Study of a geomagnetic storm effect on the ionospheric scintillation and Total Electron Content (TEC) over the SCINDA station in Abidjan

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Outline

INTRODUCTION

- In the first week of April 2010, one of the most geomagnetic storm of the solar cycle 24 has occurred
- It's well documented that magnetic storms mostly affect ionospheric parameters
- This disturbances can cause inaccuracy of Satellite Positioning Systems
- This work investigates the effects of that storm on GPS data collected with a station of the SCINDA network and compare the result with that of an IGS station.

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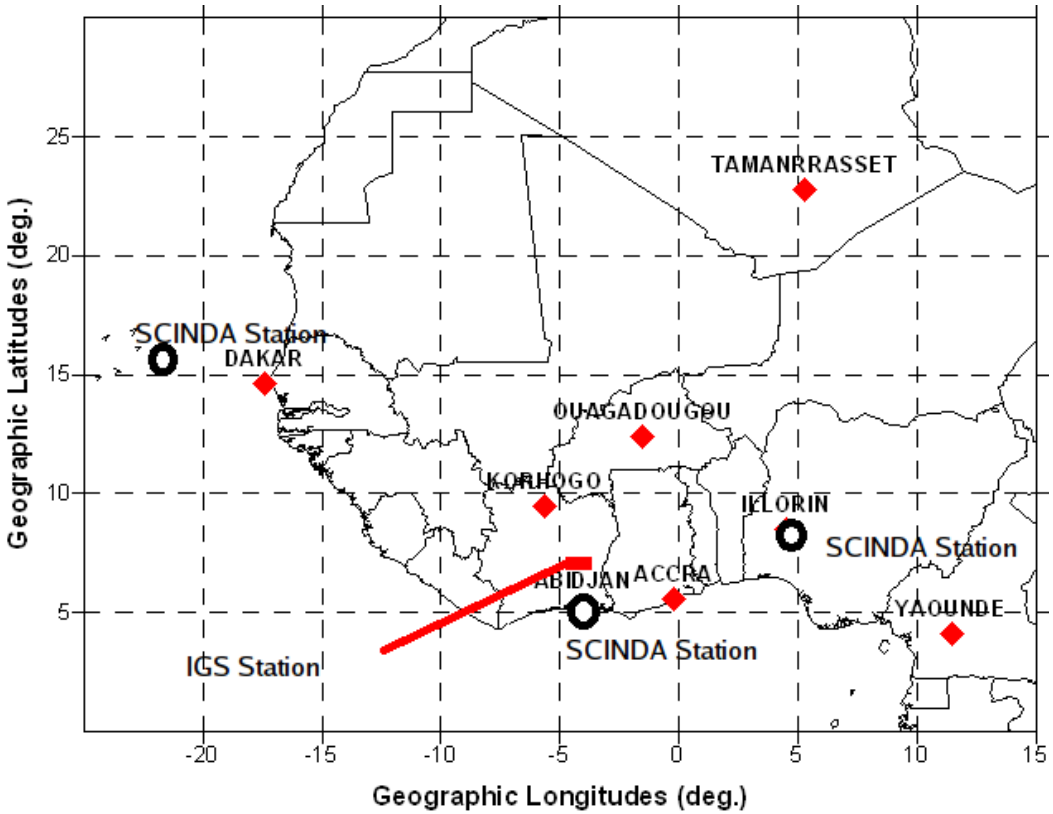
Map showing the station locations



Data used

- Scintillation index S4
- TEC
- Dst, AU and AL index

Scintillation index

The scintillation is quantified by means of an index, defined as

$S4 = \frac{\sqrt{\langle I^2 \rangle - \langle I \rangle^2}}{\langle I \rangle}$ where I is the received power.

Total Electron Content (TEC)

$$TEC = \int_S^R n_e(l)dl$$

where $n_e(l)$ is the electron density along the signal path

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METHOD OF ANALYSIS

Multipath

- Multipath were cut off following the criteria of *Otsuka et al., (2006)*
- The multipath is non significant if the $el > 30^o$

TEC Calibration

- TEC were calibrated using the technique by *Caranno et al., (2009)*

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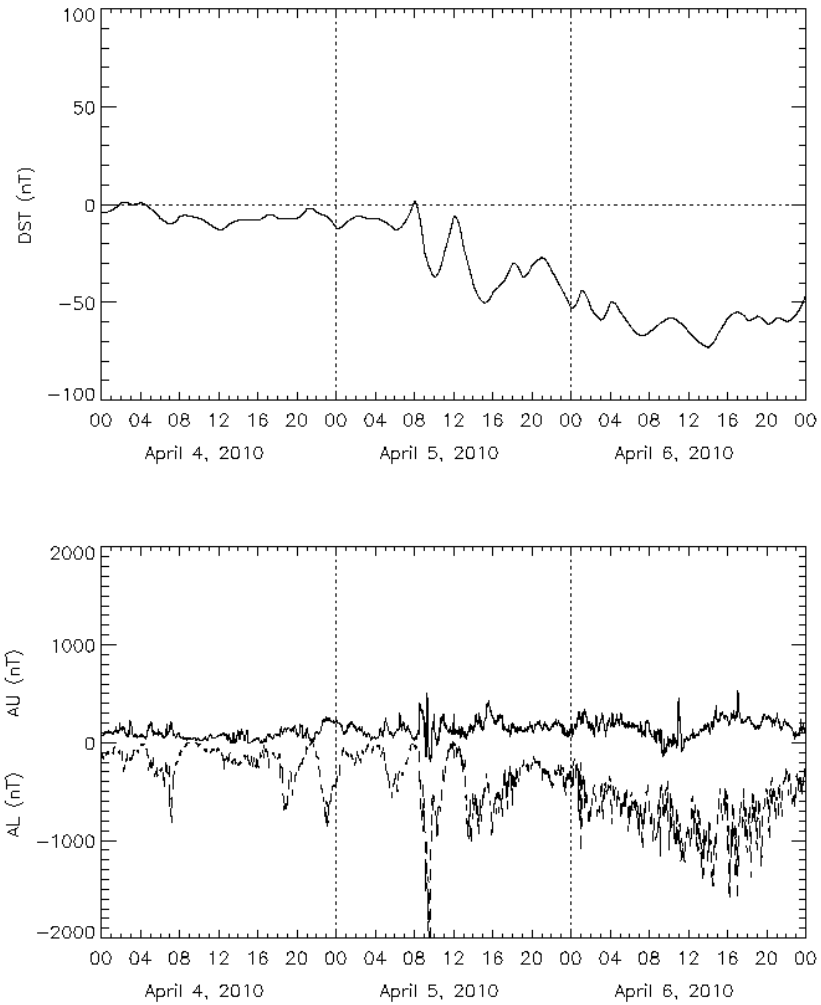
Dst, Au and Al variation, from 4-6 April 2010



The storm starts on April 5, 2010 with ssc at 0700, followed by a main phase at 0800.
There are successive sub magnetospheric storm denoting an intense auroral ionosphere activity indicated by observed value of Au and Al indexes.

TEC AND S4 ON APRIL 4TH

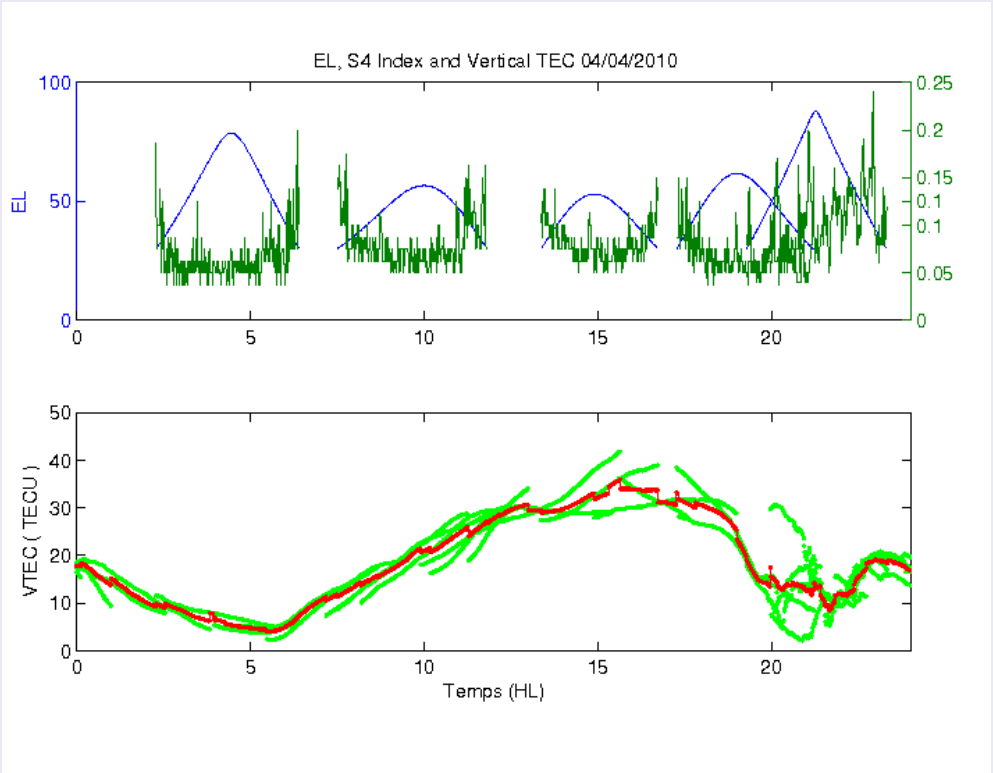


FIG.: Diurnal variation of S4 and TEC on April 4th, 2010

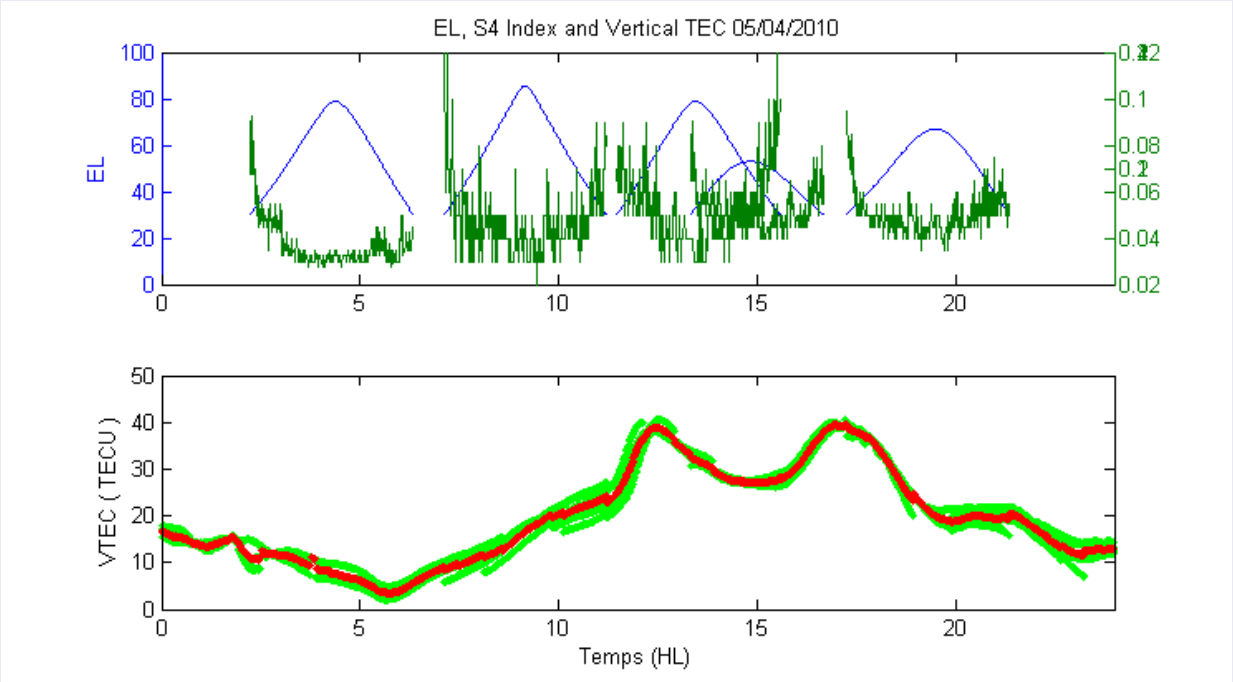


FIG.: S4 and TEC variation on April 5

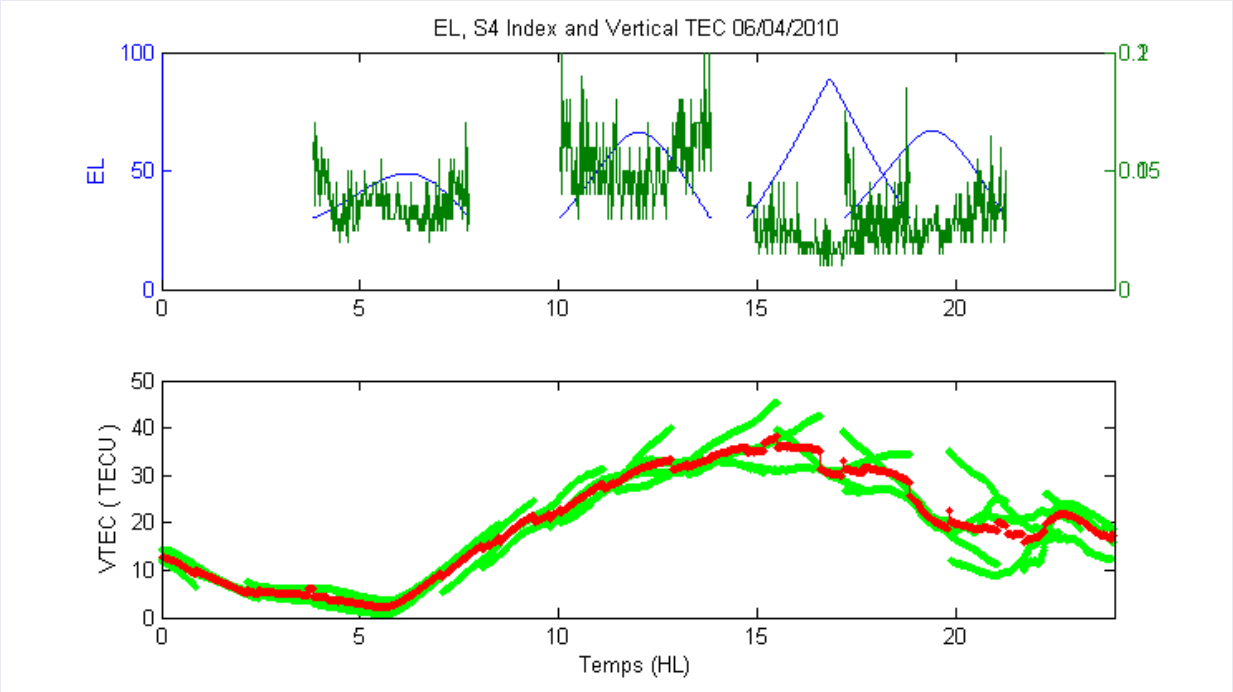


FIG.: S4 and TEC variation on April 6

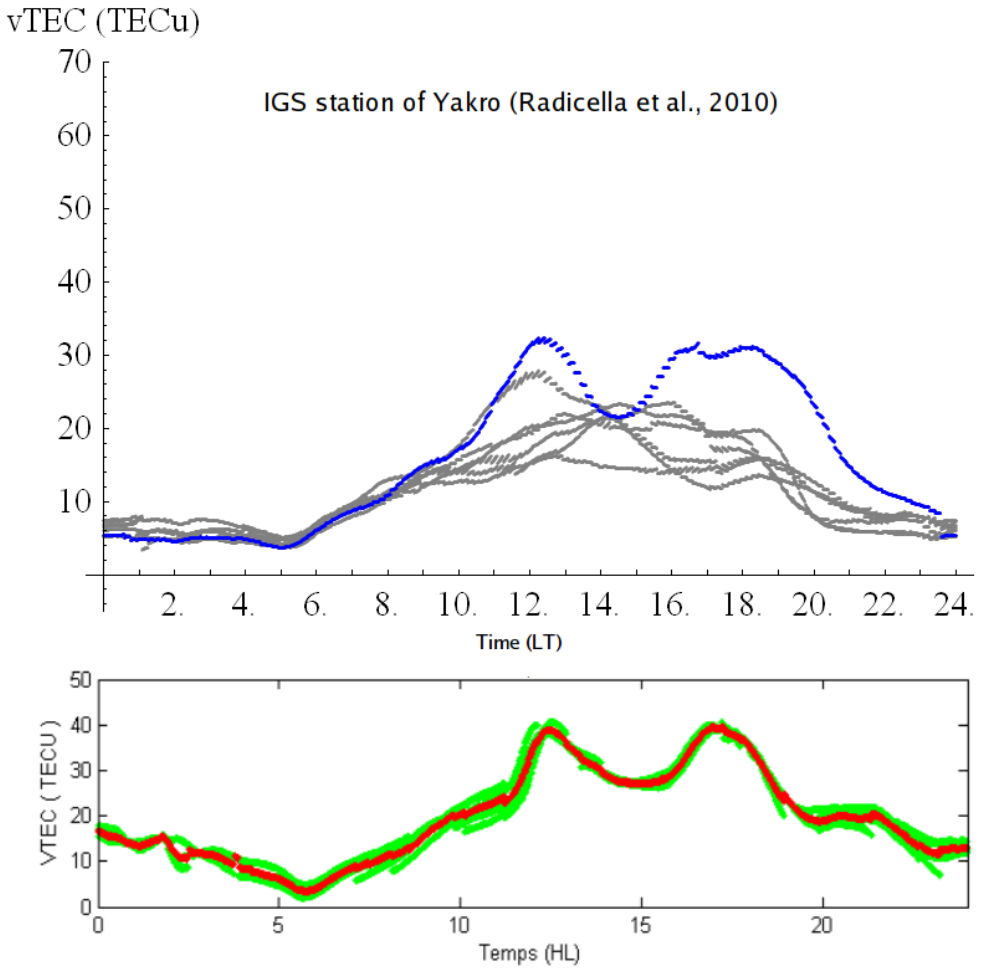


FIG : TEC variation on April 5th at Yakro(IGS) and Abidjan (SCINDA)

The result of this study shows

- There is no clear evedence of the effect of storm on the variation of scintillation
- The storm has caused a depletion on the TEC during it main phase
- This effect is seen during the same time on both stations situated approximately on the same longitude.
- The two technique used to infer the TEC are consistences

As a future plan, this work need to be extend to other stations of this network to see how this kind of effect propagates with the longitude.

Thanks for your attention !