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IODP Expedition 386 "Japan Trench Paleoseismology": Mission Specific Platform Giant Piston Coring to track past megathrust earthquakes and their consequences in a deep-sea subduction trench.

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International Ocean Discovery Program (IODP) Expedition 386, Japan Trench Paleoseismology (offshore period: 13 April to 1 June 2021; Onshore Science Party: 14 February to 14 March 2022) was designed to test the concept of submarine paleoseismology in the Japan Trench, the area where the last, and globally only one out of four instrumentally-recorded, giant (i.e. magnitude 9 class) earthquake occurred back in 2011. "Submarine paleoseismology" is a promising approach to investigate deposits from the deep sea, where earthquakes leave traces preserved in the stratigraphic succession, to reconstruct the long-term history of earthquakes and to deliver observational data that help to reduce uncertainties in seismic hazard assessment for long return periods. This expedition marks the first time, giant piston coring (GPC) was used in IODP, and also the first time, partner IODP implementing organizations cooperated in jointly implementing a mission-specific platform expedition.

We successfully collected 29 GPCs at 15 sites (1 to 3 holes each; total core recovery 831 meters), recovering 20 to 40-meter-long, continuous, upper Pleistocene to Holocene stratigraphic successions of 11 individual trench-fill basins along an axis-parallel transect from 36°N – 40.4°N, at water depth between 7445-8023 m below sea level. These offshore expedition achievements reveal the first high-temporal and high spatial resolution investigation and sampling of a hadal oceanic trench, that form the deepest and least explored environments on our planet.

The cores are currently being examined by multimethod applications to characterize and date hadal trench sediments and extreme event deposits, for which the detailed sedimentological, physical and (bio-)geochemical features, stratigraphic expressions and spatiotemporal distribution will be analyzed for proxy evidence of giant earthquakes and (bio-)geochemical cycling in deep sea sediments. Initial preliminary results presented in this EGU presentation reveal event-stratigraphic

successions comprising several 10s of potentially giant-earthquake related event beds, revealing a fascinating record that will unravel the earthquake history of the different along-strike segments that is 10–100 times longer than currently available information. Post-Expedition research projects further analyzing these initial IODP data sets will (i) enable statistically robust assessment of the recurrence patterns of giant earthquakes, there while advancing our understanding of earthquake-induced geohazards along subduction zones and (ii) provide new constraints on sediment and carbon flux of event-triggered sediment mobilization to a deep-sea trench and its influence on the hadal environment.

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