# Deep structure of the northern Tonga slab revealed by seismic array analyses

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Teleseismic short period seismic array data are analyzed for deep earthquakes at the northern Tonga subduction zones in order to reveal fine structure of the Tonga slab. We analyze short period seismograms recorded at the seismic array of University of Washington for 40 deep earthquakes with mb larger than 5.3 which occurred near the northern edge of the deep seismic zone at Tonga from 17 deg S to 18 deg S during 18 years from 1986 to 2003. Focal depths of the events range from 510 km to 640 km. We relocate those events applying the master event technique to the P wave arrival times reported by ISC. The focal depths are estimated by differential travel times of pP relative to P. After the relocation a sign of the presence of deep double seismic zone as wide as 20 km documented by Wiens et al (1993) is observed. We then apply array processing techniques to the seismograms retrieved from IRIS DMC archive, and measure the arrival times of S660P, S-to-P converted waves at the 660 km discontinuity. The depths of the 660 km discontinuity are then computed for each of the deep earthquakes. It is found that the depth of the discontinuity gradually deepens from about 660 km down to about 680 km within a lateral distance of about 100 km from northwest to southeast.
The conversion points probably are located inside the Tonga slab. A sign of similar deepening has been reported by an earlier study by Tibi and Wiens (2005) by using a different data set, so that the observed feature seems robust.
The thermal structure of the northern part of the Tonga slab will be discussed based on this observation, tectonic history of this region, and recent mineralogical findings.