

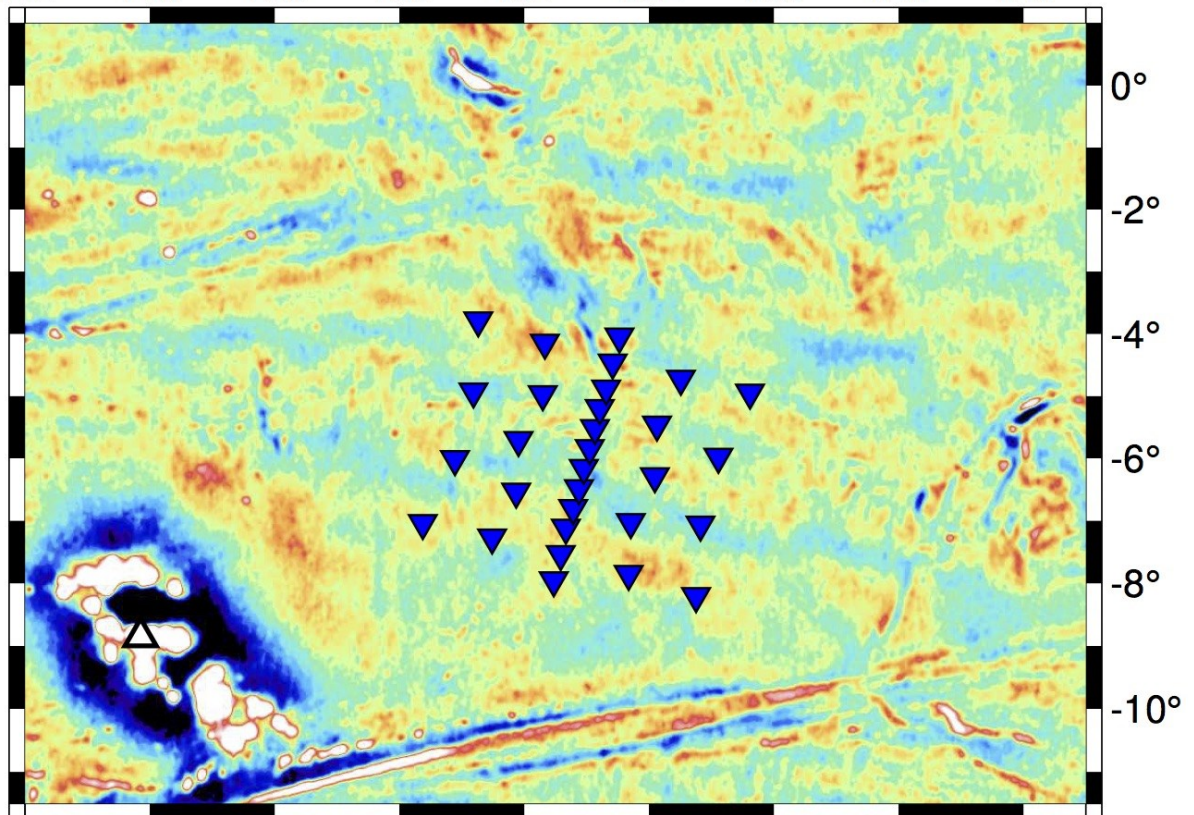
OBSIP Experiment Archive

Year:	2018
Experiment Name:	Pacific ORCA (Pacific OBS Research into Convecting Asthenosphere)
Principal Investigator(s):	Jim Gaherty Zach Eilon Don Forsyth Göran Ekström

Experiment Summary: (Taken from the NSF Abstract Award #[1658491](#)): All deformation on the surface of Earth, including faulting responsible for earthquakes, is produced by the motion of tectonic plates. It is widely accepted that thermal convection in the mantle drives plate motion, but details of that convection and how exactly it moves the plates are poorly understood. Oceanic plates make up 70% of the Earth's surface and offer important windows into mantle convection, yet they are largely unexplored due to the lack of seismic data from the ocean basins. Questions abound regarding the thermal structure of oceanic plates, the significance of

-142° -140° -138° -136° -134° -132° -130° -128° -126° volcanism in the middle of oceanic plates, and how the convecting mantle beneath the plates controls their movements.

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PacificORCA OBS deployment locations (blue triangles) plotted on filtered global gravity field data.

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Experiment Summary: ...Waves in the gravity field and un-explained shallowing of the ocean floors hint at small-scale convection beneath the oceanic plates. This project contributes to an international effort to strategically place temporary arrays of instruments across the Pacific Ocean basin that record the energy from earthquakes. Recent community advances in ocean bottom seismographs will be used to record unique datasets in locations where large gaps in coverage exist today. These data will allow us to infer deformation and variations in mantle temperature related to small-scale convection. As part of the international collaboration, all data will be openly available to scientists worldwide. The project supports the training of graduate and undergraduate students.

Cruises:

4/7/2018 - 5/7/2018:

30 broadband SIO OBS deployed over a 500x500 km regions, on 30 Ma seafloor east of the Marqueses islands in the central south Pacific on board the R/V Kilo Moana.

Data:

Data from all OBSIP instruments deployed is archived under temporary network code [XE](#) at the IRIS DMC.

FDSN network DOI ([XE_2018](#)).

Downloads/Links:

[PacificORCA Cruise Blog](#)

This project will collect 12-15 months of broadband ocean bottom seismograph (OBS) data in two 30-station arrays in the central and southern Pacific. These arrays, deployed at two distinct plate ages (~30 Ma and ~120 Ma), will address specific critical questions on the dynamics of the oceanic asthenosphere, including its underlying state (temperature, presence of melt, water or other volatiles, and deformation mechanism). The arrays are designed to image the anisotropic velocity signature of small-scale convection, which has been invoked to explain the flattening of the age versus depth curve in old ocean plates, 140-200 km wavelength gravity lineations, and ubiquitous off-axis, non-plume volcanism observed at a variety of scales. Anisotropic surface wave and body wave tomographic models will be supplemented by shear

wave splitting and attenuation measurements to obtain a multi-faceted understanding of the asthenosphere and base of the plates. Finally, the order-of-magnitude increases in path coverage for surface and body waves in the south-central Pacific will enable new advances in global tomography.

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Additional Information:



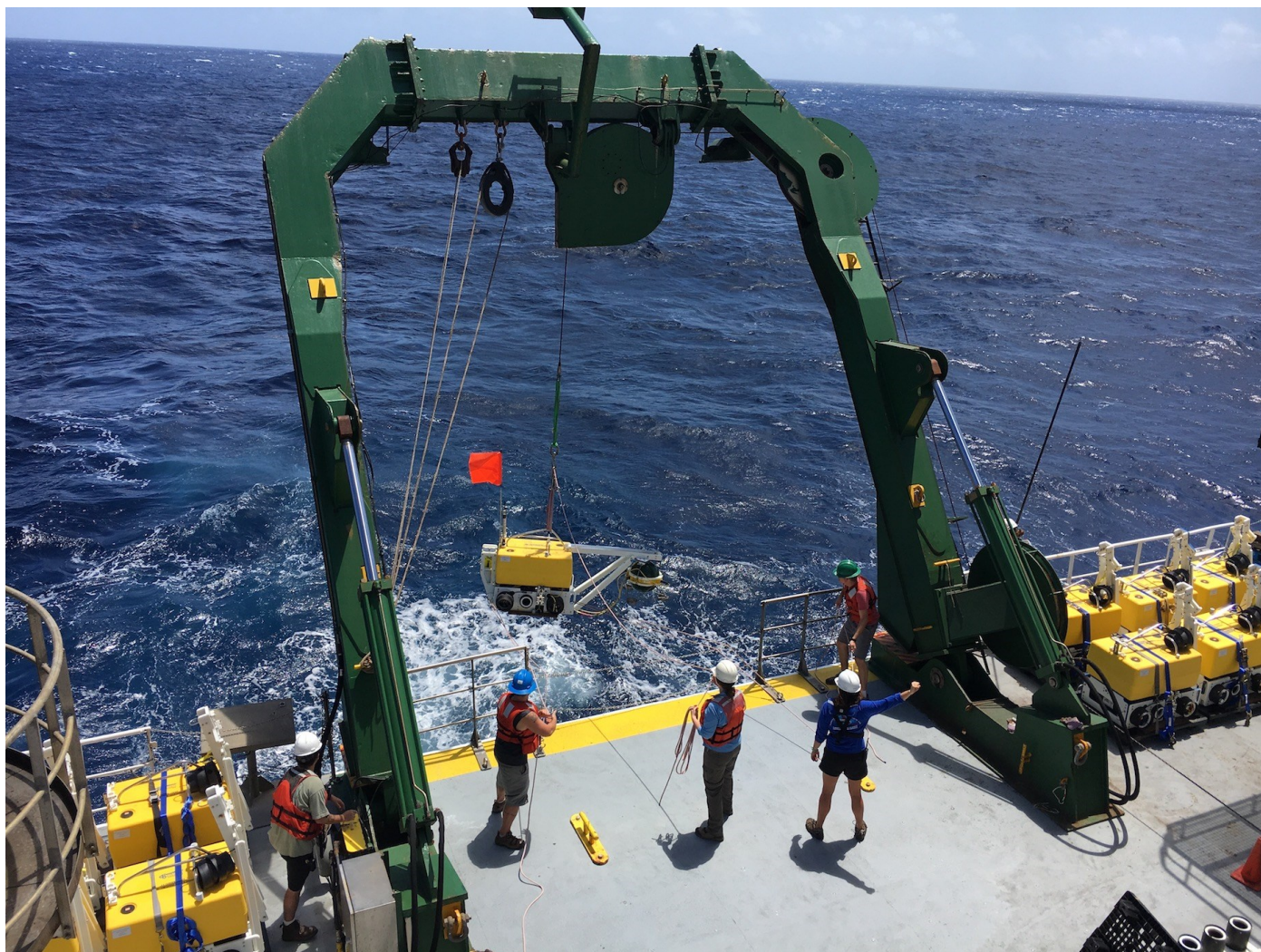
Official cruise logo for the Young PacificORCA OBS deployment by Carlos Gomez.

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Additional Information:



Caroline Eakin (center) holds the rope to pull the release with Mark Gibaud (left) and Ernest Aaron (right) from SIO holding the tag lines while deploying an SIO OBS off the R/V Kilo Moana (Photo: Zach Eilon).

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The R/V Kilo Moana loaded and about to depart San Diego on April 7, 2018 (Photo: Stephen Mosher).