Fifteen years of surface water CO_2 measurements from cruise ships in the Caribbean Sea

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Measurement of surface water CO_2 concentrations over time has been the primary means to determine regional and global air-sea CO_2 fluxes, and to determine increases in surface water CO_2 as they contribute to ocean acidification (Takahashi et al. 2014). The data have been largely gathered from ships of opportunity (SOOP-CO2). Currently, observations from approximately thirty ships are obtained in automated fashion using similar accurate and calibrated instrumentation with many of the same design (Pierrot et al., 2009). The multi-investigator data are collated through a community effort, the Surface Ocean Carbon Atlas (SOCAT) (Bakker et al., 2016).

At the inception of the global surface water CO_2 observing program the Caribbean Sea was highlighted as region with a dearth of measurements. Through a partnership with Royal Caribbean Cruise Lines the area now has 15-years of quality data from weekly voyages through the region. The combination of temperature, salinity, marine boundary air and surface water CO_2 measurements has made it possible to determine the uptake of CO_2 by the ocean and the attribution of change. Good correspondence between atmospheric XCO_2 measurements from the ship-based instrument and GLOBALVIEW-CO2 (2013) are observed but improved methods of quality control and flagging are necessary.

The marine boundary and surface water CO_2 measurements show that for much of the region the surface water CO_2 has increased only at about ½ the atmospheric growth rate over the past 15 years. The instrumentation, data delivery and quality control along with scientific highlights of the campaign in the Caribbean Sea, and future improvements will be discussed.

References

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