

## **Potential causes for the extraordinarily cold and strong Arctic polar vortex in winter 2015/16**

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The Arctic polar vortex was extraordinarily cold and strong at the beginning of the winter 2015/16, strong and displaced in mid-winter and broke down in early March 2016. We investigate the characteristics of the polar vortex using global reanalysis data, satellite observations, and mesospheric radar wind measurements over northern Scandinavia. The results are related to previous winters of the last decades. The focus of this study is on finding the causes for the extraordinary behavior of the Arctic polar vortex in the early and late winter 2015/16.

In early winter we found a correlation between the planetary wave (PW) activity and the strength and temperature of the Arctic polar vortex in the stratosphere and mesosphere. In Nov/Dec 2015, a reduced PW generation in the troposphere and a stronger PW filtering in the troposphere and stratosphere, caused by stronger zonal winds in mid-latitudes, resulted in a stronger polar vortex.

Another peculiarity of the winter 2015/16 occurred after the unusually early breakdown of the Arctic polar vortex. Typically the zonal mean zonal wind remains easterly until autumn. However, the zonal wind in the mesosphere between 50 and 80 km became westerly again after the “final warming” for over 30 days. During this phenomenon there is no sign of planetary wave activity why other possible causes will be discussed.