

# Determination of focal depth using sP depth phase in Hyuganada, Japan

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The focal mechanism and deep seismic plane in the Kyushu region have extensively been examined and the following characteristics have been obtained: (i) Normal fault type earthquakes exist over 30% in Hyuganada, and (ii) deep earthquakes are not always Down-dip Extension type which has been indicated for other subducting regions and those types change by region and depth. The Miyazaki Plain, eastern part of Kyushu, Japan, is characterized by both significant negative gravity anomalies and aseismic crustal uplifting (about 1 mm/yr) in the Late Pleistocene and Holocene. Nakada et al (2002) quantitatively explained the Late Pleistocene uplift of the Miyazaki Plain based on crustal rebound due to mass deficiencies inferred from the gravity anomaly and crustal uplift. In the mass deficiency model for the region of Hyuganada, this low density material generates tensile field in the upper crust, and it may cause the above-mentioned normal type earthquake. Moreover, it may make the coupling of the upper crust and subducting slab weaker, resulting in the difference of seismic coupling between Hyuganada region and Tounaknai region. In this study, we precisely determined the focal depth in the Hyuganada region by using sP depth phase.

Because the earthquakes in Hyuganada occur suboceanic region, it is extremely difficult to determine the focal depth precisely. We can, however, find the later phases with dominant vertical and radial components motion at epicentral distance for greater than 200km. This phase is identified to be the sP phase from apparent velocity, particle motion and travel time. The definition of sP phase is as follows: an upgoing S wave that is subsequently reflected and converted to a P wave at the top of the crust and which finally reaches stations at the surface. The difference of arrival-time between the direct P wave and the converted S wave (sP-P time) depends not only on focal depth but also on the seismic-velocity structure. We estimated observed sP-P time and relocated the focal depth in Hyuganada region. In result, we certainly confirmed that normal fault type earthquakes occur in shallower area than plate boundary in Hyuganada. These earthquakes may be related to the crustal rebound due to the mass deficiency.