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Potential forecasting of climate time series

Valerie N. Livina (1), Gerrit Lohmann (2), Manfred Mudelsee (3), and Timothy M. Lenton (4)

(1) National Physical Laboratory, Teddington, United Kingdom (valerie.livina@npl.co.uk), (2) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany, (3) Climate Risk Analysis, Hannover, Germany, (4) University of Exeter, Exeter, United Kingdom

We introduce a technique of time series analysis, potential forecasting, which is based on dynamical propagation of the probability density of time series. We employ polynomial coefficients of the orthogonal approximation of the empirical probability distribution and extrapolate them in order to forecast the future probability distribution of data. The method is tested on artificial data, used for hindcasting observed climate data, and then applied to forecast Arctic sea-ice time series, showing its vanishing within several decades in the 21st century. The proposed methodology completes a framework for 'potential analysis' of climatic tipping points which altogether serves anticipating, detecting and forecasting climate transitions and bifurcations using several independent techniques of time series analysis [1-5].

References: [1] Livina and Lenton, GRL 2007; [2] Livina et al, Climate of the Past, 2010; [3] Livina et al, Climate Dynamics, 2011; [4] Livina et al, Physica A, 2011; [5] Livina et al, submitted, arXiv:1212.4090.