Retrating continental plate: numerical modeling and observations

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Subduction zones are sites where a dense plate sinks into the mantle. Mostly, oceanic plates are good candidates for such a behavior, but in few cases a subducting (and retreating) continental plate is observed at trenches. We performed some numerical models of oceanic/continental subduction with thermo-mechanical I2VIS code (Gerya and Yuen, 2003) that account for dehydratation reactions and other phase transformations, and we compare results with the Northern Apenninic belt, where a huge amount of geological/geophysical data are avalaible. Results show that water released from the initially subducting oceanic plate creates with time a hydrated interface between the two plates that lessens plates coupling. When the subducting slab reach a reasonable depth such that the pulling force overcome plates coupling and the horizontal velocity field stresses, the subducting slab starts to retreat pulling down togheter the continental plate. Weak crustal material is scraped off by the uprising asthenospheric wedge and thrusted landward. An extensional (on the back) and compressional (on the front) waves, togheter with the coast line and the mountain belt, migrate toward the foreland. The extensional domain is characterized by thin continental crust, high heat flux and magmatism, while the compressional zone has thick crust, low heat flux and deep seismicity due to the thicker brittle layer. Results are consistent with what observed in the Northern Apenninic belt, supporting the idea that the Apennines are the result of a retreating continental plate.