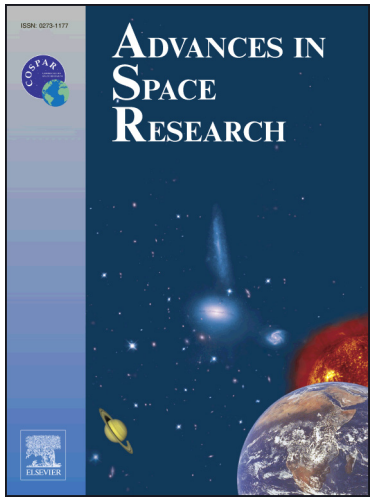

A severe negative response of ionosphere to the intense geomagnetic storm of 17 March 2015 observed at middle and low latitude stations in China zone

Guoqi Liu, Hua Shen

PII: S0273-1177(17)30118-7
DOI: http://dx.doi.org/10.1016/j.asr.2017.02.021
Reference: JASR 13111

To appear in: *Advances in Space Research*

Received Date: 18 October 2016
Revised Date: 14 January 2017
Accepted Date: 11 February 2017

Please cite this article as: Liu, G., Shen, H., A severe negative response of ionosphere to the intense geomagnetic storm of 17 March 2015 observed at middle and low latitude stations in China zone, *Advances in Space Research* (2017), doi: http://dx.doi.org/10.1016/j.asr.2017.02.021

A severe negative response of ionosphere to the intense geomagnetic storm of 17 March 2015 observed at middle and low latitude stations in China zone

Guoqi, Liu[a,*]; Hua,Shen[b]

[a] Department of Geophysics, Yunnan University, Kunming, Yunnan 650091, P R China

[b] Center for Space Science and Applied Research, Chinese academy of Sciences, Beijing 100190, P R China

*E_mail: guoqi_l@yahoo.com

Abstract:

In this paper, the foF_2 and TEC recorded at mid- and low- latitude observation sites near 120°E in China zone have been used to investigate the response to a severe geomagnetic storm of 17 March 2015 (the minimum Dst -223 nT at 23 UT). The results showed that the strong geomagnetic storm produced great impact on ionosphere. The characteristic of foF_2 and TEC did not display obvious perturbation during the main phase. Severe depletion of foF_2 and TEC were observed at all stations during the storm recovery period. The maximum absolute discrepancy in TEC compared with the past 27-day average value has been found to be 78 TECU and minimum Percentage deviations reached -71% at Fuzhou(26.1°N, 119.3°E). The minimum percentage deviations of decrease in foF_2 reached -65% at Sanya(18.1°N, 109.3°E) and Mohe(53.5°N, 122.3°E). It is infrequent negative effect that foF_2 and TEC sustained all day with extremes low level on 18 March. The [O/N_2] rate showed distinct reduces on 18 March in China zone, which may be mainly responsible for the severe depletion of foF_2 and TEC. The spread-F was seem to be developed at first time and then were inhibited to some extent during main phase. During the recovery phase, the spread-F was inhibited at Sanya while developed at Wuhan and Mohe. The disturbance electric fields and thermospheric circulation may contribute to this phenomenon .

Keywords: geomagnetic storm; ionosphere; TEC; foF2; O/N_2; spread-F

1. Introduction

A geomagnetic storm triggered by violent solar activity could result in ionospheric disturbance due to huge energetic particle, momentum and energy injected to the earth atmosphere. The drastic disturbance of ionosphere may reduce the positional accuracy and satellite tracking performance, even loss in satellite communication links and loss of signal for navigation. Several studies work about the effects of geomagnetic storms on ionosphere have been done during the last two decades (like: Fuller-Rowell et al., 1994; Zhao et al., 2005; Dabas et al., 2006; Fejer et al., 2007; Dashora and Pandey, 2007; Balan et al., 2008a; Vijaya Lekshmi et al. 2008; Astafyeva, 2009; Rao et al.,2009; Sharma et al., 2011b; Adekoya et al.,2012; D'ujanga et al., 2013; Joshua et al., 2014; and references therein). These works reveal a common feature that the response of the ionosphere during a geomagnetic storm is complicated and difficult to predict accurately and, the physical nature of many mechanisms is still insufficiently clear. The ionospheric effects of storms depends on many parameters, such as solar activity, storm onset time, storm intensity, storm duration, season, local time, and many other factors (Blagoveshchenskii, 2013).