EGU23-15678
https://doi.org/10.5194/egusphere-egu23-15678
EGU General Assembly 2023

An updated sea surface pCO_2 data-product for the global coastal ocean

Alizee Roobaert[1], Goulven Gildas Laruelle[1], Peter Landschützer[2], and Pierre Regnier[1]
[1]Department of Geosciences, Environment & Society (DGES), Université Libre de Bruxelles, Brussels, CP160/02, Belgium
[2]Flanders Marine Institute (VLIZ), Ostend Belgium and Max Planck Institute for Meteorology, Hamburg, Germany

Over the past decade, the number of high-quality measurements of the sea surface partial pressure of CO2 (pCO2) has rapidly increased and large-scale community efforts have led to the compilation of these measurements into uniform quality-controlled databases. Moreover, the development of different robust interpolation techniques allowed one to circumvent the limitation of these datasets that remain discontinuous in time and space to create continuous spatiotemporal pCO2 maps. While significant progress has been made regarding the development of several global data-products for the global ocean, most of these products omit the coastal ocean and/or their spatial resolution is too coarse to fully capture the highly heterogeneous spatiotemporal pCO2 dynamics that occurs in these regions. As a result, the evaluation of the interannual variability and the long-term trends of the coastal air-sea CO2 exchange using a continuous CO2 flux (FCO2) product dedicated to the shallow portion of the global ocean has not yet been attempted and, hence, remains poorly understood. To address these limitations, this study updates the global coastal data-product of Laruelle et al. (2017) based on the coastal version of the Self Organizing Map and Feed Forward Network method and uses ~ 32 million observations to cover the longest period available for the coastal ocean (1982-2020). The good performance in space and time of this new data-product using several evaluation methods allows us to reconstruct the temporal evolution of the global coastal FCO2 sink based on observations. Our results indicate that today's coastal ocean acts as a CO2 sink and that it has been a CO2 sink since the beginning of our study period (1982). This CO2 sink has however increased over time from a value of -0.25 Pg C yr-1 (for a total shelf surface area of 77 million km2) in the early 1980s to a current value of -0.6 Pg C yr-1. Our new product provides a new constraint for closing the global carbon cycle and its temporal evolution as well as for establishing regional carbon budgets requiring high resolution coastal flux estimates.