Global Carbon Data Management and Synthesis Project

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Project Summary

Over the past two and a half centuries, the surface oceans have absorbed approximately 30% of the total anthropogenic carbon dioxide emissions from the atmosphere, equaling >550 billion tons of carbon dioxide (Canadell et al., 2007). This absorption of CO_2 from the atmosphere has reduced the accumulation of greenhouse gases in the atmosphere, thus slowing the rate of climate change (IPCC, 2007; Sabine and Feely, 2007). The details of this uptake and storage as well as the mechanisms controlling them are still not fully understood. Continued monitoring and scientific analysis of the ocean carbon cycle is critical for understanding how this important sink for anthropogenic CO_2 is functioning and how ocean carbon storage might change in the future.

Recognizing the need to constrain the oceanic uptake, transport, and storage of anthropogenic CO_2 for the anthropocene and to provide a baseline for future estimates of oceanic CO_2 uptake, two international ocean research programs, the World Ocean Circulation Experiment (WOCE) and the Joint Global Ocean Flux Study (JGOFS), jointly conducted a comprehensive survey of inorganic carbon distributions in the global ocean in the 1990s (Wallace, 2001). After completion of the US field program in 1998, a five year effort called the Global Ocean Data Analysis Project (GLODAP) was begun to compile and rigorously quality control the US and international data sets including a few pre-WOCE data sets in regions that were data limited (Key et al., 2004). These data have greatly improved our understanding of the spatial distributions of natural and anthropogenic carbon in the ocean and are being used to examine the mechanistic controls on ocean carbon distributions.

The single snapshot of the ocean provided by the GLODAP data product is not ideal for understanding the temporal patterns of variability in ocean uptake and storage. The most important component of an assessment of ocean biogeochemical change, whether of natural or anthropogenic origin, is high-quality observations. The WOCE/JGOFS data set provides an important point of reference for ocean carbon studies, but many other useful data sets exist or are being collected which have not been analyzed in such a context because there has not been a coordinated effort to bring these data together and no data management system to make navigation and exploitation of these data convenient. For example, the NOAA Climate Observations Division's (COD) Carbon Network (hydrographic sections, underway pCO_2, and CO_2 moorings) is a valuable contribution to the Global Ocean Observing System (GOOS) and Global Climate Observing System (GCOS). It is not sufficient, however, simply to collect and archive the data if we expect the data to improve our understanding of the global carbon cycle

and the role of the ocean in climate change. Although carbon scientists and oceanographers are the primary direct users of ocean carbon data, these scientists are working to produce meaningful products from these observations that a wide range of decision makers and the public can use to make informed decisions about current and future CO_2 emissions.

The goal of the Global Carbon Data Management and Synthesis Project is to work together with the COD carbon measurement projects as well as other national and international colleagues with high-quality ocean carbon data to take the fundamental carbon observations and turn them into products that are useful for scientists and the public for understanding the ocean carbon cycle and how it is changing over time. This effort ranges from ensuring that the observations are of the highest quality and are mutually consistent with each other to combining the observations into a common data set that is available and easy for the community to use and explore to evaluating the time rate of change in global ocean carbon uptake and storage. This project brings together ocean carbon measurement experts, information technology experts and data managers to ensure the most efficient and productive processing possible for the COD carbon observations.