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Climate Variability in China in an Ensemble Simulation for the last 1200 years

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The climate in China is simulated using the atmosphere-ocean general circulation model ECHAM5/MPI-OM for 800-2005AD subject to anthropogenic and natural forcings. The ensemble simulation which comprises five members is compared with available regional temperature and precipitation reconstructions. The temperature comparison reveals weak consistency with long term anomaly periods known as the Medieval Warm Period (MWP), the Little Ice Age (LIA) and the Modern Warming (MW). Transient temperature anomalies in the Northeast, Southeast, and West China are detected up to centennial time scales. The uncertainty of the simulations is assessed by the ensemble spread which varies on long time scales and shows some relation to decadal variability. In the beginnings of the 13th and the 19th centuries, which are characterized by high volcanic activity, the ensemble spreads decrease. The amplitude of the annual cycle since 1800AD is distinctly lower than during the MWP. Temperature variability shows a continuous power-spectrum with weak long term memory including an ENSO (El Nino/Southern Oscillation) signature and deviates from the nonstationary power-spectrum of the reconstructed temperature. The simulation underestimates variability on centennial time scales while the reconstruction of the mean in China underestimates variability on decadal time scales. The model shows enhanced precipitation during the LIA and a distinct decrease during MW. There is no evidence for a relationship between temperature and precipitation anomalies.