

TOWARDS A MORE RELIABLE METRIC OF CLIMATE CHANGE

N. Stuber, M. Ponater and R. Sausen

DLR–Institut für Physik der Atmosphäre, Oberpfaffenhofen, D-82230 Weßling,
Nicola.Stuber@dlr.de

In order to react appropriately to the requirements of climate conventions, there is a strong need for a reliable metric of climate change. There are a couple of such metrics that allow to predict climate change without the need to accomplish expensive and time consuming climate simulations. The metrics currently used are all based on the radiative forcing concept. This concept only holds for global mean quantities and only for spatially homogeneous perturbations of radiatively active substances. The concept therefore fails to assess the possible effects of, e.g., aerosol or ozone perturbations in a satisfactory way.

Formulating an alternative metric requires an improved understanding of the feedback mechanisms between global climate forcing and global climate change. To this end we accomplished a set of experiments with a coupled atmosphere–ocean model, using highly idealized ozone perturbations. First results using horizontally inhomogeneous ozone perturbations indicate a higher climate sensitivity than for an equivalent CO₂ perturbation. The behaviour is qualitatively independent of the perturbed region and applies to stratospheric perturbations as well as perturbations in the planetary boundary layer. Horizontally homogeneous ozone perturbations differ more strongly with respect to the associated climate sensitivity. Possible origins to these effects are feedback mechanisms related to water vapour, sea ice and clouds.