



Phase coherence between solar/geomagnetic activity and climate variability from the stratosphere to the troposphere and the North Atlantic Oscillation

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Using the enhanced Monte Carlo Singular System Analysis (MC SSA) [1], Palus & Novotna detected a number of oscillatory modes in monthly time series of sunspot numbers, geomagnetic activity aa index, North Atlantic Oscillation (NAO) index and near-surface air temperature from several mid-latitude European stations, some of them with common periods [2]. Instantaneous phases of the detected modes underwent synchronization analysis. In the case of the modes with the period 7-8y statistically significant phase coherence, beginning from 1950's, has been observed [3]. Study of phase coherence between solar/geomagnetic activity and NCEP/NCAR and ERA40 air temperature confirms that the response to solar signal is not homogeneously distributed over the atmosphere, but it shows latitudinal, longitudinal and altitudinal dependence. The areas of marked, statistically significant coupling between solar/geomagnetic activity and climate variability observed in continuous monthly data, independently of the season or the QBO phase are extended over large areas of the stratosphere, however, confined within the area of the NAO influence near the Earth surface [4]. Using the concept of partial phase synchronization [5] we investigate the role of the NAO in transferring solar/geomagnetic signatures from the stratosphere to the troposphere.

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References

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