

P-wave velocity anomalies of the plume beneath the French Polynesia

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The French Polynesian region is characterized by positive topographic anomalies of 700 m, a concentration of hotspot chains. Many seismic tomography results show a broad low-velocity anomaly in the lower mantle continued from the base of the mantle. These observations suggest that a large-scale mantle flow rises from the bottom of the mantle beneath the region. Joint Japanese-French broadband seismological observations were performed from 2001 to 2005 with 10 island stations from the Polynesian PLUME project (Barraud et al. 2002) and 10 broadband ocean bottom seismometers (BBOBSs) from the Polynesian BBOBS project (Suetsugu et al. 2005). A P-wave

tomography using the data from these projects revealed that large-scale low-velocity anomalies (on the order of 1000 km in diameter) from the bottom of the mantle become smaller-scale low-velocity anomalies (on the order of 100 km in diameter) at the depth of about 1000 km. However the connection of the small-scale low-velocity anomalies to the surface hotspots was not revealed because of the poor resolution in the upper mantle.

A new P-wave tomography with better resolution in the upper mantle was obtained by adding data from BBOBSs around Society Islands deployed along the TIARES project during 2009 - 2010 (Suetsugu et al. 2012) and by taking the finite frequency effect into account for the frequency-depended differential travel times. The frequency-depended differential travel times were measured by multi-band cross correlating P waveforms. The new P-wave tomography shows strong low-velocity anomalies beneath the Society Islands and Pitcairn in the upper mantle although they do not extend to the 660-km discontinuity. This model also shows that small-scale low-velocity anomalies in the uppermost lower mantle. The low-velocity anomalies in the depth range about 550 - 900 km are smaller both in lateral area and amplitude than those in most of the upper mantle and the lower mantle. The velocity patterns are well correlated each other in the depth range but are not correlated with the patterns above and below, indicating the mantle beneath the French polynesia can be divided into 3 layers in terms of radial correlation.

Keywords: Tomography, Plume, Mantle, French Polynesia