planar after a time; (2) olivine crystals will grow on the walls; those with their a-axes* perpendicular to the wall will grow fastest (highest thermal conductivity), producing the observed seismic anisotropy. At ridge-transform intersections these factors will explain axis curvature towards the conjugate RT intersection, and enhance "inside corner highs" and transform ridges.

Such thick-plate genesis requires the (thick) LVZ material to be part of the plate. LVZ seismic properties are attributable to small temperature-dependent amounts of interstitial supercritical fluid (volatiles). These will control thermal conductivity so as to stabilise heatflow into the base of the lithosphere, thus explaining the $(age)^{1/2}$ subsidence law. Failure of this law beyond 80Ma is taken to mark the upflow of previously concealed residual heat as the LVZ properties fade.

This model of ocean plate evolution has major benefits at the other end. Ridge push is greatly increased, so the Himalayas are no longer a problem. Subducted young plate now includes more than the cooled lithosphere and has (a) the buoyancy implied by observed widespread undercutting of margins by subduction tectonic erosion and (b) the heat content (released by recompressing the interstitial volatiles) needed for long-lived arc magmatism and for the post-subduction melting of interface material thought to be responsible for wide spreads of coeval granitoids throughout Earth history.

*** owing to an unfortunate typing error this appears as 'c-axes' in the published abstract volume**