Expedition Co-chief Scientists

Prof. 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 Operators

This expedition is being jointly implemented by the European Consortium for Ocean Research Drilling (ECORD) Science Operator (ESO), and the Institute for Marine-Earth Exploration and Engineering (MarE3) within the Japan Agency for Marine-Earth Science and Technology (JAMSTEC). ESO comprises the British Geological Survey, the University of Bremen and the European Petrophysics Consortium (University of Leicester and University of Montpellier).

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

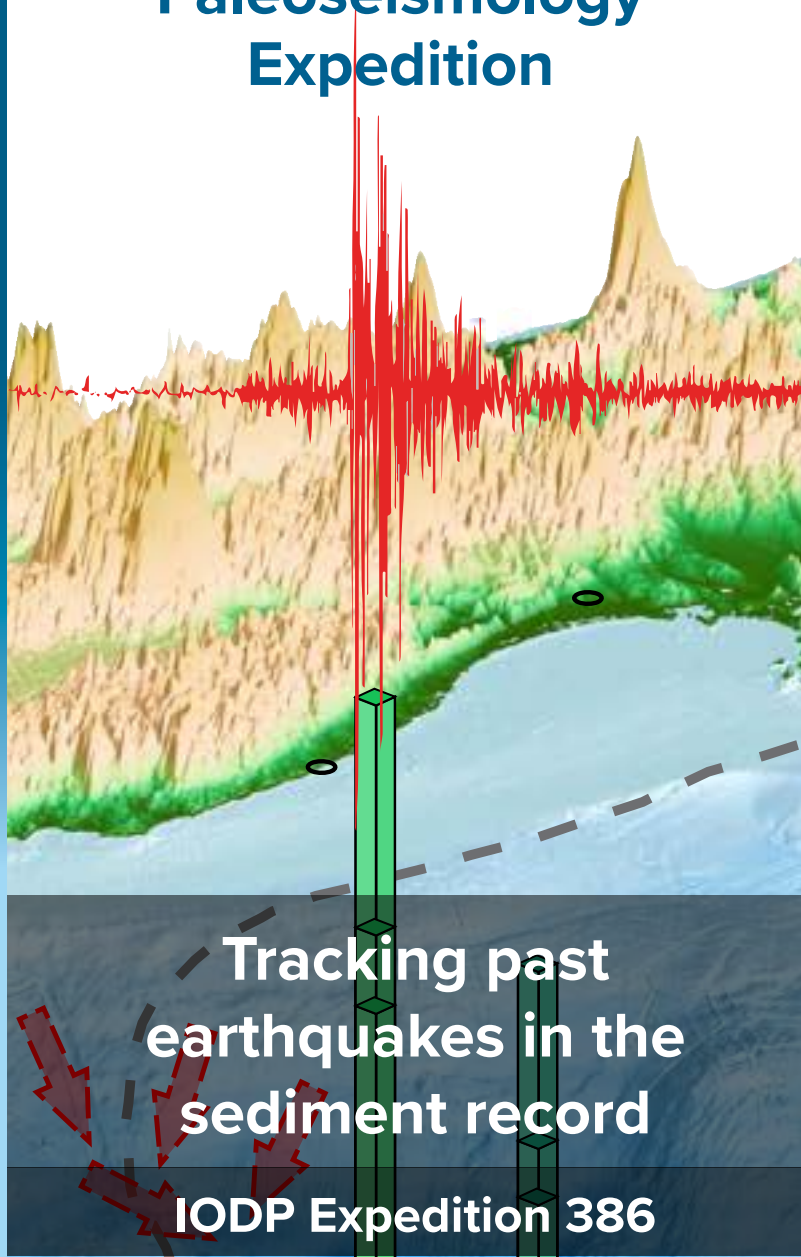
The International Ocean Discovery Program (IODP) is an international marine research programme supported by 23 countries, which explores Earth's history and structure recorded in seafloor sediments and rocks, monitors sub-seafloor environments and research the deep biosphere and microbial life. Through 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

This brochure is produced by the by the ECORD Outreach Task Force.

IODP
INTERNATIONAL OCEAN DISCOVERY PROGRAM

The Japan Trench Paleoseismology Expedition



Tracking past earthquakes in the sediment record

IODP Expedition 386

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EUROPEAN CONSORTIUM FOR OCEAN RESEARCH DRILLING

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Japan Agency for Marine-Earth Science and Technology

www.iodp.org
www.ecord.org
www.jamstec.go.jp/mare3/



DV *Chikyu*

Japan

Sendai



RV Kaimei

Expedition 386 - 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.

IODP EXPEDITION 386

JAPAN TRENCH PALEOSEISMOLOGY

Expedition 386 in numbers

Offshore phase (*Kaimei*): 50 days

Onshore phase (*Chikyu*): max 28 days

Drill sites: 18 **Drilling depth:** 40 m

Water depth: 7-8 km

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-Tohokuoki earthquakes. These high-impact earthquakes and associated tsunamis were major geological events with catastrophic societal consequences. Giant Mw9 class earthquakes have a long reoccurrence time, and 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 example, observed sediment remobilisation event-deposits can be linked to the giant Tohoku-oki earthquake. Expedition 386 aims to fill the gap in long-term records of giant earthquakes, by testing and developing 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, as conventional coring reveals good agreement between the sedimentary record and historical documents covering the last ~1,500 years. Targets for paleoseismological investigations over longer time scales are accessible through giant piston coring, potentially unravelling an earthquake history that is 10 to 100 times longer than is currently available, advancing our understanding of recurrence patterns of giant earthquakes and earthquake-induced geohazards globally.

The offshore coring phase lasting 50 days will involve shallow-subsurface piston coring in waters of 7-8 km depth to recover Upper Pleistocene to Holocene sediments along the Japan Trench. An international science team will participate in the expedition, which is being implemented by the European Consortium for Ocean Research Drilling (ECORD) as part of the International Ocean Discovery Program.

Offshore, initial analyses will be performed on the cores to obtain time-sensitive measurements. Directly after the offshore phase, the science team will meet for a maximum of 4 weeks during an onshore phase on board the IODP drillship *Chikyu*, moored in Shimizu Port. Here the cores will be split in half and the scientists will 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 by the global scientific community.

One year after expedition, the initial results and data are published online for free public access, and all cores are made available to researchers of IODP member countries. Further research will be published by the individual scientists in peer-reviewed journals.