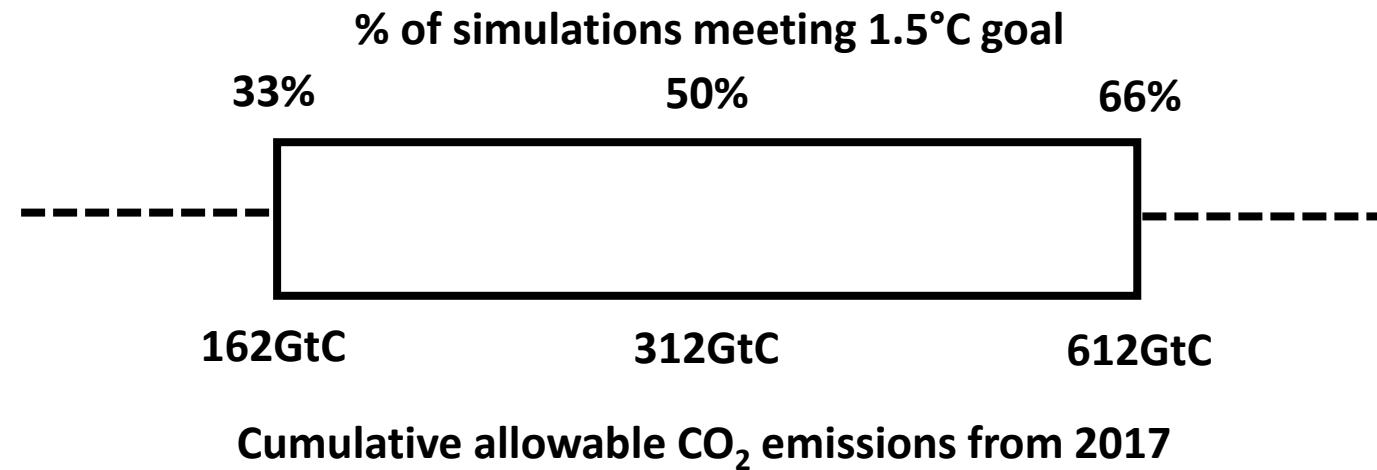


CURB CO₂: Carbon Uptake Revisited - Biases Corrected using Ocean Observations

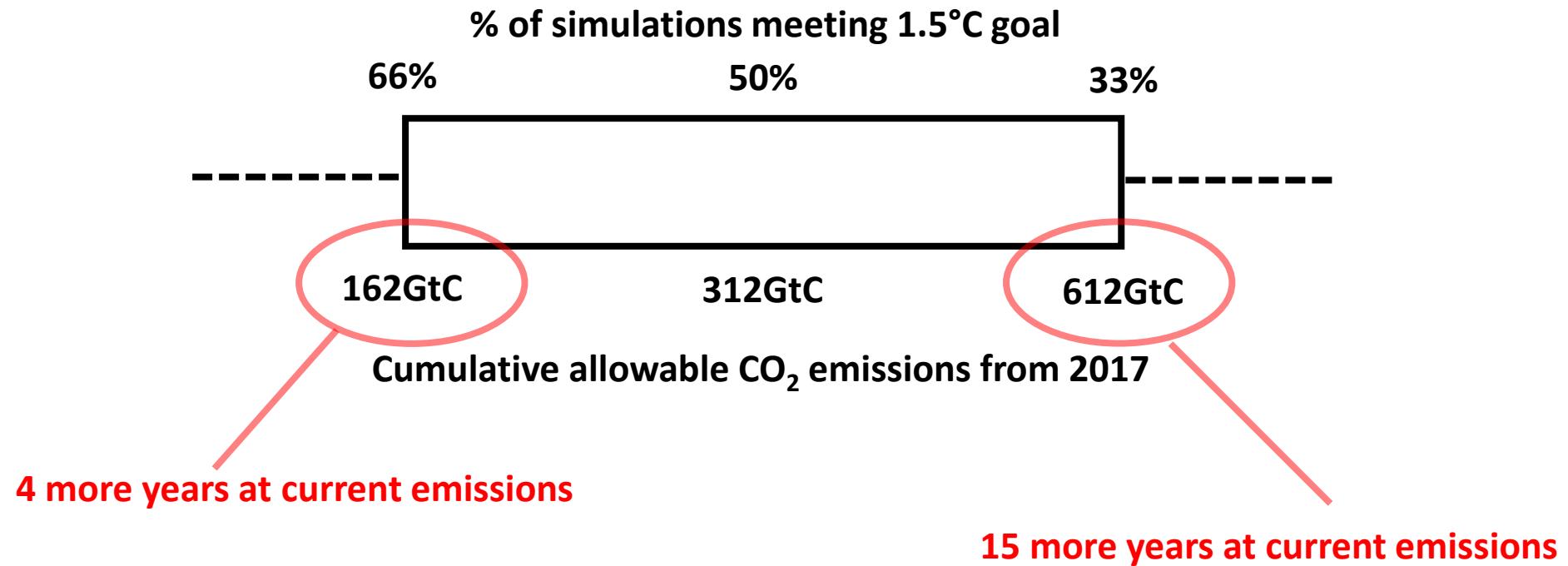
Paul Halloran, Alice Lebehot, Andy Watson, David Ford, Tobia Tudino, Doug McNeill,
Ute Schuster





IPCC AR5 Synthesis Report Table 2.2, GCP 2017, Carbon Brief 'carbon countdown'

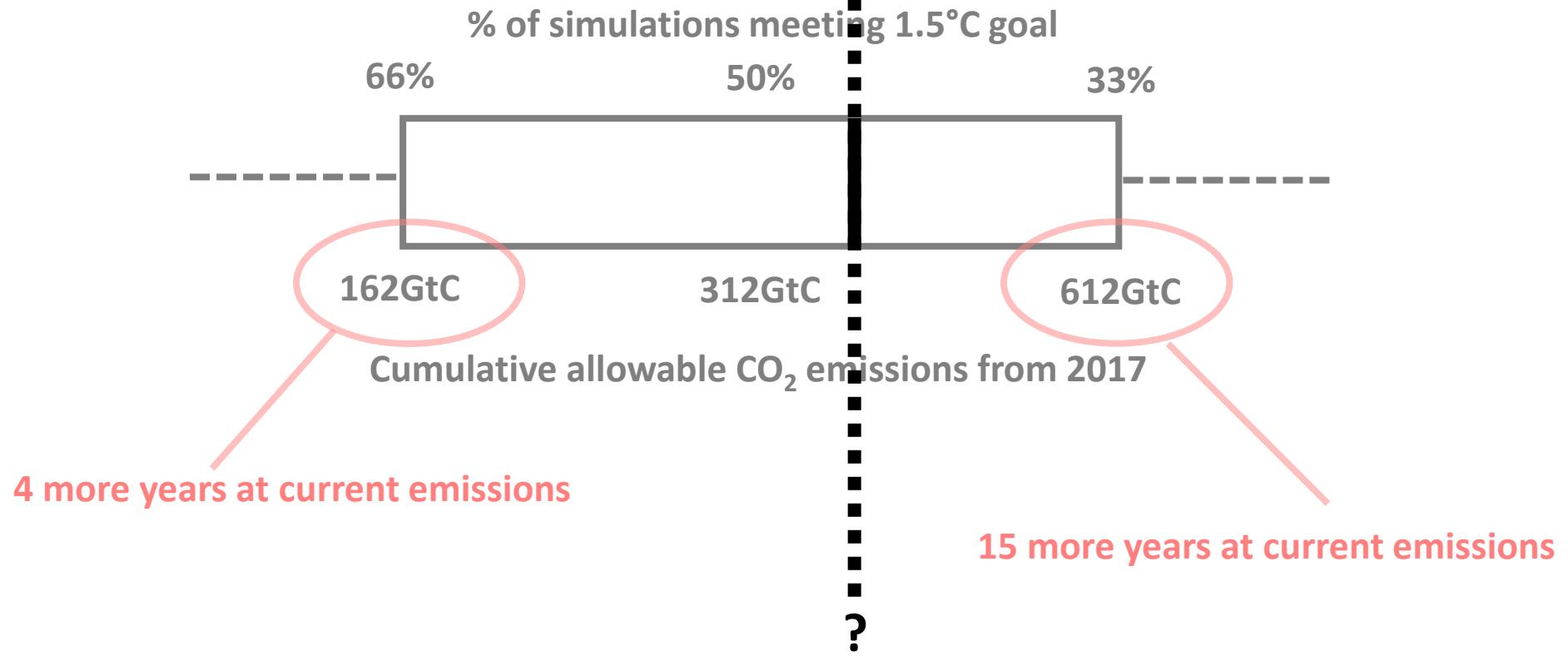




IPCC AR5 SPM Table 2.2, GCP 2017, Carbon Brief 'carbon countdown'

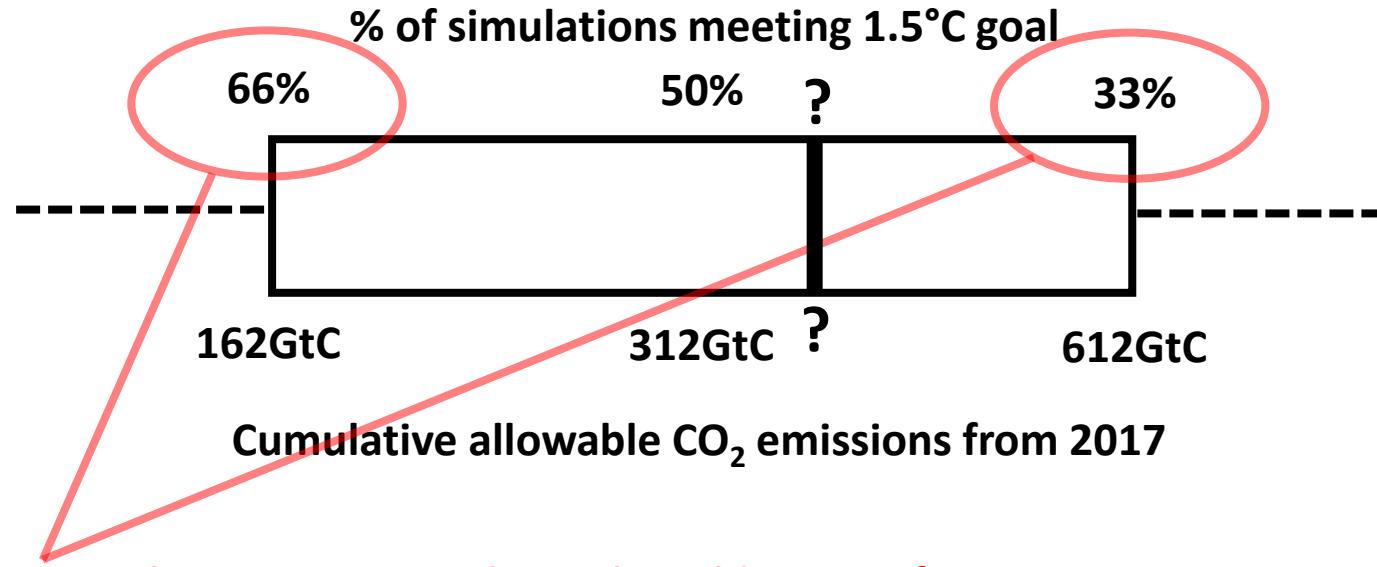


? To set the most useful emission targets it is
crucial to know where the *real world* sits



IPCC AR5 SPM Table 2.2, GCP 2017, Carbon Brief 'carbon countdown'



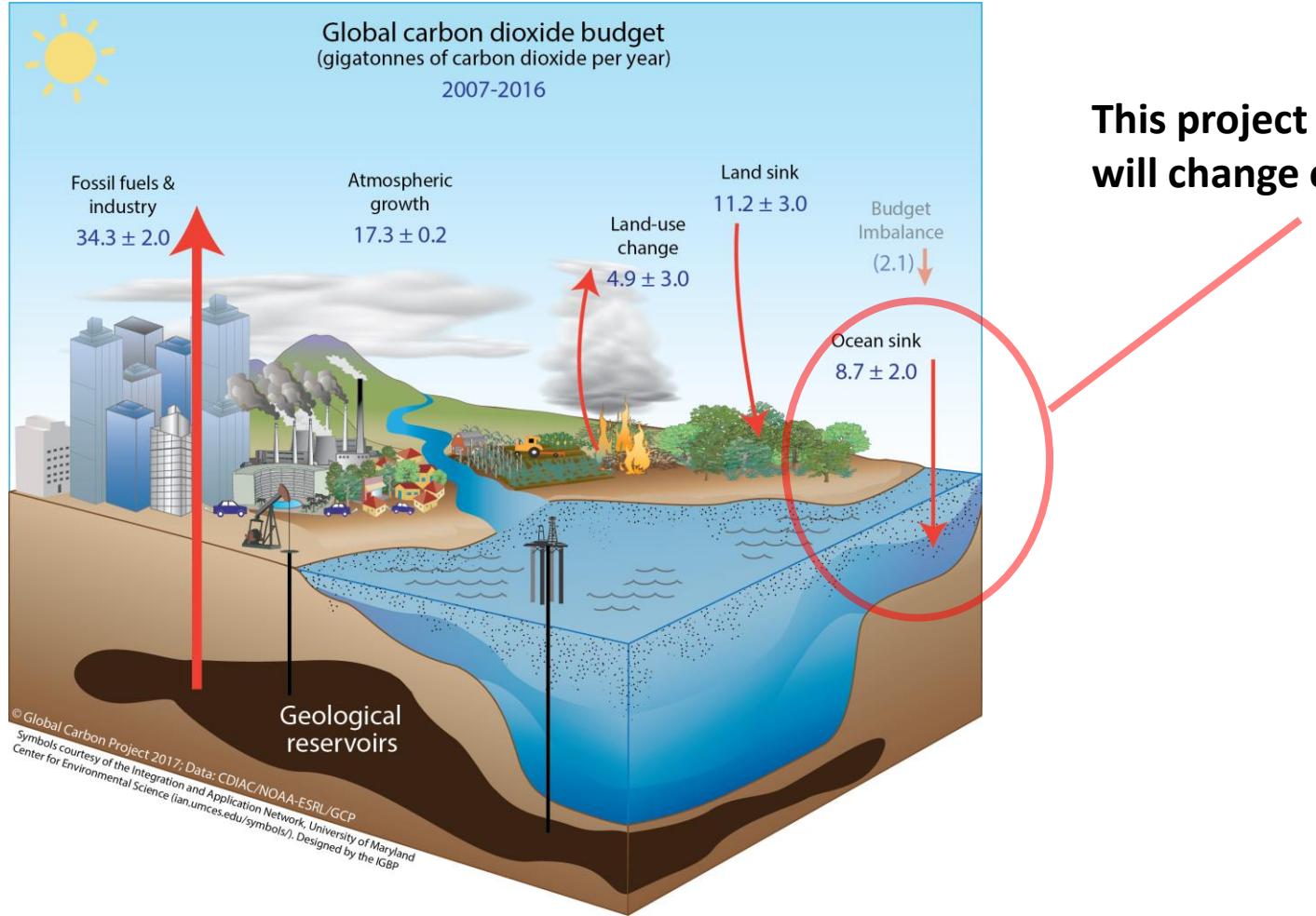


This uncertainty does not exist in the real world, comes from:

- 1) What fraction of CO₂ emissions stay in the atmosphere in each model
- 2) Each model's relationship between atm. CO₂ and warming

IPCC AR5 SPM Table 2.2, GCP 2017, Carbon Brief 'carbon countdown'



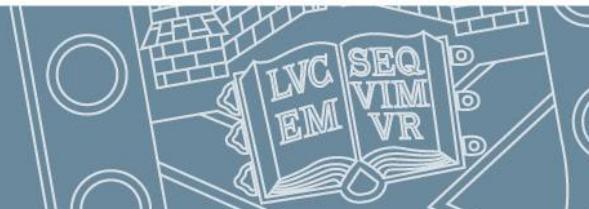


This project wants to know how this number will change over the coming decades

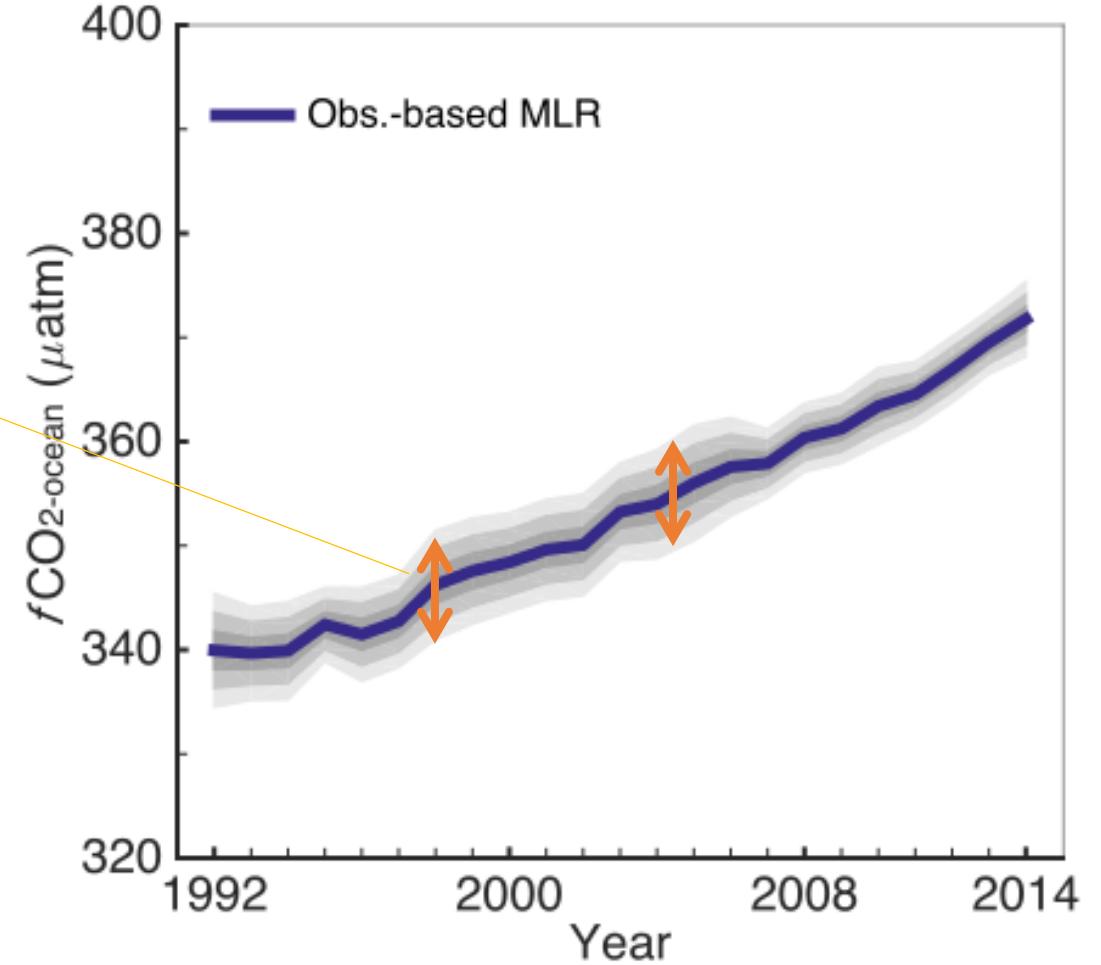
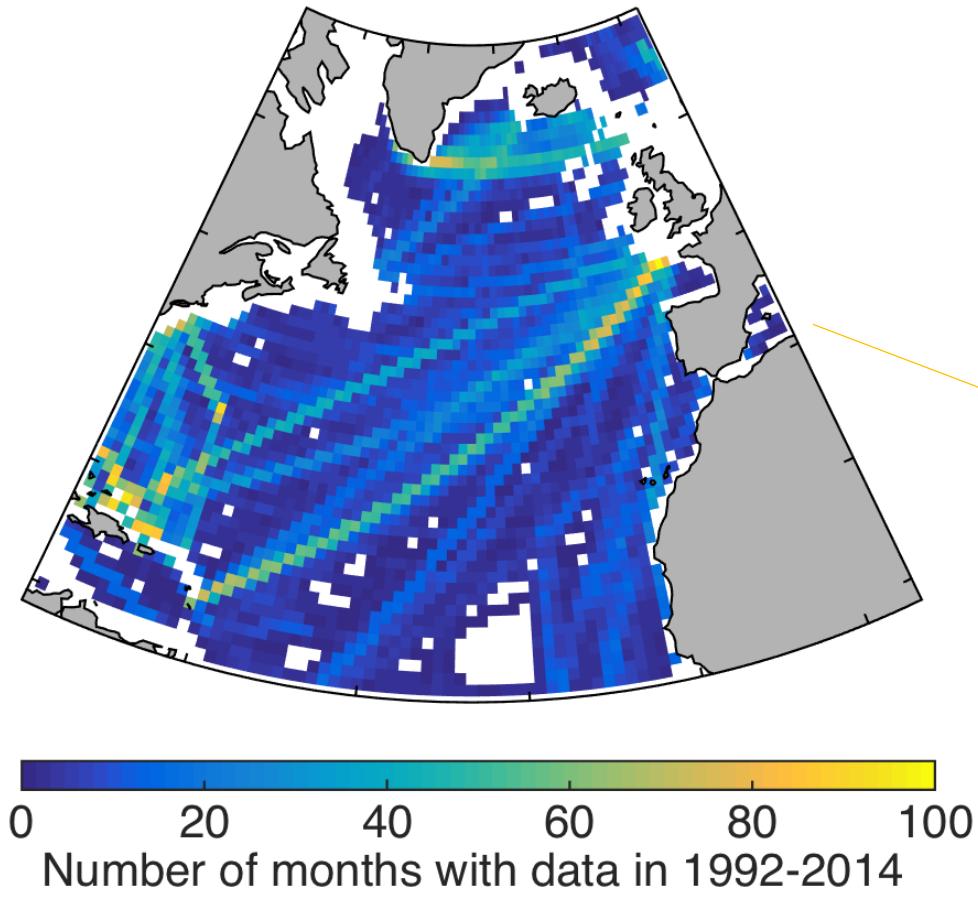
GCP 2017, [CDIAC](#); [NOAA-ESRL](#); [Le Quéré et al 2017](#); [Global Carbon Budget 2017](#)

Paul Halloran

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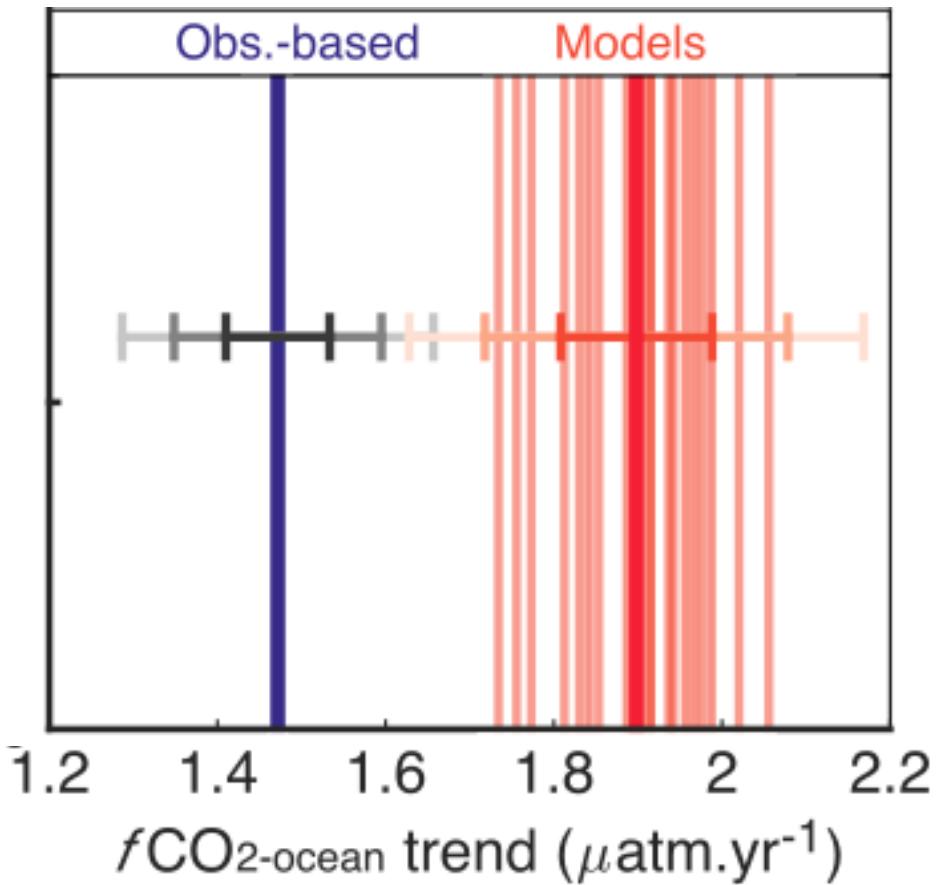
Step 1: What is the observed trend in ocean CO₂?



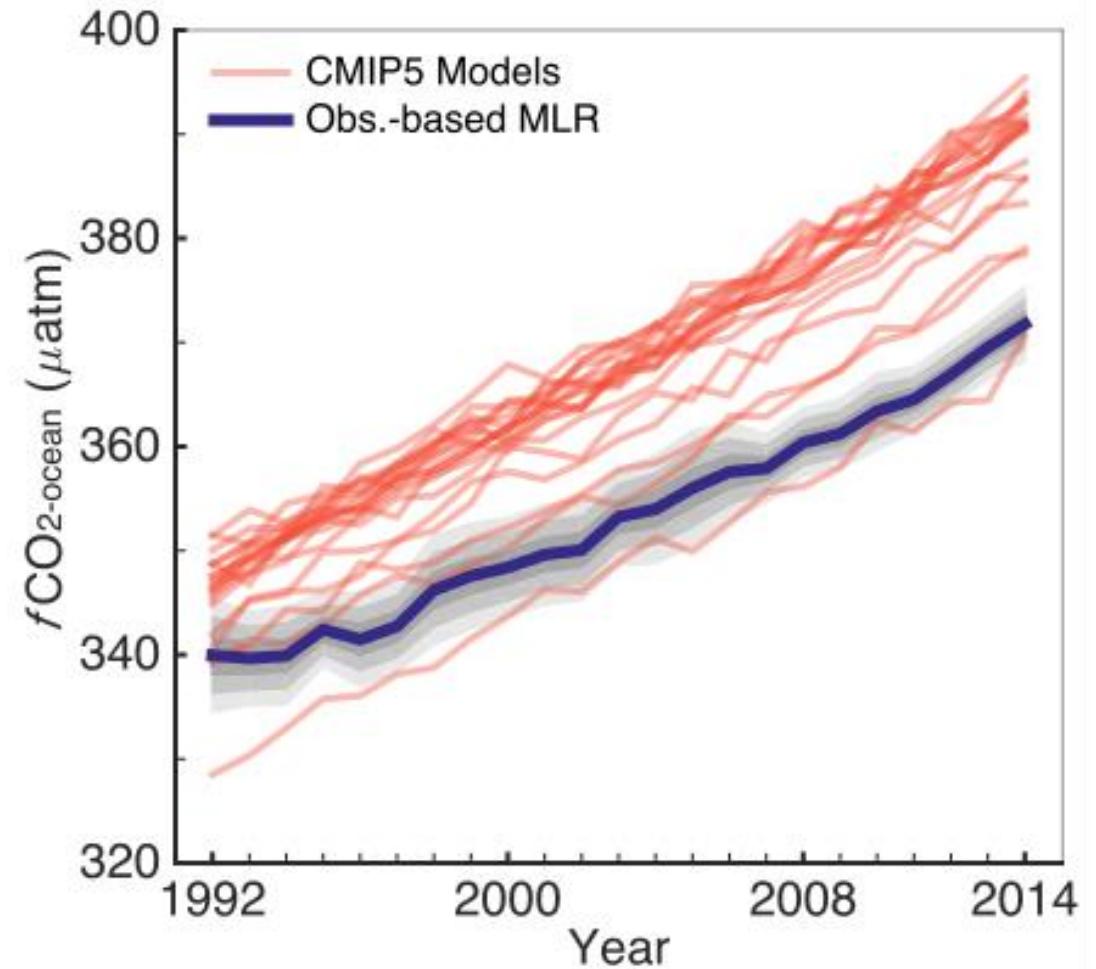
Lebehot et al., in revision



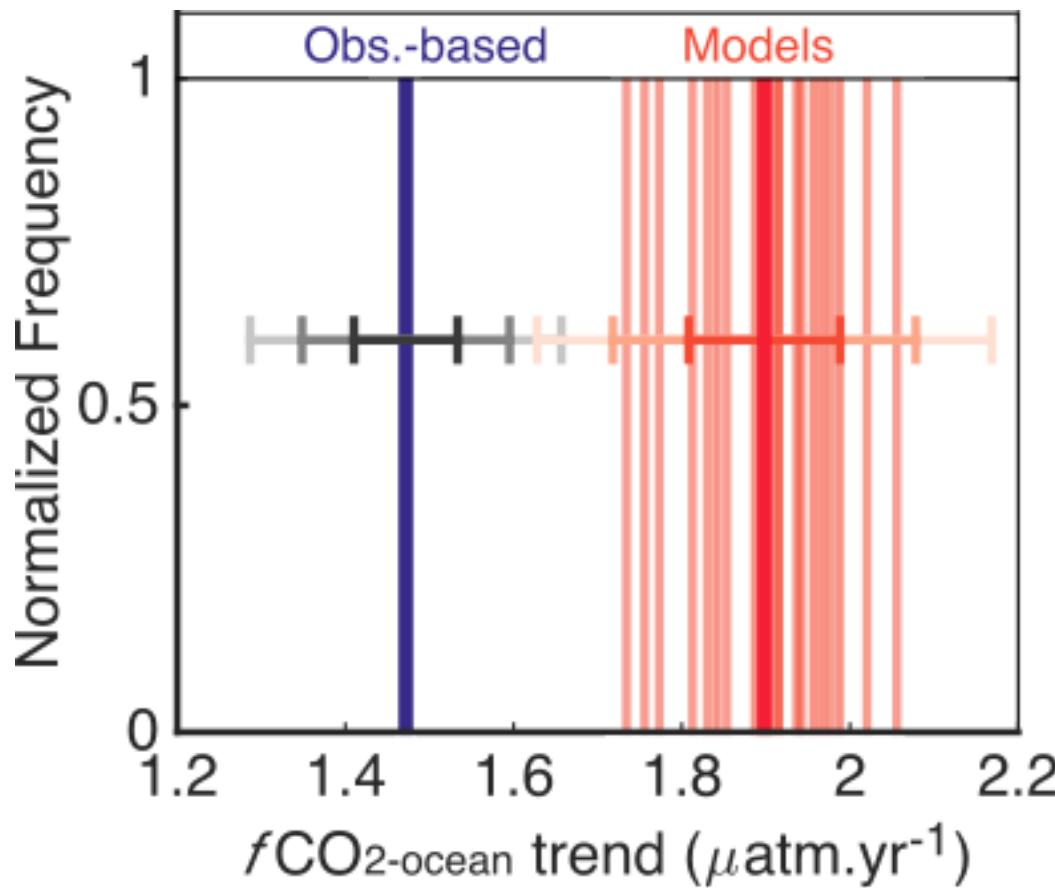
Step 2: How does it compare to current model projections?



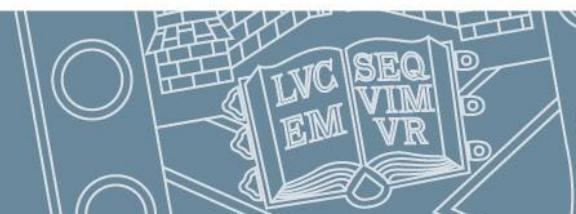
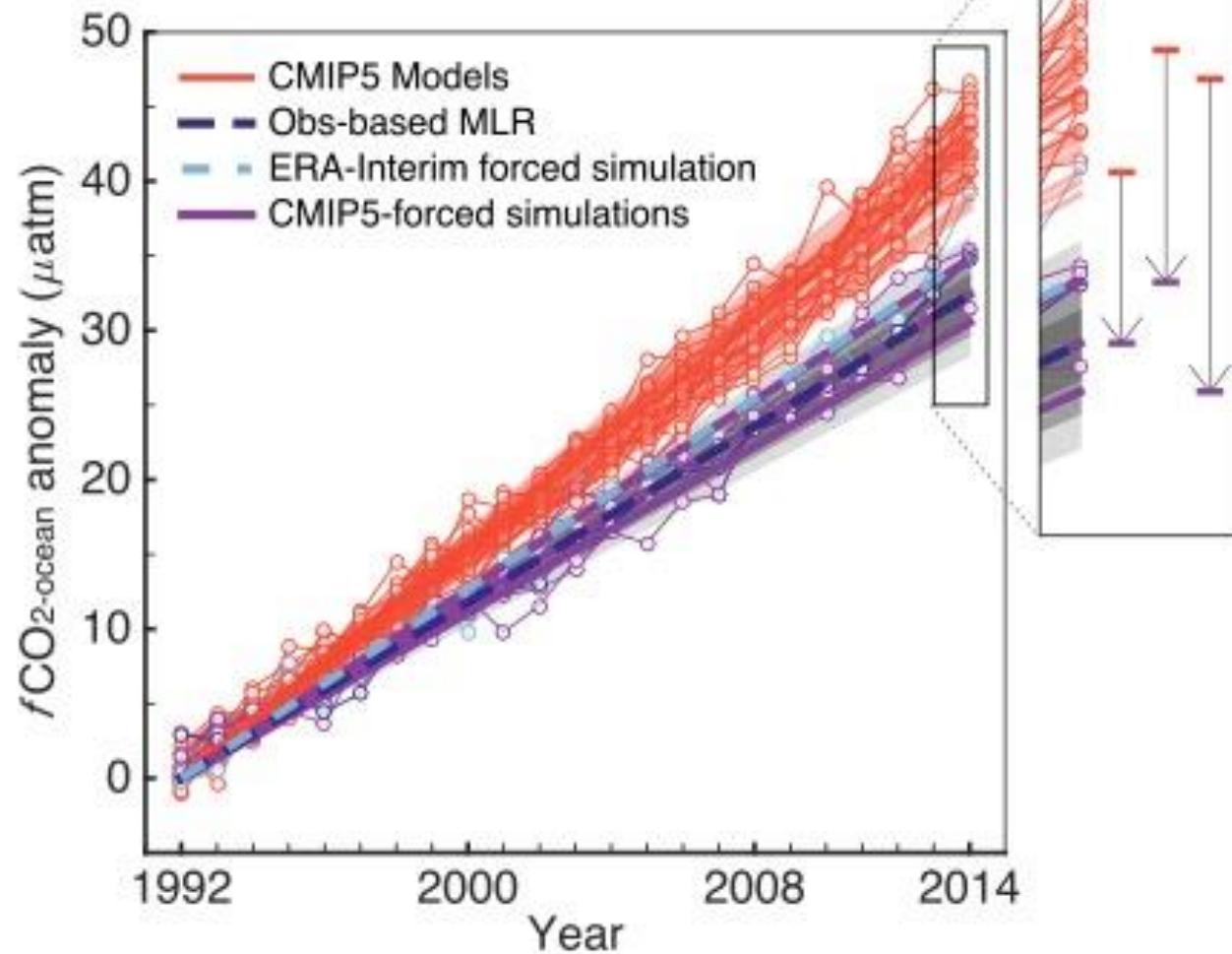
Lebehot et al., in revision

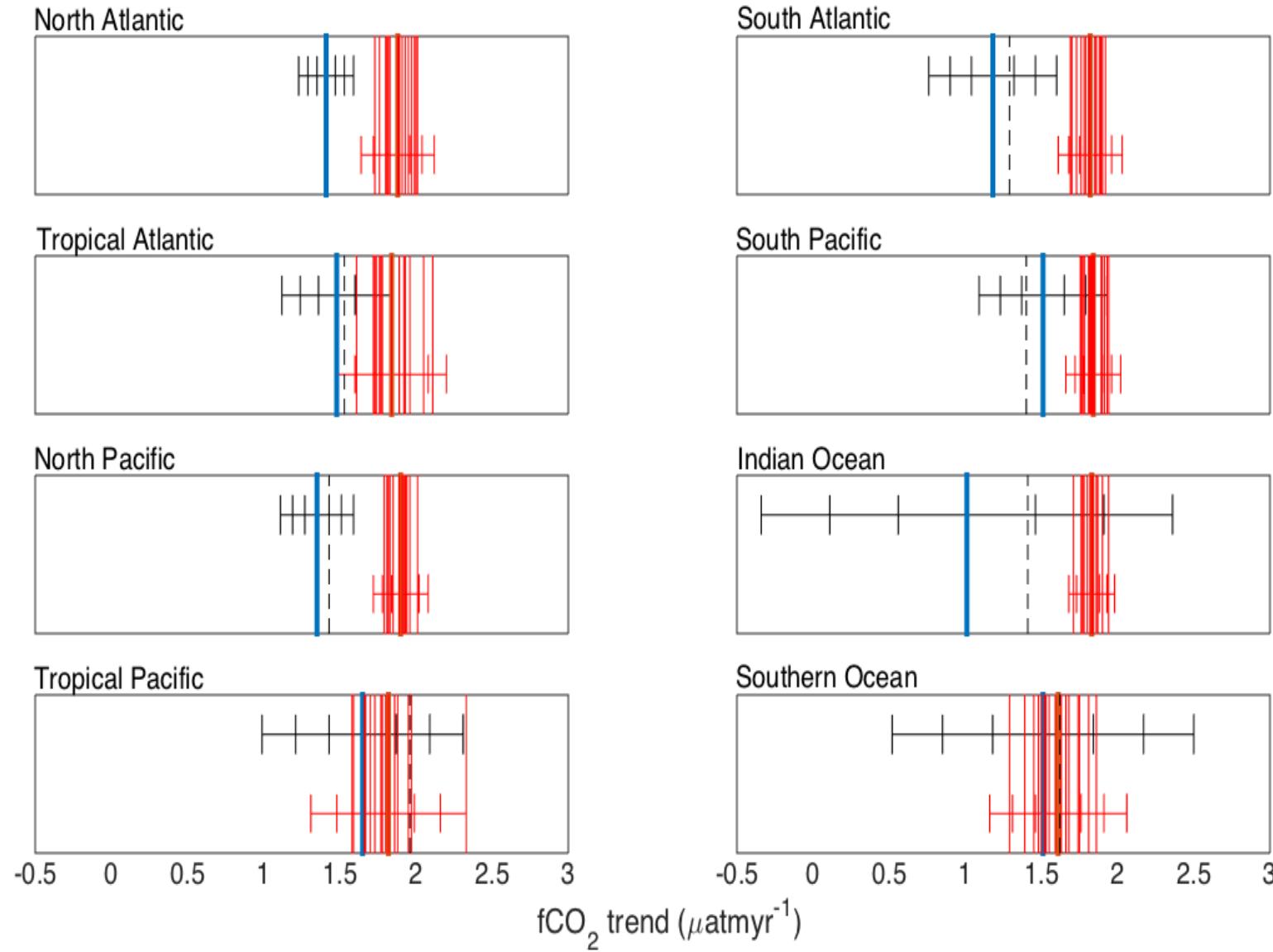


Step 3: Can we understand and correct for differences?



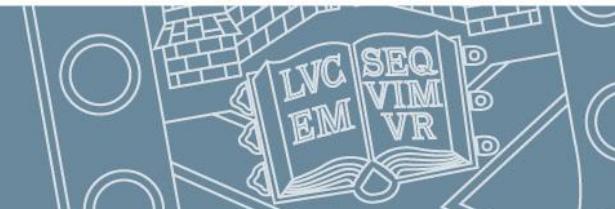
Lebehot et al., in revision



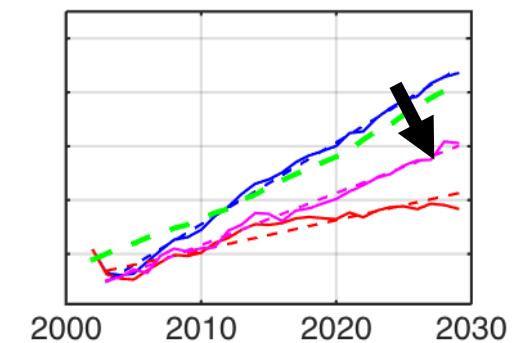
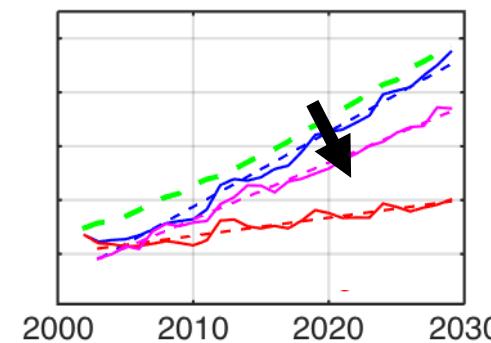
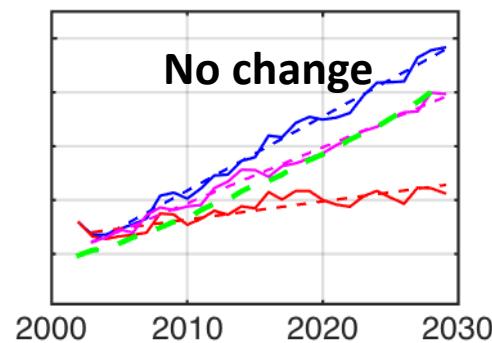
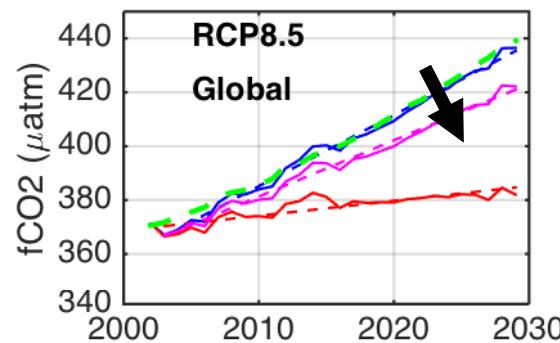
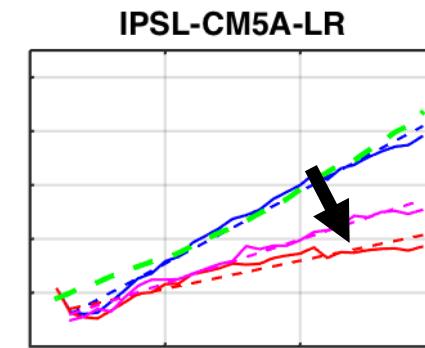
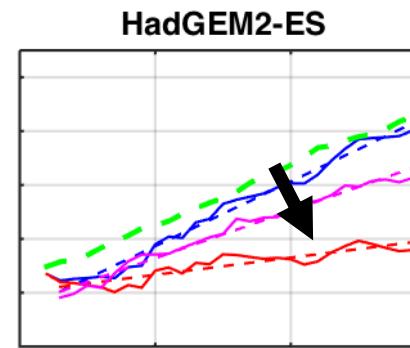
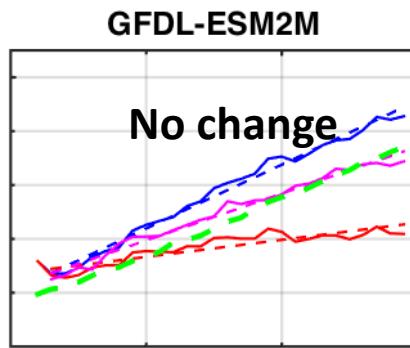
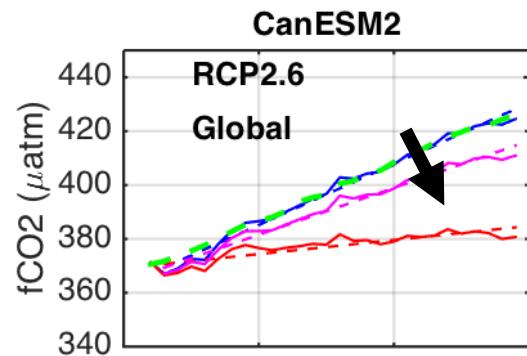


Observations

CMIP5 models



Impact on surface ocean CO₂ of bias-correcting models before doing future global projections *INITIAL RESULTS*



Green: original cmip5 timeseries. Magenta: bias-corrected projection with drift correction. Blue: bias-corrected projection. Red: model drift

Bias corrected predictions either have no impact, or reduce surface ocean CO₂ concentrations. Suggesting that CMIP5 models are typically under-predicting ocean CO₂ uptake and potentially underestimating allowable emissions.



Summary

- Where observations are adequate, it appears that models are underestimating recent trends in removal of CO₂ from atm. to the ocean
- Future projections again to underestimate future ocean CO₂ uptake
- Based on the ocean contribution to the budget alone, allowable emissions may be higher than CMIP5 models suggest

