Difference between slabs subducted to the lower mantle and slabs horizontally lying on 660km mantle boundary

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Recent sudies of 3-D seismic wave tomography show that some slabs subduct into the lower mantle, and the others lie horizontally on the mantle boundary. In this study, we attempted to estimate the difference of the condition between the two slabs behaviors.

The results show that when we gave viscosity jump alone of about 10 to 30 times of the upper mantle to the lower mantle, slabs subducted into the lower mantle. Slabs became lying horizontally on the 660km mantle boundary when phase transitions at 410km and 660km, and high Rayleigh number were given.

We concluded that whether slabs subduct into the lower mantle or lie horizontally on the 660km mantle boundary depends on the viscosity jump of the lower mantle, the existence of the phase transitions and Rayleigh number.