Study of the ionospheric response to the super storm of 16-22 March 2015 using the chain of GPS stations in Benin and Côte d'Ivoire in West-Africa.

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Abstract

The ionosphere plays an import role in the applications of the Global Navigation Satellite Systems (GNSS) since it greatly affects the radio waves propagating throughout it. The ionosphere is known to cause the largest error on navigation systems. Although, the ionospheric effects may be mitigate using dual frequency GNSS equipments; some peculiar behaviors of the ionosphere such as the irregularities and electron density gradient can negatively affect the navigation systems during space weather events. This study presents the results of the equatorial and low latitude ionosphere response to the major geomagnetic storms of the current solar cycle that occurred during 16-22 March 2015. The *Dst* index has exhibited a minimum value of about -228 nT.

The data used for this study are the TEC derived from the GPS receiver of the *Continuously Operating Reference Station (CORS)* network across the country of Benin Republic in West Africa and the SCINDA station of Abidjan (*Lat = 5.330; Long = -3.4*). The CORS network ranges from Cotonou (*Lat = +6.384 Long = +2.45 Dip = -13.965*) to Kandi (*Lat = +11.124 Long = +2.928 Dip = -1.6*). The strength of the equatorial electrojet is derived from the magnetic data recorded at Tamanrasset (*Lat = 22.792, Long = 5.530*) and M'bour (Lat = 14.4, Long = + 16.96).

The vertical drift velocity exhibits higher value during the major phase of the storm as well as the scintillation index s4 that reach a maximum value of about 0.8. The variation of Rate Of change of TEC (ROT) reveals the propagation of gravity waves associated to the storm.