Characteristics of the polar vortex and the AO index in the upper stratosphere and lower mesosphere in Arctic winter II

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Purpose of this research is to clarify relationship between solar activity and disturbance in the middle atmosphere during Arctic winter. In this research we consider stratospheric sudden warming (SSW), which is a typical phenomenon in Arctic winter, as disturbance in the middle atmosphere including the mesosphere. Previous research [ex. Labitzke, 2005] reported effect of 11-year solar cycle on thermal structure only in the Stratosphere.
Traditional classification of SSW is not suited for quantitative comparison with other indices. Therefore we are exploring new indices which display condition of disturbance in the mesosphere. In this presentation, we calculate AO index in the altitude range from 1000 hPa to 0.1 hPa (65km alt) in 1999/2000 -2007/2008 winters. AO index also represents well the degree of disturbance in the middle atmosphere. We also use 2D vortex moment diagnostics (Z10 method) [Seviour et al., 2013] to check condition of the polar vortex at 10 hPa and 0.316 hPa. The results of these analysis is summarized as follows:
> The peak altitude of AO index is about 0.5 hPa.
> Positivity/negativity of AO index is almost coincident at 100 hPa -0.1 hPa.
> High negative value and negative AO index in all altitude are not necessarily required in Major Warmings.
> Wave 1 and 2 configuration are observed at 10 and 0.316 hPa in Major Warmings and comparable level events. Strong wave 1 is exists especially in 10 hPa.
> Wave 1 and 2 configuration are observed at 0.316 hPa in minor Warmings. At 10 hPa there are no disturbance or wave 2 configuration.
> Negative AO is shown in all altitude range when strong wave 2 exist at 10 hPa.
References:
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