Geophysical Research Abstracts
Vol. 13, EGU2011-1951, 2011
EGU General Assembly 2011

Surface Air Temperature Changes during the Last Millennium Simulated by a Climate System Model

Wenmin Man (1,2), Tianjun Zhou (1), Jie Zhang (1,2)

(1) Institute of Atmospheric Physics, Chinese Academy of Sciences, LASG, Beijing, China , (2) Graduate University of Chinese Academy of Sciences, Beijing, China

The temporal and spatial patterns of surface air temperature change during the last millennium are simulated with a climate system model named FGOALS_gl. The simulation is driven by reconstructions of both natural forcing (solar variability, volcanic aerosol) and anthropogenic forcing (greenhouse gases, sulfate aerosol). The model results are compared against the multi-proxy reconstruction data of Mann et al. (2009). Major features of the past millennial global SAT variations, including the Medieval Climate Anomaly (AD1000-1300), the Little Ice Age (AD1400-1700) and the 20th Century Warming, are generally consistent with the reconstruction. The simulated MCA shows a cooling pattern over much of the globe with reference to the 1961-1990 mean. The LIA is characterized by pronounced coldness over the extratropical Northern Hemisphere continents in both the reconstruction and the simulation. The simulated global mean SAT difference between MCA and LIA is 0.16°C, with enhanced warming occurring over North American, high-latitude North Atlantic, and Arctic Eurasian. The model is able to reasonably reproduce both the hemispheric- and continental-scale SAT variations of the last millennium. The coincidence suggests that the specified external forcings have played significant roles in large-scale SAT evolutions during the last millennium. Consistencies between the simulation and the reconstruction on regional scales are generally lower than that on large scales. There is general agreement between the simulated and the reconstructed time series over China despite difference in the detail. The coherence supports the impacts of external forcing on SAT variations over China.