



## Two-dimensional imaging of large-scale traveling ionospheric disturbances over China based on GPS data

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This paper reports the first results of the 2D imaging of large-scale traveling ionospheric disturbances (LSTID) using GPS network data from China, combined with observations of these events using an ionosonde chain. 2D TEC perturbation maps for North America were also constructed to allow the study of LSTIDs on a global scale. During the medium storm on 28 May 2011, the onset of a substorm initiated a slow-speed LSTID over North America just after midnight. Subsequently, an LSTID reached China 1.5 hours later, at dusk. A second LSTID was observed over China before midnight, 6.6 hours after substorm onset. The phase fronts of the China events had a front width of at least 1600 km, and moved southwestwards at a speed of  $540 \pm 85$  m/s and  $362 \pm 89$  m/s, respectively. Ionosonde data addressed a downward vertical phase velocity of  $\sim 75$  m/s for the dusk event and  $\sim 60$  m/s for the night event. Although the nighttime LSTID travelled farther south than the earlier dusk event, both disappeared in South China, and this was due to increase of the attenuation at low latitudes. According to the energy dissipation equation of atmospheric gravity waves there is severe dissipation due to viscosity and heat conductivity at low latitudes, since such dissipation increases strongly with time; dissipation due to ion drag is less important but cannot be ignored because of enhancement in background TEC; In addition, uplift of the ionosphere at low latitudes is another factor that results in a reduced amplitude of TEC perturbation at low latitudes.