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The use of CFCs and Sulfur Hexafluoride to Better Constrain Estimates of Anthropogenic CO_2 Uptake in the Ocean

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Global surveys of the ocean during the 1990's included measurement of dissolved inorganic carbon (DIC) and other carbon parameters, oxygen, nutrients and the chlorofluorocarbons CFC-11 and CFC-12. These data have been used in a number of ways to help derive estimates of the uptake of anthropogenic CO_2 in the global ocean, and in the evaluation of a wide variety of ocean models.

During the past decade, atmospheric CFC-12 concentrations have remained nearly constant and CFC-11 concentrations have begun to slowly decrease. In contrast, sulfur hexafluoride (SF_6) levels in the atmosphere have continued to increase rapidly. The simultaneous measurement of SF_6 with CFCs can provide additional information over the use of each tracer alone.

Vertical profiles of the concentrations of dissolved SF_6, CFC-11 and CFC-12 were measured at the Hawaii Ocean Time-Series (HOT) site in 2005-2006, and along a section in the Pacific Ocean from Tahiti to Kodiak in 2006 as part of the CLIVAR repeat hydrography program. These multi-tracer data sets can be used to better constrain estimates of the ventilation time scales and 'ideal' age of water masses, oxygen utilization rates and anthropogenic CO_2 uptake in this region of the Pacific Ocean.