

# **The effect of doubled CO<sub>2</sub> and model basic state biases on the monsoon-ENSO system: the mean response and effects on variability**

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The impact of doubled CO<sub>2</sub> concentration on the Asian summer monsoon is studied using a coupled ocean-atmosphere model. Both the mean seasonal precipitation and interannual monsoon variability are found to increase in the future climate scenario presented. Systematic errors in current climate simulations of the coupled system prevent accurate representation of the monsoon-ENSO teleconnection, of prime importance for seasonal prediction and for determining monsoon interannual variability. By applying seasonally varying heat flux adjustments to the tropical Pacific and Indian Ocean surface in the future climate simulation, some assessment can be made of the impact of systematic model error on future climate scenarios. In simulations where the flux adjustments are implemented, the response to climate change is magnified, with the suggestion that systematic biases may be masking the true impact of increased greenhouse gas forcing. The teleconnection between ENSO and the Asian summer monsoon remains robust in the future climate, although the Indo-Pacific takes on more of a biennial character in the flux adjusted simulation. Assessing the teleconnection across interdecadal timescales shows wide variations in its amplitude despite the absence of external forcing, suggesting that recent changes in the observed record may represent internal variation.