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Global patterns of changes in underwater sound transmission caused by ocean acidification

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Oceanic uptake of man-made CO2 leads to a decrease in the ocean pH and carbonate saturation state. This processes, known as ocean acidification is expected to have adverse effects on a variety of marine organisms. A surprising consequence of ocean acidification, which has gone widely unrecognized, is its effect on underwater sound transmission. Low-frequency sound absorption in the ocean occurs due to chemical relaxation of the pH-dependent boric acid−borate ion reaction. As ocean pH drops, sound absorption in the audible range decreases. The decreased sound absorption will amplify ambient noise levels, and enhance long distance sound transmission, although its exact environmental impact is uncertain. Changes in the underwater sound absorption will affect the operation of scientific, commercial, and naval applications that are based on ocean acoustics, with yet unknown consequences for marine life. We project these changes using a global biogeochemical model (HAMOCC), which is forced by the anthropogenic CO2 emissions during the years 1800-2300. Based on model projections, we quantify when and where in the ocean these ocean chemistry induced perturbations in sound absorption will occur.