Geophysical Research Abstracts
Vol. 15, EGU2013-7206, 2013
EGU General Assembly 2013

Biases in tropical convection in CMIP5 models, their origin and remote climatic impacts.

Panos Athanasiadis, Alessio Bellucci, Silvio Gualdi, and Enrico Scoccimaro
CMCC, Bologna, Italy (panos.athanasiadis@cmcc.it)

Being imperfect, climate models (CGCMs) are known to have significant biases in the representation of tropical convection and precipitation comparing to the observed climatological fields. A number of studies have investigated the causes of these biases pointing to weaknesses in one or another parameterization scheme (convection, cloud formation, etc) and feedback mechanisms involving the response of the ocean circulation.
In this study we examine the respective biases in a number of CMIP5 historical simulations (15 different models). First, an analysis of the so-called double intertropical convergence zone syndrome is carried out for this multi-model ensemble, following the methodology of Bellucci et al., 2010. This work emphasizes the partitioning of the associated precipitation biases (frequency and intensity) according to large-scale convection regimes (deep and shallow convective components). Extending this work, we examine the role of low-level cloud biases in modifying the radiative budget and, consequently, causing the evident biases in convection and precipitation. The diabatic heating associated with such biases suggests a modified energy budget with far reaching consequences.
Next, using monthly mean fields from the CMIP5 multi-model ensemble, we calculate the respective Rossby Wave Source (RWS) and based on theoretical arguments and statistical relationships we document the likely remote climatic effects of the model biases in deep-convection.
Our work contributes to the general understanding of the origin of recurring biases in the current generation of climate models. The ultimate goal of reducing these biases is fundamental for advancing seasonal forecasting, decadal prediction and long-term climate projections.