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Impact of sudden stratospheric warming (SSW) over tropical region: A study using COSMIC/ FORMOSAT-3 observations

Prof. Surendra Dhaka, Dr. Vinay Kumar

University of Delhi

skdhaka@rajdhani.du.ac.in

The effect of sudden stratospheric warming (SSW) on the tropical region is being investigated using radio occultation measurements by COSMIC/FORMOSAT-3. Significant temperature changes are observed in stratosphere and tropopause area from polar to tropical region during a major SSW event that occurred in Jan 2009. SSW event strongly modified the polar and tropical stratospheric circulation pattern and the newly emerged pattern, after termination of SSW, dominated for ~ 2-3 months. Stratospheric and tropospheric region have shown certain unique changes after the event such as a clear downward propagating cold phase at polar region seen which is located at similar heights as that of warming phase. The magnitude of this cold phase was ~ -80°C whereas the temperature prevailed of ~ 40°C in upper stratosphere (>30 km altitude) during warm phase. On the other hand, during cold phase at polar region that followed after the SSW event, a new warm motion emerged over tropical region. Strong implications of these unusually warm and cold phases are shown. Specifically it altered the cold point tropopause temperature and its height significantly for a period of ~2-3 months from polar to tropical region. SSW event also affected the tropical atmospheric stability, which is reduced during the event. Cross equatorial response from northern to southern hemisphere of both cold and warm anomalies are also seen, such features are reported using COSMIC data which unprecedented.