Geophysical Research Abstracts, Vol. 8, 10082, 2006
SRef-ID: 1607-7962/gra/EGU06-A-10082

On the influence of the ultraviolet radiation and ozone on the stratosphere-troposphere coupling -simulation with a chemistry-climate model-

Y. Kuroda and K. Shibata

Meteorological Research Institute, Japan (kuroda@mri-jma.go.jp)

Observational studies by Kuroda and Kodera (2005) indicated that the variability associated with the Southern Annular Mode (SAM) was largely modified with the 11-year solar activity. In fact, the signal associated with the late-winter-mean SAM index extended to the upper stratosphere and persisted until next autumn in the high solar (HS) years, whereas it was almost restricted in the troposphere and disappeared very quickly in the low solar (LS) years. Such a modulation of SAM by the change of the ultra-violet (UV) radiation associated with the solar cycle was also successfully simulated by a chemistry-climate model, and the results suggested that such a modulation originated from the activities of ozone (Kuroda and Shibata, 2006). Modulation of the vertical extension of the SAM should be equivalent to the modulation of the strength of the stratosphere-troposphere coupling. So it will be interesting to examine how the strength of the UV and ozone affect the strength of the stratosphere-troposphere coupling. To examine this problem, we had examined three 21-year runs of the chemistry-climate model with different UV strengths. Comparison of these runs shows that the stratosphere-troposphere coupling tends to become stronger as the UV radiation becomes stronger. As a result, it is found that the SAM signal tends to extend more to upper stratosphere and the preceding wave forcing and the meridional circulation becomes more apparent when UV becomes stronger as a high solar activity years. The results suggest that enhanced ozone tend to strengthen the stratosphere-troposphere coupling through enhancement of the wave-mean flow interaction.