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## In-Situ Calibration of Differential Pressure Gauges on OBSIP Ocean Bottom Seismometers

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A standard ocean bottom seismometer (OBS) package of the U.S. OBS Instrument Pool (OBSIP) carries a seismometer and a pressure sensor. For broadband applications, the seismometer typically is a wide-band or broad-band three-components seismometer, and the pressure sensor is a differential pressure gauge (DPG). The purpose of the pressure sensor is manifold and includes the capture of pressure signals not picked up by a ground motion sensor (e.g. the passage of tsunami), but also for purposes of correcting the seismograms for unwanted signals generated in the water column (e.g. p-wave reverberations).

Unfortunately, the instrument response of the widely used Cox-Webb DPG remains somewhat poorly known, and can vary by individual sensor, and even by deployment of the same sensor.

Efforts have been under way to construct and test DPG responses in the laboratory. But the sensitivity and long-period response are difficult to calibrate as they vary with temperature and pressure, and perhaps by hardware of the same mechanical specifications. Here, we present a way to test the response for each individual sensor and deployment in situ in the ocean. This test requires a relatively minimal and inexpensive modification to the OBS instrument frame and a release mechanism that allows a drop of the DPG by 3 inches after the OBS package settled and the DPG equilibrated on the seafloor. The seismic signal generated by this drop is then analyzed in the laboratory upon retrieval of the data.

The results compare favorably with calibrations estimated independently through post-deployment data analyses of other signals such as Earth tides and the signals from large teleseismic earthquakes. Our study demonstrates that observed response functions can deviate from the nominal response by a factor of two or greater with regards to both the sensitivity and the time constant. Given the fact that sensor calibrations of DPGs in the lab require very specific and stable environments and are time consuming, the use of in-situ DPG calibration frames pose a reliable and inexpensive alternative.