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Temporal dynamics of the carbonate system in the western English Channel at station ASTAN (48°46'40''N; 3°56'15''W)

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The need for a global sea surface carbon observing system to unravel inorganic carbon dynamics in coastal ecosystems was recently pointed out at the OceanObs09 conference. Such an observing system would rely on time-series observations of the different parameters of the CO2 system in seawater for various coastal ecosystems. These observations should allow a better understanding of present day carbon cycle dynamics and future long-term trends of CO2 in response to global change forcings such as ocean acidification.
Since spring 2009 we performed bi-monthly measurements of Dissolved Inorganic Carbon (DIC), Total Alkalinity (TA), pH and ancillary data in the western part of the English Channel (station ASTAN (48°46'40"N; 3°56'15"W) of the French Network for Observation of the Coastal Ocean (SOMLIT)). Here we report the seasonal variability of the partial pressure of CO2 (pCO2) (calculated from DIC and TA measurements), the CO2 air-sea fluxes (FCO2) as well as the Net Ecosystem Production (NEP) from a DIC mass balance approach. The FCO2 showed strong seasonal variability: surface waters were a sink of approximately -4 mmol m2 d-1 during spring and early summer; and a source of approximately + 7 mmol m2 d-1 during late summer and early fall. These largest sink and source of CO2 observed during the year were associated with autotrophy (average NEP of 37 mmol m2 d-1) and heterotrophy (average NEP of -75 mmol m2 d-1), respectively. The winter values of FCO2 were close to equilibrium. Over an annual cycle, the surface waters at ASTAN were near equilibrium with the atmosphere with preliminary estimates of FCO2 and NEP of +0.3 mol C m-2 yr-1 and +0.2 mol C m-2 yr-1, respectively. We will discuss the main processes controlling inorganic carbon dynamics on an inter-seasonal to annual level.