EMS Annual Meeting Abstracts
Vol. 9, EMS2012-350, 2012
12th EMS / 9th ECAC

Temperature response and climate sensitivity in last millennium climate simulations and reconstructions.

L. Fernández-Donado (1,2), J. F. González-Rouco (1,2), C. C. Raible (3), D. Barriopedro (1), J. Luterbacher (4), J. H. Jungclaus (5), D. Swingedouw (6), J. Servonnat (6), S. Tett (7), P. Brohan (8), E. Zorita (9), S. Wagner (9), C. M. Ammann (10), P. Yiou (6), S. Lorenz (5), S. J. Phipps (11), and D. Klocke (12)

(1) Universidad Complutense de Madrid, CC. Físicas, Dpto. Física de la Tierra, Astronomía y Astrofísica II, Madrid, Spain (laurafernandez@fis.ucm.es), (2) Instituto de Geociencias CSIC-UCM, (3) Physics Institute, University of Bern, Switzerland, (4) Justus Liebig University of Giessen, Germany, (5) Max Planck Institute, Hamburg, Germany, (6) LSCE, Paris, France, (7) School of Geosciences, University of Edinburg, UK, (8) Hadley Centre, UK, (9) Helmholtz-Zentrum Geesthacht, Germany, (10) National Center for Atmospheric Research, Boulder, USA, (11) University of New South Wales, Sydney, Australia, (12) ECMWF, Reading, UK

An assessment of the state of knowledge of the last millennium climate from both paleoclimatic sources, simulations and reconstructions, is proposed. A total of 26 forced runs coming from 8 different Atmosphere Ocean General Circulation Modes (AOGCMs) are analyzed. The AOGCMs, namely ECHO-G, CSM1.4, CCSM3, MPI-ESM, CNRM, IPSL, CSIRO and HadCM3, have produced the simulations under different assumptions of natural and anthropogenic external forcings such as solar variability, volcanic activity, greenhouse gases, anthropogenic aerosols, land use, etc. These forcings are described in terms of the total effective radiative forcing for each model, evidencing the different scenarios applied to the models.

The analysis of the simulations is focused on their temperature response, its temporal evolution, its spatial characterization for the MCA-LIA transition and its relation with the external forcing. The quasi linear relation found between temperature response in simulations and the total equivalent radiative external forcing applied is useful to calculate a Paleo Transient Climate Response (PTCR) estimation for the last millennium for each model, and to compare it with their already known values of future climate change transient climate response and equilibrium climate sensitivity. In turn, the available climate reconstructions for the last millennium are also compared with the simulations, not only their temporal evolution but also their spatial characterization of MCA-LIA transition. PTCR estimates are also obtained for the reconstructions based on the same procedure as the simulations.