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Meteorological influence of the solar wind ? Strong correlation of the temperature and the solar wind parameters at the

MATSUO, Shinya[1*], ITOH, Kiminori[1]

[1]Yokohama National University

Recent our findings strongly suggest that the solar wind affects the surface temperatures [1, 2]. The regions from the magnetosphere to the troposphere should participate to this phenomenon. In this presentation, we focus on the temperatures of the troposphere and the stratosphere.

Grid temperature data of the lower stratosphere and the troposphere (upper, middle and lower) were taken from the RSS satellite temperature data site. The data cover the period of 1979 to 2010. We mainly used Pa, rate of energy flow from the solar wind into the stratosphere, together with the aa index (a geomagnetic disturbance index). Years were classified into two groups using the wind phase of the QBO (easterly or westerly) at a suitable month. The Arctic Oscillation (AO) index was also considered because it gives correlation maps similar to those for the aa index (a geomagnetic disturbance index)[1].

Figure 1 shows examples of the correlation maps for the lower stratosphere and for the lower troposphere. Monthly temperatures and monthly Pa values for January were calculated for each year, and the correlation between their yearly variations was estimated.

When stratified using the QBO phase (easterly and westerly) at January, the correlation maps for the easterly and for those for the westerly were clearly different.

In Fig. 1, examples of correlation maps are shown. Specific procedures are as follows. Monthly values were obtained for the temperature, the aa index and Pa, and correlation was calculated using their time variations at each grid. The correlation maps largely depended on the QBO phase.

Figure 1a shows that the January lower stratosphere temperature positively correlates well with the January Pa at the Equatorial regions. The aa index gave similar results.

Figure 1b shows a correlation map for the lower troposphere. The spatial distribution is quite similar to that for the correlation map between the temperature and the AO index, where large correlation can be seen at, for instance, Europe and Siberia. The middle troposphere gave results similar to the lower troposphere.

These observations clearly show that the energy (and/or particles) transferred from the solar wind affects the stratosphere and the troposphere. It is strongly suggested that the QBO plays an important role in this phenomenon.

[1] Kiminori Itoh, JpGU, 2008-2011
[2] Kiminori Itoh and Shinya Matsuo, JpGU, 2012

Keywords: Solar wind, Temperature, Troposphere, Stratosphere, QBO, Arctic Oscillation

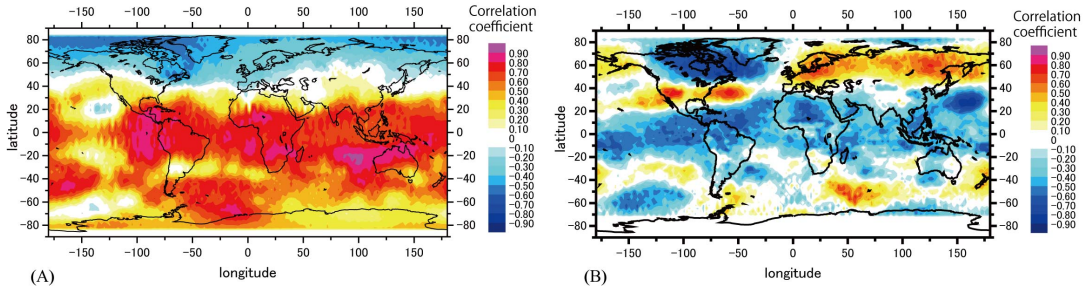

Fig.1. Correlation maps for the temperature and Pα (rate of energy flow from the solar wind into the magnetosphere) for the period of 1979-2010. A) For lower stratosphere, in January, and at QBO westerly phase. B) For lower troposphere, in January, and at QBO easterly phase.