Fourth International Conference on Earth System Modelling
4ICESM-216, 2017

Searching for climate equilibrium: short instrumental records, slow ocean adjustment, and sparse paleoclimate observations

P. Huybers
Harvard University, United States (phuybers@fas.harvard.edu)

The latest IPCC Assessment Report widened the Equilibrium Climate Sensitivity (ECS) range from 2–4.5°C to 1.5–4.5°C in order to account for lack of consensus between estimates based on climate models and instrumental observations. This lack of consensus arises from differences in how anomalies in outgoing radiation are extrapolated as a function of global average temperature. Better accounting for the structure of this extrapolation and its uncertainties using a Bayesian fit to general circulation model simulations indicates that instrumental and model-based estimates are both consistent with a lower-range ECS value of 2°C. The upper range of ECS, however, largely depends on the strength of feedbacks associated with the Eastern Equatorial Pacific and Southern Ocean. Feedbacks in these regions are essentially unconstrained by instrumental observations because warming manifests only over the centennial timescales associated with thermal adjustment of the interior ocean. Questions regarding how far out of thermal equilibrium are the Eastern Equatorial Pacific and Southern Ocean, how fast will these regions warm, and what feedbacks will such warming evoke are addressed using inversions of ocean tracer observations and Holocene paleoclimate records.