



Role of the shelf in the biogeochemical cycling off the U.S. West Coast

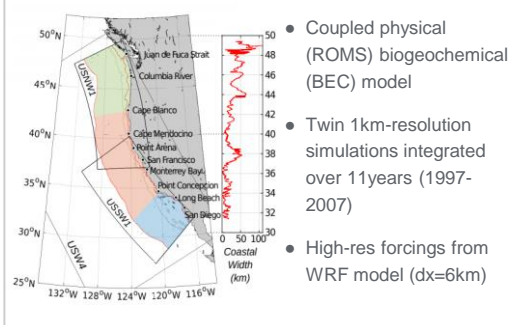
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Background

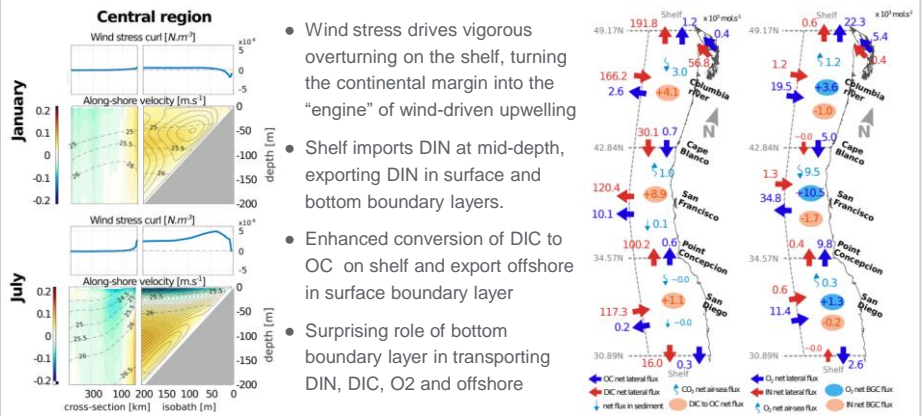
- Oceanic margins play a major role in global biogeochemistry, but global assessments remain largely uncertain. Progress relies on improved regional estimates
- Here, we use high resolution numerical simulations to quantify biogeochemical cycles along the U.S. West Coast shelf, within the broader context of the California Current System.

Methods



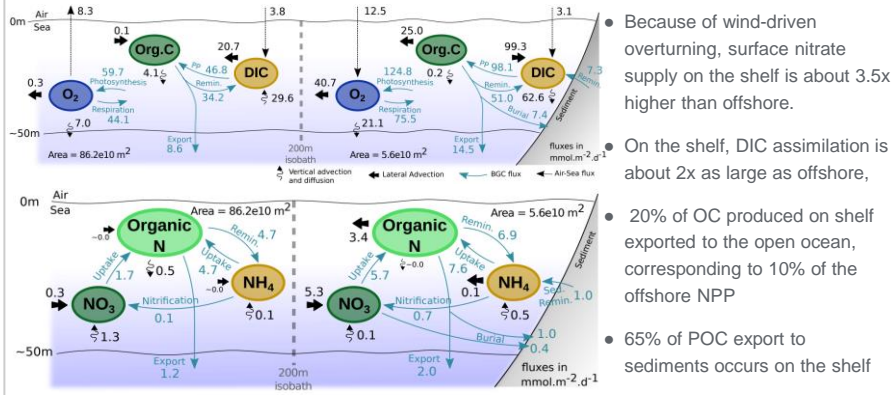
- Coupled physical (ROMS) biogeochemical (BEC) model
- Twin 1km-resolution simulations integrated over 11years (1997-2007)
- High-res forcings from WRF model (dx=6km)

Results I : Circulation on the shelf



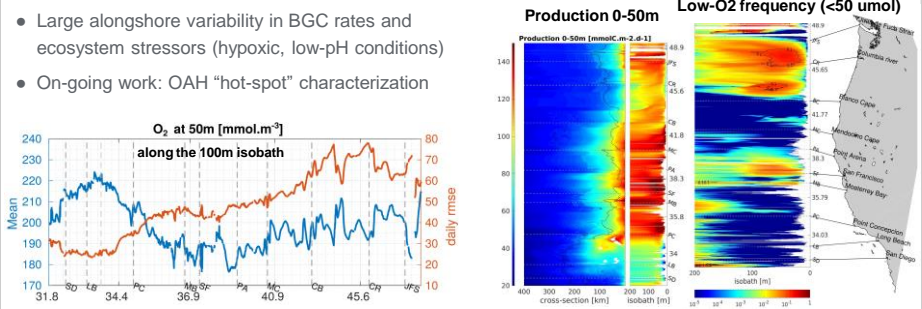
- Wind stress drives vigorous overturning on the shelf, turning the continental margin into the “engine” of wind-driven upwelling
- Shelf imports DIN at mid-depth, exporting DIN in surface and bottom boundary layers.
- Enhanced conversion of DIC to OC on shelf and export offshore in surface boundary layer
- Surprising role of bottom boundary layer in transporting DIN, DIC, O2 and offshore

Results II : U.S. West Coast Biogeochemical cycles



- Because of wind-driven overturning, surface nitrate supply on the shelf is about 3.5x higher than offshore.
- On the shelf, DIC assimilation is about 2x as large as offshore,
- 20% of OC produced on shelf exported to the open ocean, corresponding to 10% of the offshore NPP
- 65% of POC export to sediments occurs on the shelf

Results III : Spatial variability



- Large alongshore variability in BGC rates and ecosystem stressors (hypoxic, low-pH conditions)
- On-going work: OAH “hot-spot” characterization