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Inter-hemispheric variations in stratopause structure

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This study uses observations from the EOS-MLS satellite instrument to demonstrate that variations in the temperature and altitude of the stratopause display inter-hemispheric linkages. In particular, variations in the stratopause altitude and temperature inside the polar vortices can often be linked to anti-correlated variations in the tropics. We focus on strong variations in the Southern hemisphere polar vortex in 2010 which caused significant changes in the stratopause properties all the way into the Northern hemisphere tropics. In previous studies of inter-hemispheric coupling, the focus has generally been on variations in the Northern hemisphere stratosphere affecting the Southern hemisphere. The observed patterns are then further analysed in an attempt to discern whether this pattern is a reflection of the previously observed stratosphere-mesosphere linkage or a separate phenomenon. We then use the information derived from the MLS data, along with additional ancillary reanalyses and COSMIC data, to gain some understanding of the conditions required in the middle atmosphere for these patterns to occur. We also examine the planetary and gravity wave fields in the stratosphere using both MLS and COSMIC to attempt to understand whether atmospheric waves play a significant role in the propagation of these signals from one hemisphere to the other. We also examine whether the changes observed have any impact on the vertical propagation of these waves.