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**Stratospheric Sudden Warming Signatures in Satellite Data and Data  
Assimilation Systems: Stratopause Evolution and Transport**

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Four of the most intense and prolonged stratospheric sudden warmings (SSWs) on record have occurred in the past eight years, a period with a uniquely comprehensive set of satellite measurements covering the upper troposphere/lower stratosphere (UTLS) through the mesosphere. Prior to the launch of instruments such as Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) and the Aura Microwave Limb Sounder (MLS), information on both temperatures and constituents in the upper stratosphere/lower mesosphere (USLM) region was particularly sparse. Here, the evolution of the stratopause during recent prolonged SSWs is described using MLS and SABER data, and compared with operational (ECMWF, GEOS-5) and research (CMAM, NOGAPS-ALPHA) data assimilation system (DAS) products. The NOGAPS-ALPHA DAS has a higher model top than GEOS-5 and ECMWF and assimilates MLS and SABER temperatures and MLS ozone and water vapor. The CMAM-DAS has a high model top and includes a more sophisticated non-orographic gravity-wave drag scheme than GEOS-5 and ECMWF. In both cases, these improvements result in better representation of large-scale transport in the USLM and much better representation of the stratopause during the SSWs.

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