



## **The relationship between the northern annular mode in the stratosphere and in the troposphere investigated with an empirical master equation**

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Time series of three climate variables are used to derive a master equation in the discretized phase space spanned by the variables. The empirical master equation (EME) predicts the probability density function in this phase space. The EME is formally equivalent to an (empirical) first-order Markov chain description. The time series consist of normalized and de-seasonalized quantities obtained from the ERA-40 re-analysis. The variables chosen are highly correlated with the northern annular mode (NAM). The EME shows that NAM anomalies in the middle stratosphere propagate into the lower stratosphere and then in the lower troposphere with a time scale of about two and four weeks, respectively. The influence of strong tropospheric NAM anomalies is confined to the lower stratosphere.