

Origin of a discontinuity in the uppermost mantle beneath Chugoku District

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It is considered that a discontinuity exists at depth of about 40 km in the uppermost mantle beneath Chugoku District. The origin of the discontinuity is discussed here.

Katsumata (2010) estimated Moho depth distribution beneath the Japan Islands from arrival times of body waves. The estimated Moho depth beneath Chugoku District was relatively shallow. Shiomi et al. (2004) estimated Moho depth distribution beneath Chugoku and Shikoku with receiver function analysis. The Moho depth estimated by Shiomi et al. (2004) was about 40 km, and it is relatively deep. A reflective layer was recognized beneath the Moho in a seismic reflection profile by Ito et al. (2009). The bottom of the layer reached 43 km in the seismic profile. The depth nearly coincided with the Moho depth estimated by Shiomi et al. (2004). The top of the reflective layer almost coincide with the Moho estimated by Katsumata (2010).

If the boundary obtained from the receiver function analysis is assumed as a discontinuity in the uppermost mantle, the extent of the discontinuity can be known as the region where the depths by Katsumata (2010) and Shiomi et al. (2004) are different. The region almost cover the whole of Chugoku District. A clear NS cross-section image of the extent is seen in Ito et al. (2009).

Ito et al. (2009) assumed that the reflective layer in the mantle was olivine-pyroxene cumulate based on studies of xenolith found in Chugoku District (Arai et al, 2000). The reflective layer was considered as the result of melting.

Some kind of event is considered to have occurred in Chugoku district. One candidate would be Japan Sea opening. However it is assumed that relating volcanic activity did not reach Chugoku District. Most of Chugoku District is covered with granite which was formed in the Cretaceous. It would be consistent that melting of the uppermost mantle could occur at the same with the formation of the granite (Yoshida, personal communication). The discontinuity is considered as the bottom of the melting portion.

Keywords: velocity structure beneath Chugoku District, depth of the Moho discontinuity, discontinuity in the uppermost mantle, cumulate