Ionospheric electric field oscillation associated with Sudden Impulse seen by SuperDARN radars

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Sudden Impulse (SI) is a sudden increase of H-component geomagnetic field often seen at low latitudes. Past studies showed that it is caused by a sudden compression of the magnetosphere associated with rapid increases of the solar wind dynamic pressure. At middle and high latitude, SIs cause some kind of perturbation in twin vortex type ionospheric currents. It was reported that the disturbance of the ionospheric current and the electric field associated with SI consists typically of the Preliminary Impulse (PI) and the Main Impulse (MI). Examining SI-associated flow variations observed by SuperDARN radars in the present study, we find that some of them show only two successive pulses, while some others are accompanied by damped oscillations of the ionospheric electric field lasting for about several tens of minutes to an hour with periods of several minutes, which is consistent with the past geomagnetic field observations of damped oscillations known as Psc's. However, the cause of this difference is not understood. We examine the cause of the difference between the two kinds of SI events, using SuperDARN radars in north hemisphere covering ~40 to 90 geomagnetic latitudes. From January 2012 to December 2014, 161 SI events were identified and 30 events out of them were accompanied by the ionospheric electric field oscillations as observed by at least one SuperDARN radar immediately following SIs. We have statistically investigated the relation between the ionospheric oscillations after SI and solar wind dynamic pressure. As a result, it is found that presence/absence of ionospheric electric field oscillations do not much depend on solar wind dynamic pressure. We will discuss the MLT dependence, comparison with previous studies of Pc5 pulsations, spatial displacement of the magnetopause and oscillations of the solar wind dynamic pressure as the external factor.

Keywords: SuperDARN, Sudden Impulse, ionospheric electric field oscillation

