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Improving predictability of monthly mean temperature forecasts in Northern Europe during boreal winter by the QBO

The quasi-biennial oscillation (QBO) refers to the mean zonal winds of the tropical stratosphere oscillating between westerlies and easterlies with a mean period of 28-29 months. The QBO affects the polar vortex, e.g., via the Holton-Tan effect. During boreal winters, the westerly (easterly) QBO often coincide with stronger (weaker) than average polar vorticity and warmer (colder) than average weather in Northern Europe. To quantify this teleconnection between the QBO phase and weather in Northern Europe, we used the equatorial stratospheric monthly mean zonal wind data of the Free University of Berlin, ERA-Interim gridded monthly mean temperature data of years 1981-2016, and Finnish Meteorological Institute's monthly mean temperature station data of years 1961-2017.

We found indicators in the previous month's QBO vertical profile, leading to milder/cooler monthly mean temperatures in Northern Europe. In general, the deepening of the westerly QBO at certain levels of low and mid stratosphere, coincided with 1 to 2 degrees Celsius milder temperatures during the next month in Finland (Figure 1a). Further, the strengthening of the QBO easterlies at certain levels of low and mid stratosphere coincided with 1.8 to 3 degrees Celsius colder than average temperatures during the next month in Finland (Figure 1b).

In our presentation we will show how we selected the QBO phases and our views how they could be used to improve monthly mean temperature forecasts over Northern Europe during boreal winter.

Primary author: Mrs KORHONEN, Natalia (Finnish Meteorological Institute)

Co-authors: Dr HYVÄRINEN, Otto (Finnish Meteorological Institute); Dr GREGOW, Hilppa (Finnish Meteorological Institute)

Presenter: Mrs KORHONEN, Natalia (Finnish Meteorological Institute)

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