



Indications for a synchronization between the phase evolution of the Madden-Julian oscillation and the solar 27-day variability

Christoph G. Hoffmann and Christian von Savigny

Universität Greifswald, Institute of Physics, Environmental Physics, Germany (christoph.hoffmann@uni-greifswald.de)

The solar irradiance is subject to variations on different time scales including the 27-day cycle. These variations are known to introduce variability in the upper and middle atmosphere. Implications for the troposphere are currently under discussion.

The Madden-Julian oscillation (MJO) is a major source of intraseasonal variability in the troposphere. Recently, studies have indicated that the occurrence of strong MJO events could be modulated by the solar 27-day cycle.

We analyze whether also the temporal evolution of the MJO phases could be linked to the solar 27-day cycle. We basically count the occurrences of particular MJO phases as a function of time lag after the solar 27-day extrema in about 38 years of MJO data.

We find indications for a synchronization between the MJO phase evolution and the solar 27-day cycle, which are most notable under certain conditions: MJO events with a strength greater than 0.5, during the easterly phase of the Quasi-biennial oscillation, and during boreal winter. The MJO appears to cycle through its 8 phases within 2 solar 27-day cycles. These results strongly depend on the used MJO index such that the synchronization is most clearly seen when using univariate indices like OMI, but can hardly be seen with multivariate indices like RMM.

Although we think that these initial indications are already worth to be noted, we do not claim to unambiguously prove this relationship; neither in a statistical, nor in a causal sense. Instead, we challenge these initial findings ourselves in detail by varying underlying datasets and methods.