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Global Observations in Ocean and Cryosphere

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Changes from direct and proxy observations in all components of the climate system are assessed In "Climate Change 2013: The Physical Science Basis", the Working Group I contribution to the Fifth IPCC report. This talk addresses the main climate-related changes observed in ocean and the cryosphere, as well as their roles in the climate system. The ocean has absorbed more than 90% of the energy increase in the climate system in the last 40 years, with warming detected even in the abyss over the last few decades. The ocean has also taken up about 30% of the carbon released by fossil fuel burning and land use change since 1750, lowering the pH of (acidifying) near-surface waters. Relatively saline near-surface ocean waters, where evaporation dominates, have become more saline, and relatively fresh regions, where precipitation dominates, have become fresher; providing indirect evidence of change in evaporation and precipitation over the oceans. Arctic Sea Ice extent has decreased much more than Antarctic sea ice extent has increased from 1979 through 2012. Ice sheets and glaciers have been losing mass at an increasing rate over recent decades. Sea level rise is driven by both, ocean warming and mass loss from ice sheets and glaciers into the ocean. The observational estimates of the various contributors to the total sea level rise account for the total from 1993–2010.