OBSIP Experiment Archive

Year:	2018
Experiment Name:	Hawaiian-Emperor Seamount Chain
Principal Investigator(s):	Donna Shillington

Experiment Summary: (Taken from the NSF Abstract Award #1737245): The Hawaii-Emperor Seamount Chain is the most well-known example on Earth of hotspot magmatism, where volcanoes form far from plate boundaries above hot regions in the underlying mantle. Many questions remain about the fundamental earth processes that create the volcanoes of the Hawaii-Emperor chain and elsewhere, and how the enormous mass of these volcanos is supported by the rock material below them. This study will involve two seagoing expeditions to seismically image the magmatic crust created by the hotspot and obtain critical information about the crust's volume, its composition, how it varies along the island chain, and how the tectonic plate deforms in response to the weight of the volcanoes. In addition to gaining fundamental insight into the formation of the Hawaiian-Emperor chain, the study will also be beneficial to a more comprehensive assessment of geohazards for the Hawaiian island region. Seismic data will image faults within the volcanic edifice and in the surrounding oceanic crust that can be used to evaluate seismic, tsunami and submarine landslide hazards. The project involves strong national and international collaborations. The research cruises will provide excellent opportunities to involve students in data acquisition and analysis, and the results will be the basis for a large public outreach and education effort.

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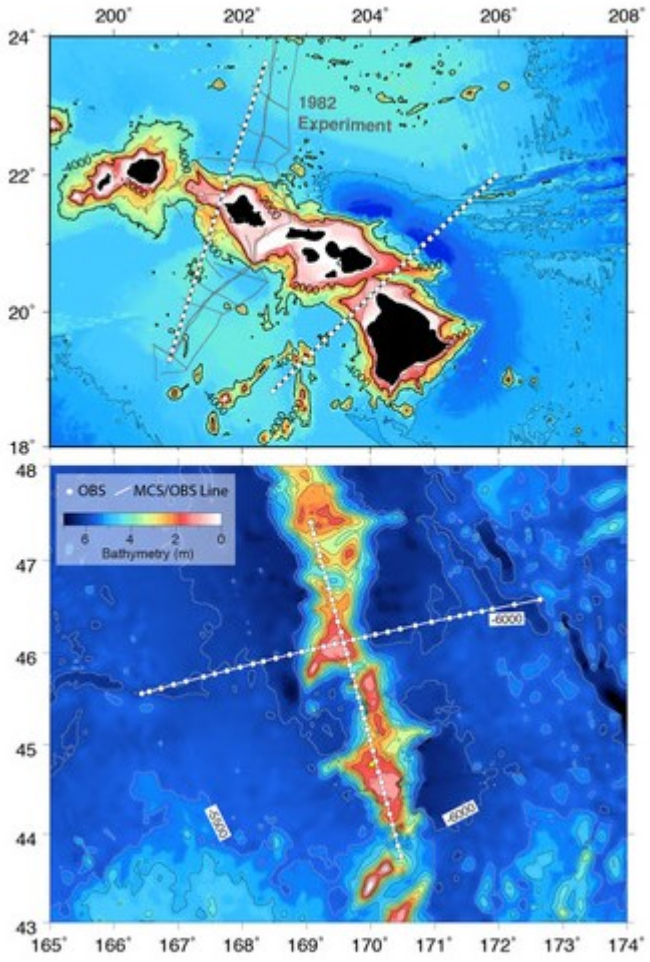

Hawaiian-Emperor OBS deployment locations (white dots).

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Experiment Summary: ... The scientific objectives of the planned data acquisition and analysis of this project are to examine controls on magmatic addition along the Hawaiian-Emperor seamount chain, provide fundamental constraints on rheological properties of oceanic lithosphere, address the origin of the hotspot swell, and assess implications for earthquakes and tsunamis from plate deformation in response to flexure. The plan is to acquire coincident 2D, deep-penetration seismic reflection data as well as wide-angle reflection/ refraction data using ocean bottom seismometers spaced at 15 km along four 500-km-long transects across the Hawaiian-Emperor seamount chain. The locations of these transects will encompass wide variations in the timing of magma emplacement and volume flux, the age of the lithosphere at the time of loading and the presence/absence of a topographic swell. The transects are sufficiently long to capture the flexural response of the lithosphere to volcano loading out to the flexural bulge. The processed seismic reflection profiles and velocity models created from wide-angle seismic data will constrain the volume and distribution of magmatic addition to the crust as well as faulting within the volcanic edifice and within the loaded oceanic plate. New seismic constraints will be combined with gravity, magnetic, bathymetric and geochemical data and used as the basis for flexural analysis and numerical modeling to gain fundamental new insights into crust and lithosphere dynamics.

Cruises:
9/11/2018 - 10/20/2018:
70 short period OBS will be deployed and recovered along the two transects of the Hawaii section of the seamount chain on board the R/V Langseth.

Data:
Data from all OBSIP instruments deployed will be archived under temporary network code ZU and assembled data set ID #18-015 at the IRIS DMC.

Downloads/Links:

Experiment Website