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TITLE: A review of global ocean temperature observations: Implications for ocean heat content estimates and climate change

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ABSTRACT:

Abstract The evolution of ocean temperature measurement systems is presented with a focus on the development and accuracy of two critical devices in use today (expendable bathythermographs and conductivity?temperature?depth instruments used on Argo floats). A detailed discussion of the accuracy of these devices and a projection of the future of ocean temperature measurements are provided. The accuracy of ocean temperature measurements is discussed in detail in the context of ocean heat content, Earth's energy imbalance, and thermosteric sea level rise. Up?to?date estimates are provided for these three important quantities. The total energy imbalance at the top of atmosphere is best assessed by taking an inventory of changes in energy storage. The main storage is in the ocean, the latest values of which are presented. Furthermore, despite differences in measurement methods and analysis techniques, multiple studies show that there has been a multidecadal increase in the heat content of both the upper and deep ocean regions, which reflects the impact of anthropogenic warming. With respect to sea level rise, mutually reinforcing information from tide gauges and radar altimetry shows that presently, sea level is rising at approximately 3 mm yr ?1 with contributions from both thermal expansion and mass accumulation from ice melt. The latest data for thermal expansion sea level rise are included here and analyzed.

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