



Tracing the “lost” deposits of the 2011 Tohoku-oki tsunami (Northern Japan)

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Overtopping coastal defense walls of Oirase and Misawa with waves of 6-10 m, the 2011 Tohoku-oki tsunami caused massive damages along the entire coastline of Northern Japan. Along the shores of the Aomori Prefecture inundation reached up to 550 m inland, before stopped by the slope of a ca. 10-15 m high terrace scarp. Sandy tsunami deposits, however, only reach ~250-350 m inland. At the field site, a small fishing port, this clearly identifiable tsunami remains show up to 10 cm thick sand layers. Further observations show that the coastal forest stopped indicators of an inundation (such as barrels, fishing nets, buoys, etc.) within the first 50-75 m after entering the forest. Most larger objects were deposited in backwash positions whilst objects, such as fishing nets, remain on tree branches at run-up heights (up to 3.2 m) and are observable still 7 years following the event. Further inside the coastal forest the inundating tsunami waves eroded increasing amounts of the organic topsoil, including loose plant material and wood, which probably partially swam on top of the inundating water. Field observations show that this material is deposited by the 2011 Tohoku-oki tsunami as organic-rich peat-like sediments.

Our observation shows that the organic- and plant-rich deposits first emerge on top of the clearly identifiable sand deposit as a thin layer. Then it thickens inland to up to 5 cm as the tsunami sands thin out. After ~250-350 m further inland no sands are preserved, but the organic- and plant-rich deposits. Along with the tsunami inundation a transported plastic particle (that swims) was deposited within this organic- and plant-rich tsunami deposit. As a conclusion, the 2011 Tohoku-oki tsunami serves as a blue-print for paleo-tsunami studies, as most of them only rely on sand deposits as marker for inundation distances from the beach, however the organic- and plant-rich layer reaches far more inland. The preservation/tracing and relics of this “lost” layer may contribute to (paleo-)tsunami hazard assessment in future.