SH VELOCITY AND COMPOSITIONAL MODELS NEAR THE 660-KM DISCONTINUITY BENEATH SOUTH AMERICA

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The IRIS PASSCAL experiments have supplied the seismology community with high quality, freely available and spatially dense datasets. The high quality broadband seismic data recorded in two PASSCAL experiments in South America (BANJO and BLSP) provide us an opportunity to investigate the upper mantle seismic structure beneath South America. The dense observations also minimize the effects of lateral seismic heterogeneities on the seismic results. We constrain SH wave velocity structures near the 660-km discontinuity beneath South America using triplicated phases near the discontinuity recorded in the epicentral distance range of 10° for a deep event. The seismic data suggest that the velocity gradient above the 660-km discontinuity is larger than that of Preliminary Earth Reference Model (PREM), while the velocity jump and the velocity gradient below the 660-km discontinuity across the discontinuity are the same as PREM. The large velocity gradient above the 660-km discontinuity requires existence of ilmenite phase in the bottom of the transition zone; the velocity jump across the discontinuity can be explained by the presence of more garnet above the discontinuity than the pyrolite model; and the high velocity gradient in the top of the lower mantle can be explained by gradual transformation of garnet to prevoskite persisting to a greater depth. Such a mineralogical model may be explained by an aluminum content of 3.4% in the top of the lower mantle and a low temperature and/or low Al content in the bottom of the transition zone beneath South America.

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