

Deciphering submarine gravity deposits on the South Ryukyu subduction zone: sediment archives of past major earthquakes and tsunamis?

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The southern part of the Ryukyu subduction zone (northeast of Taiwan) is characterized by low and sparse seismicity on an instrumental scale, despite an oblique convergence velocity of around 105 ± 15 mm/yr. In this geographical area, the Japanese Yaeyama islands were the site of a major tsunami in 1771, the Meiwa tsunami, which claimed over 12,000 victims. Several studies of the coastal areas of these islands show the impact of recurrent tsunamis over the last thousand years. During the MD214/EAGER french-taiwanese oceanographic cruise in 2018 (<https://doi.org/10.17600/18000520>), four sediment cores ranging in length from 12 to 23 meters were collected in the Hateruma forearc basin area (south of the Yaeyama Islands) at water depths of more than 2,500 m. The study of bathymetric map and sediment profiler data around the coring sites allowed to identify sedimentary bodies corresponding to large-scale gravity deposits (debris flow deposits and homogenites). Analysis of sedimentary facies in the cores confirms a wide variety of submarine gravity deposits in these small basins, including fine turbidites, sandy turbidites, debris flow deposits, homogenites and reworked tephra levels. The stratigraphic calibration of these sedimentary archives was carried out using a combination of different methods: excess ^{210}Pb (last century), ^{14}C dating, isotope stratigraphy on hemipelagic sedimentation and calibration on tephra levels (over almost 200 ka BP). Despite various transport and depositional processes at the four core sites and in two distinct basins (forearc basin and accretionary wedge mini-basin), major gravity events are identified and correlated together, potentially indicating the impact of large-scale seismic events, possibly associated with tsunamis. The recurrence time of such events, leaving a significant imprint on deep sedimentation, is relatively long, on the order of one event every 3,000-4,000 years. Considering also the smaller turbidite deposits observed in the most proximal core of the dataset, the recurrence of submarine gravity events is of the order of a thousand years. This value is fairly consistent with the recurrence of major tsunamis recognized over the last 5,000 years in the geological record of the Yaeyama Islands.

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