Ionosphere variations observed with the DEMETER satellite during the 22 July 2009 solar eclipse

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Ionospheric scientists have been also attracted by the solar eclipses because the eclipses offer an opportunity to investigate the ionospheric variation associated with the solar radiation. Variations of the ionosphere would provide useful information on the photochemical processes and the ionospheric dynamics [e. g., Anastassiades, 1970], and modeling studies have been also developed [e. g., Evans, 1965]. According to their studies, the photochemical process and the ionospheric dynamics yields complex structures of plasma density and temperature [Risbeth, 2000], which have shown the different features in each eclipse. Although most of ionospheric observations during the eclipses are ionosonde and GPS-TEC (Global Positioning System – Total Electron Contents), recent papers have shown variation in topside ionosphere during the eclipse. In particular, Wang et al. [JGR, 2010] investigated topside ionospheric variations during the total solar eclipse in the on March 29, 2006. Measurements of the plasma densities and temperatures were provided by instruments aboard the Centre National d'Etudes Spatiales microsatellite DEMETER. During the eclipse, a clear thermal effect with a fast drop of about 200 K of the electron and ion temperatures followed the variations of the solar UV flux in the F region of the ionosphere conjugate to the satellite position. Following the this study, we investigate topside ionospheric dynamics of 2009 total solar eclipse in East Asia by using Ne/Te and Ni/Ti data of DEMETER, of which altitude is around 660 km. On July 22, 2009, one of DEMETER orbits crossed eclipse zone, and the distance closest to the total eclipse area was approximately 200km. Just after the total solar eclipse, Te decreased while Ne did not change. Before the maximum obscuration, Ne decreased and Te increased because production rate of plasma decreased under the F-region. Since strong fountain effect appeared up to +30 degree in latitude, the satellite measured the enhancement of Ne, while Te further decreased due to the eclipse. This feature differs from another eclipse case [Wang et al., JGR, 2010]. In the presentation, we discuss quantitatively ionospheric dynamics during the total solar eclipse.