OBSIP Experiment Archive

Year:	2005
Experiment Name:	Tomography of Deception Island Volcano, Antarctica (TOMODEC) High-Resolution Seismic Tomography and Earthquake Monitoring at Deception Island Volcano, Antarctica
Principal Investigator(s):	William Wilcock (UW)

Experiment Summary: (Taken from NSF Abstract Award #0230094): Deception Island volcano is an active, back arc stratovolcano with a flooded caldera that is located in Bransfield Strait. The historical eruptions at Deception have all occurred near the ring fracture and extend around the caldera. The three most recent, in 1967-1970, are unusual in that each eruptive event involved simultaneous eruptions from multiple vents. Chemical differences between the lavas are best explained if the eruptions were fed by isolated shallow intrusive pods but their synchronicity and distribution suggests that they may have been driven by an extensive magma body underlying the whole caldera. However, a recent model for the caldera suggests that it formed by progressive passive extension rather than catastrophic collapse and this model implies that magma may be less widely distributed beneath the volcano. Although the volcano has not erupted for 30 years, it is still very active. There is extensive fumarole activity, earthquake swarms in 1992 and 1999 were attributed to magma injection events, and bathymetric data suggests that the northeastern portion of the caldera is resurging at rates of up to 0.5 m/yr. However, the size, distribution and interconnectivity of subsurface magma bodies and their relationship to resurgence, the recent eruptions, and the distribution and style of faulting is poorly constrained.

There have been many seasonal experiments to monitor seismicity at Deception Island but they have all been small scale and lacked seafloor stations. While they demonstrate that the volcano is seismically active the hypocentral locations have large uncertainties and there are no focal mechanisms. No seismic tomography experiment has been attempted at Deception Island, which is perhaps rather surprising because its geometry that makes it ideal for a combined land and marine high-resolution active source experiment.

This project represents a US component of an international project organized by Jesus Ibanez at the University of Granada, Spain. The combined objective is to deploy a joint marine-land seismic network around Deception Island for an Antarctic summer to monitor seismicity and to conduct a high-resolution active-source tomography experiment.

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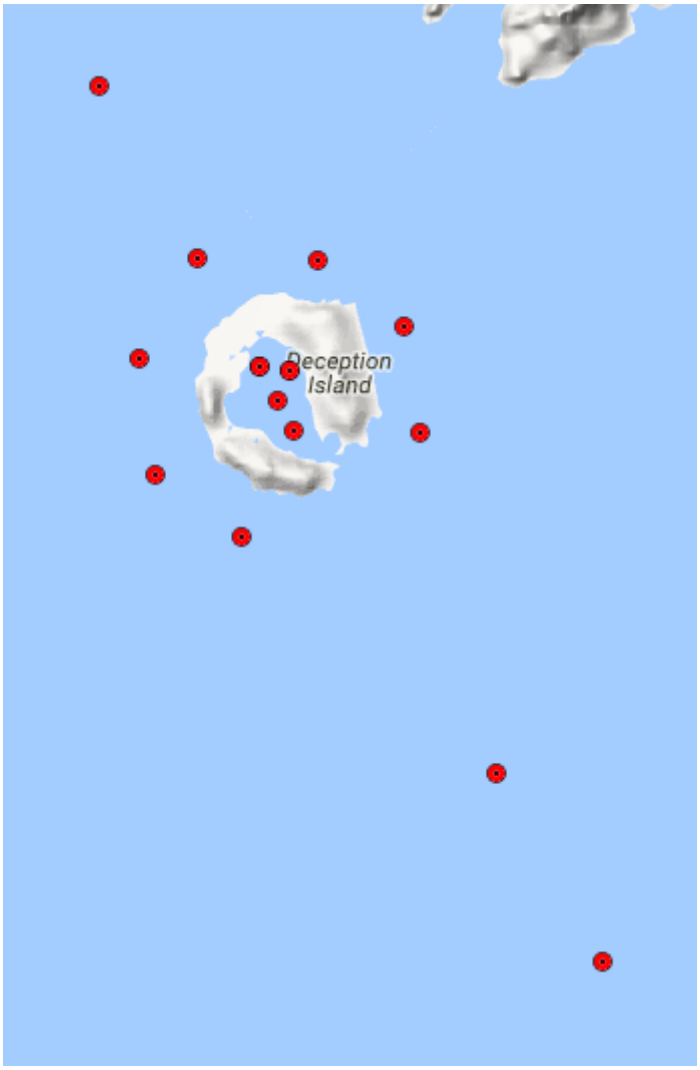
Experiment Summary: …The scientific goals of the experiment are to:

- Understand the distribution of magma and its relationship to recent volcanic activity.
- Understand the details of resurgence in northeastern portion of the caldera.
- Understanding the distribution of faulting and the state of stress and its relationship to volcanic and tectonic processes.



Cruises:
1/7/2005 - 1/13/2005:
16 LDEO broadband ocean bottom seismographs were deployed and recovered on board the R/V Hesperides.

Data:
Data from all instruments deployed are archived under temporary network code XU at the IRIS DMC.

Downloads/Links:
JGR Publication