



Interplay between effects of solar forcing and internal climatic factors on tropospheric and stratospheric temperature anomalies in the Northern Hemisphere

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The purpose of this study is to evaluate the role of solar and climatic factors in the distribution of tropospheric and stratospheric temperature in the Northern Hemisphere. Solar UV data, teleconnection indices from the Euro-Atlantic zone, namely the North-Atlantic oscillation, the Arctic Oscillation and the Scandinavian Oscillation, and temperature anomalies in troposphere and stratosphere, obtained from wheatear balloon observation in the Northern Hemisphere for the period 1960 – 1975, were analyzed. Correlations studies were performed in order to identify characteristics of relationships between solar forcing, internal climatic oscillations and temperature anomalies in troposphere and stratosphere. Seasonal effects were also taken into account. The UV radiation flux imprint on the temperature anomaly is observed only during summer, and mainly at stratospheric levels (100-50 hPa), where the correlation is significant. Expectedly, the role of atmospheric dynamics on temperature anomalies in the troposphere and stratosphere is clearer both in troposphere and stratosphere. The positive phase of the North Atlantic Oscillation is associated with positive variations in temperature in the Northern Hemisphere's troposphere and with negative variations in the stratosphere. Similar results are observed for the Arctic Oscillation and Scandinavian Oscillation. The latter internal climatic oscillation seems to have a greater influence on temperature anomalies. A strong negative correlation between the SO index and temperature anomalies is observed both at annual scale, as well as for three seasons, i.e. for winter, spring and summer. This shows that when the atmospheric circulation is blocked, i.e. during the positive phase of the Scandinavian Oscillation, the temperature anomaly is smaller. On the other hand, the stratospheric temperatures are negatively correlated with the Arctic Oscillation but positively correlated with the Scandinavian Oscillation. Temperature anomalies in the troposphere are strongly related with internal dynamic factors while stratospheric temperature variations depend both on solar forcing and on atmospheric circulation. Possible mechanisms of these relationships and implications for solar effects on climate are discussed.