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Correcting anthropogenic ocean heat uptake estimates for the Little Ice Age

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Estimates of anthropogenic ocean heat uptake typically assume that the ocean was in equilibrium during the pre-industrial era. Recent reconstructions of the Common Era, however, show a multi-century surface cooling trend before the Industrial Revolution. Using a time-evolving state estimation method, we find that the 1750 C.E. ocean must have been out of equilibrium in order to fit the H.M.S. Challenger, WOCE, and Argo hydrographic data. When the disequilibrated ocean conditions are taken into account, the inferred ocean heat uptake from 1750-2014 C.E. is revised due to the deep ocean memory of Little Ice Age surface forcing. These effects of ocean disequilibrium should also be considered when interpreting climate sensitivity estimates.