

## Response of northern hemisphere ionosphere to 2009 January SSW

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Effect of the sudden stratospheric warming which occurred in January 2009(SSW2009) on the ionosphere is studied by using COSMIC ionosphere data. The SSW2009 shows the highest temperature increase for recent 7 years. The temperature increases steeply from 215K on the 19 January, 2009, peaks on 23rd January, and then gradually reduces. While the temperature increase at 10hPa shows the maximum in the longitude zone of 30E-30W during the period 19-30 January. We take SSW days as the period from 19- 28, and compare the data before SSW (356DOY2008- 1809). Very similar temperature variation pattern of SSW is seen in 150E- 150W which is opposite side of 30EW, although the temperature increase is less. Increase of atmosphere temperature which is seen in higher latitude, gradually reduces as we go to midlatitude, and it becomes finally lower than non SSW day in low latitude. Here we mainly used COSMIC ionosphere data (NmF2, height of maximum electron density and height profile). We study local time and latitude dependence in the longitude regions above in northern hemisphere. Variation of ionosphere (GIM TEC, COSMIC TEC, NmF2 by COSMIC ) changes almost in phase in all latitude zone as well as in local time; Period of the change of NmF2 (maximum electron density) in low and higher latitudes corresponds to the period of reduction or increase of atmospheric temperature respectively. In low latitude (0-40 degrees), reduction of NmF2 occurs except 9-12 LT in the morning. Height of NmF2 increases in the morning, and reduces in the afternoon. In the higher latitude (25-40), NmF2 shows reduction before 12 LT, including evening, and starts increase in the afternoon. Height of NmF2 shows reduction in the afternoon. In the latitude of 25-45degrees and 30-50 degrees, the height increase still continues like in lower latitude (0-40 degrees). There is a region in mid latitude where reduction of NmF2 is not recognized or small. This latitude zone seems to coincide with the region where no atmospheric temperature variation is not recognized during SSW period. These ionospheric features is also recognized in the longitude of 150EW, which suggests that the ionospheric behavior seen for 2009 SSW might represent the typical SSW feature. It is therefore advised that data analysis should be done for SSW2010. The features are explained as the reduction of neutral density in low latitude, and increase of neutral density on higher latitude. In lower latitude, intensified dynamo electric field due to the semi diurnal tide seems to play an essential role. On 26-32 DOY, NmF2 4 x10<sup>5</sup> elec/cc to 1 x10<sup>5</sup> els/cc only during 06-09 LT. Similar but less remarkable ionospheric features can be seen in the longitude band of 150E-150W. This special phenomena which is seen in these two longitude bands , but not in another longitude zones, is explained due to semidiurnal tide, which intensifies at 06-09 LT.

### Reference

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