

# Isostasy and flexural deformation of Yap trench and their implications for subduction initiation

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**Abstract:** Subduction system where plate generated at ridge sinks is one of the most dynamic and complex regions on the surface of our planet. Understanding the nature of subduction mechanism is important for elucidating the interaction between the surface of the earth and its interior, and yet little is known about how subduction zones develop in the first place. The Yap trench located in the southeastern section of the Philippine Sea plate is considered as an important geological case where subduction has recently started or restarted. The evidences for such argument include (1) short trench–arc distance (~ 50 km), (2) lack of Wadati–Benioff zone, and (3) presence of exposed oceanic crust section along the landward slope of the trench. To understand how young subduction systems respond to various tectonic forces, we examined bathymetric and gravity data collected by R/V Hakuho–maru (KH05–01–Leg 3) in 2005 and by R/V Onnuri in 2002 in this region. We also examined gravity and bathymetric data from the Mussau and Puysegur trenches for comparison. In the cases of Yap trench, the isostatic residual gravity anomalies in general increase towards the margin of the overriding plate. Such gravity anomaly feature also appears in the Mussau and Puysegur trenches. Therefore, it may be unique to young subduction systems as similar feature can not be found in mature systems such as Izu–Bonin–Mariana trench. After eliminating the effect of seafloor topography from the observed gravity anomaly, we examined the residual gravity on both the overriding and subducting plates. Important differences are found between the incipient and mature subduction zones. We interpret these differences in terms of the difference in the geological situation at incipient and mature stages such as development of the arc and its root.

**Keywords:** subduction, gravity anomaly, isostasy, flexure