

Discussion about new indices which display condition of disturbance in the mesosphere during Arctic winter

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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. To get thing started, we selected daily bottom altitude of easterly wind area, which corresponds to SSW, in the zonal mean horizontal wind. Averaged value of those during one SSW event is used for quantitative comparison with solar activity and QBO index. No clear relationship was found between the selected new value (ZEW index) and two indexes. However we confirm that the ZEW index represents well the degree of disturbance. In the next step, we calculate AO index in the altitude range from 1000 hPa to 0.1 hPa (65km alt). AO index also represents well the degree of disturbance in the middle atmosphere.

In this presentation, we will examine and discuss in more detail about ZEW and AO index using meteorological data in order to confirm which condition these two new indices display in the middle atmosphere.

Keywords: Middle atmosphere disturbance, Solar activity, Arctic Oscillation, QBO, Arctic region, Stratospheric sudden warming