Parametric study of the effects of micro-continents collision in ocean-continent subduction systems by 2D numerical simulations

Alessandro Regorda[1], Manuel Roda*[1], and Cedric Thieulot[2]

[1]Università degli Studi di Milano – Italie
[2]Universiteit Utrecht – Pays-Bas

Résumé

Heterogeneities of the oceanic crust are very diffuse and considered to represent remnants of extinct arcs, abandoned spreading ridges, detached, and submerged continental fragments, anomalous volcanic piles, and uplifted oceanic crust (Stein and Ben-Avraham, 2007; Vogt and Gerya, 2014). Here, we simulated the collision of micro-continents with different different sizes in an oceanic-continent subduction setting characterized by different convergence velocities, to verify their effects on the thermo-mechanical evolution of the subduction systems.
Our results show that the subduction of a micro-continent has an impact on the thermal state of the subduction complex, the larger the micro-continent, the higher the temperature increase in the slab. From the mechanical point of view, larger micro-continents cause higher forces at the trench during the collision, with a consequent retreat of the trench toward the overriding plate. Consequently, for larger micro-continents the upper plate records higher compressive strain. In addition, if the micro-continent is larger than 100 km there is a jump of the subduction to the back of the micro-continent with the development of a new subduction zone. The convergence velocity affects the occurrence of a slab or trench retreat and, therefore the slab dip. Lastly, a strain partition can be observed in the subducted micro-continent, from portions highly deformed to portions where the accumulated strain is almost zero.

References:

M. Stein and Z. Ben-Avraham. Mechanisms of continental crust growth. 2007.
K. Vogt and T. V. Gerya. From oceanic plateaus to allochthonous terranes: Numerical modelling. Gondwana Research, 25(2):494–508, 2014. ISSN 1342-937X. doi:10.1016/j.gr.2012.11.002.1

Mots-Clés: micro, continent collision, numerical modeling, ocean, continent subduction zone

*Intervenant