

Predicting near-term changes in ocean carbon uptake

Nikki Lovenduski

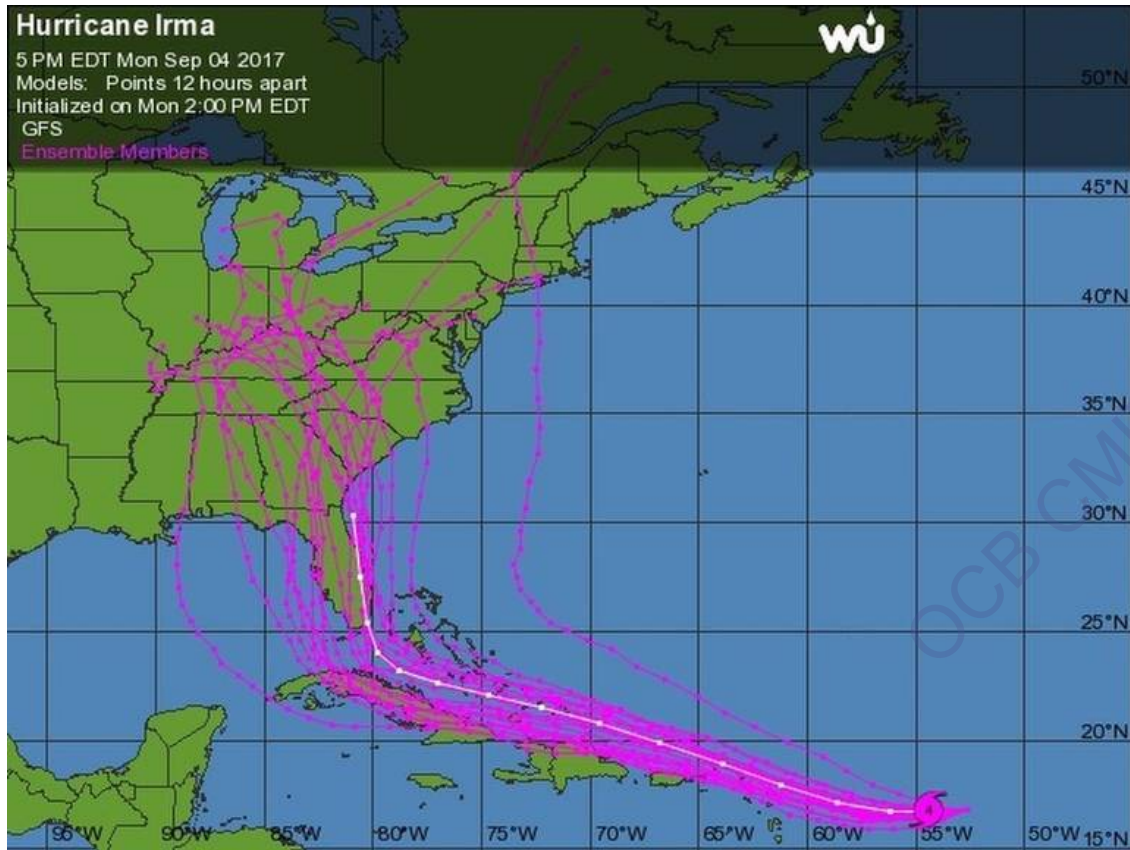
University of Colorado Boulder

thanks to:

Steve Yeager, Keith Lindsay, & Matt Long

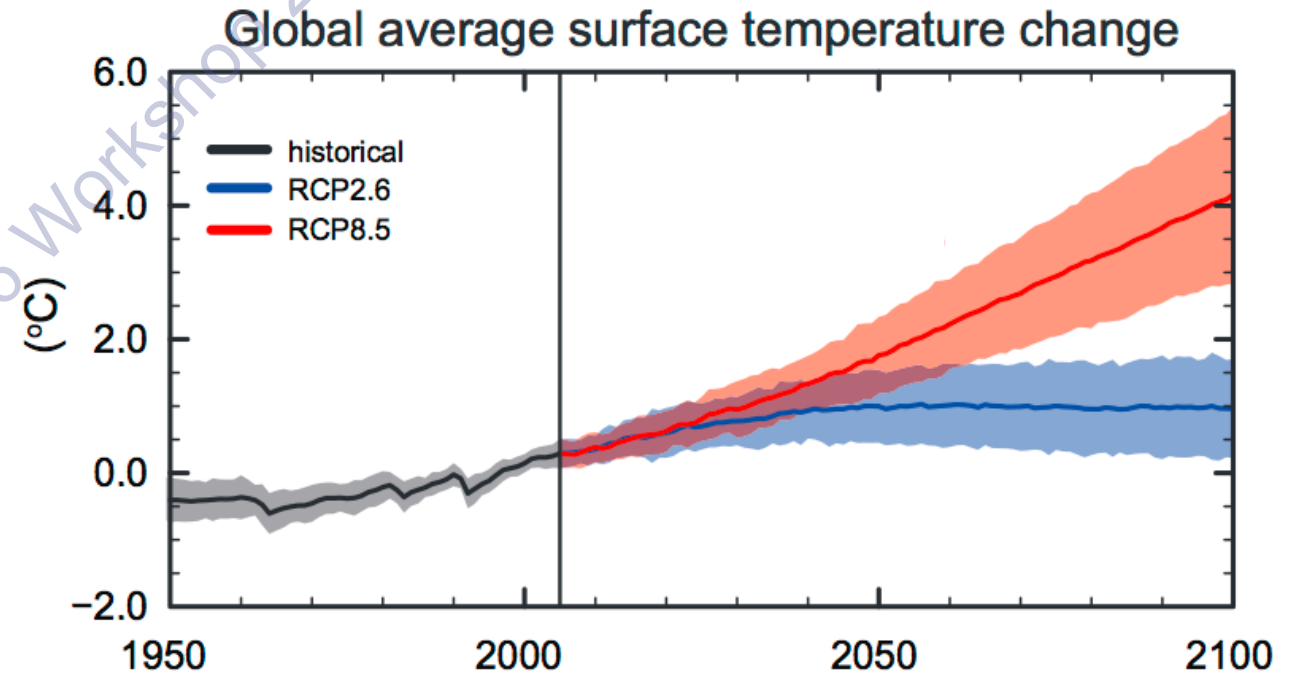
Prediction vs. Projection

Short-term, initialized predictions



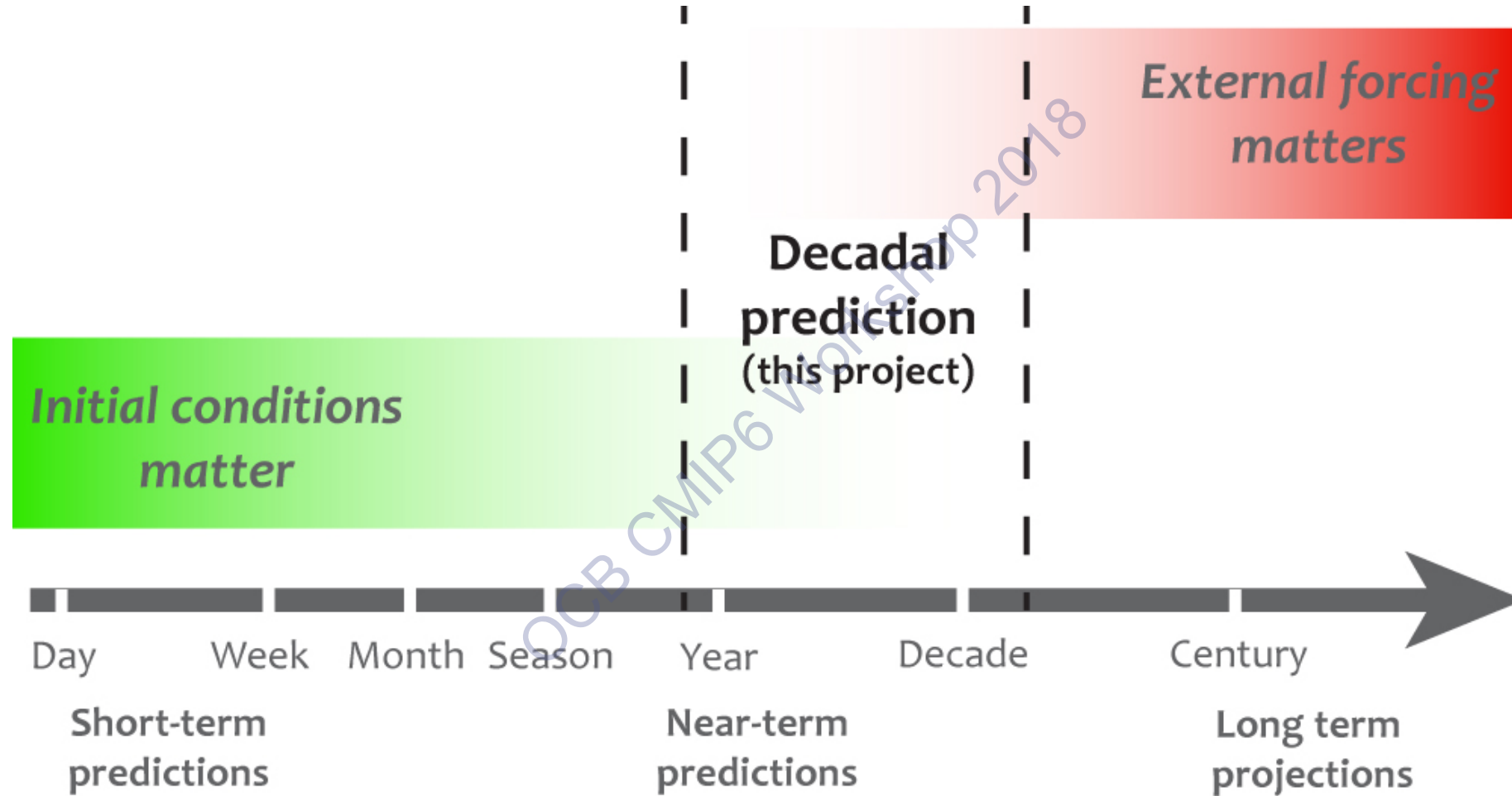
wunderground.com

Long-term, un-initialized projections



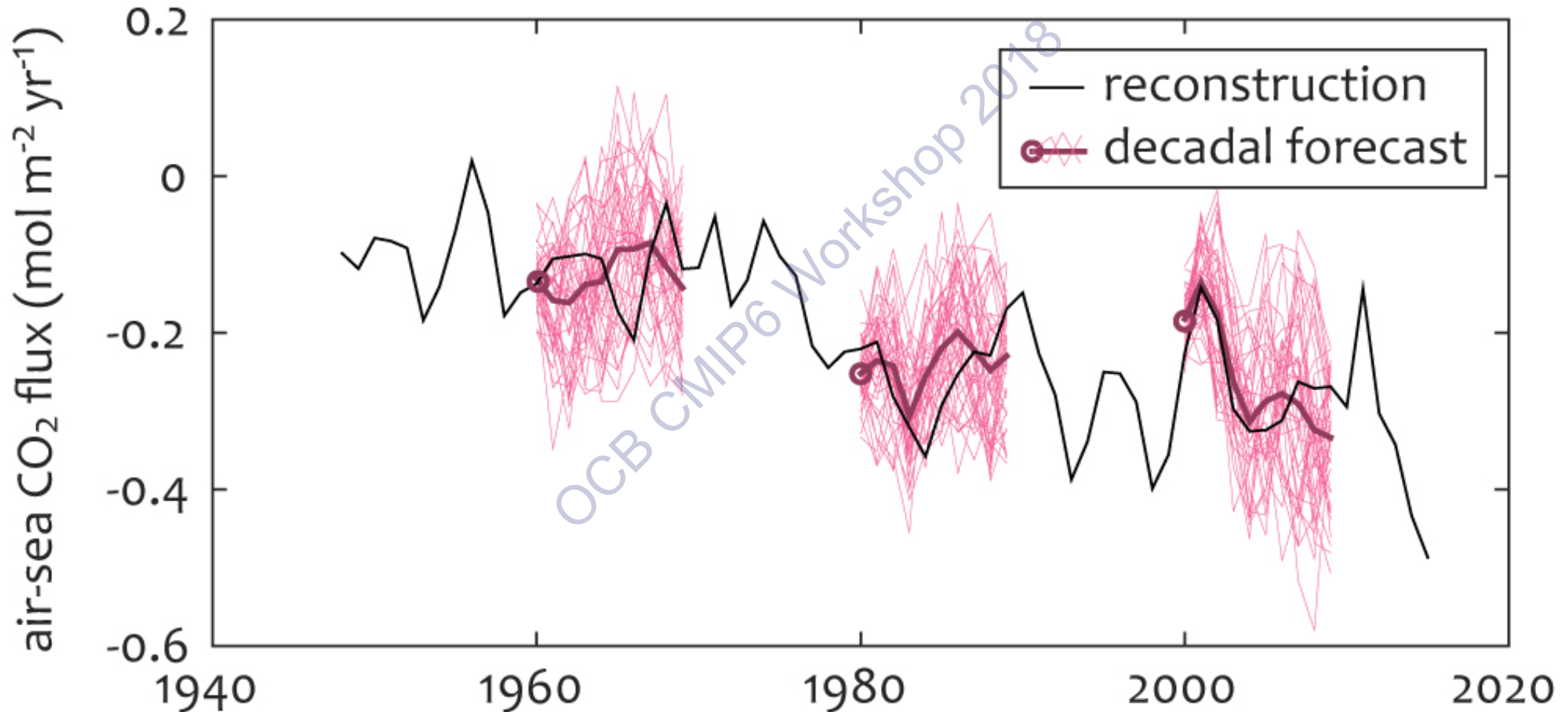
IPCC AR5 (2013)

Decadal prediction

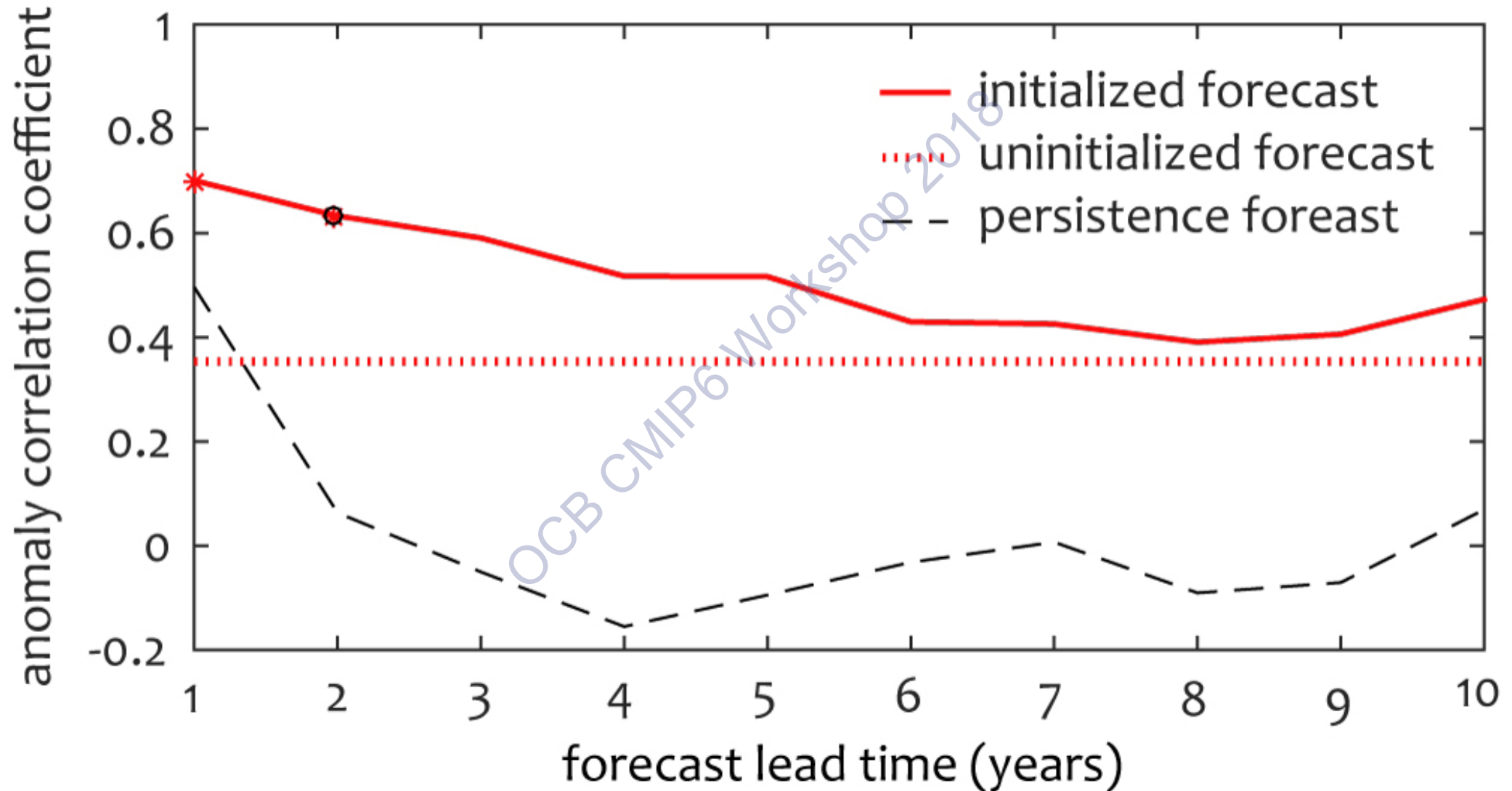


CESM Decadal Prediction Large Ensemble

South Pacific Subtropical Permanently Stratified Biome



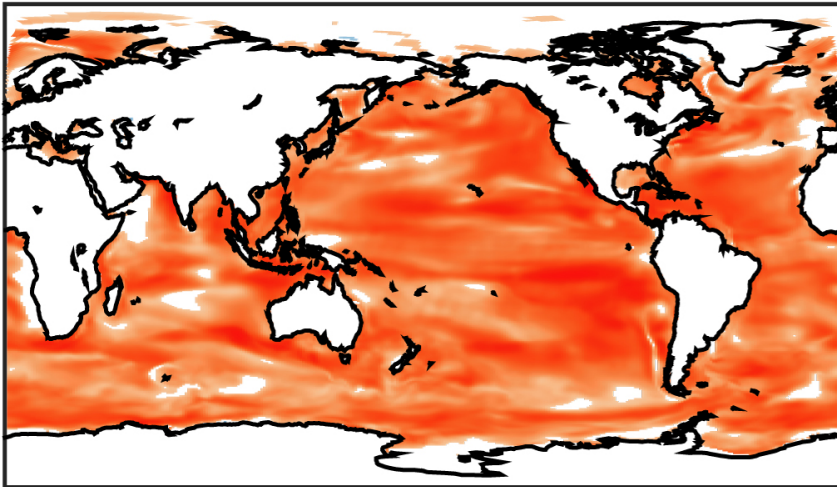
Globally integrated CO₂ flux



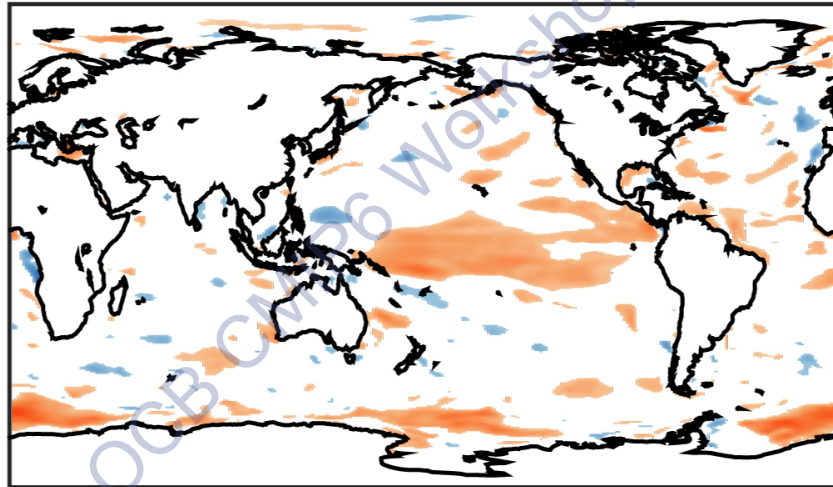
Initialization engenders predictability

Forecast lead year 1

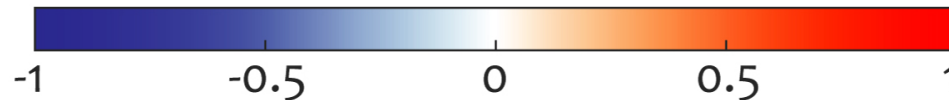
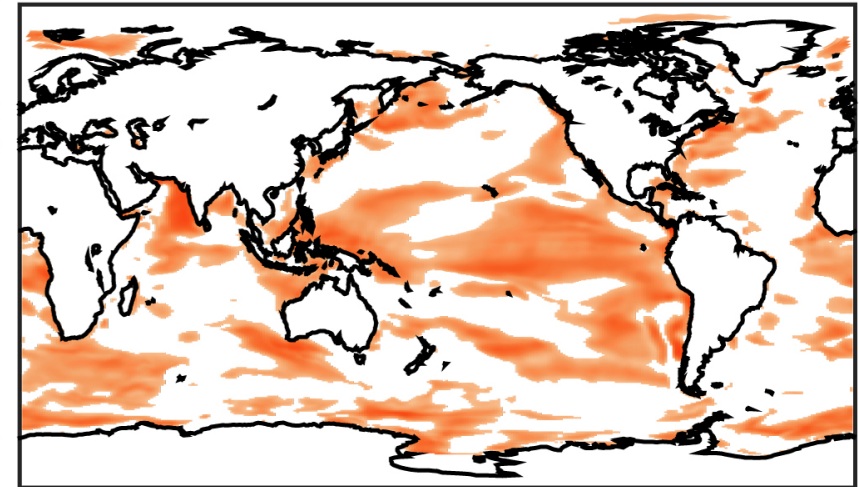
Initialized forecast



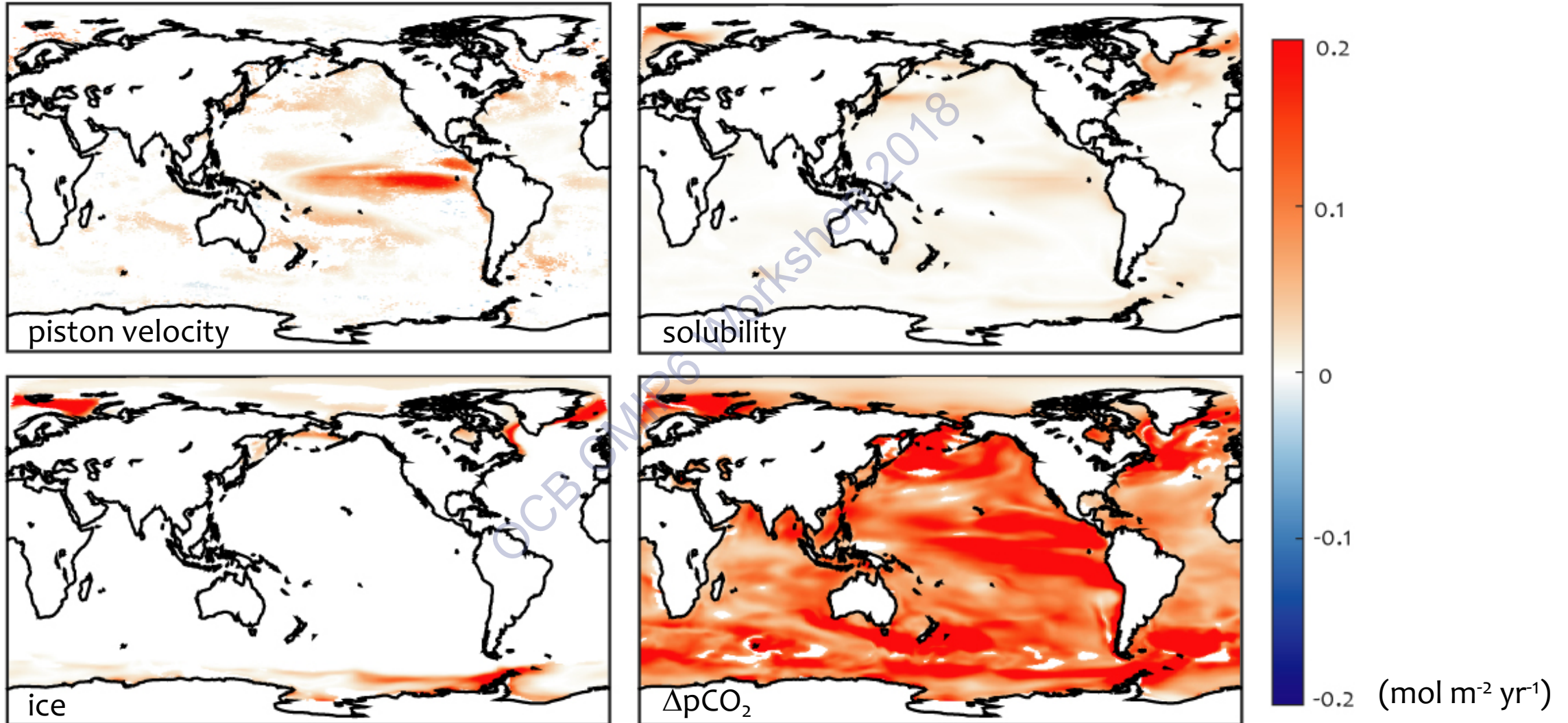
Uninitialized forecast



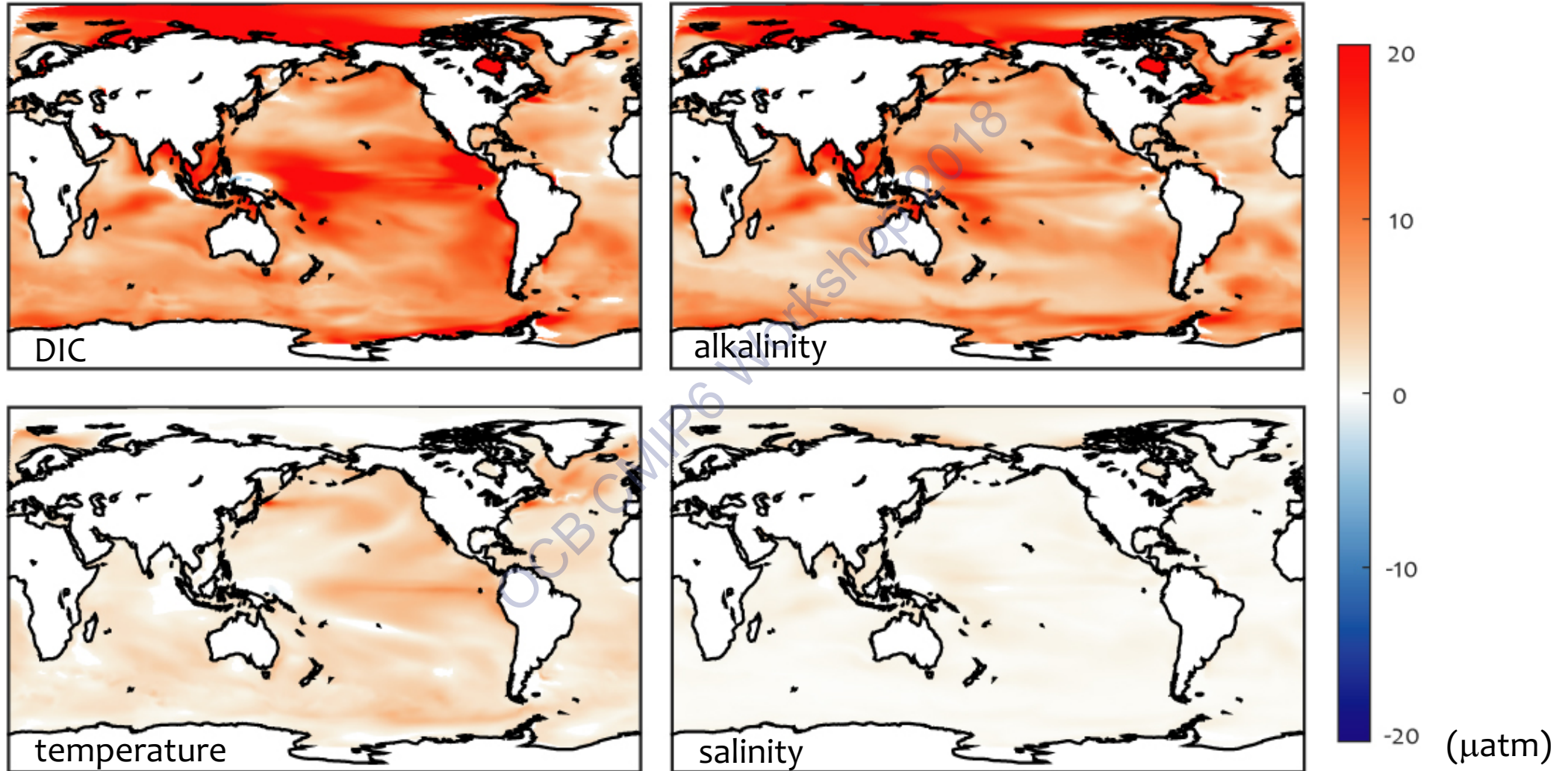
Persistence forecast



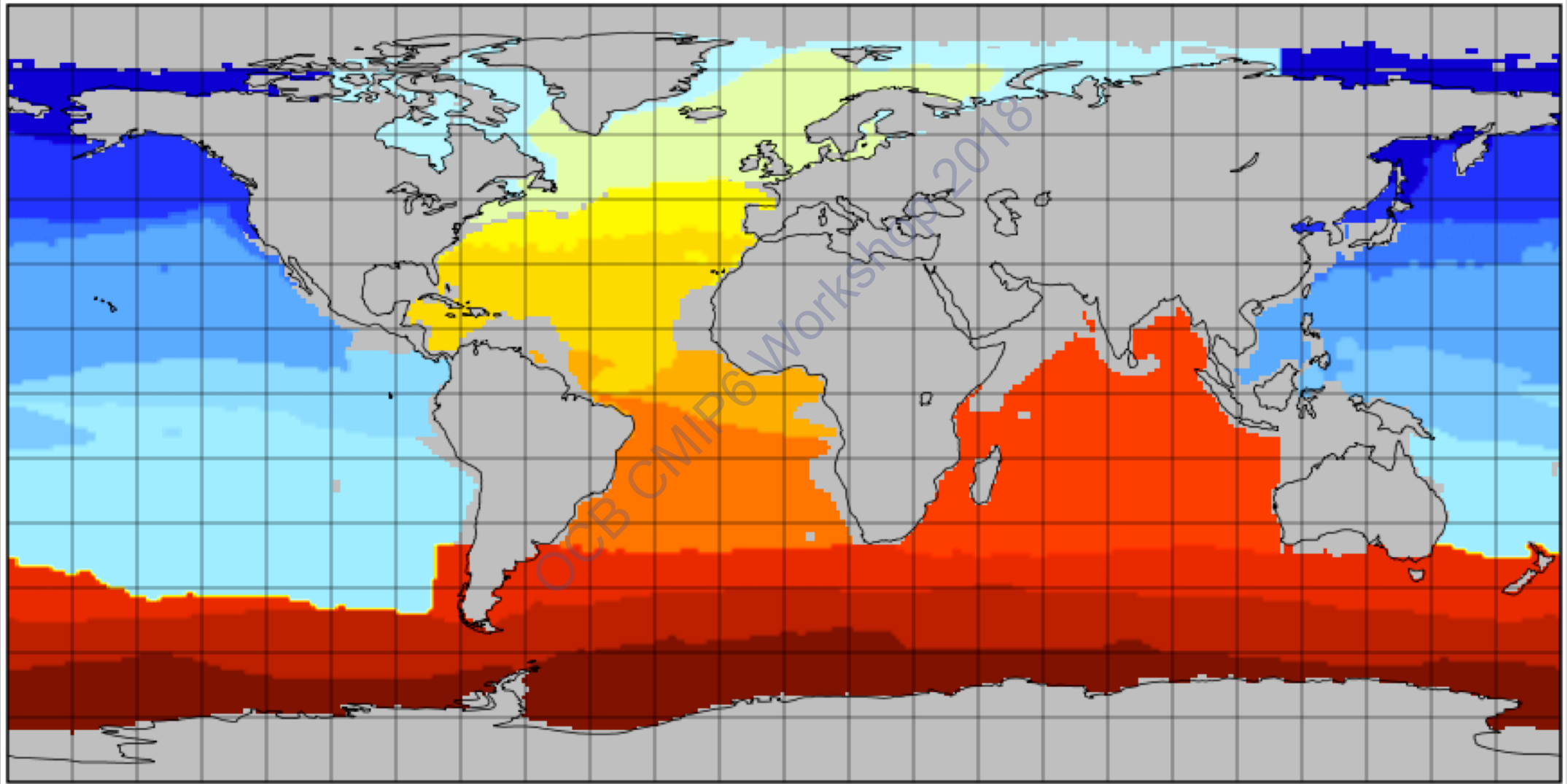
What drives CO₂ flux predictability?



What drives pCO₂ predictability?

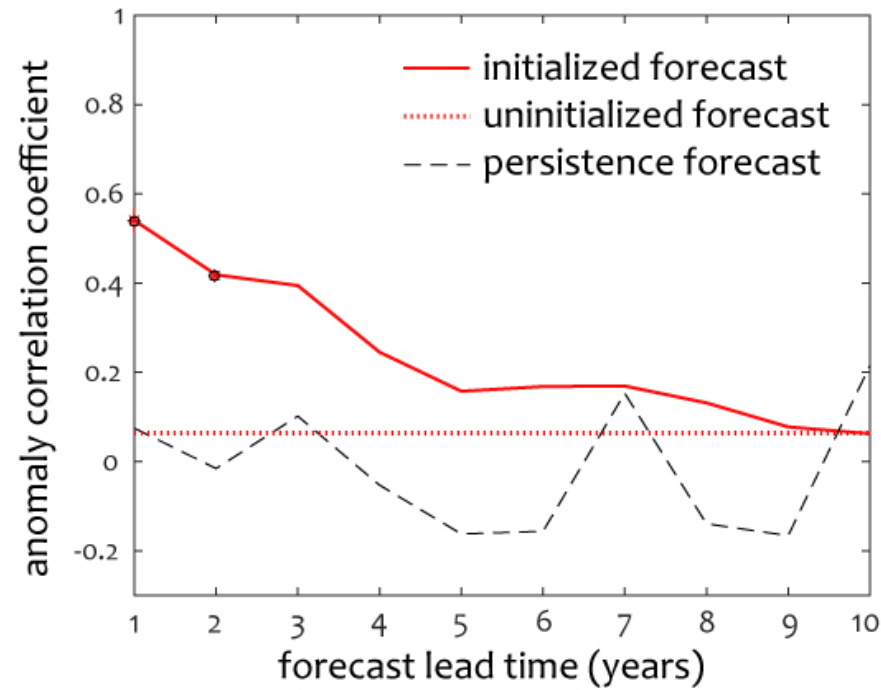
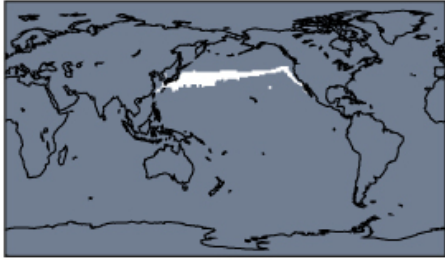


Forecasting CO₂ flux on the biome scale

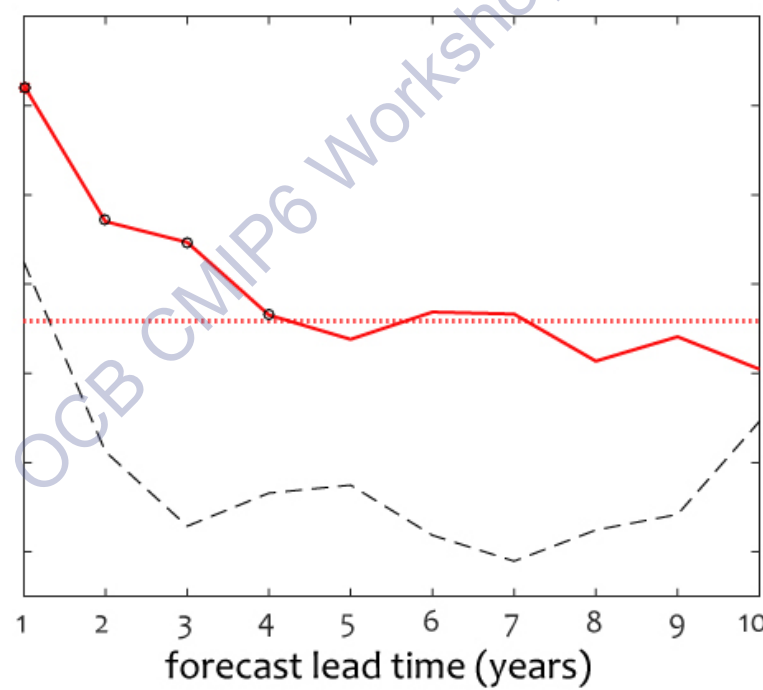
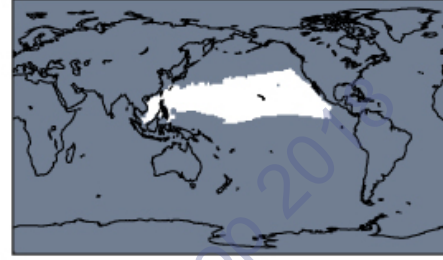


Forecasting CO₂ flux on the biome scale

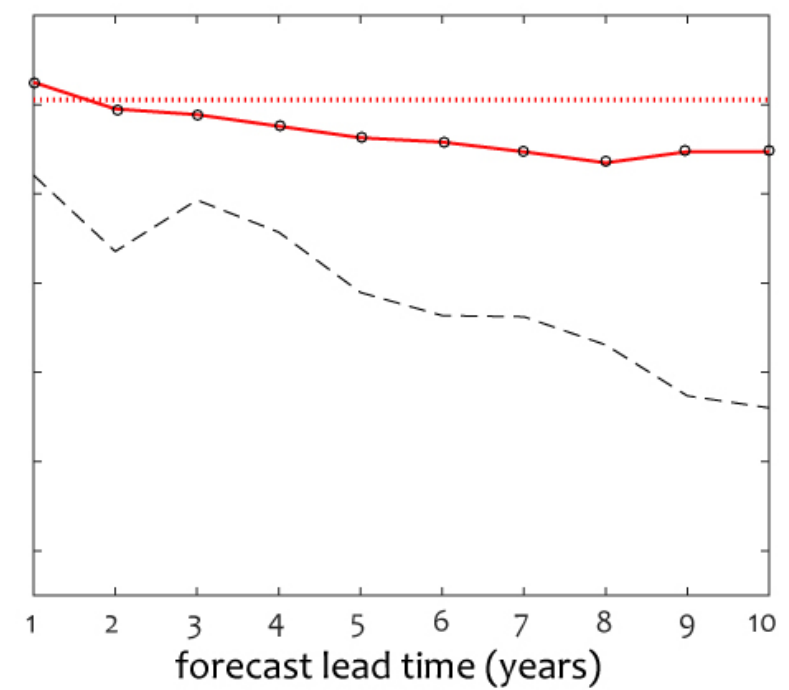
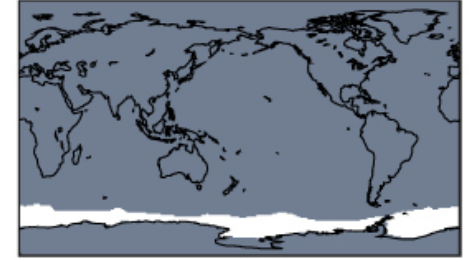
Biome 3:
NP STSS



Biome 4:
NP STPS

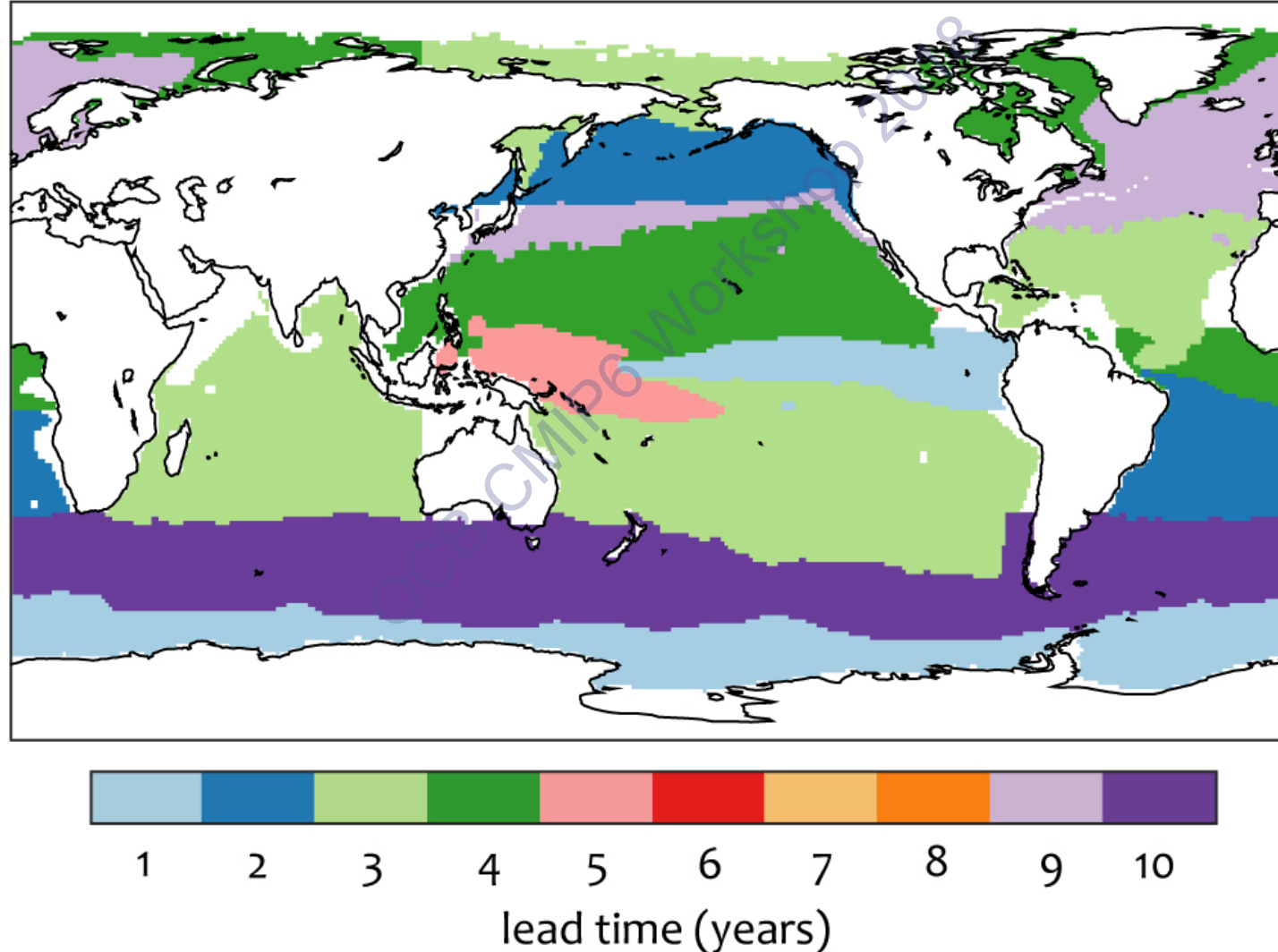


Biome 17:
SO ICE



Forecasting CO₂ flux on the biome scale

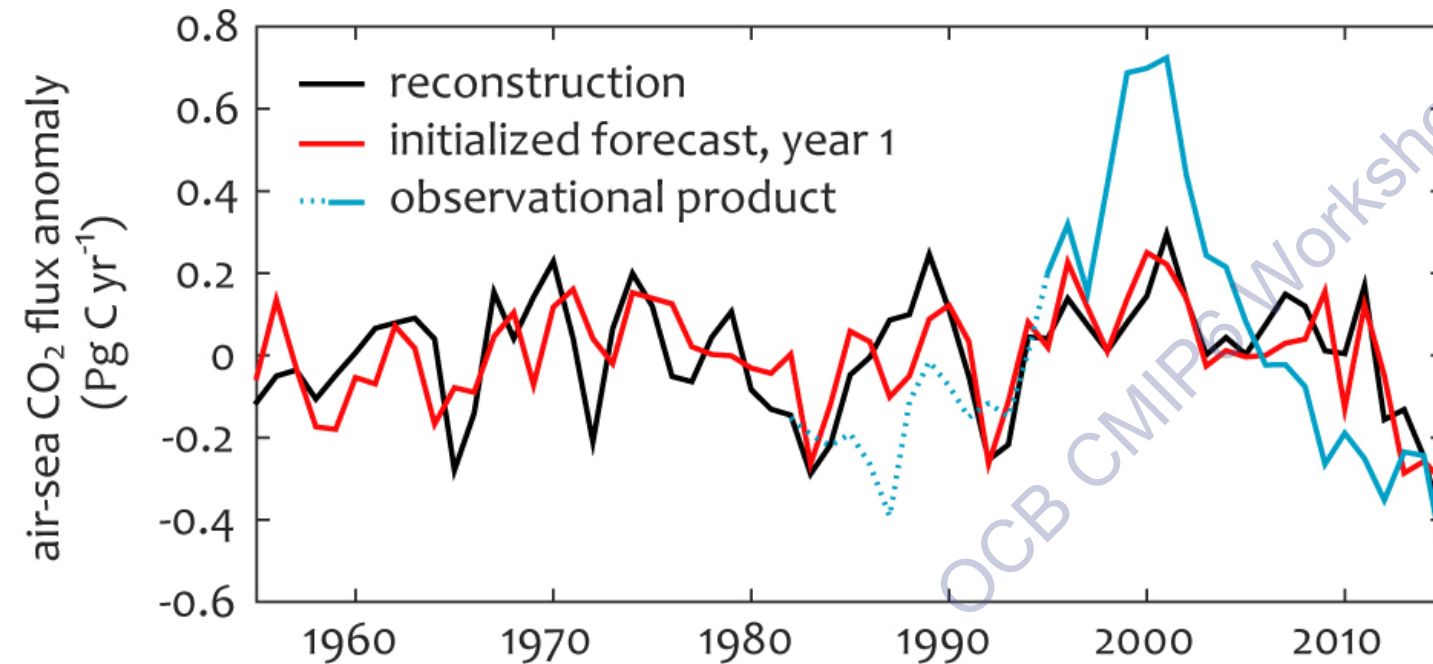
Initialization beats other forecast methods until...



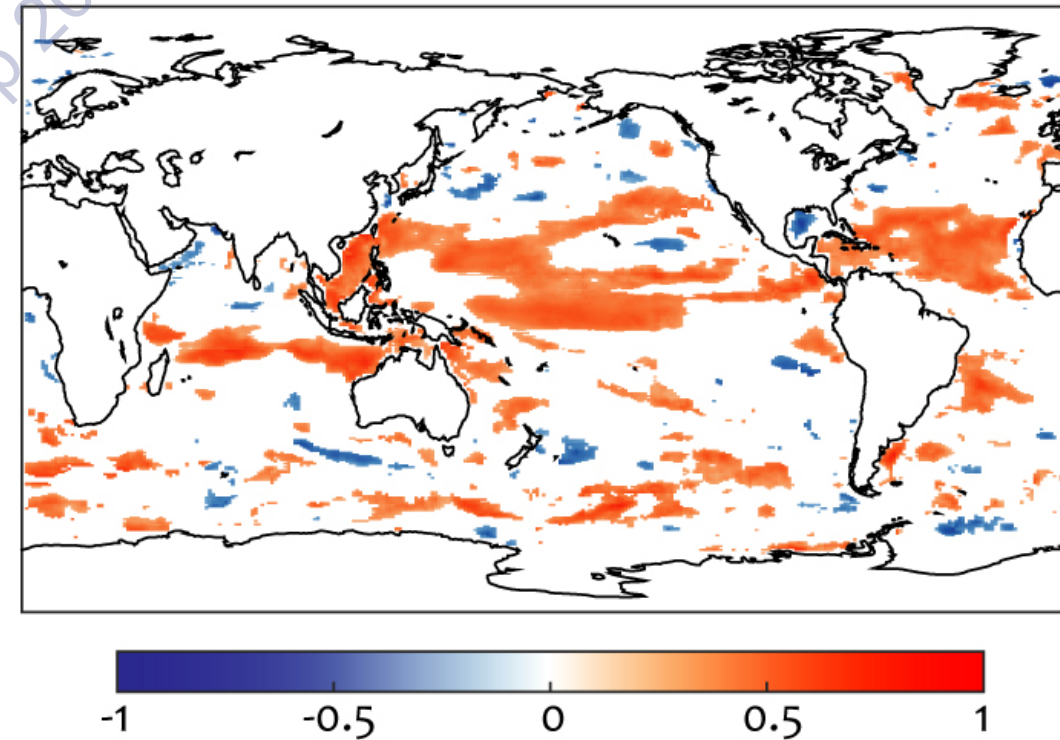
Forecast skill

(as compared to the Landschutzer observational product)

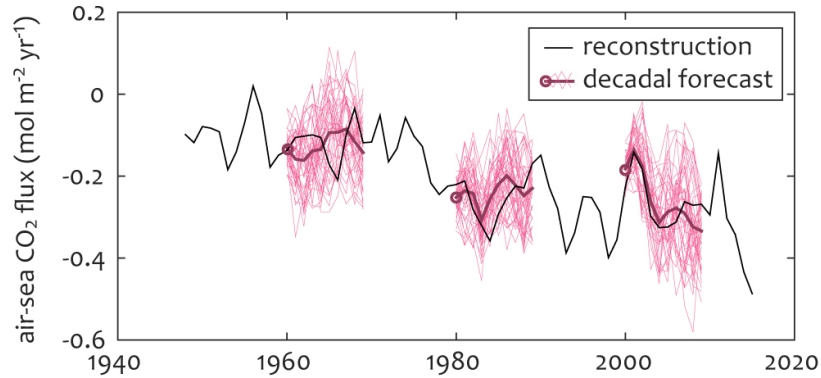
Globally-integrated



Regional skill



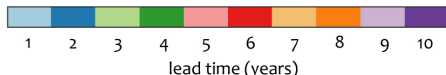
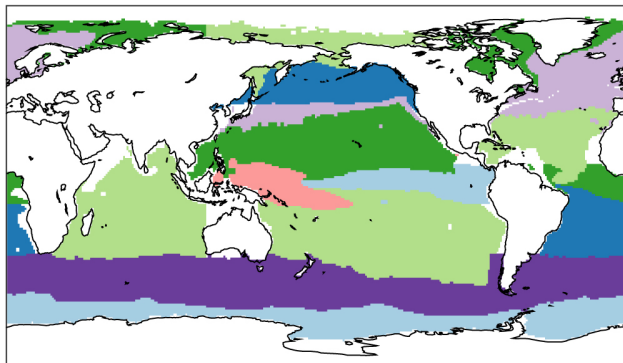
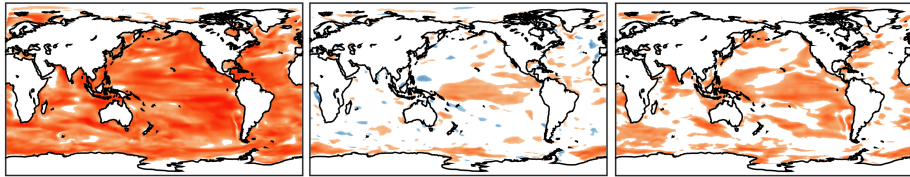
Conclusions



initialized

uninitialized

persistence



A novel set of decadal prediction simulations finds high near-term predictability in ocean carbon uptake

Predictability on global and regional scales is enhanced by initialization and surpasses persistence

The boost in predictability from initialization lasts longest in the North Atlantic and Southern Oceans