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Air-sea CO2 flux in the North Sea: spatio-temporal variability and uncertainty of the estimates

A. Omar(1,2), E. Heegaard (2,3), A. Olsen (2,1), T. Johannessen (2,1), and H. Thomas (4)

(1) Geophysical Institute, University of Bergen, Norway, (2) Bjerknes Centre for Climate Research, Bergen, Norway, (3) Department of Biology, University of Bergen, Norway, (4) Department of Oceanography, Dalhousie University, Halifax, Canada (abdir.omar@gfi.uib.no/ 47 55584330)

Marginal seas in temperate and high latitude oceans are significant sinks for atmospheric carbon dioxide (CO_2) and often characterized by higher variability compared to open ocean regions. Here we evaluate the air-sea CO_2 flux in the North Sea. We combine high frequency data of SST and fCO_2 from ships of opportunity and publicly available data for wind speed, salinity, and atmospheric CO_2 to determine the flux and simultaneously estimate its uncertainty. The spatio-temporal variability of the data is analysed. Additionally, by using basin-wide cruise data, the long term trend of the flux is investigated by comparing basin-wide flux estimates based on data from 2001 and 1986.