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日本海溝の巨大海底地すべり：津波発生の古くて新しいシナリオ
Large submarine landslides in the Japan Trench: An old but new scenario for tsunami generation

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We describe in detail possible large submarine landslides, several tens of kilometers in length and width, on the trench landward slope of the Japan Trench on the basis of high-resolution topographic surveys and detailed seafloor observations. These slides stopped at the toe of the trench slope. After initial movement of the toe along a basal decollement or thrust of the trench landward slope wedge during an earthquake, the basal frictional condition(s) might change drastically from static to dynamic, thus reducing the frictional strength. As a result, rapid submarine landsliding push downward on the toe, generating large vertical and horizontal displacements for tsunamis. The thrust movement at the toe of the trench slope was probably resulting from submarine landsliding with rupture propagation. This thrust movement might be with big slips without strong seismic waves. This hypothesis could explain suitably the relation between large displacement of the thrust fault and tsunami generation by the 2011 Tohoku earthquake as well as tsunami generation by the 1896 Tohoku earthquake.

It has been believed that tsunamis are generated only by seafloor topographic change caused only by active faulting, excepting for local effects by volcanic and/or small landsliding. However, the Japanese tsunami warning system does not include the tsunami excitation scenario by submarine landsliding. In fact, in 1979, a tsunami 2?3 m in height struck Nice, France, unaccompanied by any seismic signals. This silent tsunami was considered to be generated by submarine landsliding near the Nice harbor (Dan et al., 2007). Tsunami-generating submarine landslides have been known to occur from various areas in the world (Yamada et al., 2012). Thus, all data pertaining to tsunami generation mechanisms as well as topographic changes in survey data from before to after the 2011 Tohoku earthquake should be carefully examined to improve our understanding of tsunami generation.

Some of the Tohoku people have called the silent tsunami as Yoda, which is different meaning from Tsunami. In spite of the previous people experience we forget totally the Yoda, because we believe that tsunamis should be excited only by seafloor deformation of rupture propagation. According to Yamada et al. (2011), there are many giant submarine landslides, not only in active margins as the Japan Trench, Nankai Trough, Kuril Trench, but also in passive margins as continental slope of the Atlantic Ocean, and also in volcanic islands and deep-sea fan. We must consider the basic mechanism of tsunami excitation immediately. Our tsunami early warning systems following the ever-believed tsunami excitation mechanism may be wrong.

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