

# Climate Change Impacts on Net Primary Production (NPP) and Export Production (EP) in the CMIP5 Models

## Objective:

To identify the primary factors driving the ocean biogeochemical response to climate change in the CMIP5 Earth System Models (ESMs) under the RCP 8.5 scenario.

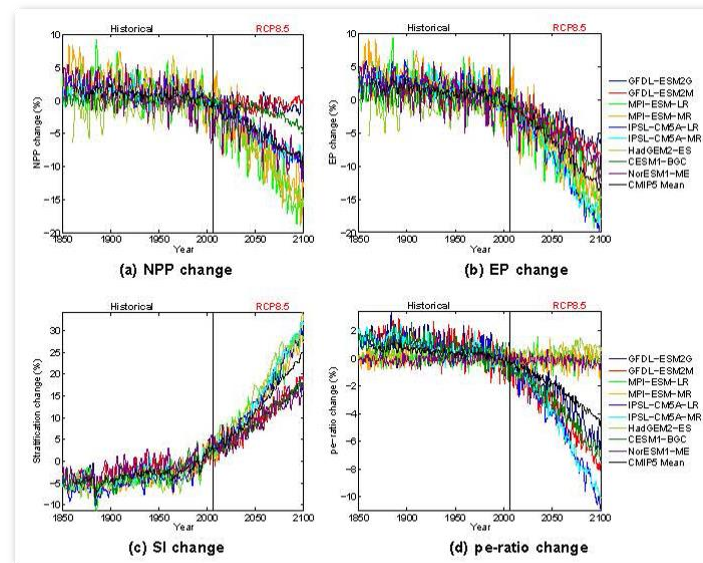
## Approach:

- Analyzed ocean climate response in output from nine ESMs over 1850–2100, compared with observations.

## Results/Impacts:

- Increasing stratification decreased surface nutrients that drove declines in export production.
- NPP responses to climate change depended strongly on model phytoplankton community structure.
- Models with multiple phytoplankton groups projected more modest reductions in NPP as the phytoplankton community shifted, modifying the particle export ratio.
- Models with the largest positive biases in stratification for the current era projected the largest future increases in stratification under RCP 8.5.
- This suggests possible overestimation of the response to climate change in the more biased models.

Fu, W., J. T. Randerson, and J. K. Moore (2016), Climate change impacts on net primary production (NPP) and export production (EP) regulated by increasing stratification and phytoplankton community structure in the CMIP5 models, *Biogeosci.*, 13(18):5151–5170, doi:[10.5194/bg-13-5151-2016](https://doi.org/10.5194/bg-13-5151-2016).



Shown above are time series of the percent changes in net primary production, export production, and the particle export ratio and stratification over the period 1850–2100 (each relative to their 1990s means).