



Using paleoclimate proxy-data to select optimal realisations in an ensemble of simulations of the climate of the past millennium

H. Goosse (1), H. Renssen (2), A. Timmermann (3), R.S. Bradley (4), M.E. Mann (5)

(1) Institut d'Astronomie et de Géophysique G. Lemaître, Université catholique de Louvain, Belgium (hgs@astr.ucl.ac.be), (2) Faculty of Earth and Life Sciences, Vrije Universiteit Amsterdam, The Netherlands, (3) IPRC, SOEST, University of Hawaii, Honolulu, USA, (4) Department of Geosciences, University of Massachusetts, Amherst, USA, (5) Department of Meteorology and Earth and Environmental Systems Institute (EESI), Pennsylvania State University, USA

We present and describe in detail the advantages and limitations of a technique that combines in an optimal way model results and proxy-data time series in order to obtain states of the climate system consistent with model physics, reconstruction of past radiative forcing and proxy records. To achieve this goal, we select among an ensemble of simulations covering the last millennium performed with a low-resolution 3-D climate model the ones that minimise a cost function. This cost function measures the misfit between model results and proxy records. In the framework of the tests performed here, an ensemble of 30 to 40 simulations appears sufficient to reach reasonable correlations between model results and reconstructions, in configurations for which a small amount of data is available as well as in data-rich areas. Preliminary applications of the technique show that it can be used to provide reconstructions of past large-scale temperature changes, complementary to the ones obtained by statistical methods. Furthermore, as model results include a representation of atmospheric and oceanic circulations, it can be used to provide insights into some amplification mechanisms responsible for past temperature changes. On the other hand, if the number of proxy record is too low, it could not be used to provide reconstructions of past changes at regional scale.