Outline

- Introduction
- Description and characterization of April 2006 events
- Data and Method
- Discussion of the results
- Summary and conclusions
Introduction

- Vietnamese ionosphere shows particular sensitivity to the Equatorial Electrojet
- Region poorly described in the open literature
- Two GISTM receivers
  - Hue (near the crest)
  - Hoc Mon (close to the equator)

<table>
<thead>
<tr>
<th>Location</th>
<th>ID</th>
<th>Latitude (°N)</th>
<th>Longitude (°E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hue</td>
<td>HUE</td>
<td>16.4</td>
<td>107.6</td>
</tr>
<tr>
<td>Hoc Mon</td>
<td>HOC</td>
<td>10.9</td>
<td>106.6</td>
</tr>
</tbody>
</table>
Geomagnetic conditions

- 2006: year of solar minimum
- Moderate storm from April 4th to 7th
- SSC on 4th
- DST reaches -87 nT under southward IMF conditions
- Substorms
- April 1st is used as a quiet day of reference
Data and Method

- **GISTM (GPS Ionospheric Scintillation and TEC Monitor)**
  - High sampling rate (50 Hz)
  - $S_4$ and $\sigma_\phi$ (1, 3, 10, 30 and 60 s)
  - TEC and ROT (15 s)

- **MIDAS (Multi – Instrument Data Analysis System)**
  - Ionospheric tomography to support the identification of irregularities
  - Dual frequency measurements from IGS network
  - Vertical TEC maps

- **ROT (30 s), ROTI and Amplitude Scintillation index ($S_4$) are used**
  - ROTI is the std. dev. of ROT (5 minutes intervals)

- **S$_4$, ROT and ROTI gives information on the dimension of the irregularities**
  - $S_4$ is sensitive to scale below the Fresnel scale
  - ROTI > 0.5 corresponds to scale lengths of few km

- No meaningful phase scintillation (as expected)
Results

PRN 30

- Scintillation between 1200 and 1400 (local post-sunset)
  - 1st, 5th and 7th
  - Pre-reversal activity
- Inhibition on 4th and 6th.
- vTEC
  - Smooth during inhibited days
  - Steep changes during scintillating days
Results

PRN 30

- ROT and ROTI
  - Stable values during inhibited days
- ROTI > 0.5 for 6th (HUE @ 1200 UT)
  - Irregularity scale < few km
  - BUT not sufficient to produce scintillation
Results

- vTEC profiles (MIDAS)
- Scintillation 1200-1400 UT
- Dots indicates S4
  - Scint. co-located with TEC gradients
- Crests recognizable on 1st, 5th and 7th
- 4th and 6th crest approaches equatorial lat.
  - No sufficient fragmentation (?)
Results

*Possible explanation*

- IMF:
  - southward on early 4\textsuperscript{th}
  - northward on late 5\textsuperscript{th}
  - southward on early 6\textsuperscript{th}
- Southward turnings associated with AE activity enhancements: substorms possibly causing penetrating electric fields
  - Suppression of spread F
- On 7\textsuperscript{th} the F layer goes back to the unstable conditions
  - Expected local post-sunset scintillation enhancement
Summary

- Identification of scintillation inhibition during different phases of the storm development (PRN 30)

- vTEC, ROT and ROTI indicates that amplitude scintillation is due to steep changes in vTEC

- vTEC time evolution is smooth under inhibited conditions

- The MIDAS maps indicate that the crest configuration is lost on 4th and 6th
  - IMF turns southward on 4th, comes back to northward on 5th and turns southward again on 6th:
    - IMF South often associated with AE activity intensification (penetrating E fields?)

- IMF Bz and AE critically contribute to the suppression of the spread F generating ionospheric scintillations.

Similar inhibitions happen during a storm occurred few days later…
A comparative study with the previous event is in preparation
Thanks for your attention!

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