Controls of the spatiotemporal variation of the air-sea CO_2 exchange in the coastal ocean: global and regional analysis

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The spatial and temporal variability of the oceanic air-water CO_2 exchange (FCO_2) is still characterized by large uncertainties, especially in coastal regions. Furthermore, the physical and biogeochemical processes controlling its seasonal variability are not yet well understood. Here, a quantitative global analysis of the seasonal and spatial variability of coastal FCO_2 is presented over the 1998-2015 period. This analysis is performed using a recent monthly pCO_2 climatology for continental shelves at a 0.25 degree resolution derived from a two-step artificial neural network (Laruelle et al., 2017). This novel pCO_2 product allows for the creation of the first high resolution seasonal maps of FCO_2 for the coastal ocean worldwide. The respective contributions of the different oceanic basins and latitudinal bands are compared and analysed. Moreover, a decomposition of the physical and biological mechanisms responsible for this seasonal variability of FCO_2 is performed. We quantify the effects of wind speed, temperature, sea ice cover and the biological pump as controls of the air-water CO_2 exchange.

Laruelle, G. G., Landschützer, P., Gruber, N., Tison, J. L., Delille, B. and Regnier, P.: Global high-resolution monthly pCO_2 climatology for the coastal ocean derived from neural network interpolation, Biogeosciences, 14(19), 4545–4561, doi:10.5194/bg-14-4545-2017, 2017.