



Modulation of the Semiannual Oscillation Associated with Stratospheric Sudden Warming Events

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In the equatorial middle atmosphere, there exists the semiannual oscillation (SAO) with two separate out-of-phase amplitude maxima centered near the stratopause (SSAO) and the middle mesosphere (MSAO). Climatologically, the SSAO (MSAO) in zonal winds has easterly (westerly) maxima around solstices and westerly (easterly) maxima around equinoxes, respectively; the seasonal march of the SAO shows significant interannual variations. Although earlier studies reported the modulation of the SAO due to the quasi-biennial oscillation (QBO) in the equatorial lower stratosphere, features of the interannual variability are complex and their causing mechanisms are still unclear. In this study, such interannual variability related to stratospheric sudden warming (SSW) events is examined on the basis of Aura Microwave Limb Sounder (MLS) observations for the period from June 2004 to present. Resultantly, the large amplification of the SAO is clearly observed during mid-winter SSW events when the SSAO and the MSAO have easterly and westerly maxima, respectively. On the other hand, the SAO is significantly weakened in the case of the SSW occurrence in March. The SSW enhances poleward flows of the residual mean meridional circulation bringing about equatorial temperature perturbations which consist of a cooling in the upper stratosphere and a warming in the lower mesosphere. These temperature perturbations are found to modulate the SAO amplitude.