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Mantle Flow Beneath French Polynesia deduced from SKS splitting and P-polarization at on-land and Ocean Bottom Seismic stations

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We investigated upper mantle flow related to the South Pacific Superswell and to the associated short-lived hotspots using seismic stations deployed in French Polynesia. SKS splitting measurements and P-polarization analyses have been performed at 8 permanent seismic stations (IRIS, CEA and GEOSCOPE), 10 temporary broadband stations deployed on-land during the period 2001 to 2005 in the frame of the Polynesian Lithosphere and Upper Mantle Experiment (PLUME) and at 8 broadband ocean bottom seismometers (BBOBS) deployed between the various Polynesian archipelagos to investigate the "unperturbed" oceanic upper mantle. Anisotropy has been detected at all except 2 stations located on top or close to the Society hotspot and the major trend appears to be primarily controlled by the plate motion. Both SKS and P-polarization suggest the presence of 2 anisotropic layers: a lower, asthenospheric, layer viscously accommodating the moving Pacific plate and an upper lithospheric layer in the related to the palaeospreading direction between the Pacific and Farallon Plates before 25 Ma. Interestingly, seismic anisotropy measured at BBOBS and at island stations are at first order very similar suggesting a rather small influence of the hotspots on the regional mantle flow pattern. However, the complex pattern associated to the Society hotspot can be explained by the interaction between the plume upwelling and the moving asthenosphere.