Geophysical Research Abstracts
Vol. 12, EGU2010-12936, 2010
EGU General Assembly 2010

Exploring the climate response to the 1815 Tambora eruption with respect to natural climate variability

Stephan J. Lorenz, Claudia Timmreck, and Johann H. Jungclaus
Max-Planck-Institut fuer Meteorologie, Hamburg, Germany (stephan.lorenz@zmaw.de)

The largest historic volcanic eruption with known origin was the explosion of Mount Tambora in Indonesia in April 1815. In the aftermath of this devastating eruption, the following year 1816 came to be known as the "year without a summer", in particular in USA, Canada, and Europe, where the worst famine over a century as well as typhus epidemics accompanied by enhanced emigration from Europe were recorded. The stratospheric aerosol mass load was estimated to be about three times that of the Pinatubo eruption in 1991, leading to strong impact on the Earth's climate system.
In a series of ensemble simulations of the last Millennium we applied our Earth system model, based on the ECHAM5/MPIOM model family, to investigate the climate signal of the Tambora eruption with respect to natural and forced variability. This event contributed to one of the strongest cooling periods during the last Millennium in the ensemble of simulations. However, this period is associated with a large ensemble spread in simulated air temperature on a hemispheric and global as well as on a regional scale, with limited to very strong atmospheric response. The unique path of the climate evolution through the Earth's history yielding the extreme summer in 1816 in North America and Europe is compared with the simulations. A special focus of our analysis is Tambora's impact on climate and its relationship with the status of the climate system, e.g. the ENSO state, at the time of the eruption. Additionally, the contribution of the large volcanic eruption with tropical but unknown location about six years prior to the Tambora in 1809 will be discussed.