

Plate interface roughness of subducted slab off Miyagi, Japan: a tentative interpretation for structural style of accretionary prism

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The 2011 Tohoku earthquake and tsunami event, one of the most catastrophic disaster that resulted in mass death of human beings and huge damage to human society and economics. A significant deformation feature of the 2011 Tohoku earthquake is the coupled occurrence of the large amount offsets of the subsidence at nearshore-upper slope (~ 2m) and those of the uplift at lower slope (~ 9m). While the mechanism for these structural features has not been fully explored. Here we analyzed the large offset marine multichannel seismic (MCS) data collected off Miyagi, cross the Japan Trench subduction zone. Preliminary results of the MCS depth-convergence sections show the range of the frontal part of the accretionary prism relatively narrow, suggesting the development of the accretionary prism of the Japan Trench subduction zone is limited. Further landward beneath the middle-lower accretionary prism, the plate boundary fault and décollement show a wavy surface and several relief highs. Semblance velocity spectrums at this interval derived from large-offset MCS data display a local velocity high as well. According to previous study, this area happens to spatially corresponds to a high value area of the residual gravity. Collectively, a revisit of the dominating structural style and deformation pattern is required. These features are likely to be related to the crustal heterogeneity resulting from plate convergence, probably the inherited seafloor relief from seamounts or horst-and-graben structures of the subducted Pacific slab.

Keywords: 2011 Tohoku earthquake, Velocity semblance spectrum, Subducted seafloor relief