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Progress and remaining problems in subduction paleoseismology along the Pacific coast of northeast Japan

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In the last two decades, tsunami geology in northeast Japan (Hokkaido and Tohoku) has focused on extending the record of tsunamis beyond the range of historical documents in the region. In Hokkaido facing to southern Kuril trench, recurrent sandy deposits interbedded with peat are regarded as evidence of historical and prehistoric tsunamis. Distribution of one of the sand layers just below a historic tephra (Ko-c2; 1694 CE), so-called 17th-century tsunami deposit, exceeds historical and recent tsunami inundations in eastern Hokkaido. Numerical simulations to reproduce the distributions first suggested a multi-segment fault model with unimodal slip ($M_w > 8.4$; Nanayama et al., 2003 in Nature), and later with variable slip ($M_w > 8.8$; Ioki and Tanioka, 2016 in EPSL). Tohoku region, facing to Japan trench, has longer historical record than Hokkaido and the oldest historical earthquake is the Jogan event in 869 CE. Numerical simulations constrained by spatial distributions of the tsunami deposits, coastal submergence, and observation of the 2011 Tohoku tsunami deposit suggest that the 869 event was a plate-boundary rupture at least 200 km long along the Japan Trench ($M_w > 8.3$ – 8.6). After the 2011 Tohoku event, a large tsunami in 1454 CE (Kyotoku event) became reexamined and considered to have been generated by a rupture area including the Miyagi-oki region (part of the Jogan rupture). If the 869, 1454, and 2011 events were similar, recurrence of earthquakes in Japan trench is more periodic than southern Kuril trench. This presentation is based on descriptions and discussion in Sawai (2020) in Earth Science Reviews.