Expedition Co-Chief Scientists

Professor Michael Strasser

Michael Strasser is a professor in sedimentary geology at the University of Innsbruck in Austria. His research focuses on the quantitative characterization of dynamic sedimentary and tectonic processes and related geohazards, as unraveled from the event-stratigraphic record of lakes and ocean margins. "Michi" has participated in 5 ocean drilling expeditions to subduction zones (including Nankai Trough Seismogenic Zone Experiment Expedition 338 as co-chief) and has received the 2017 AGU/JpGU Asahiko Taira International Scientific Ocean Drilling Research Prize for his outstanding contributions to the investigation of submarine mass movements using multidisciplinary approaches through scientific ocean drilling. His work on submarine paleoseismology has focused on the Japan Trench since the 2011 Tohoku-oki earthquake, after which he lead two research cruises to characterize the offshore impact of the earthquake on the hadal sedimentary environment.

Dr Ken Ikehara

Ken Ikehara is a prime senior researcher in the Research Institute of Geology and Geoinformation, Geological Survey of Japan, AIST. His research focuses on sedimentology and marine geology of active margins, with special interests in sedimentary processes, formation and preservation of event deposits, Quaternary paleoceanography and Asian monsoon fluctuation. His work on submarine paleoseismology has concentrated not only on the Japan Trench but also on the Nankai Trough, Ryukyu Trench and northern Japan Sea. "Ken" attended more than 80 survey cruises, mainly around the Japanese islands, including US Sumatra-Andaman Trench, German-Japan Japan Trench, French Antarctic Ocean cruises, and the IODP Exp 346 Asian monsoon.

Expedition Operator

Mission-specific platform expeditions are conducted for IODP by the European Consortium for Ocean Research Drilling (ECORD), which represents the ocean-drilling efforts of 15 European countries and Canada. Operations are undertaken by the ECORD Science Operator comprising the British Geological Survey (BGS), the University of Bremen and the European Petrophysics Consortium comprising the universities of Leicester, UK, and Montpellier, France.

During the expedition regular updates are posted on the webpage, through blogs and via social media:

http://www.ecord.org/expedition386

International Ocean Discovery Program

The International Ocean Discovery Program (IODP) is an international marine research programme supported by 23 countries, which explores Earth's history and structure recorded in seafloor sediments and rocks, monitors sub-seafloor environments and research the deep biosphere and microbial life. Through multiple platforms - a feature unique to IODP - scientists can sample and analyse the deep data across a wide range of disciplines and themes, including climate change, processes and effects, the deep biosphere and solid earth cycles and dynamics.

Credits: front cover: Figure from "*Nature Scientific Report*" article: Megathrust earthquake drives drastic organic carbon supply to the hadal trench, DOI: 10.1038/s41598-019-38834-x

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IODP
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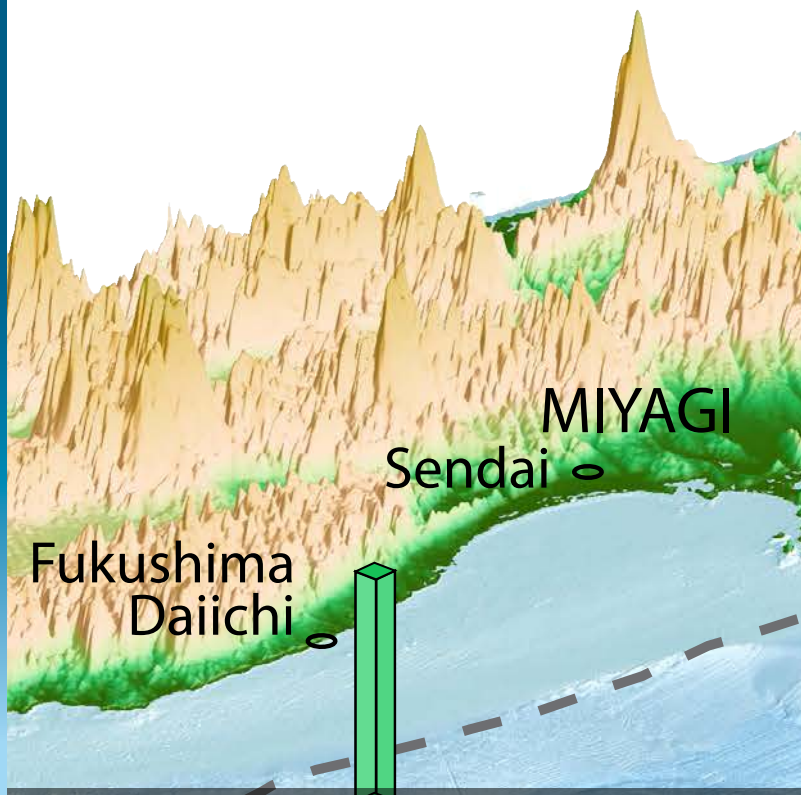
The Japan Trench Paleoseismology Expedition



Tracking past earthquakes in the sediment record

IODP Expedition 386

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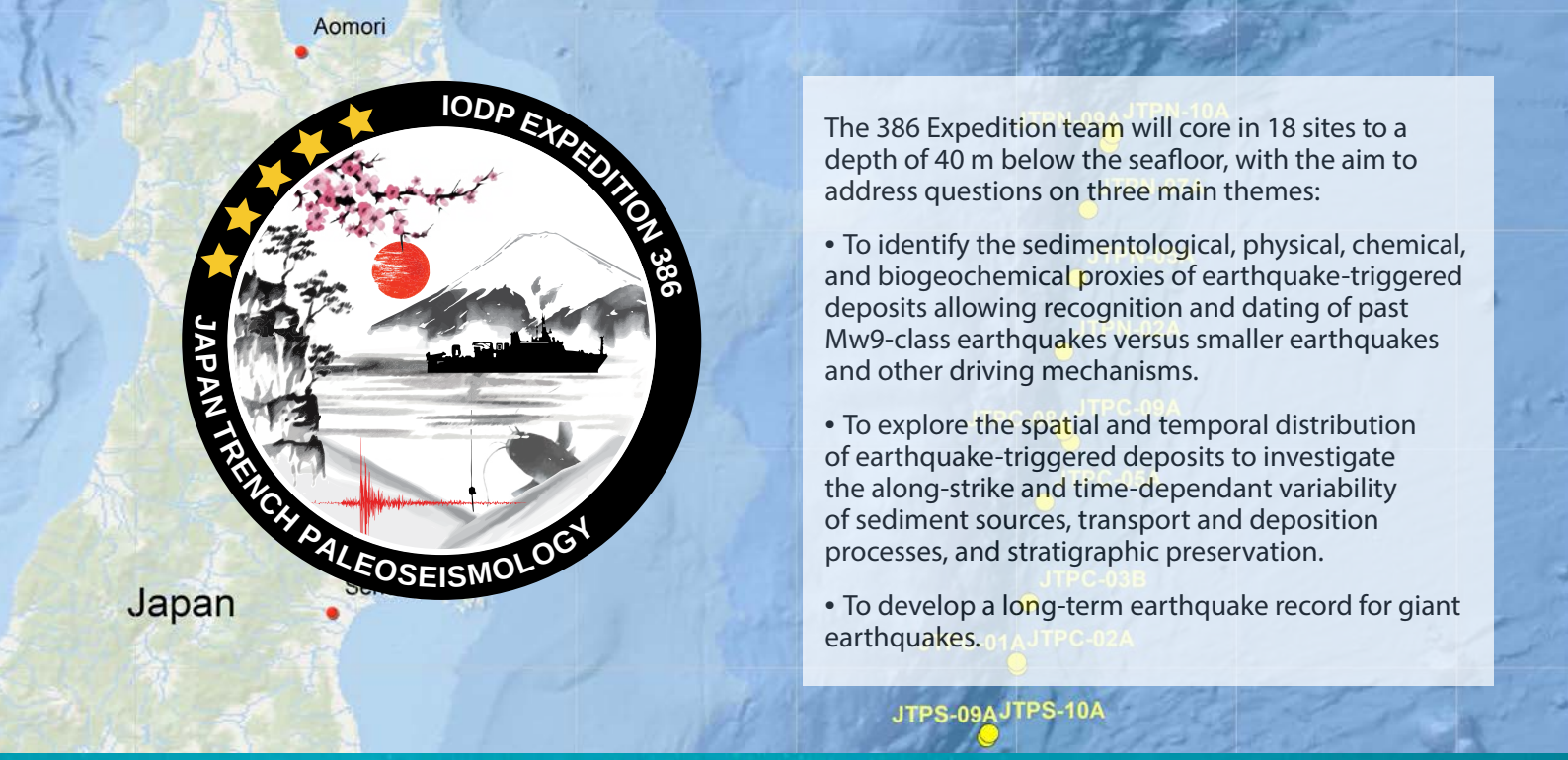

The 386 Expedition team will core in 18 sites to a depth of 40 m below the seafloor, with the aim to address questions on three main themes:

- To identify the sedimentological, physical, chemical, and biogeochemical proxies of earthquake-triggered deposits allowing recognition and dating of past Mw9-class earthquakes versus smaller earthquakes and other driving mechanisms.
- To explore the spatial and temporal distribution of earthquake-triggered deposits to investigate the along-strike and time-dependant variability of sediment sources, transport and deposition processes, and stratigraphic preservation.
- To develop a long-term earthquake record for giant earthquakes.

Japan is located on the Pacific Ring of Fire, an approximately 40,000 km long arc-shaped belt around the Pacific Ocean. More than 90% of stress accumulated by global plate tectonics is released along active margins through subduction earthquakes, and the majority of Earth's earthquakes occur within the Pacific Ring of Fire, including two of the largest known magnitude: the giant 2004-Mw9.2-Sumatra and 2011-Mw9.0-Tohoku-oki earthquakes. These high-impact earthquakes and associated tsunamis were catastrophic geological events with major societal consequences. Giant Mw9 class earthquakes have a long reoccurrence time, are poorly sampled, and consequently, instrumental and historic records are inadequate to reduce uncertainties in seismic hazard assessment and predictions across time scales relevant to subduction zone processes.

"Submarine paleoseismology" is a promising approach to investigate deposits from deep-sea (hadal) environments. Earthquakes leave traces in isolated, poorly-connected hadal trench basins, for instance, sediment remobilisation event-deposits documented in the trench linked to the giant Tohoku-oki earthquake. Motivated by the mission to fill the gap in long-term records of giant earthquakes, Expedition 386 aims to test and develop submarine paleoseismology in axis-parallel trench-fill basins of the Japan Trench. This is an ideal location to reconstruct a long history of giant earthquakes as event-deposits here have high preservation potential, and conventional coring covering the last ~1,500 years reveals good agreement between the sedimentary record and historical documents. Targets for paleoseismological investigations over longer time scales are accessible through Giant Piston coring, potentially unravelling an earthquake history that is 10 to a 100 times longer than currently available information, advancing the understanding of recurrence patterns of giant earthquakes and earthquake-induced geohazards globally.

The offshore coring phase will last for 50 days, and involve shallow-subsurface piston coring in waters of 7-8 km depth to recover Upper Pleistocene to Holocene sediments along the Japan Trench. A team of scientists and the two Co-Chief Scientists, will participate in the expedition Science Party, which is planned and conducted by the European Consortium for Ocean Research Drilling (ECORD) as part of the International Ocean Discovery Program.

Due to the limited facilities available offshore, only a minimum number of measurements will be made on the vessel. For this reason, not all members of the Science Party will participate offshore. Directly after the offshore expedition, the entire team will meet for a maximum of 4 weeks during an onshore phase on the IODP drillship *Chikyu*, moored in Shimizu Port. Here the cores will be split and the scientists will have their first opportunity to describe, analyse, and sample the cores in detail. One half of the core material will be archived at the IODP Kochi Core Center for future research needs by the global scientific community.

The initial results from the expedition will be published in peer-reviewed journals, the IODP Proceedings, and in the ICDP-IODP Program Journal *Scientific Drilling*. One year from the end of the onshore phase, the cores and all data acquired during the offshore and onshore phases of the expedition become available for use by any scientific researcher who wishes to study them.