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Constraining the climatology of CO_2 ocean surface flux for North Atlantic and the Arctic

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The ocean sink is an important part of the anthropogenic CO_2 budget. Because the terrestrial biosphere is usually treated as a residual, constraining the net flux into the ocean sink is crucial for understanding the global carbon cycle. The air-sea interface flux is calculated from millions of measurements of CO_2 partial pressures. However the regional and temporal means depend on parametrization of gas transfer velocity as well as on the wind/waves fields used for calculations.

A recently developed tool, FluxEngine, created within the ESA funded (SOLAS related) OceanFlux Greenhouse Gases project, creates an opportunity to create an ensemble of regional CO_2 flux climatologies for the North Atlantic and Arctic waters using multiple combinations of forcing fields and gas transfer velocity parameterizations. The aim of the study is to provide constraints on the regional monthly averages for the chosen area for the whole "climatology ensemble". This approach is similar to the one used by IPCC for the whole model ensemble used for modeling of the climate. Doing a regional study provides an additional test of the parameterizations because the local flux averages may differ even for parameterizations giving similar global averages.

We present the methodology and CO_2 flux climatology constrains for selected regions and seasons, the preliminary results of a study which aim is to cover the whole North Atlantic and ice-free areas of Arctic Ocean. The study is done within the new ESA funded OceanFlux Evolution project we are part of and at the same time is part of a PhD thesis funded by Centre of Polar Studies “POLAR-KNOW” (a project of the Polish Ministry of Science).