



QBO and solar cycle influences on the Arctic middle stratosphere investigated with empirical master equations

M. Dall'Amico (1) and J. Egger (2)

(1) The Walker Institute for Climate System Research, Reading, UK, (2) Meteorologisches Institut der Ludwig-Maximilians-Universität München, Munich, Germany
(m.dallamico@reading.ac.uk / Phone: +44 118 378 7987)

Time series of stratospheric climate variables are used to derive master equations in the discretized phase space spanned by three variables. The empirical master equation (EME) predicts the probability density 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 and observations. A first EME captures the climatological features of the QBO and the probabilistic character of its phase transitions. Also, the Arctic stratosphere at 10 hPa is about 2 K warmer during the easterly phase of the QBO than during the westerly phase. A second EME including a time series of the solar radio flux at 10.7 cm hints that the relationship between the QBO and the temperature in the Arctic stratosphere is shifted towards warmer or colder states by about 1 K during periods of high or low solar activity, respectively.