Climate of the Past
An Interactive Open Access Journal of the European Geosciences Union

Clim. Past, 1, 9-17, 2005
www.clim-past.net/1/9/2005/

A timescale analysis of the Northern Hemisphere temperature response to volcanic and solar forcing

S. L. Weber
Department of Climate Variability Research, Royal Netherlands Meteorological Institute (KNMI), P.O. Box 201, 3730 AE De Bilt, The Netherlands

Abstract. The Northern Hemisphere temperature response to volcanic and solar forcing in the time interval 1000–1850 AD is studied using first a set of simulations with an intermediate-complexity climate model, driven by reconstructed forcings. Results are then compared with those obtained from the seven high-resolution reconstructed temperature records for the last millenium that are at present available. Focus of the analysis is on the timescale dependence of the response. Results between the model and the proxy-based reconstructions are remarkably consistent. The response to solar forcing is found to equilibrate at interdecadal timescales, reaching an equilibrium value for the regression of 0.2–0.3°C per W/m^2. The time interval between volcanic eruptions is typically shorter than the dissipation timescale of the climate system, so that the response to volcanic forcing never equilibrates. As a result, the regression on the volcanic forcing is always lower than the equilibrium value and goes to zero for the longest temporal scales. The trends over the pre-anthropogenic period are found to be relatively large in all reconstructed temperature records, given the trends in the reconstructed forcing and the equilibrium value for the regression. This is at variance with a recent claim that reconstructed temperature records underestimate climatic variations at multi-centennial timescales.

Final Revised Paper (PDF, 467 KB) Discussion Paper (CPD)

Citation: Weber, S. L.: A timescale analysis of the Northern Hemisphere temperature response to volcanic and solar forcing, Clim. Past, 1, 9-17, 2005. Bibtex EndNote Reference Manager