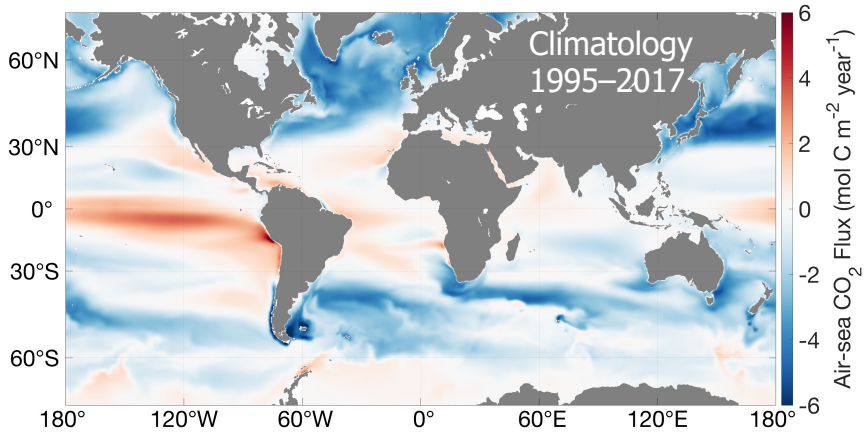
The **ECCO-Darwin** Data-assimilative Global Ocean Biogeochemistry Model

Objectives:

- Quantify global-ocean carbon sequestration.
- Identify and predict the consequences of natural and anthropogenic perturbations to marine biogeochemistry.
- Understand the climate-related sensitivity of marine ecosystems.

Red = CO_2 outgassing, blue = uptake



Approach:

- Use ECCO global ocean state estimates to constrain ocean circulation and hydrography from 1992–near present.
- Use a highly-realistic ocean carbon and ecology model (Darwin) to couple ECCO's physical ocean state with biogeochemistry.
- Estimate unknown ECCO-Darwin biogeochemistry and ecosystem parameters to a suite of biogeochemical ocean observations using Green's Functions.

Key Deliverables:

- Multi-decadal estimate of ocean carbon sequestration.
- Global-ocean pCO_2 and CO_2 flux across a wide range of time-space scales.
- Closed property budgets for key biogeochemical quantities (e.g., DIC, nutrients, phytoplankton biomass).
- Improved global-ocean biogeochemistry estimates that become ever-more accurate as ECCO state estimates evolve and increase through time.
- Carroll et al., 2020, *The ECCO-Darwin Data-assimilative Global Ocean Biogeochemistry Model: Estimates of Seasonal to Multi-decadal Surface Ocean pCO2 and Air-sea CO2 Flux,* Journal of Advances in Modeling Earth Systems, 12, e2019MS001888