# Global systematics of subduction zone thermal structures

Award: 06-46632, 06-46757, 06-46667 (June 2007)

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Dynamical modeling can be used effectively to complement experimental and observational approaches to our understanding of the dynamics and thermal structure of subduction zones. In this project, we develop a global suite of 2D subduction thermal models, to capture the full variation in thermal structure due to variations in subduction parameters. Slab geometries are based on recent reassessments of Wadati-Benioff zone geometry and other subduction parameters. These models depend critically upon the transition from fault-like, decoupled plate motion at shallow depths, to full viscous coupling at greater depths, and are run for a set of different assumptions about the physics of this transition. Regardless, virtually all models indicate the subducted sediment and top of the downgoing plate should dehydrate before reaching sub-arc depths, and come close to depths of melting for hydrated sediments. On the other hand, the subducting mantle lithosphere is cold enough for serpentine to remain stable past the arc front at all but the hottest subduction zones. These models form an initial 2D benchmark for comparison to full 3D flow models, to be developed in the next phase of this project. These flow models will be used to investigate the influence of arc-parallel flow on mantle wedge conditions near the edges of subduction zones.

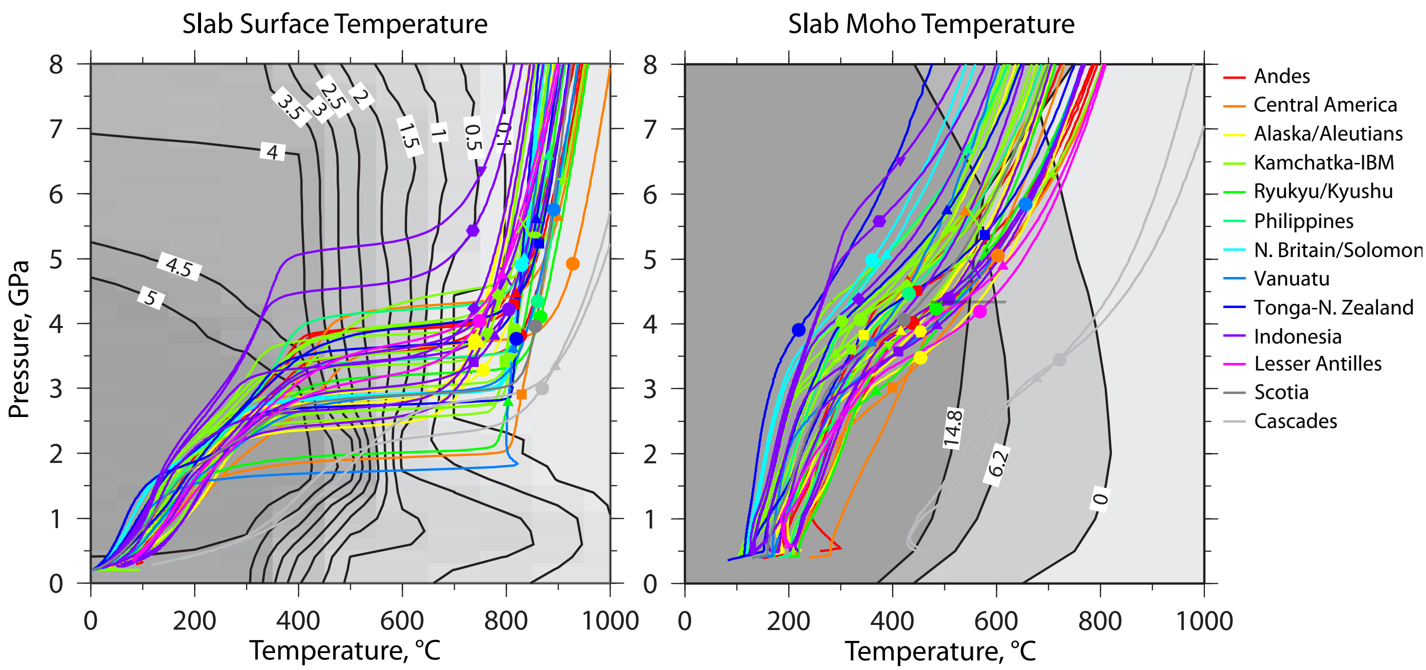


*Figure: Slab surface and Moho P-T paths for 2D thermal models of forty-six 500-km-long sections of subduction zone, overlain on MORB and harzburgite dehydration models showing water content in wt%. Symbols indicate the P-T beneath the arc. The slab crust is routinely dehydrated by the time the slab reaches beneath the arc, whereas the slab mantle has generally not yet dehydrated at this point. The high temperature gradient seen in the slab surface paths indicates the location of the transition from partial to full coupling between the slab and the mantle wedge, set at 25 km trenchward of the arc.*