Geophysical Research Abstracts
Vol. 20, EGU2018-16379, 2018
EGU General Assembly 2018

Continent obduction induced seamount subduction along Manila Trench : numerical modelling

Zihua Cheng (1,2), Weiwei Ding (2), and Manuele Faccenda (3)

(1) ZHEJIANG UNIVERSITY, Hangzhou, China (czh2436@outlook.com), (2) Second Institute of Oceanogarghy, 310012, Hangzhou China, (3) Department of Geoscience, University of Padova, Via Gradenigo n. 6, 35131, Padova, Italy

Seamount, oceanic ridge and plateaus is a common geometry that make oceanic crust non homogenous. So far several models of analogue and numerical modeling studies have completed on seamount subduction, these studies have designed to evaluate slab dip, volcanic activities, collision patterns and topographic response of the upper plate. However, all these studies above were considered seamount forced to subducted under continent plate which is fixed or have a slow convergence rate. The role of continent obducted over seamount still remain rarely discussed. The Huangyan seamount chain of South China Sea is a present day example of an oceanic seamount that passively subducted beneath Luzon island along Manila trench at 15˚∼16˚N . The aim at this research is to investigate seamount subduction geodynamic effects on slab tearing and slab angles.

We employ the thermo-mechanical code I2VIS on seamount subduction system (Gerya, 2010; Gerya and Yuen, 2003). This numerical code solves for the two-dimensional steady state momentum equations and heat conservation equations using the finite-difference/ marker-in-cell method on an Eulerian grid. In order to ascertain the impact of a moderate size (150km x 16km) of seamount, 7 groups of experiments were carried out to study the importance of the crust rheology, subducting- and overriding-plare rates and with or without seamounts on Manila subduction system.

The preliminary results showed that:

i) from variable convergent rates experiments, slab detachment will occur when overriding continental plate have a higher rate than subdtucting oceanic plate, while in opposite case detachment can not be observerd.

ii) by analysing the curst rheology, the lower activation volume, slab angle is larger and detached slab sinks rapidly, due to viscosity increase with depth is small.

iii) As to oceanic age, it could be noticed that slab break-off occurred while slab is young ($\leq$40 Ma) because of the young slab is much hotter and weaker.

iv) When it comes to the relationship between break-off and seamount, break-off point always locate at back or front margin of seamount. This, in turn, suggest seamount serve as weak point where large large tensional stress takes place. And the time of slab break-off will be much earlier if seamount is not existing.

These results highlight that continent obduction will dominate slab break-off process which is different from normal oceanic plate subduction. Also our experiments match well with previous tomography studies in Manila trench where Huangyan seamount subducted and break-off.

Reference:

Gerya, T.V., 2010. Introduction to Numerical Geodynamic Modelling. Cambridge Uni-versity Press.

Gerya, T.V., Yuen, D.A., 2003. Characteristics-based marker method with conservative finite-difference schemes for modeling geological flows with strongly variable transport properties. Physics of the Earth and Planetary Interiors 140 (4), 293–318.