Geophysical Research Abstracts
Vol. 12, EGU2010-2364, 2010
EGU General Assembly 2010

Adiabatic temperature profile in the mantle

Tomoo Katsura (1,2), Akira Yoneda (2), Daisuke Yamazaki (2), Takashi Yoshino (2), and Eiji Ito (2)

(1) Bayerisches Geoinstitut, Universität Bayreuth, Germany (tomo.katsura@uni-bayreuth.de), (2) Institute for Study of the Earth' Interior, Okayama University, Japan

The temperature at the 410-km discontinuity is re-evaluated by comparing the depth of the discontinuity with the olivine-wadsleyite transition pressure obtained using in situ X-ray diffraction experiments by Katsura et al. (2004b) and equation of state (EoS) of MgO by Tange et al. (2009) (Tange scale) and Matsui et al. (2000). The newly estimated temperature is 1830 $\pm$ 40 K, 70 K higher than that by our previous estimation. The EoSes of the major mantle minerals (olivine, wadsleyite, ringwoodite and perovskite) are also recalculated using the Tange scale. The adiabatic temperature gradient is calculated using the thermal expansion coefficient obtained from these EoSes. The adiabatic temperature gradient gradually decreases with increasing depth without a phase transition, and abruptly increases in association with phase transitions. The adiabatic temperature gradients are found to be 04 $\sim$ 0.5 and 0.3 K/km in the upper and lower parts of the mantle, respectively. The temperatures at a depth of 200 km, the bottom of the mantle transition zone, the top of the lower mantle and a depth of 2700 km are found to be 1720 $\pm$ 40, 2010 $\pm$ 40, 1980 $\pm$ 40, and 2730 $\pm$ 50. The mantle potential temperature is found to be 1610$\pm$35 K.