AGU FALL MEETING
San Francisco | 12–16 December 2016

T31C-2896: Subducting Plate Breakup by Plume-Lithosphere Interaction

Wednesday, 14 December 2016
08:00 - 12:20
Moscone South - Poster Hall

We use a 3D high-resolution thermo-mechanical modeling to investigate the impact of active mantle plume on a subducting lithospheric plate.

Initial model setup consists of an overriding continental lithosphere and subducting lithospheric plate including oceanic and continental lithosphere. A mantle plume thermal anomaly has been initially seeded at the bottom of the model box underneath the continental segment of subducting plate.

Mantle plume impingement on lithospheric bottom leads to thinning of continental lithosphere and decompressional melting of both lithospheric and sublithospheric mantle along stretched trench-parallel zone. Further continental breakup is followed by opening of an oceanic basin separating a newly formed microcontinent from the main subducting continent. Despite continuous push applied at the boundary of subducting plate, plume-induced oceanic basin opens during several Myrs reaching several hundred kilometers wide. Cooling of the mantle plume and beginning of collision between the separated microcontinent and the overriding continental plate lead to gradual closure of newly formed oceanic basin that gets further involved into subduction and collision. The final stage sees continental subduction of main body of subducting plate and simultaneous tectonic exhumation of the upper crust of the subducted microcontinent.

This scenario involving a plume-induced rifting of a microcontinent away from main body of subducted plate can be compared to the Mesozoic-Cenozoic development of the African plate characterized by the consecutive separation of the Apulian microcontinent and Arabian plate (in the Jurassic and the Neogene, respectively) during subduction of Neo-Tethys oceanic lithosphere beneath the Eurasian margin.

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