The rule of thumb for inferring plate coupling status based on the mantle lithospheric buoyancy

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The subduction zone is a convergent plate boundary, and where most seismic activity is concentrated and megathrust may occur. To evaluate the potential hazard in subduction zones always relates to the plate coupling status. From previous studies, the status of plate coupling between plates can be reflected by the vibration of the buoyancy of mantle lithosphere (Hm). As far as the respective plate coupling states are concerned, more than a dozen Hm profiles across different subduction zones have been successfully verified. It is normally to determine the coupling status depending on the Hm vibration without manifest definition. We therefore propose a method to estimate the plate coupling factor (pcf) quantitatively. The pcf is defined as the difference of the Hm caused by the respective subduction and overriding plates between the distances where Hm deviated from the normal lithospheric Hm value across the plate boundary. The collected Hm profiles are calculated by the proposed method, the results show that the pcf value is corresponding well to the plate coupling status in the respective subduction zone. The small pcf is for strong plate coupling, such as the northern Sumatra and the southern central Andes subduction zones, while the large pcf is for weak coupling, such as the Calabria and the northern Manila subduction zones. The calculation of pcf is a feasible solution for determination of plate coupling status, but more Hm profiles across subduction zones will help the estimation more reliable.