

## Interannual changes of the semiannual oscillation induced by stratospheric sudden warming events

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The semiannual oscillation (SAO) is observed in circulation changes in the equatorial middle atmosphere, which consist of two separate maxima centered near the stratopause (SSAO) and the upper mesosphere (MSAO) with an approximate out-of-phase relationship between the two [e.g., Andrews et al., 1987]. The SSAO has easterly and westerly maxima at solstices and equinoxes, respectively, while the MSAO shows an out-of-phase change with the SSAO. It is known that somewhat different consideration must be made between the SSAO and the MSAO for their forcing mechanisms, and it seems to be also true of their interannual changes. In this study, we make global gridpoint data for geopotential and temperature fields up to the mesopause level derived from Aura MLS data, to make dynamical analyses for equatorial zonal wind and temperature changes since August 2004 to present. It is found that the strength of both the SSAO and MSAO might be modulated by stratospheric sudden warming (SSW) events in boreal winter solstices. In the equatorial regions, enhanced poleward flows of the residual meridional circulation associated with SSW events lead to temperature perturbations consisting of a cooling in the stratosphere and a warming in the mesosphere. Such temperature perturbations may bring about opposite changes in the SSAO and the MSAO through the thermal wind balance at the equator, leading to their amplifications.

Keywords: semiannual oscillation, stratospheric sudden warming, MLS data