An observation-based global monthly gridded sea surface pCO$_2$ product from 1998 through 2011 and its monthly climatology.

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Method:

The observation-based pCO$_2$ fields were created using a 2-step neural network technique. In a first step, the global ocean is divided into 16 biogeochemical provinces using a self organizing map. In a second step, the non-linear relationship between variables known to drive the surface ocean carbon system and gridded observations from the SOCATv2 dataset (Bakker et al. 2014) is reconstructed using a feed-forward neural network within each province separately. The final product is then produced by projecting these driving variables, i.e., surface temperature, chlorophyll, mixed layer depth, and atmospheric CO$_2$ onto oceanic pCO$_2$ using these non-linear relationships. This results in monthly pCO$_2$ fields at 1°x1° resolution covering the entire globe with the exception of the Arctic Ocean and few marginal seas. The air-sea CO$_2$ flux is then computed using a standard bulk formula. More details can be found in Landschützer et al. 2013 and Landschützer et al. 2014.

Content:

File 1: spco2_1998-2011_ETH_SOM-FFN_CDIAC_G05.nc

The netcdf file contains:

- lat: latitude in degrees north (89.5°S – 89.5°N with 1° resolution)
- lon: longitude in degrees east (179.5°W-179.5°E with 1° resolution)
- time: time in seconds since 2000-01-01-00:00 (monthly resolution)
- spco2_raw: The raw 2-step neural network sea surface pCO_2 output as described in Landschützer et al. 2014 in µatm
- fgco2_raw: The air-sea flux density, calculated from the raw sea surface pCO_2 output as described in Landschützer et al. 2014 in mol m^{-2} yr^{-1}.
- spco2_smoothed: A smoothed product of the raw pCO_2, created by the spatial and temporal mean of each points neighboring pixels (the 3x3x3 pixel neighborhood domain) in µatm.
- fgco2_smoothed: A smoothed product of the raw air-sea CO_2 flux, created by the spatial and temporal mean of each points neighboring pixels (the 3x3x3 pixel neighborhood domain) in mol m^{-2} yr^{-1}.
- aco2: Atmospheric pCO_2 in µatm for the air-sea flux calculation, derived from the Globalview Marine Boundary Layer (MBL) xCO_2 product and SST (Reynolds et al. 2002) as well as sea level pressure (Kalnay et al. 1996) following Dickson et al. 2007.
- dco2: Delta pCO_2 calculated from the CO_2 partial pressure difference between atmosphere and the raw surface ocean partial pressure.
- dco2_smoothed: Delta pCO_2 calculated from the CO_2 partial pressure difference between atmosphere and the smoothed surface ocean partial pressure.
- kw: The gas transfer velocity calculated from the CCMP wind product (Atlas et al. 2011) as described in Landschützer et al. 2014 in m yr^{-1}.
- sol: The CO_2 solubility in mol m^{-3} µatm^{-1} calculated from sea surface temperature (Reynolds et al. 1996) and ECCO2 sea surface salinity (Menemenlis et al. 2008) following Weiss 1974.
- ice: The percentage of sea ice from the Rayner et al. 2003 sea ice product.
- lsmask: The land-sea mask used in Landschützer et al. 2014.

File 2: spco2_clim_ETH_SOM-FFN_CDIAC_G05.nc

The netcdf file contains:

- lat: latitude in degrees north (89.5°S – 89.5°N with 1° resolution)
- lon: longitude in degrees east (179.5°W-179.5°E with 1° resolution)
- spco2_clim: The monthly pCO_2 climatology calculated from the average of the 14 year (1998-2011) smoothed neural network output in µatm.
- fgco2_clim: The monthly air-sea CO_2 flux climatology calculated from the average of the 14 year (1998-2011) smoothed neural network output in mol m^{-2} yr^{-1}.
- lsmask: The land-sea mask used in Landschützer et al. 2014.

Inquiries:

Inquiries should be sent to Peter Landschützer: peter.landschuetzer@usys.ethz.ch. Other data formats (e.g. matlab) available upon request.

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