



Trench parallel Bouguer anomaly and its application in detecting asperities along interplate and outer-rise

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The subduction process is inherent with large mass movements, resulting in gravitational anomaly templates specific of subduction zones. Great outer-rise earthquakes leave considerable morphological signatures. The 2007/01/13 ($M_w=8.1$) Kurile earthquake left a downthrow exceeding 14 meters for a length of tens of kilometers long. Such vertical displacements are expected to leave their gravitational signature. However, the relationship between great interplate earthquakes and gravity is not so straightforward. Several studies found considerable correlation between asperity locations of interplate earthquakes and the deep sea terrace lows. Song and Simons (2003) [Science, 301] quantitatively studied the relationship between interplate seismogenesis and a gravity-derived measure called trench parallel gravity anomaly or TPGA. In spite of good correlations found for both seismicity-gravity and seismicity-deep sea terrace lows, some unexplained contradicting cases were also observed. There are several factors affecting the relationship between interplate asperity locations and the forearc gravitational measures, including slab buoyancy, interplate shear traction, normal traction, and density. We extended the TPGA measure and called the new measure “trench parallel Bouguer anomaly”, TPBA. In order to validate, the new measure was compared against several available slip distribution of great interplate earthquakes. It was also applied on seamount detection. We were able to observe the bathymetry-derived seamounts clearly, and also to detect some of the subducted seamounts which are not observable by bathymetry. Discrimination between seamounts based on their density seems to be feasible by using TPBA. Of usages of this new measure is locating the asperities along interplates. Detecting subducted seamounts and also locating the regions of considerable downthrow which are the locations of previous and future great outer-rise earthquakes are of the other capabilities of the new measure.