

Using Large Ensembles for decadal prediction

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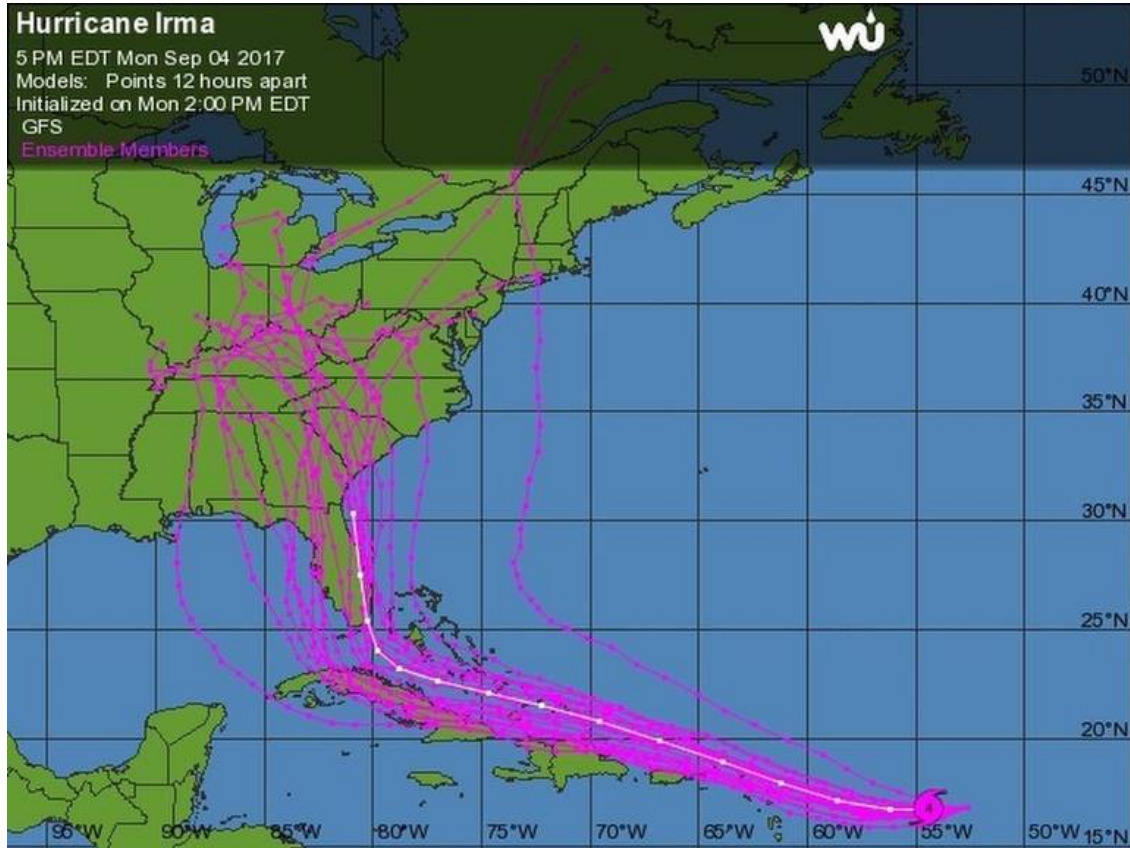
University of Colorado Boulder

thanks to:

Steve Yeager, Elizabeth Maroon, Kristen Krumhardt, Riley Brady

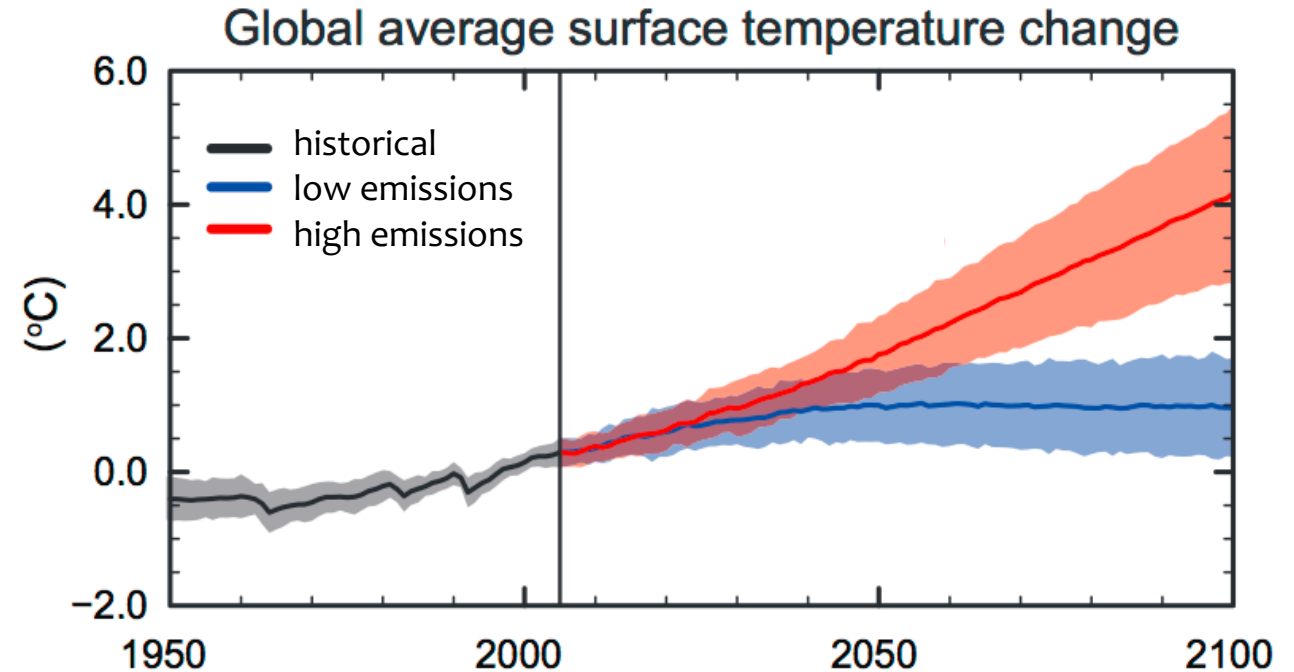
Prediction vs. Projection

Short-term, initialized predictions



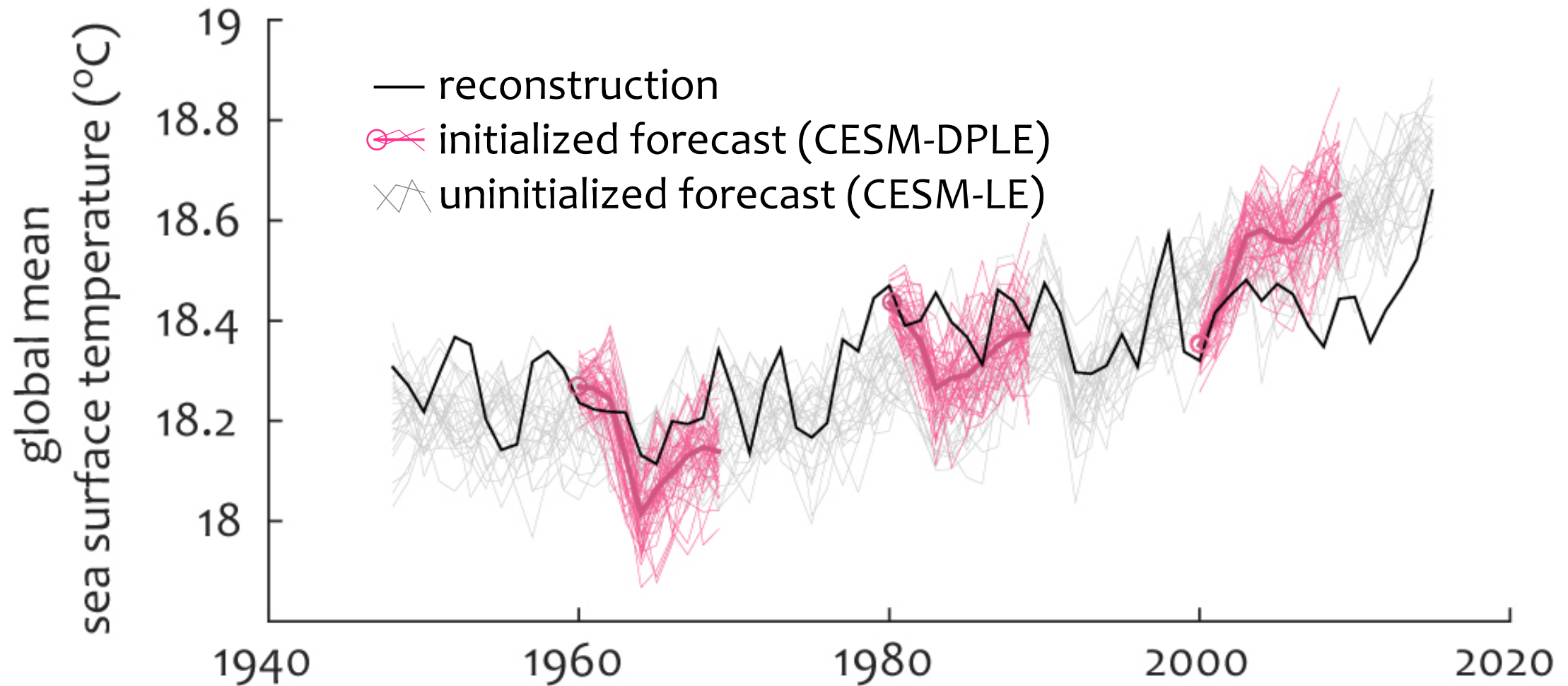
wunderground.com

Long-term, un-initialized projections



IPCC AR5 (2013)

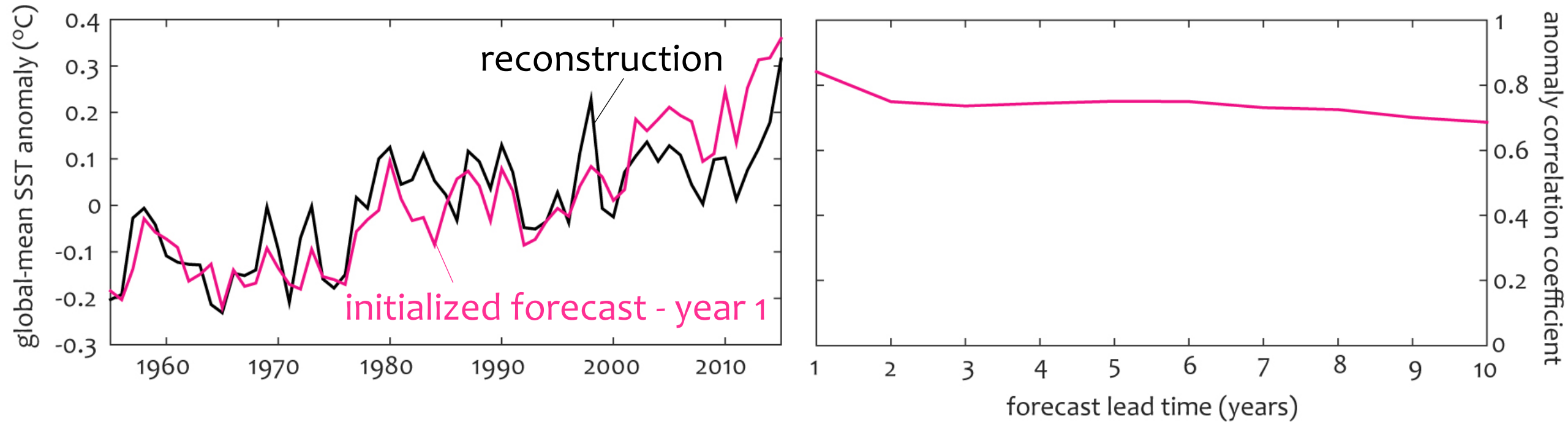
Community Earth System Decadal Prediction Large Ensemble



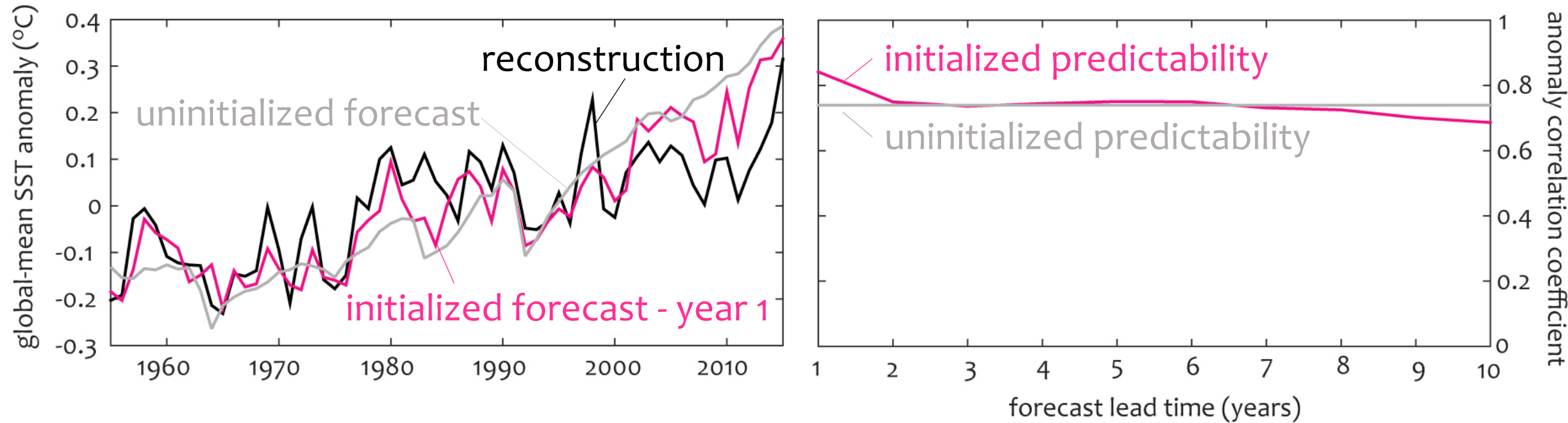
CESM-DPLE described in Yeager et al. (2018)

CESM-LE described in Kay et al. (2015)

Is global-mean SST predictable?

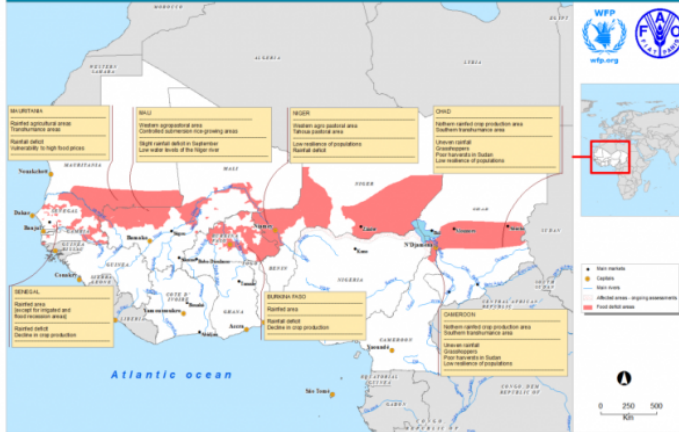


Is global-mean SST predictable?



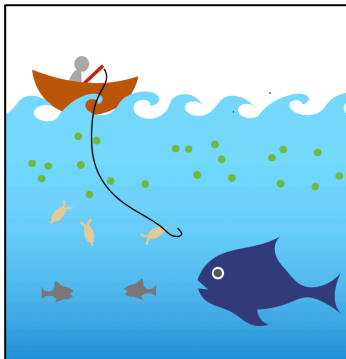
A few examples...

Sahel precipitation



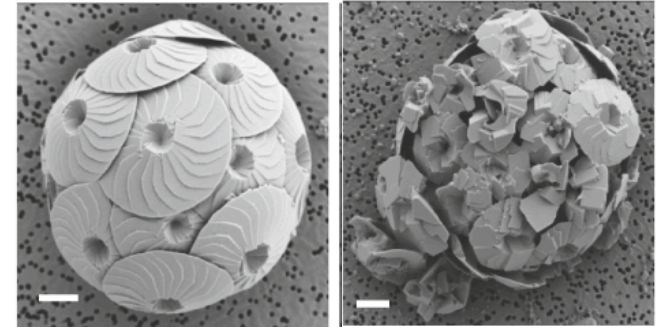
Yeager et al. (2018)
Maroon et al. (in prep.)

Marine phytoplankton



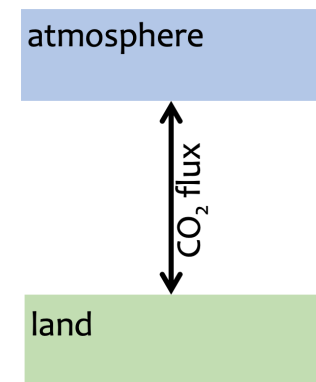
Krumhardt et al. (in prep.)

Ocean acidity



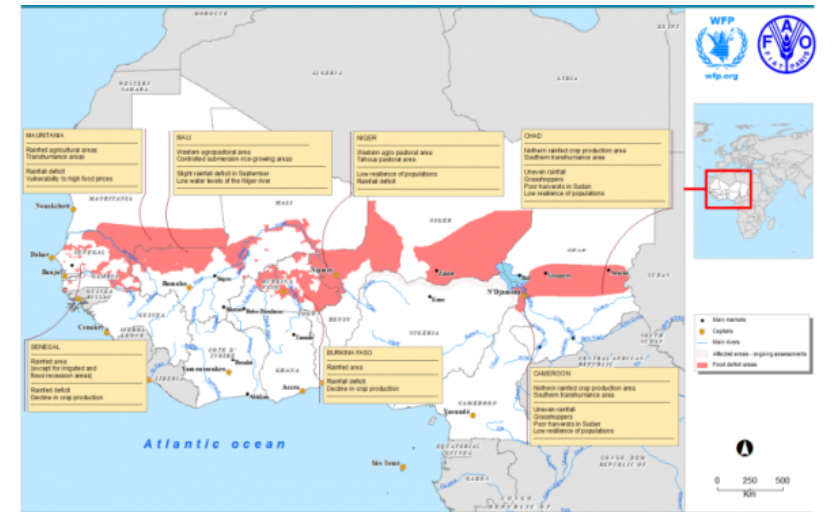
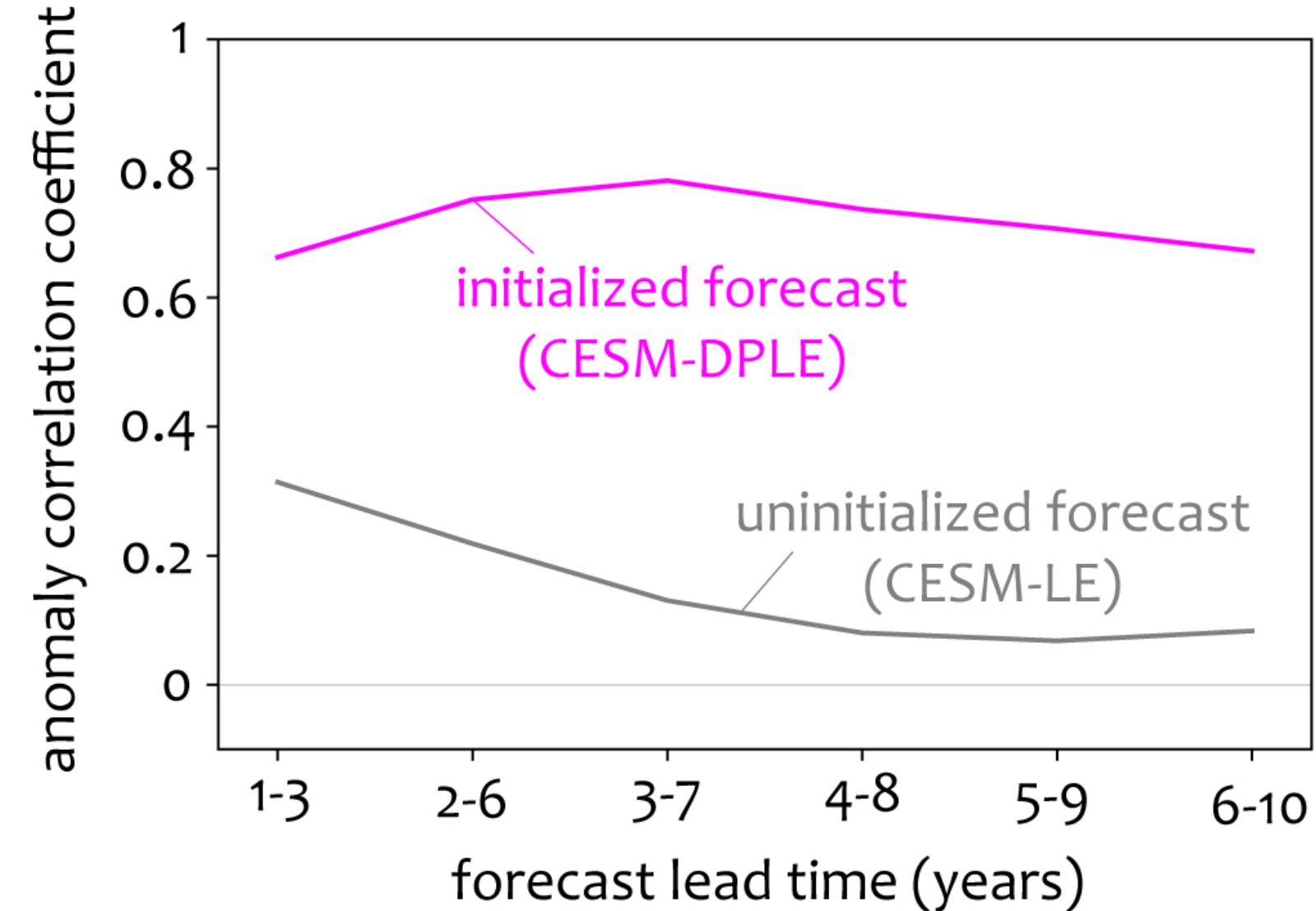
Brady et al. (in prep.)

Terrestrial carbon fluxes



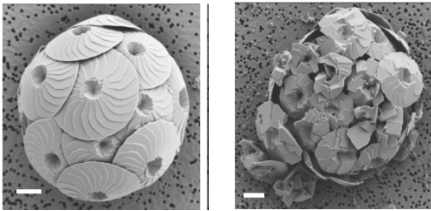
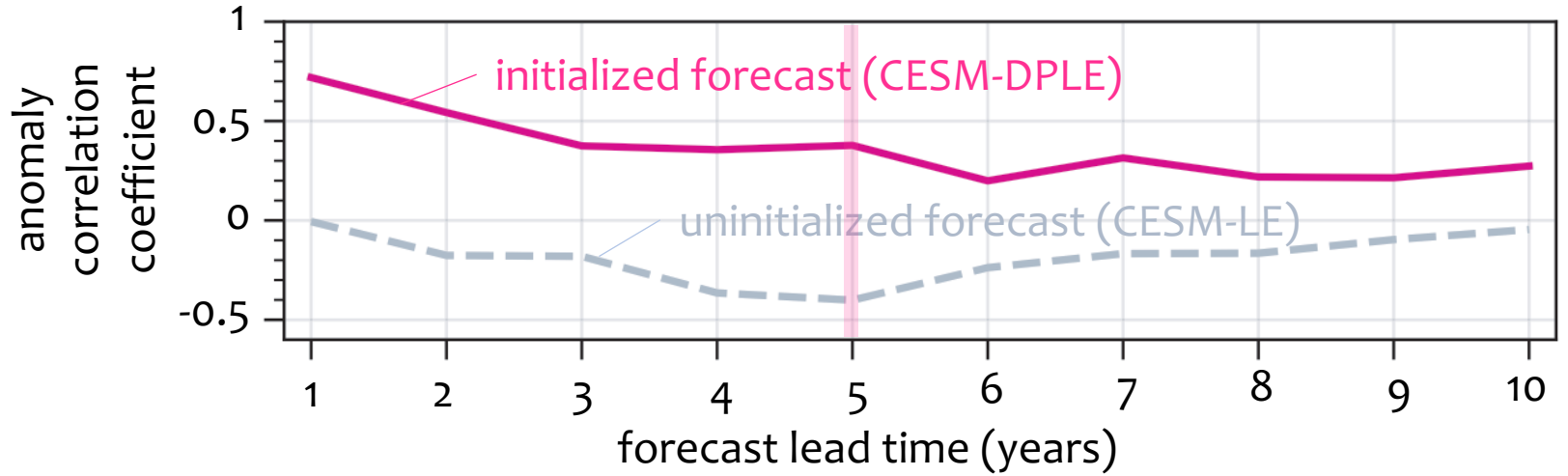
Lovenduski et al. (in prep.)

Sahel precipitation

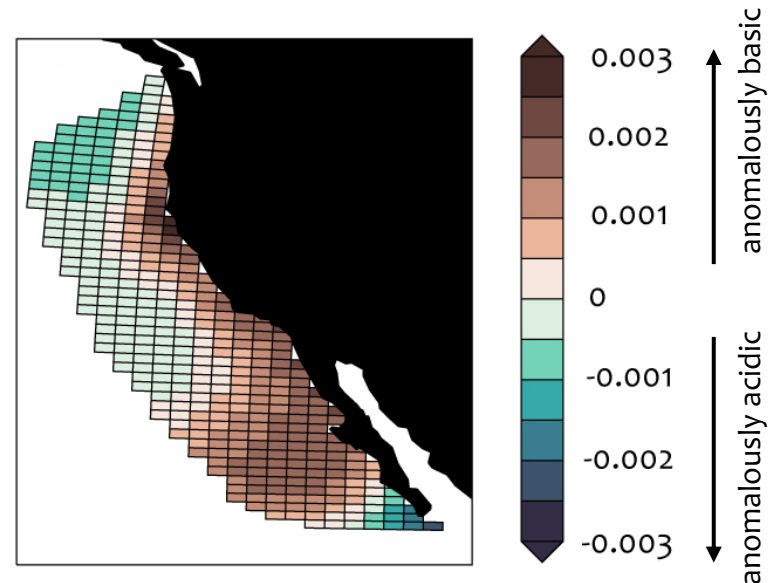


Yeager et al. (2018)
Maroon et al. (in prep.)

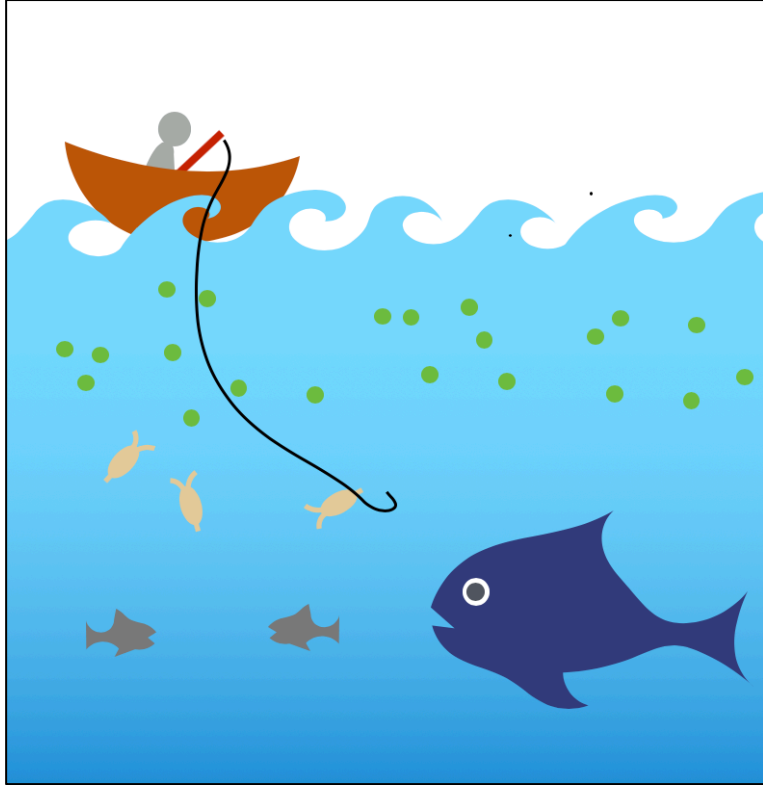
Ocean acidification in the California Current



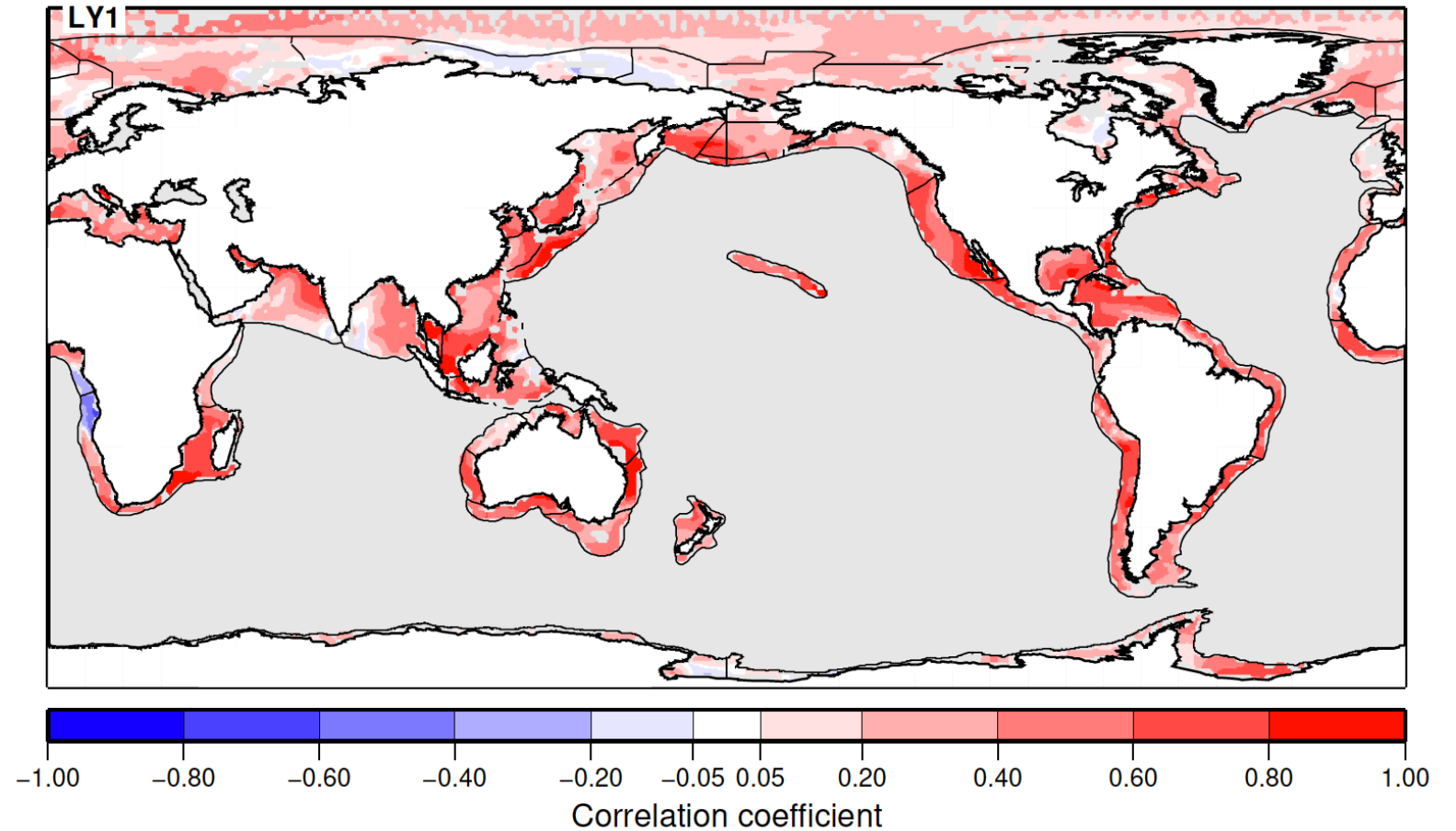
we made a
forecast for
2020 !



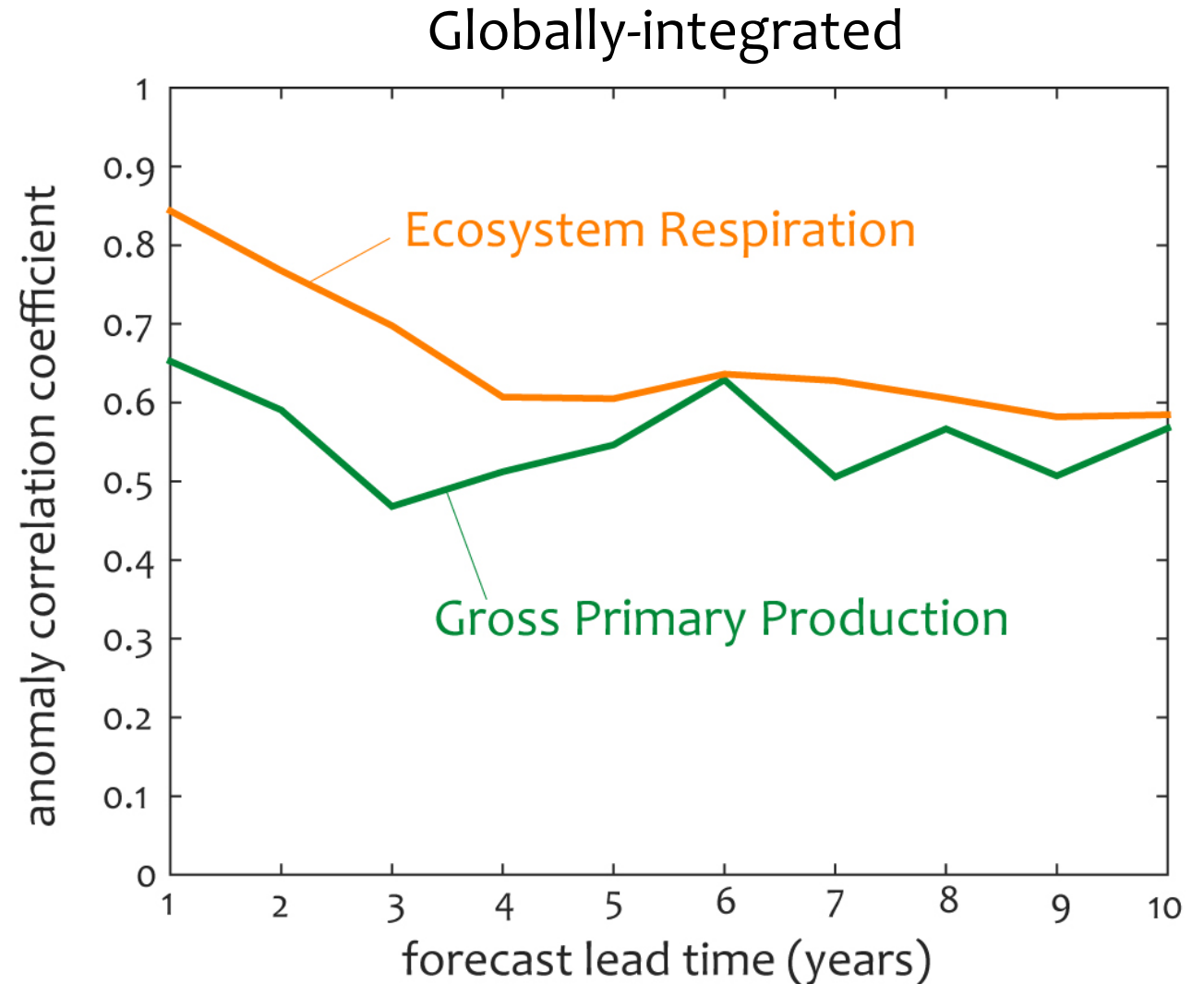
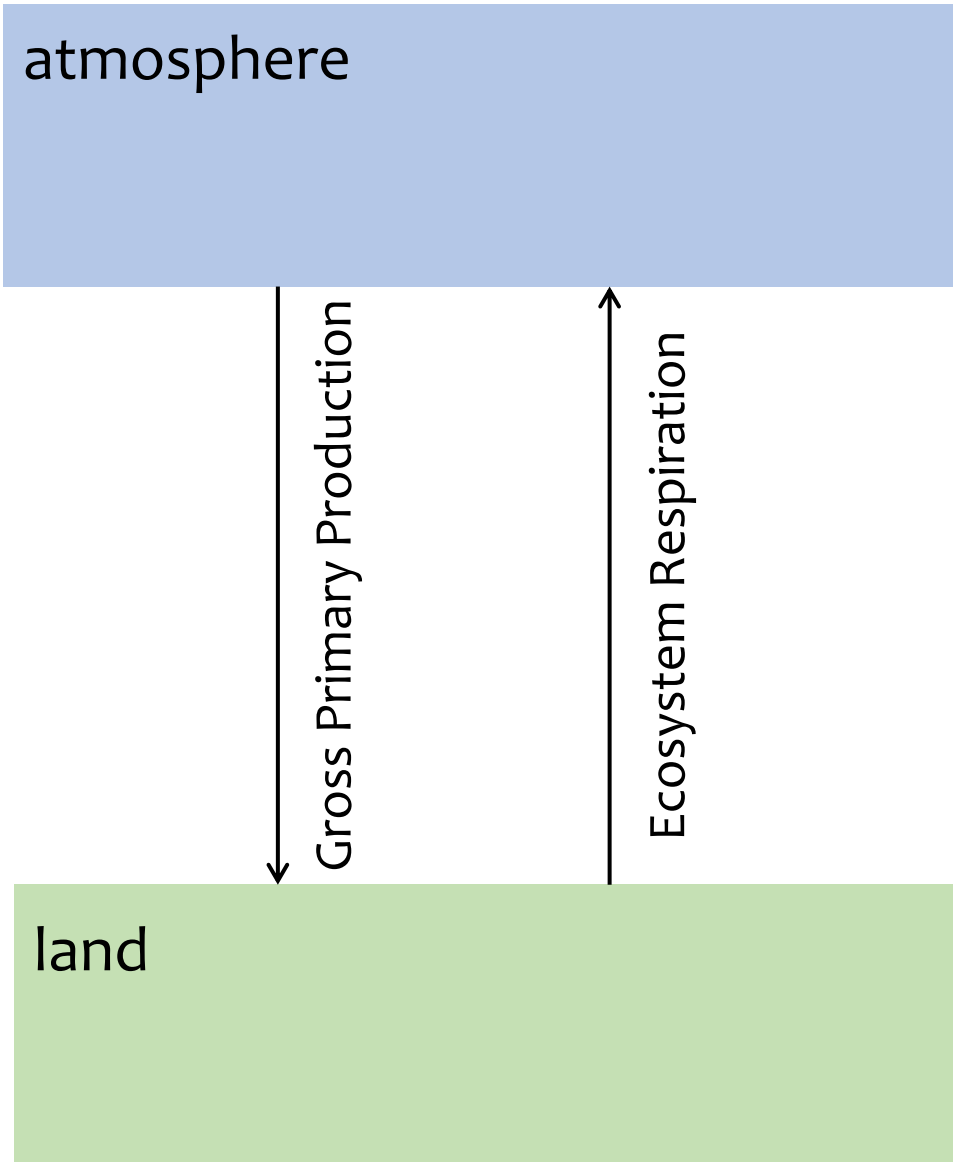
Predictable plankton



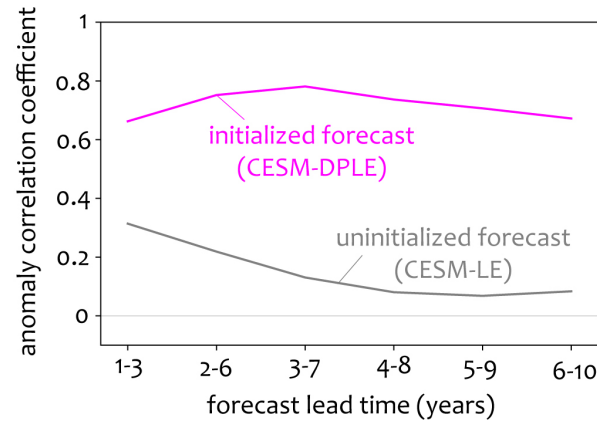
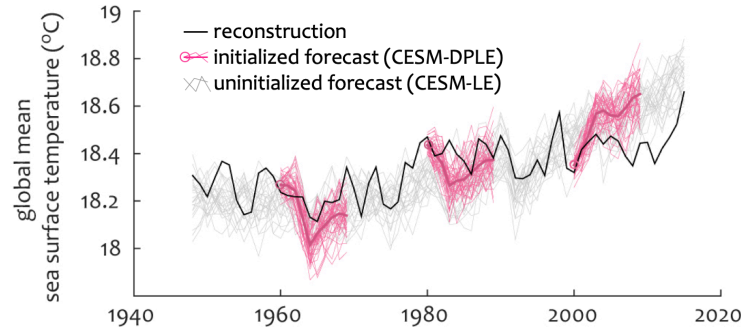
Net Primary Production -- Forecast lead time: 1 year



Terrestrial carbon fluxes



Conclusions



A novel set of decadal prediction simulations allows exploration of predictability in the Earth system

An uninitialized large ensemble is used to assess the impact of external forcing on predictability

There is potential to predict various aspects of the Earth system with several years lead time

