



Solar activity affects the annularity of the Arctic Oscillation

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Arctic Oscillation (AO) is defined as the leading principal component (PC) of monthly sea level pressure (SLP) anomalies in the Northern Hemisphere (NH). Here we investigate whether the AO pattern is affected by solar activity, approximated by the 10.7 cm radio flux, in the NH winter (December to March). The intensity of the AO (PC score) does not manifest a significant linear dependence on the solar activity; however, there are signs of the AO being stronger (implying more zonal circulation over mid-latitudes, especially in the European-North Atlantic sector) and more variable in solar maxima. The sensitivity of the AO to the 11-year solar cycle becomes more obvious if separate PC analyses are conducted for 20% wide percentile intervals of the solar activity. For the average solar activity (i.e., approximately for the 30%-50% to 60%-80% intervals), the loading patterns corresponding to the AO lose their annular character due to a considerable weakening or even disappearance of the Pacific (Aleutian) centre. The overall weakening of the AO under the average solar activity is manifested by a lower variance explained. For the 40%-60% percentile interval, the AO even ceases to be the leading mode of the NH SLP variability, being superseded by the Pacific / North American-like pattern. The AO is most active (i.e., explains the largest share of variance) in solar maxima. The lack of the annularity of the AO under average solar activity is confirmed by maps of correlations with AO's Arctic centre and by compositing AO's extreme phases, both conducted within the percentile intervals. This work was conducted within project A3042401 funded by the Grant Agency of the Czech Academy of Sciences.