Is the Moho in southern Tibet a Phase Change Boundary or a Material Boundary? Evidence from Receiver Function Observations

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Since the Tibetan plateau has the thickest crust on the earth it challenges the traditional interpretation of the seismic Moho. At a depth of about 70-km, granulite (believed to be the major component of the lower continental crust) underneath the southern Tibet can be transform into eclogite, which is seismically similar to mantle olivine. The phase change boundary between granulite and eclogite then becomes the seismic ”Moho”, instead of a traditional definition of the Moho being a material boundary between crust and mantle rocks. Because the phase transition is sensitive to local P-T conditions, depth of this ”Moho” varies with different P-T settings as opposed to the traditional Moho which is relatively stable to local P-T variations. This is consistent with our receiver function observations from two broadband seismic profiles (International HI-CLIMB project and Peking University RISE project). HI-CLIMB N-S profile shows Moho becomes shallower near Indian subduction region while RISE E-W profile shows Moho is deeper beneath the Yadong-Gulu rift. These variations can be explained by the process of eclogitization of granulite that forms a phase transition boundary seismically observed as the ”Moho” and the depth of the ”Moho” varies with the local P-T conditions. Because this phase transition has a positive slop, that is, pressure increases as local temperature rises, the relatively warmer rift region has a deeper ”Moho” due to deeper transition depth while the cold subduction region has a shallower ”Moho”.

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