

Warming of the World Ocean, 1955-2006 and Earth's Heat Balance

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We present analyses of approximately 8 million temperature profiles from the world ocean that indicate that the world ocean has warmed since 1955 by approximately 14.5×10^{22} J. This corresponds to a warming of 0.037 degrees centigrade of the upper 3000 m of the world ocean at a rate of approximately 0.2 watts per square meter of the earth's surface. During the 1955-98 period, ocean warming accounted for approximately 84% of the possible increase of the entire earth system including atmosphere and lithospheric (continental) warming and possible melting of parts of the earth's cryosphere. The increase in ocean heat content is consistent with the increase of heat in the earth system expected from the observed increase in greenhouse gases in the earth's atmosphere since the Industrial Revolution. We also present evidence of gyre- and basin-scale changes in the salinity of the world ocean which indicate that earth's hydrological cycle undergoes decadal-scale variability.