

Title: Assessing the Role of Water in Alaskan Flat-Slab Subduction

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The mechanisms that initiate, drive, and sustain flat slab subduction are not well understood. It is thought that water could play a substantial role in flat slab subduction as hydrated mineral phases associated with the subducting slab are typically less dense than anhydrous phases. We conducted a study of the thermal and compositional conditions in the Alaskan flat slab subduction region, where the overthickened Yakutat block is being subducted beneath the Alaskan continental lithosphere. Thermal modeling results of the Alaskan flat slab system allow for a comprehensive model of mineral phases along both the top of the subducting crust and the top of the slab mantle. Various degrees of hydration for both peridotite and basalt compositions are used in this study in order to assess the role that water plays in the density of the subducting slab. Results show that hydration in the crust is necessary to generate a buoyant slab and initiate flat slab subduction. The shallow angle of subduction is then maintained in Alaska for several hundred kilometers as the slab does not reach temperature and pressure conditions necessary to cause dehydration embrittlement. Once the slab reaches the necessary PT conditions, dehydration embrittlement of the crust and subsequent dehydration of the slab mantle allow for a density shift that increases the angle of subduction.