Geophysical Research Abstracts
Vol. 19, EGU2017-2178, 2017
EGU General Assembly 2017

Deep ocean sound speed characteristics passively derived from the ambient acoustic noise field

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The propagation of acoustic waves in the ocean strongly depends on the temperature. Low frequency acoustic waves can penetrate the ocean down to depths where few in-situ measurements are available. It is therefore attractive to obtain a measure of the deep ocean temperature from acoustic waves. The latter is especially true if the ambient acoustic noise field can be used instead of deterministic transient signals. In this study the acoustic velocity, and hence the temperature, is derived in an interferometric approach from hydrophone array recordings. The arrays were separated by over 125 km, near Ascension Island in the Atlantic Ocean, at a depth of 850m. Furthermore, the dispersive characteristics of the deep ocean sound channel are resolved based on the retrieved lag times for different modes. In addition, it is shown how the resolution of the interferometric approach can be increased by cross correlating array beams rather than recordings from single-sensor pairs. The observed acoustic lag times between the arrays corresponds well to modeled values, based on full-wave modeling through best-known oceanic models.