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observations of deep ocean temperature change passively probed with acoustic waves

The oceans are filled with acoustic waves, which are trapped in a low-velocity layer at about 1 km water depth. The sound speed of these waves strongly depends on the temperature. An increase in temperature will lead to an increase in the sound speed and hence shorter travel times. IMS hydro-acoustic stations measure these waves continuously and travel times can be obtained through the cross correlation of transient signals between different hydrophones. IMS hydroacoustic station H10 near Ascension Island has been operational for nearly two decades. Although in place to detect nuclear-test explosion, H10 appeared well equipped to measure deep ocean temperature change. A decrease in the travel time between the two arrays was derived, being -0.002 s/yr. This corresponds to a deep ocean warming of 0.007 degC/yr, at about 900 m water depth. As such, acoustic waves provide an independent and passively acquired measure of the temperature increase in the deep ocean under climate change.

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