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Drilling Quaternary submarine landslides on the Nankai accretionary wedge: Results from IODP Expedition 333

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We present results from Integrated Ocean Drilling (IODP) Expedition 333 on D/V Chikyu drilling and coring a Pleistocene-to-Holocene stratigraphic succession of a slope basin seaward of a margin-dominating out-of-sequence thrust (termed megasplay) in the Nankai accretionary wedge, offshore the Kii Peninsula, southwest Japan. The slope-basin represents the depocentre for downslope mass transport from various sources such as the hanging-wall block of the megasplay, anticline structures within the accretionary prism and the slope apron sedimentary cover. The stratigraphic succession is characterized by stacked mass-transport deposits (MTDs), including an exceptionally-large, up to 150 m thick MTD, the lateral extension of which is mapped in a 3D seismic reflection data set. Continuous coring over 315 meter at a location where the MTD bodies wedge-out and where basal erosion by mass-transport events is minimal, reveal a nearly complete stratigraphic succession recording more than 1 Million years of the submarine landslides history in this active tectonic setting.
We present D/V Chikyu shipboard results from IODP Site C0018, including litho- bio- magneto- and tephra-stratigraphy and physical property data. Six mass transport deposits of thickness ranging from 50 cm to 60 m at the drill site were identified from visual core description and X-ray CT-scans. The thick MTD lies at the base of the stack and coincides with a lithological transition between a sandy turbidite sequence below and ash bearing hemipelagites above. The thinnest MTD corresponds to a fluidized ash layer whereas the dominant lithology of the other MTDs is clay and ash bearing silty clay. The deformation style of these MTDs appeared heterogeneous, with intervals of chaotic or mixed sediments and intervals retaining coherent bedding. Shear zones and faults are often identified in the lower part of the MTDs and, in four occurrences the base of the MTD is defined by a shear zone within fine-grained sediments. However, a thick ash layer attributed to a cataclysmic eruption on Kyushu Island dated 1.05 Ma was found immediately below the thick MTD. Remarkably, no evidence for remobilization induced by fluidization was found in the underlying turbidite sequence. We hypothesize that the fluidization of ash layers during earthquakes is one mechanism by which exceptionally large submarine landslides could occur in subduction zones.