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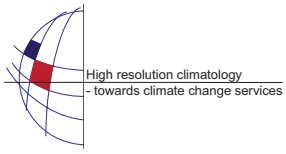

Climate Predictability and Long Term Memory

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The benefit of climate Long Term Memory (LTM) for long term prediction is assessed using data from a millennium control simulation with the atmosphere ocean general circulation model ECHAM5/MPIOM. The forecast skills are evaluated for surface temperature time series at individual grid points. LTM is characterised by the Hurst exponent in the power-law scaling of the fluctuation function which is determined by detrended fluctuation analysis (DFA). LTM with a Hurst exponent close to 0.9 occurs mainly in high latitude oceans, which are also characterized by high potential predictability. Climate predictability is diagnosed in terms of potentially predictable variance fractions. Explicit prediction experiments for various time steps are conducted on a grid point basis using an auto-correlation (AR1) predictor: in regions with LTM, prediction skills are beyond that expected from red noise persistence; exceptions occur in some areas in the southern oceans and over the northern hemisphere continents. Extending the predictability analysis to the fully forced simulation shows large improvement in prediction skills.