Shuangxi Zhang et al., Expert Opin Environ Biol 2014, 3:2
http://dx.doi.org/10.4172/2325-9655.C1.006

OMICS International
conferenceseries.com SciTechnol

3rd International Conference on
Earth Science & Climate Change
July 28-30, 2014 DoubleTree by Hilton Hotel San Francisco Airport, USA

Factors influencing the dynamics of slab subduction based on temperature-dependent thermal coefficients

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The thermal conductivity and expansion coefficients are two significant parameters that influence the dynamic process of slab subduction. Due to the heterogeneity of earth medium, these two coefficients are usually variable with temperature. Unfortunately, such variations are often ignored in current modeling studies of geodynamics. The present study refers to the temperature-dependent thermal conductivity and expansion to simulate the dynamics of slab subduction. The impact of temperature-dependent thermal coefficients and other factors including the Clapeyron slope of phase transitions, olivine metastability, mantle viscosity and trench retreat on slab geometry and the corresponding characteristics of mantle convection are analyzed. The modeling results show the temperature-dependent thermal conductivity and expansion influence the slab angles by changing the thermal and viscosity structure. Slabs tend to be bent at the 410 km phase transition, while the metastable olivine wedge in a cold slab can increase the positive buoyancy which facilitates the slab stagnation. The positive Clapeyron slope at the 660 km phase transition, mantle viscosity jump and trench retreat also play a role in deflecting the slab above the 660 km discontinuity. The mantle convection is affected by slab dynamics and appears different patterns, such as layered convection and local multiple convection loops etc.

Biography

Shuangxi Zhang completed his PhD degree from Hong Kong University in 2003. He is the Deputy Director of the Research Institute of Geodesy and Geophysics, School of Geodesy and Geomatics, Wuhan University, P.R. China. His major is geophysics, with more than 50 papers in international geophysics journals and conferences.

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