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Using pressure and seismological broadband ocean data to model shear wave velocities in the north Atlantic.

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Seafloor compliance is the transfer function between pressure and vertical displacement at the seafloor
Infragravity waves in the oceanic layer have long periods in the range of 30 – 500 s and obey a simple frequency-wavenumber relation. Seafloor compliance from infragravity waves can be analyzed with single station recordings to determinate sub-seafloor shear wave velocities. Previous studies in the Pacific Ocean have demonstrated that reliable near-surface shear wave profiles can be derived from infragravity wave compliance. However, these studies indicate that, beside the water depth the compliance measurements are limited by instrument sensitivity, calibration uncertainties and possibly other effects.
In this work seafloor compliance and infragravity waves are observed at two different locations in the Atlantic Ocean: the Logatchev hydrothermal field at the Mid Atlantic Ridge and the Azores (Sao Miguel Island). The data was acquired with the broadband ocean compliance station developed at the University of Hamburg as well as ocean station from the German instrument pool for amphibian seismology (DEPAS) equipped with broadband seismometers and pressure sensors.
Vertical velocity and pressure data were used to calculate power spectral densities and normalized compliance along two profiles (one in each location). Power spectral densities show a dominant peak at low frequencies (0.01-0.035Hz) limited by the expected cut-off frequency, which is dependent on the water depth at each station. The peak has been interpreted as a strong infragravity wave with values between 10-14 and 10-11 (m/s2)2/Hz and 104 and 106 (Pa2)2/Hz for acceleration and pressure respectively. The results show compliance values between 10-10 and 10-8 1/Pa and its estimations take into account the coherence between seismic and pressure signals in order to confirm that the seismic signals in the infragravity waves are caused by pressure sources. Shear wave velocity models, with depth resolution from 200 to 2500 m for the deep water stations, were derived from compliance. Preliminary results indicate shear wave velocity increasing from 200 to 3500 m/s.