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# Model Climate Sensitivity Spread forced by Mean Sea Surface Temperature Biases

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Uncertainties in the numerical realization of small-scale physical processes in coarse-resolution IPCC climate models cause large spread in the global mean and regional climate response to a given anthropogenic forcing scenario and they cause the climate models to have mean state climates different from the observed and different to each other.
In a series of sensitivity simulations with an atmospheric general circulation model coupled to a slab ocean the role of mean state sea surface temperature (SST) differences in global mean and regional climate response spread is explored. The model simulations are forced into the control mean state SST of 24 IPCC climate models and $2xCO_2$-forcing experiments are started from the different control states. The differences in the SST mean state cause large differences in other climate variables but do not reproduce most of the large spread in the mean state climate over land and ice covered regions found in the IPCC model simulations.
The spread in the mean SST climatology leads to a spread in the global mean and regional climate response of about 10%, which is about half as much as the total spread in the IPCC climate models and is therefore of considerable size. Since the SST climatology biases are only a small part of the models mean state climate biases it is likely that the climate model's mean state climate biases are accounting for a large part of the model's climate sensitivity spread.