Geophysical Research Abstracts
Vol. 20, EGU2018-9657, 2018
EGU General Assembly 2018

Different responses of the ionosphere-magnetosphere coupling under severe storm drivers

Giulia D'Angelo (1), Mirko Piersanti (2), Lucilla Alfonsi (3), Luca Spogli (3,4)

(1) Dipartimento di Matematica e Fisica, Università degli studi "Roma Tre", Rome, Italy (giu.dangelo8@gmail.com), (2) Istituto di Astrofisica e Planetologia Spaziali, Rome, Italy., (3) Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy., (4) SpacEarth Technology, Rome, Italy.

An outstanding challenge in Geophysics is to understand the physics of the systemic coupling between magnetosphere and ionosphere from hemisphere to hemisphere. The magnetosphere-ionosphere (M-I) coupling processes mediate almost all effects of solar wind input into the ionosphere and its feedback on the magnetosphere. Hence, the understanding of the M-I coupling processes is crucial to understand the solar-terrestrial relationship. Moreover, from a variety of experimental observations, it is known that the high-latitude ionosphere is profoundly affected by energy sources of magnetospheric origin, which in turn directly depend to the solar wind forcing and variability. Hence, a good knowledge of the M-I coupling can help in understanding the behaviour of the high latitude ionosphere, especially in terms of formation and dynamics of plasma irregularities that can affect trans-ionospheric signals. Several plasma irregularities source mechanisms have been proposed: particle precipitation from the magnetosphere, bulk plasma processes, plasma instability mechanisms, and neutral atmosphere dynamics. The relative importance of each mechanism undoubtedly depends on scale size and geographic location with respect to the impressed magnetospheric boundaries. To date, however, the rule of the M-I coupling in the ionospheric irregularities production at high latitudes is not completely clear. In this context, this work investigates the link between the nature of storm drivers and the response of the M-I coupling in terms of the ionospheric dynamic (in irregularities production) at high latitudes. We show how the different magnetospheric configurations produced by different storm drivers give rise to completely different high latitudes irregularities structures, in terms of scale-size, location and spectral distribution. In the specific, we analyse the drivers and the relative effects of the most intense storms of the 24th solar cycle, occurred during the March 17, 2015 and the June 22, 2015 respectively. To the scope, we use Wind, GOES (Geostationary Operational Environmental Satellite), Iridium and Swarm satellites data, GNSS (Global Navigation Satellite Systems) parameters and SuperDARN measurements. The results show an asymmetric ionospheric response in the two hemispheres, with a greater impact on GNSS signals propagation in Antarctica during both storms. Nevertheless, the ionospheric turbulence result to be more intense in the southern hemisphere in March 2017 and in the northern hemisphere in June 2017. The paper discusses the comparison between the two events.