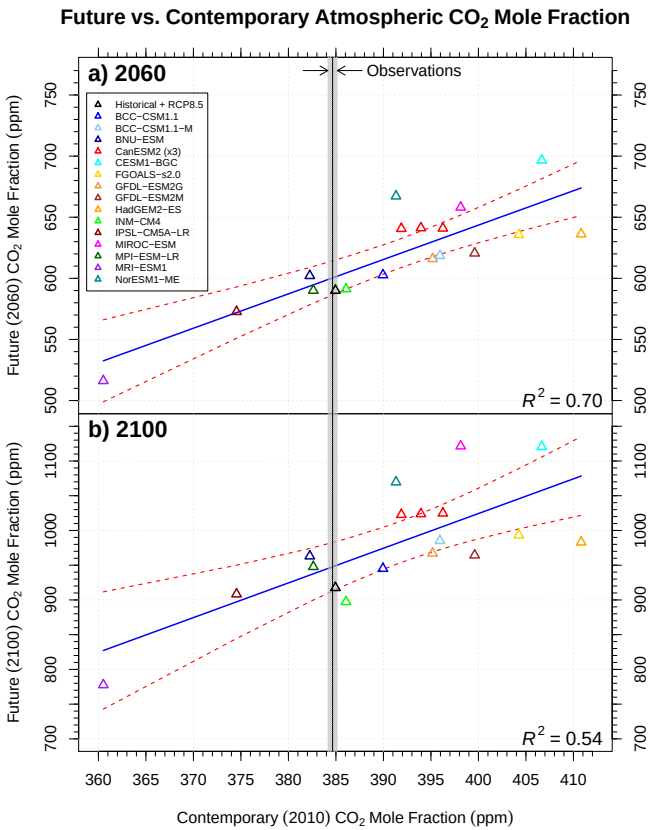
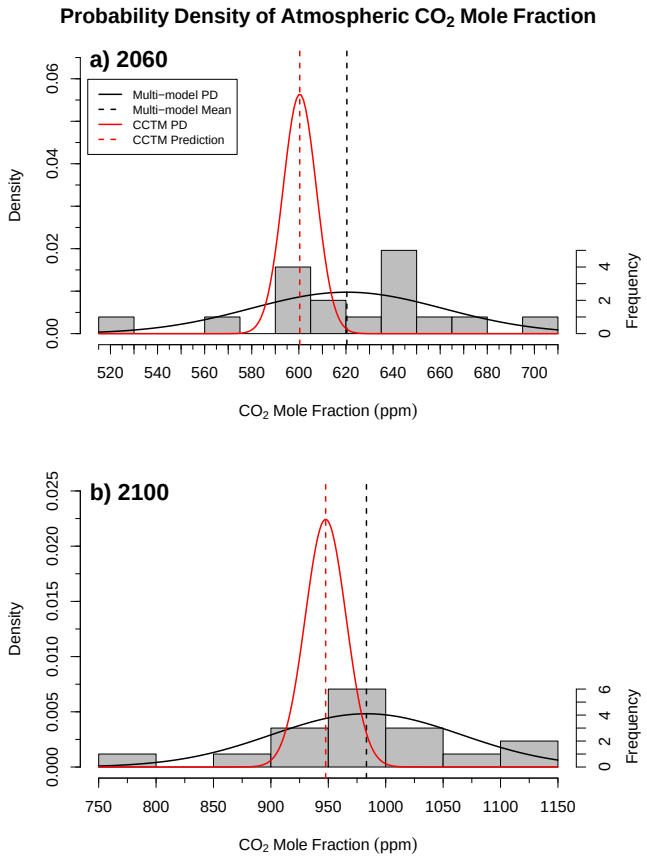
Emergent Constraint Developed from CMIP5 ESMs

An emergent constraint based on carbon inventories was applied to constrain future atmospheric CO_2 projections from CMIP5 ESMs.



- Much of the model-to-model variation in projected CO_2 during the 21st century is tied to biases that existed during the observational era.
- Model differences in the representation of concetration–carbon feedbacks and other slowly changing carbon cycle processes appear to be the primary driver of this variability.
- Range of temperature increases at 2100 slightly reduced, from $5.1 \pm 2.2°C$ for the full ensemble, to $5.0 \pm 1.9°C$ after applying the emergent constraint.



Best estimate using Mauna Loa CO_2

At 2060: 600 ± 14 ppm, 21 ppm below the multi-model mean

At 2100: 947 ± 35 ppm, 32 ppm below the multi-model mean

Hoffman, Forrest M., James T. Randerson, Vivek K. Arora, Qing Bao, Patricia Cadule, Duoying Ji, Chris D. Jones, Michio Kawamiya, Samar Khatiwala, Keith Lindsay, Atsushi Obata, Elena Shevliakova, Katharina D. Six, Jerry F. Tjiputra, Evgeny M. Volodin, and Tongwen Wu. February 2014. "Causes and Implications of Persistent Atmospheric Carbon Dioxide Biases in Earth System Models." *J. Geophys. Res. Biogeosci.*, 119(2):141–162. doi:10.1002/2013JG002381. *Most downloaded JGR-B paper for February 2014!*