Figure F1. Japan Trench subduction margin physiography and the epicenter and coseismic slip distribution of the 2011 Mw 9.0 Tohoku-Oki earthquake (40 and 20 m slip contour lines from compilation in Chester et al. [2013]; 2 m contour line from Sun et al. [2017]). Also shown are previous IODP/Integrated Ocean Drilling Progam/ODP/DSDP drilling sites in the region and sites where surface cores and/or conventional (as long as 10 m) gravity and piston cores were retrieved between the 2011 earthquake and 2019. Solid red symbols = core locations with water depth >100 mbsl where recent publications (Arai et al., 2013; Ikehara et al., 2014, 2016, 2018; Kioka et al., 2019a, 2019b; McHugh et al., 2016; Noguchi et al., 2012; Nomaki et al., 2016; Oguri et al. 2013; Strasser et al., 2013; Usami et al., 2017, 2018; Yoshikawa et al., 2016) or preliminary results from the most recent *Sonne* Cruise SO-251 (Strasser et al., 2017) document various distinct earthquake-related event deposits or stratigraphic gaps (Molenaar et al., 2019) linked to the 2011 earthquake and tsunami; open red symbols = locations where core data reveal no indication for recent sediment deposition (or erosion) related to the 2011 earthquake and tsunami as documented by Fink et al. (2014), Ikehara et al. (2016), Yoshikawa et al. (2016), and Kioka et al. (2019b); black symbols = location of cores for which no detailed information is available; cross symbols = sediment-trapped ocean-bottom seismometers (OBSs) or buried/displaced ocean-bottom pressure recorders (OBPs) associated with the 2011 earthquake (Arai et al., 2013; Miura et al., 2014). JMA = Japan Meteorological Agency.

Figure F2. Stratigraphic correlation between cores from isolated trench-fill basins in the central part of the Japan Trench (between 37°40′N and 38°10′N; along-trench axis distance = ~50 km). The records preserve evidence for three major sediment remobilization events (referred to as thick turbidite [TT] units), each consisting of 30–240 cm thick, stacked fine-grained turbidites. Also shown is correlation of TT units to coastal tsunami deposits and reported run-up heights >5 m from historical documents (Sawai et al., 2012), along with inferred occurrence of three earthquakes with sedimentary imprint comparable to the 2011 Tohoku earthquake (Ikehara et al., 2016). vf = very fine, f = fine, m = medium, c = coarse.

Figure F3. Compiled results from organic matter (OM) radiocarbon analyses on samples from Line GeoB16431-1 and colored TT units linked to historic volcanic eruption and earthquakes (Bao et al., 2018). A. Lithology core log with volcanic tephra (pink) (see Figure F2 for legend). B. High-resolution bulk OC ^{14}C age profile measured using the new online $\delta^{13}C$ and ^{14}C gas measurements by coupled elemental analyzer–isotope ratio mass spectrometry–accelerator mass spectrometry (EA-IRMS-AMS) at ETH Zürich (McIntyre et al., 2016), which allows for high-throughput bulk sediment OC ^{14}C determination. BP = before present. C. OC flux calculated using TOC measured using EA-IRMS-AMS, sedimentation rates calculated by ratio of sediment depth spanning time intervals constraints by historic events, and density measured by gamma ray attenuation. D. Chronology and radiocarbon characteristics of ramped pyrolysis/oxidation (Ramped PyrOX; RPO) thermal fractions of OM for five selected samples. Measurement error is smaller than the symbol. The method following Rosenheim et al. (2008) analyzes CO_2 gas samples collected from ramped temperature pyrolysis/oxidation integrated over five temperature intervals (T1–T5) by AMS radiocarbon measurements. Results document (1) very high OC fluxes (two orders of magnitude higher than background) of pre-aged OC input to the hadal environment of the Japan Trench that are directly linked to the earthquake-triggered sediment remobilization process; (2) bulk OM radiocarbon ages have consistent offsets of ~2000 y, likely related to constant transport of pre-aged OM to the trench; and (3) consistency in ^{14}C differences of thermal fractions ages (parallel lines in D) and their correspondence (in terms of absolute time between known volcanic and correlated tectonic events), which might reflect radioactive decay in the sediment after deposition. The latter result holds promise for placing chronological constraints on Japan Trench sediment cores (accurate floating chronology), which can be anchored to dated tephra layers.

Figure F4. Top left: high-resolution bathymetric map (acquired in October 2016 during Cruise SO251-1 with the state-of-the-art EM 122 Kongsberg multibeam echo sounder system installed on *Sonne*) with the 5 m contours and track lines of high-resolution subbottom profiles. Top right: SSW–NNE noise-attenuated Parasound Line GeoB21806-part2 along the Japan Trench. SP = shotpoint. Bottom left: WNW–ESE noise-attenuated Parasound Line SLF120318225 crossing the Japan Trench. Colored units represent low-amplitude to homogeneous seismic facies in an otherwise layered reflection pattern (colors match bottom right panel). Dotted lines are continuous high-amplitude reflections often traceable throughout multiple basins. Also shown is projected location of Holes M0091B and M0091D. Bottom right: core-seismic correlation of Core KS-15-03 PC08 of Ikehara et al. (2018) and Kioka et al. (2019a). The fine sandy tephra at 2.1 m subsurface is identified as the Towada-a (To-a) tephra and corresponds to a strong reflection on the Parasound data. Homogeneous units in the core interpreted to be sedimentary event deposits (i.e., yellow, purple, and blue layers) correspond to low-amplitude acoustic units with a basin-fill geometry (top right). Green is for similar low-amplitude units below the cored interval that were targets for piston coring at Site M0091. This HRS data was acquired using the Atlas Parasound P70 echo sounder on *Sonne*. Interference of two signals with high frequencies (18 and 22 kHz) produces a secondary low frequency of ~4 kHz that is used for subbottom profiling. Generally, acquisition parameters were as follows: low-pass filter at 6 kHz, pulse length = 1 ms, sampling rate = 12.2 kHz.

Figure F5. GPC deployment sequence, Expedition 386. (1) The GPC system is lowered by winch toward the seafloor with a transponder mounted 50 m above the system for precise positioning and a small trigger corer suspended below the piston coring system. (2) The trigger corer hits the seafloor, triggering the release of the lever arm, and the release of the main coring system. The piston coring system is driven into the seafloor sediments by the weight of the weight head and the main coring barrel. (3) As the piston corer barrel enters the sediment, a piston inside the piston corer barrel moves up on top of the sediment being cored by the main coring barrel, preventing disturbance of the sediment layers. (4) Once penetration is completed, the entire system is recovered to the surface. Onboard *Kaimei*, the core barrel sections are opened and the core sections are cut, recorded, and moved into the laboratory for measurement and storage.

Figure F6. Site map, Expedition 386. Bathymetric overview map of the Japan Trench (modified after Kioka et al., 2019a) between the Daiichi Seamount in the south and the Erimo Seamount in the north. Red dots = site locations along the Japan Trench axis. Black bold and dashed lines mark the Nakaminato and Ogawara canyon in the south and north, respectively. Note that locations are indicative.

Figure F7. Core processing and measurement flow during offshore, OSP, and PSP phases, Expedition 386. WR = whole round.

Figure F8. Hydroacoustic Line 386_Underway_010, a trench-parallel line that passes 730 m west of Site M0081 and intersects Site M0082, showing the acoustic character of the southernmost trench-fill basin in the Japan Trench. SP = shotpoint.

Figure F9. Composite Strater plot, Hole M0081F. cps = counts per second.

Figure F10. Composite Strater plot, Hole M0082D. For lithology legend, see Figure F9. cps = counts per second.

Figure F11. Hydroacoustic Line 386_Underway_096, a trench-parallel line that intersects Site M0092 and passes nearby Site M0095, showing the acoustic character along strike of the trench-fill basin located in the central part of the southern Japan Trench.

Figure F12. Composite Strater plot, Hole M0092D. For lithology legend, see Figure F9. cps = counts per second.

Figure F13. Composite Strater plot, Hole M0095B. For lithology legend, see Figure F9. cps = counts per second.

Figure F14. Hydroacoustic Line 386_Underway_092, a trench-parallel line that passes nearby Site M0091, showing the acoustic character along strike of the trench-fill basin located in the northern part of the Southern Japan Trench.

Figure F15. Composite Strater plot, Hole M0091D. For lithology legend, see Figure F9. cps = counts per second.

Figure F16. Hydroacoustic Line 386_Underway_089, a trench-parallel line that passes nearby Site M0090, showing the acoustic character along strike of the trench-fill basin located within the relatively elevated trench-floor segment in the central Japan Trench. SP = shotpoint.

Figure F17. Composite Strater plot, Hole M0090D. For lithology legend, see Figure F9. cps = counts per second.

Figure F18. Hydroacoustic Line 386-Underway_021, a trench-perpendicular line that passes west of Site M0089, showing acoustic character at this location. SP = shotpoint.

Figure F19. Composite Strater plot, Hole M0083D. For lithology legend, see Figure F9. cps = counts per second.

Figure F20. Composite Strater plot, Hole M0089D. For lithology legend, see Figure F9. cps = counts per second.

Figure F21. Hydroacoustic Line 386_Underway_055, a trench-parallel line that passes nearby Site M0093, showing the acoustic character along strike of the trench-fill basin located in the boundary area between the central and northern Japan Trench.

Figure F22. Composite Strater plot, Hole M0093B. For lithology legend, see Figure F9. cps = counts per second.

Figure F23. Hydroacoustic Line 386_Underway_102, a trench-parallel line that passes nearby Site M0094, showing the acoustic character along strike of the trench-fill basin located in the boundary area between the central and northern Japan Trench. SP = shotpoint.

Figure F24. Composite Strater plot, Hole M0094B. For lithology legend, see Figure F9. cps = counts per second.

Figure F25. Hydroacoustic Line 386_Underway_049, a trench-parallel line that passes nearby Site M0087, showing the acoustic character along strike of the trench-fill basin located in the boundary area between the central and northern Japan Trench. SP = shotpoint.

Figure F26. Composite Strater plot, Hole M0087D. For lithology legend, see Figure F9. cps = counts per second.

Figure F27. Hydroacoustic Line 386_Underway_047, a trench-parallel line that passes nearby Site M0086, showing the acoustic character along strike of the trench-fill basin located in southern part of the northern Japan Trench.

Figure F28. Composite Strater plot, Hole M0086B. For lithology legend, see Figure F9. cps = counts per second.

Figure F29. Hydroacoustic Line 386_Underway_056, a trench-parallel line that passes nearby Site M0088, showing the acoustic character along strike of the trench-fill basin located in central part of the northern Japan Trench.

Figure F30. Composite Strater plot, Hole M0088D. For lithology legend, see Figure F9. cps = counts per second.

Figure F31. Hydroacoustic Line 386_Underway_029, a trench-parallel line that passes nearby Sites M0084 and M0085, showing the acoustic character along strike of the trench-fill basin located in northern part of the northern Japan Trench. SP = shotpoint.

Figure F32. Composite Strater plot, Hole M0084F. For lithology legend, see Figure F9. cps = counts per second.

Figure F33. Composite Strater plot, Hole M0085D. For lithology legend, see Figure F9. cps = counts per second.