



## A Study of middle and upper atmosphere during Displacement and Splitting Sudden Stratospheric Warming Episodes

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A large scale thermodynamical phenomenon in winter Polar Regions which affects the middle atmosphere vigorously is Sudden Stratospheric Warming (SSW). It plays an important role in the overall budgets of heat, momentum, energy and trace constituents in the stratosphere. The effects of three major SSW episodes occurred during 2006, 2007 and 2009 winters have been studied over the middle and upper atmosphere of Western India region. Among the events, two are associated with Vortex Splitting and other is associated with Vortex Displacement. The polar vorticity maps have been taken from MIMOSA (Modélisation Isentrope du transport Méso-échelle de l'Ozone Stratosphérique par Advection) model. The temperature profiles have been obtained by using SABER (Sounding of the Atmosphere using Broadband Emission Radiometry) on board TIMED (Thermosphere Ionosphere Mesosphere Energetics Dynamics) satellite. The temperature profiles have showed that though SSWs mostly occur over high latitudes, their effects can be seen over this region also. The effects of SSW over upper atmosphere have been investigated by studying the ionospheric parameters (Critical frequency and Peak Height of F2 layer) taken during the events from COSMIC (Constellation Observing System for Meteorology, Ionosphere, and Climate) satellite.

The temperature peak over here has been observed after three days of the central date for the 2006 splitting event, while it has been seen on the same day of the central date for 2009 event. On the other hand, for 2007 Displacement event the temperature peak appears after five days of the central date. The time of response of the Ionospheric during the warming events are found to be different for all the events.

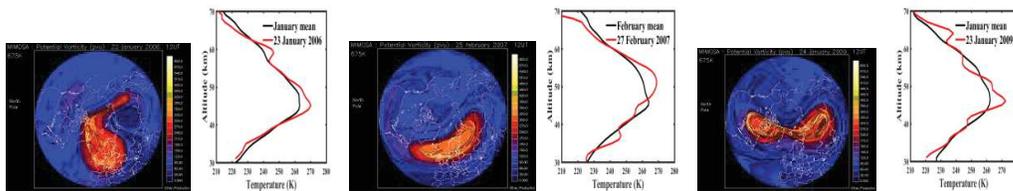


Figure 1(a)    Figure 2(b)    Figure 2(a)    Figure 2(b)    Figure 3(a)    Figure 3(b)

**Figure:** Polar vorticity maps during warming event during 1(a): 2006, 2(a): 2007 and 3(a): 2009

Temperature peak over Ahmedabad during 1(b): 2006, 2(b): 2007 and 3(b): 2009

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