Geophysical Research Abstracts
Vol. 19, EGU2017-19555-1, 2017
EGU General Assembly 2017

Characterising the Japan Trench subduction margin in the vicinity of the 2011 Tohoku earthquake using seismic reflection data

Yu Ting Kwok (1), Rebecca Bell (1), and Kimihiro Mochizuki (2)

(1) Imperial College London, Prince Consort Rd, South Kensington, London, SW7 2BP, UK, (2) Earthquake Research Institute, Tokyo, Japan

Using a suite of 2D pre-stack time migrated seismic reflection profiles, collected between 2000 and 2014, we characterise the structure of the Japan Trench subduction margin in the region of high, shallow slip in the 2011 Tohoku earthquake (between latitudes 37^{o}N and 39^{o}N). In order to convert our interpretations of margin structure from time to depth we have developed a velocity model using published pre-stack depth migrated data and accompanying velocity models, new ocean bottom seismometer velocity analysis and well log data.

We observe that significant variations in margin characteristics exist from North to South across the study area. To the north of 38.2^{o}N the accretionary prism has a taper angle of $>4^o$ and is c. 30 km wide and c. 3 km thick. Between 37.5^{o}N and 38.2^{o}N the taper angle reduces (c. 3.5^o) and the wedge is somewhat narrower and considerably thinner (c. 2 km). To the south we observe that the taper angle, wedge width and thickness begin to increase up to similar magnitudes seen in the northern part of the study area.

At 38.2^{o}N three crossing seismic reflection profiles reveal that the décollement becomes locally shallower by 1.5 km over a region measuring 20 km along-strike and 20 km down-dip. The location of this local décollement upwarping also corresponds with a local indentation in the deformation front by 2 km. These observations may be indicative of previously unknown subducted relief, potentially a seamount or large horst block, in the zone of high, shallow 2011 Tohoku earthquake slip.

The region of localised wedge narrowing, thinning, décollement shallowing and wedge taper reduction correlates with the location of maximum slip of $>$ 50 m during the 2011 Tohoku earthquake. We therefore suggest a negative correlation between wedge thickness and earthquake slip at this subduction margin. We speculate that the slip in this area may have been enhanced, in part, due to reduced overburden stresses on the décollement.