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ISWI AND AWESOME PROJECT IN VIETNAM

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Outline

1. Instruments related to Space Weather Science in Vietnam
2. Some results of Ionospheric Research in Vietnam
3. Implement the ISWI Instrument Project: Setting up an AWESOME in Vietnam
4. Some lessons from practical experience
5. Some comments.

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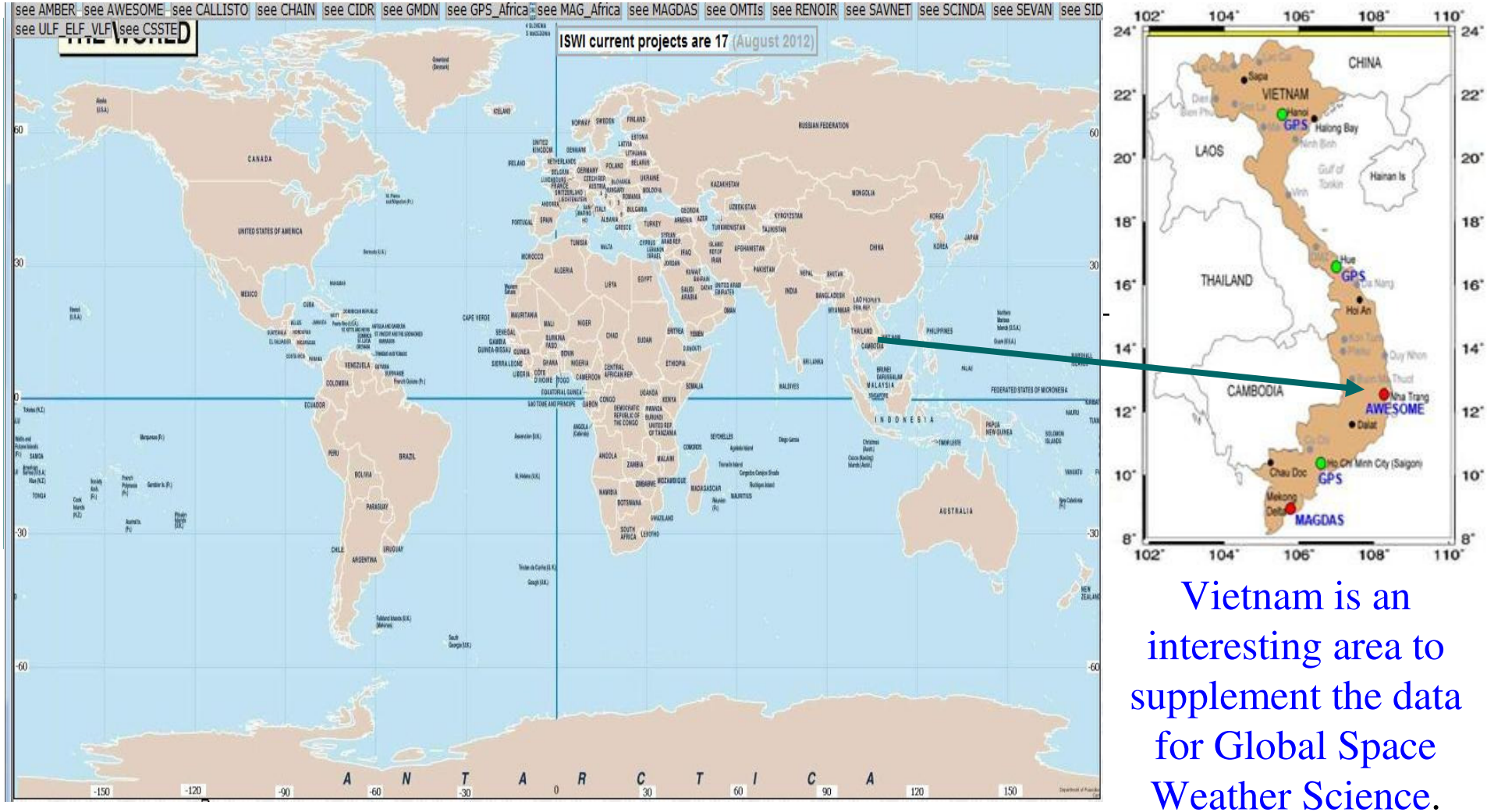
Location of Vietnam on the World Map



Vietnam is an interesting area to supplement the data for Global Space Weather Science.

- It is stretching from the North tropic to the magnetic equator (~23^0 N to ~8^0N) in one longitudinal zone.
- It is the mainland zone adjacent to the Pacific Ocean.

We can wait different ionospheric properties going on here.

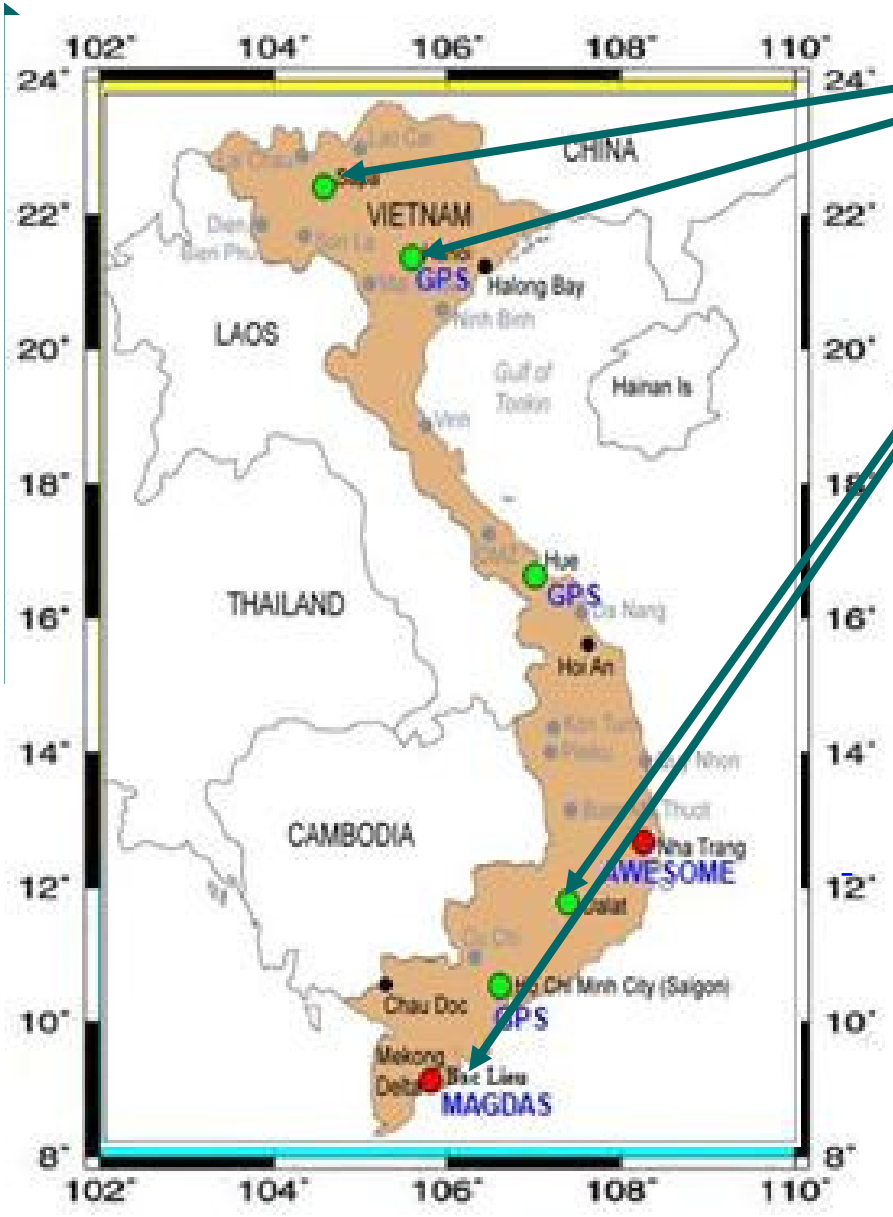
1. Instruments Network of Vietnam

- During many past years, we have had much bilateral research cooperation with foreign research institutions. We have received various International supports and from foreign colleagues on monitoring equipment. We have done studies on the Ionosphere and the Magnetic fields.

- **Our observations and studies are carrying out by 3 Institutes belong to Vietnam Academy of Science and Technology (VAST):**
  - **Hanoi Institute of Geophysics.**
  - **Ho Chi Minh City Institute of Physics.**
  - **Nha Trang Institute of Technology Research and Application**

All these activities allow us to be able to participate in the global Space Weather Science today.

Instruments Network of Vietnam



Magnetometers:

There are 4 magnetic observatories in Vietnam:
Sapa and Hanoi in the North
Dalat and Bac Lieu in the South

- Sapa (φ= 22.20'N; λ = 103.50'E): Established in 1957
- Hanoi (φ= 21.02'N; λ = 105.57'E): Established in 1967
- Dalat (φ= 11.57'N; λ = 108.29'E): Established in 1981
- Bac Lieu (φ = 9.17'N; λ = 105.44'E): Established in 1988

GPS: There are 3 GPS Receivers in Vietnam.
They have been installed in Hanoi, Hue and Ho Chi Minh and collecting data since 2005.

- Hanoi (φ= 21.02'N; λ = 105.57'E).
- Hue (φ= 16.27'N; λ = 107.35'E)
- Ho Chi Minh (φ= 10.51'N; λ = 106.33'E)

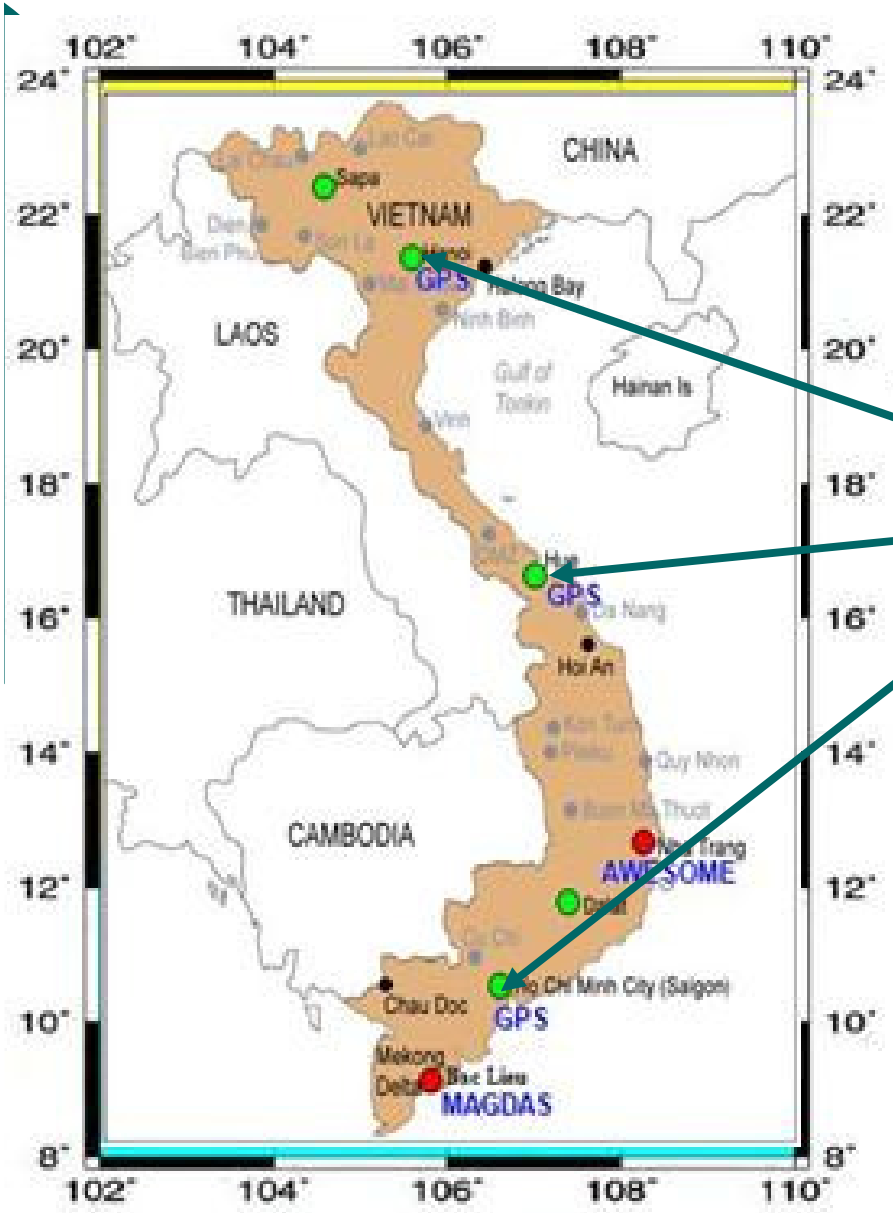
Ionosondes:

- In Ho Chi Minh a CADI is operating since 2000
- In Hanoi Ionosondes operated from 1963 to 1998.
- Since 2006, 2 ionosondes from SEALION project were installed in Hanoi and Bac Lieu.

ISWI:

- In November 2011, an AWESOME Receiver was installed in Nha Trang.
- In 2009, a MAGDAS II was installed at Bac Lieu and in March 2012, the Kyushu University upgraded the MAGDAS II to a MAGDAS 9.

Instruments Network of Vietnam

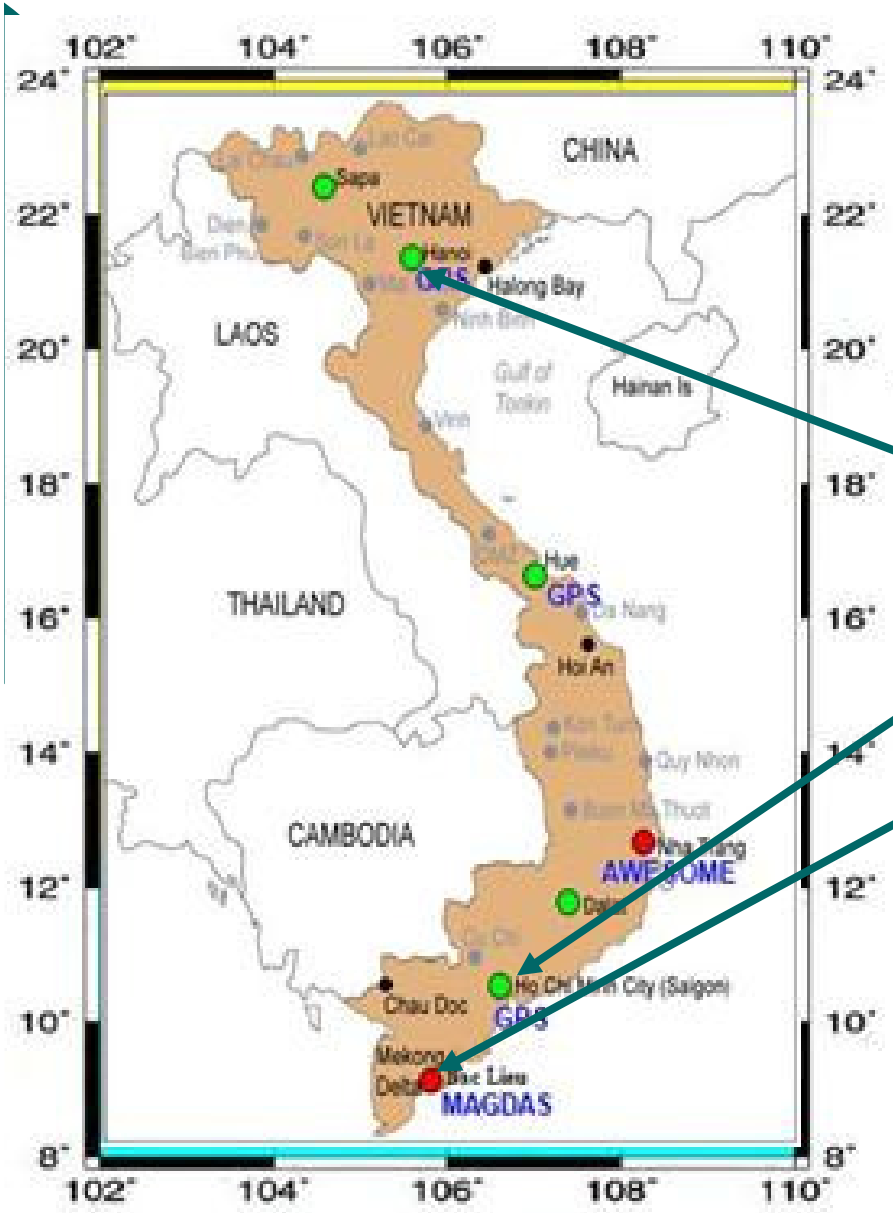


GPS: There are 3 GPS Receivers in Vietnam. They were installed in Hanoi, Hue and Ho Chi Minh since 2005. (in collaboration with France)

- Hanoi (φ= 21.02'N; λ = 105.57'E).
- Hue (φ= 16.27'N; λ = 107.35'E)
- Ho Chi Minh (φ= 10.51'N; λ = 106.33'E)

Many thanks to Christine Amory for her very active collaboration in education Vietnamese students and research.

Instruments Network of Vietnam



Ionosondes:

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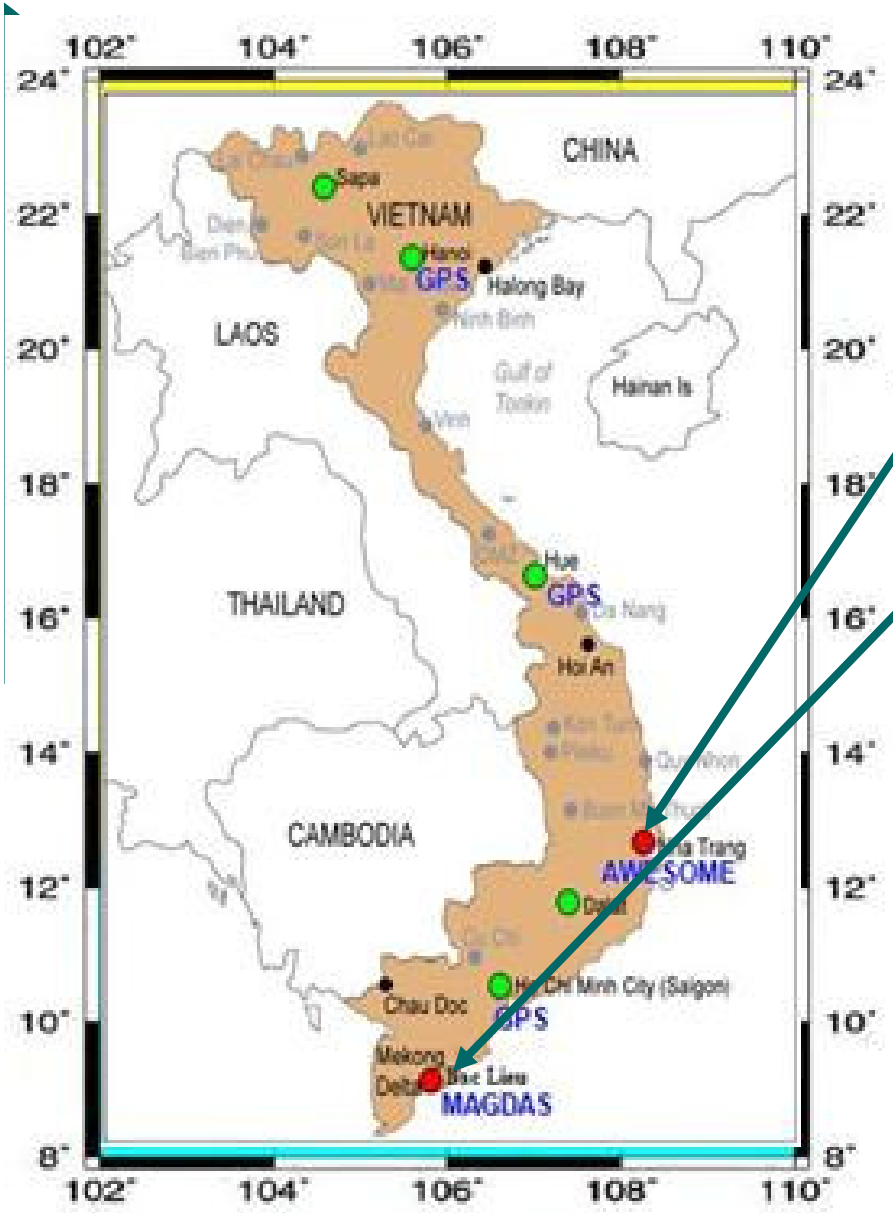
Instruments Network of Vietnam



ISWI: AWESOME and MAGDAS

- In November 2011, an AWESOME Receiver was installed in Nha Trang.

- In 2009, a MAGDAS II was installed at Bac Lieu and in March 2012, the Kyushu University upgraded it to a MAGDAS 9.

With this presentation we would like to mention all the data sets recorded in Vietnam .

2. IONOPSPHERIC CHARACTERISTICS based on Ground Observatories

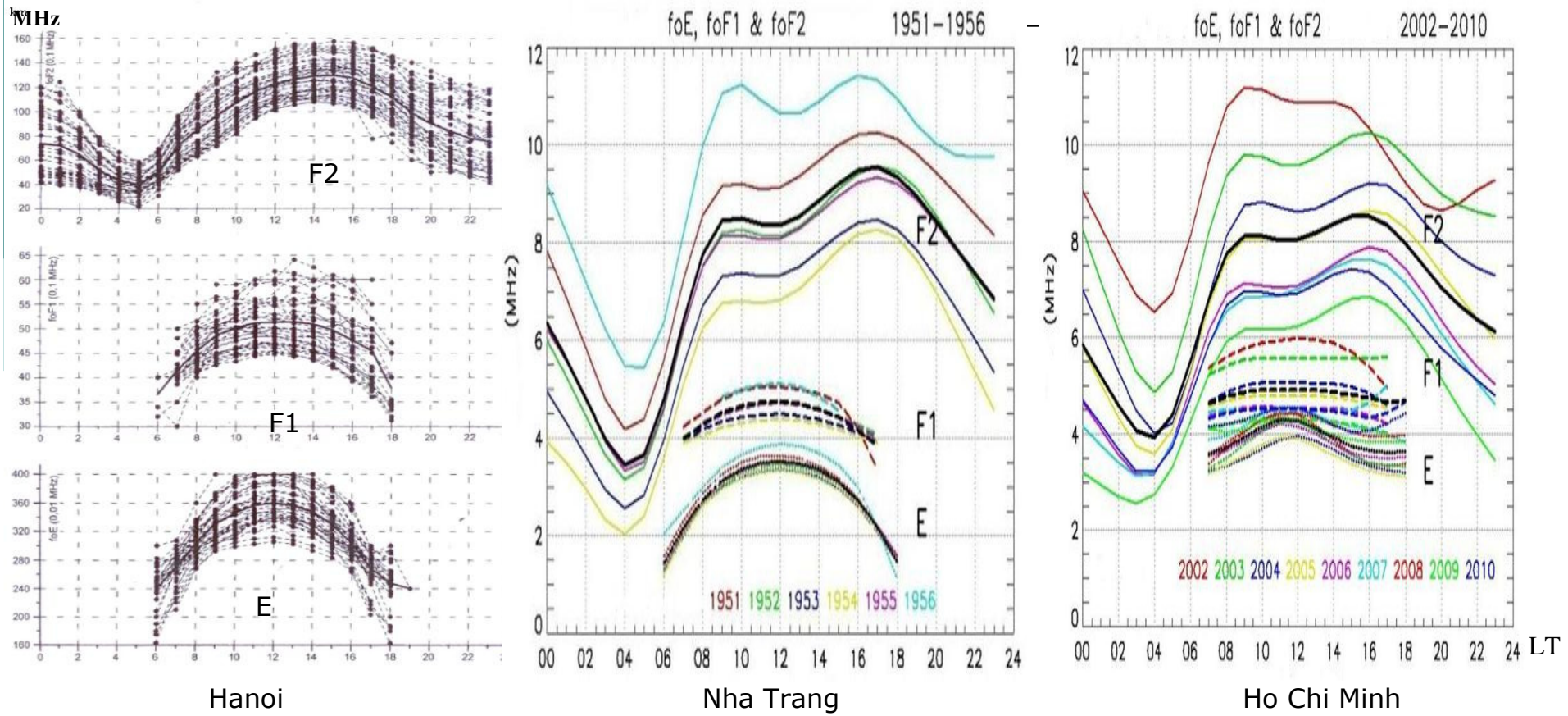


Fig.: The critical frequencies of the E, F1 and F2 layers observed at Ha Noi, Nha Trang and Ho Chi Minh

The results exhibit common features for the ionospheric parameters with latitudinal variations from the tropical to the equatorial region. The critical frequencies of the E, F1 and F2 layers follow the variation of the sunspot cycle.

TEC CHARACTERISTICS
based on GPS data

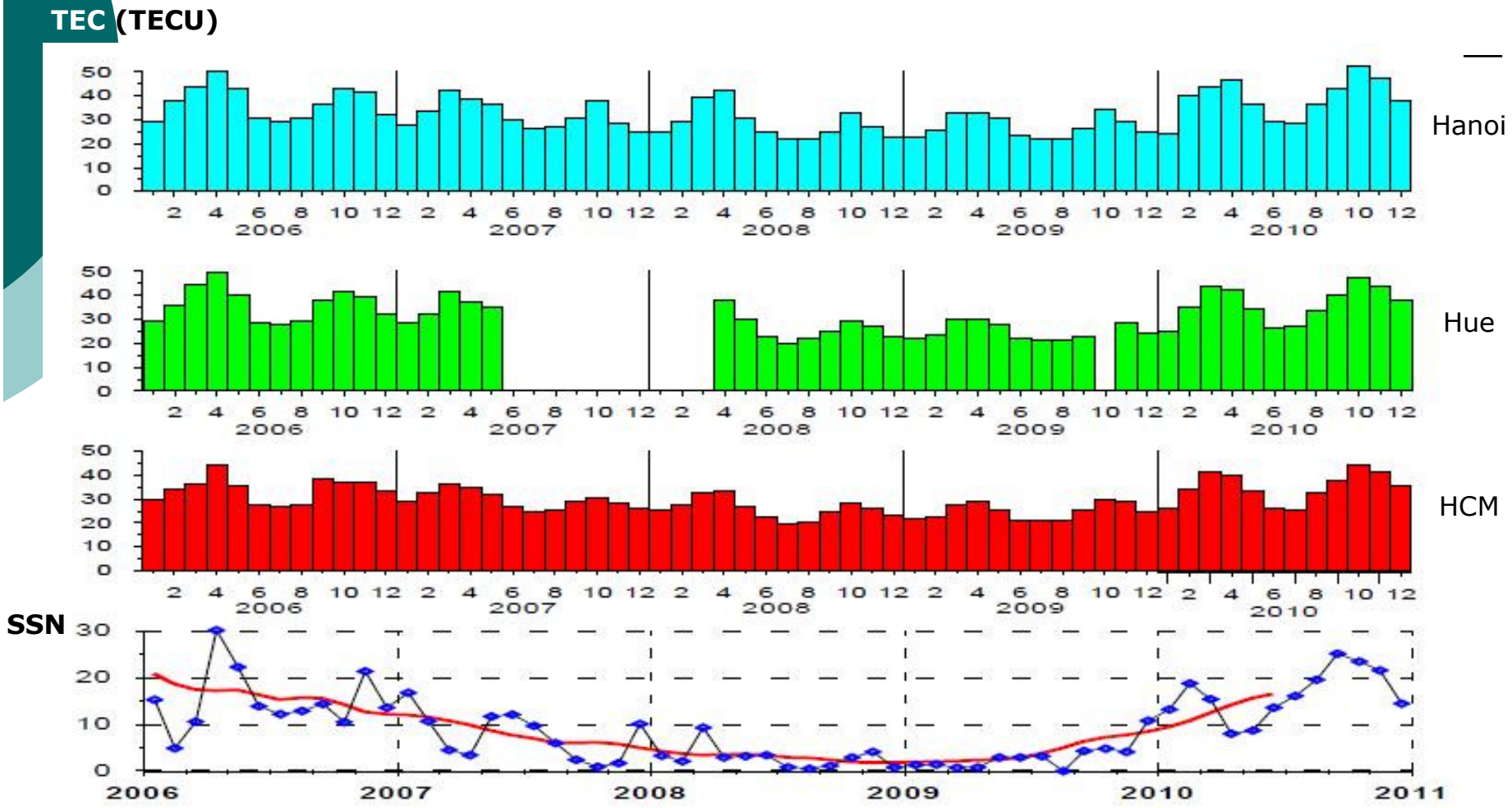


Fig.: Variations of maximum TEC observed at Ha Noi, Hue and Ho Chi Minh during period 2005 - 2010

SCINTILATION CHARACTERISTICS

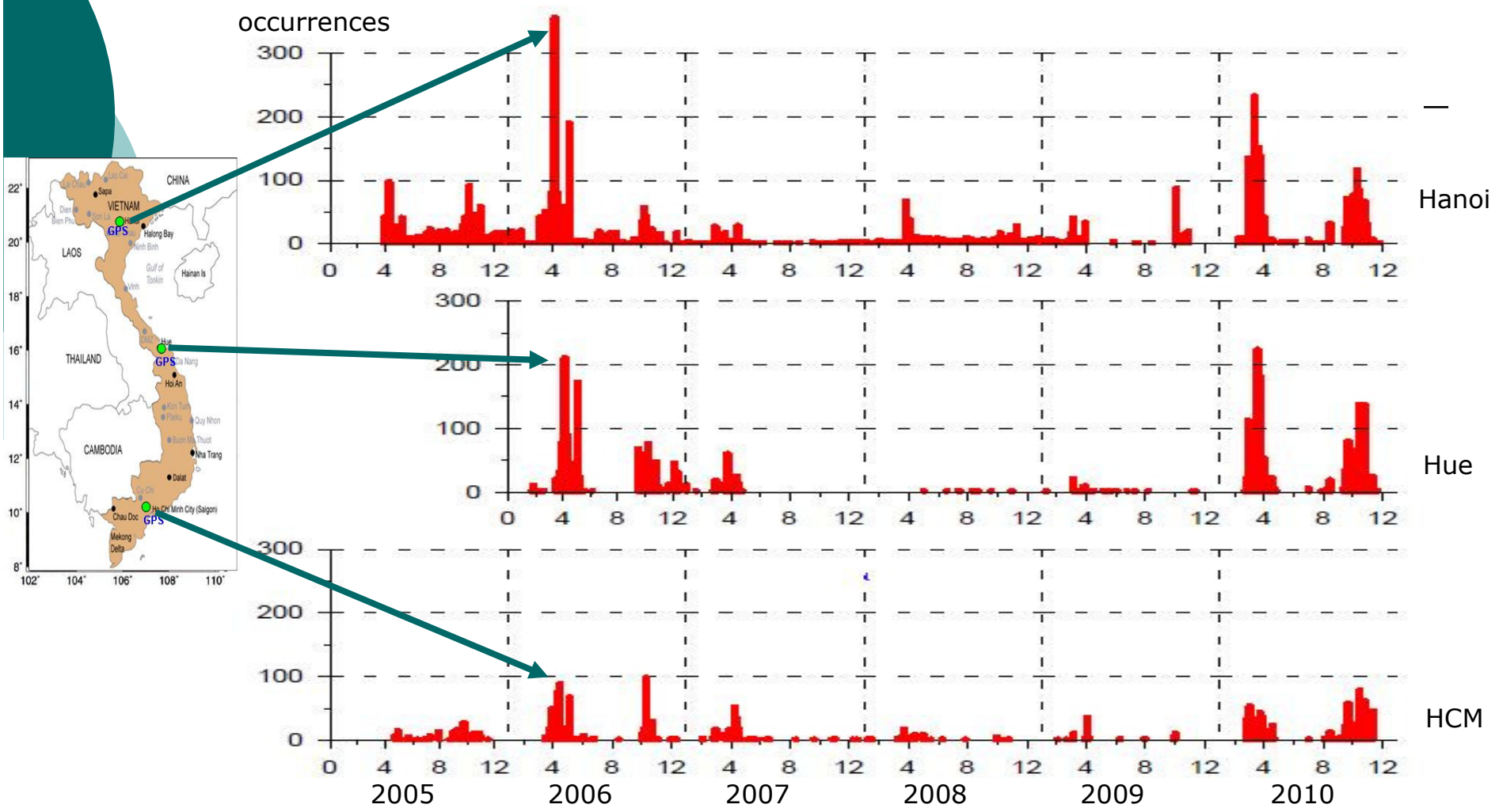
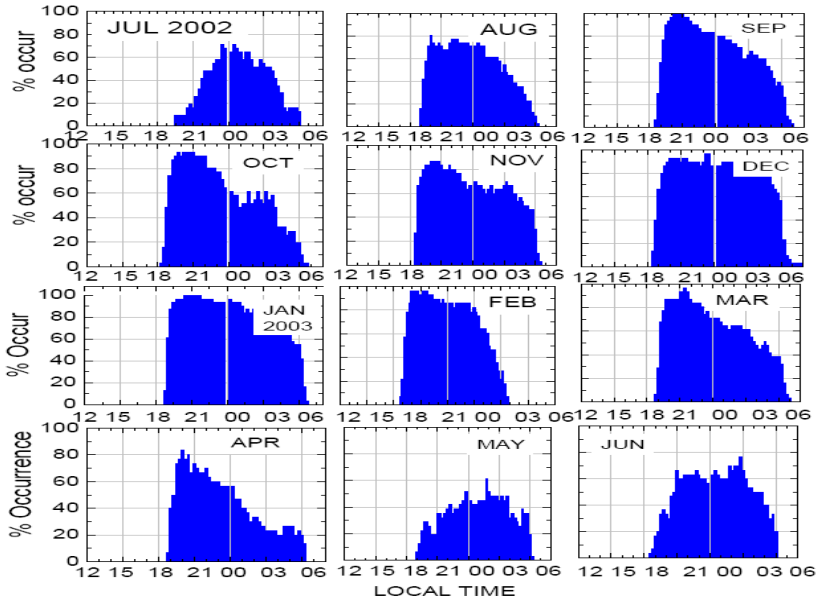


Fig.: Statistical Scintilation over Ha Noi, Hue and Ho Chi Minh during period 2005 -2010

The strongest intensity of scintilation observed at Ha Noi, weaker at Hue and smallest at HCM

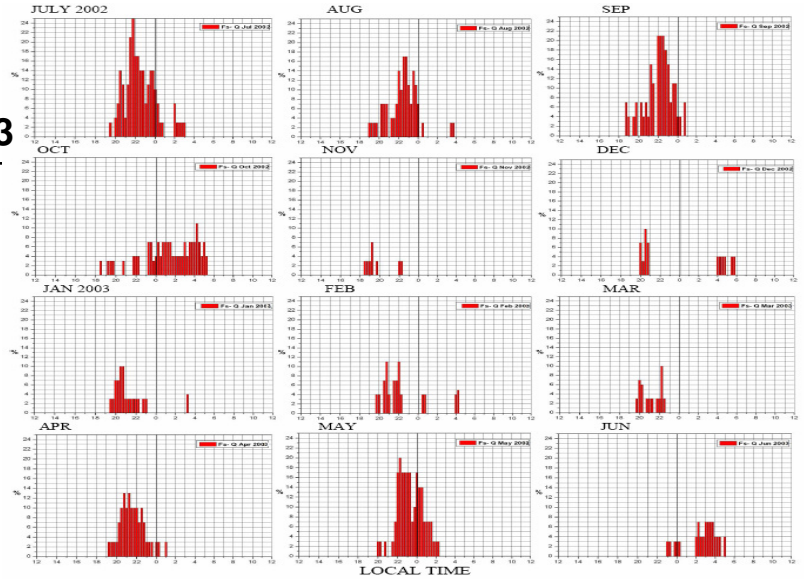
Comparison with other longitudinal regions

Spread F observed at Sao Luis, Brazil:

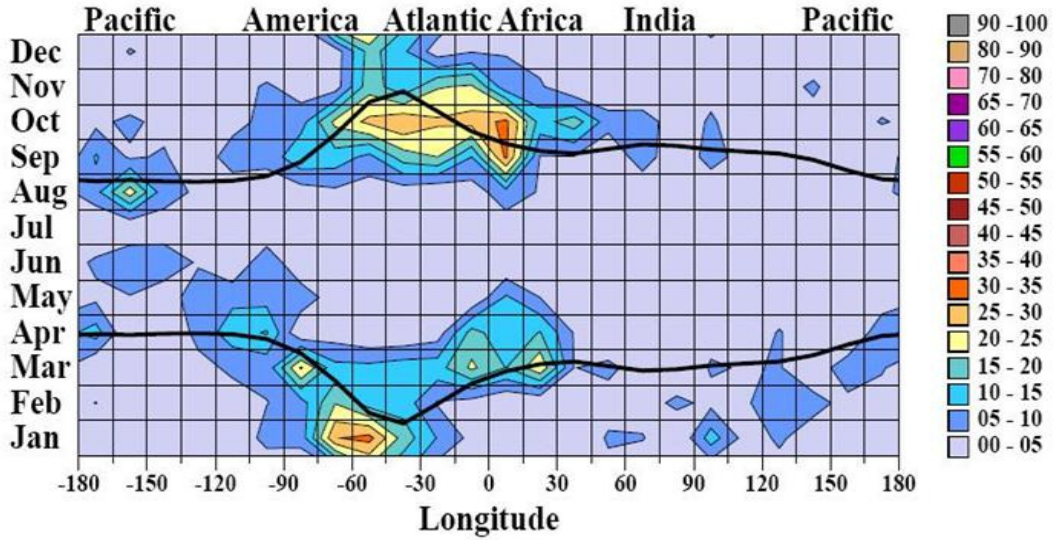


2002 - 2003

Spread F observed at Ho Chi Minh, Vietnam:



Equatorial Plasma Bubble (EPB) based on DMSP data 2003:

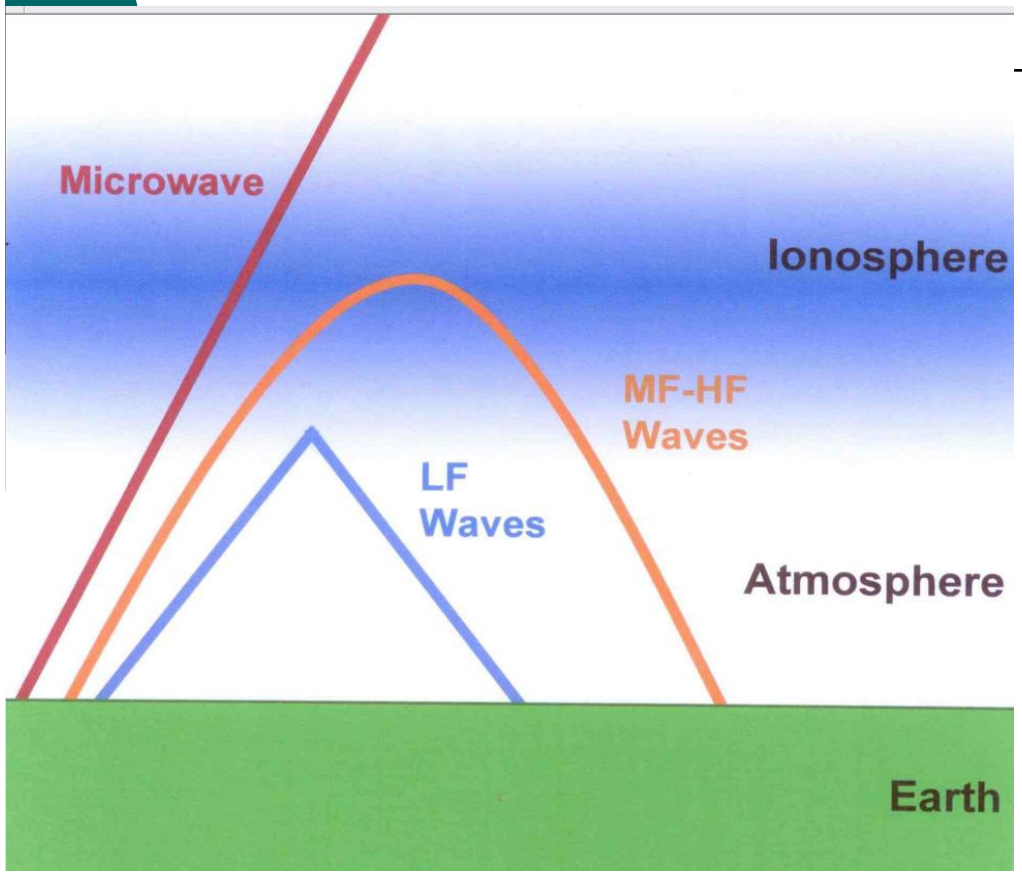


[L.C. *Gentile et al.*, 2006]

- **In our Ionospheric studies, we found longitudinal differences between the Asian and American sectors** (L. Hoang, M. Abdu, J. MacDougall, I. Batista, 2010; Y. Sahai, L. Hoang, et al, 2009; Y. Sahai, L. Hoang, et. al 2005; Le Huy and Amory-Mazaudier, 2005).
- **Many problems not yet explained.**

  So it is necessary to analyze more data to understand sources of these differences.

3. Implementation of ISWI - AWESOME Project in Vietnam



- Unmanned balloon record altitude ~ 50 km
- Lowest reasonable satellite altitude ~200 km
- Ionosonders reflecting altitude:

~ 90 – 500 km

+ GPS (sensitive mostly to F region)

+ Radar (cannot scatter off D region)

How about the altitudes: ~ 60 - 90 km?

The VLF method is useful for detecting changes in reflection heights, electron density in the D-region ionosphere, which could correspond to abnormal geophysical conditions.

WHY AWESOME IN VIETNAM?

Nha Trang is a coastal City and very quiet location

Ionospheric studies have been started in Vietnam with HF ionosonde, GPS. These instruments allow studying Space Weather only above 90 km. An AWESOME will complete observations for all ionospheric environment.

Thus, Vietnam can contribute to study Space Weather not only with the observed data set, but with the new data.

An AWESOME VLF Receiver was setting up in Nha Trang (12.20 N; 109.13 E) in November, 2011.

Instrument Provider: **STAR Laboratory of Stanford University**.
Hosting Organization: **VAST** (with the participation of two research institutes: Ho Chi Minh City Institute of Physics and Nha Trang Institute of Technology Research and Application).

There are 5 main components to a complete VLF Receiver:

1) VLF Antenna
2) GPS Antenna
3) Preamplifier box
4) Line receiver box
5) Computer and software.

AWESOME main components:

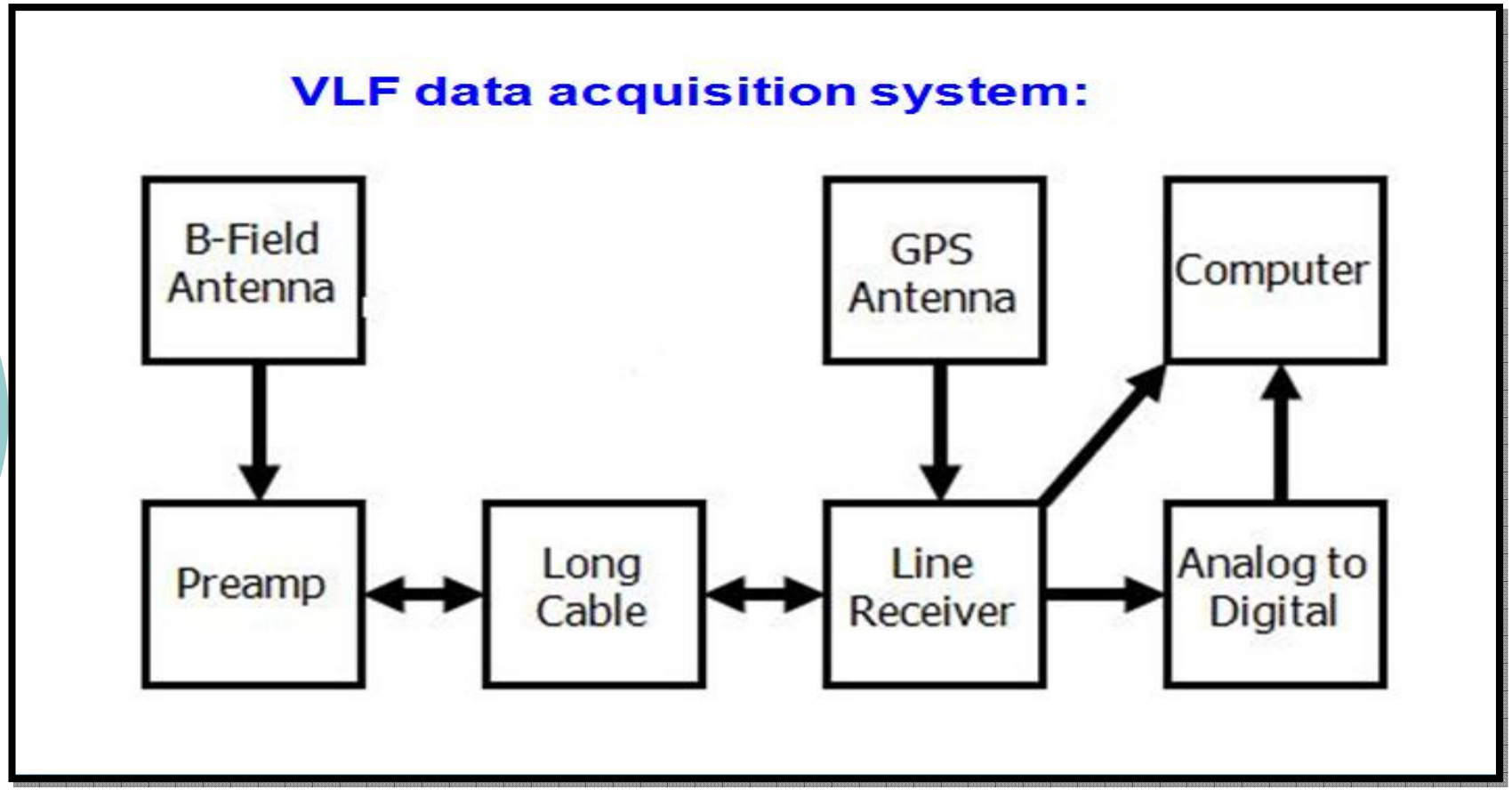
The VLF loop antenna

GPS antenna

Preamplifier box

Line receiver box

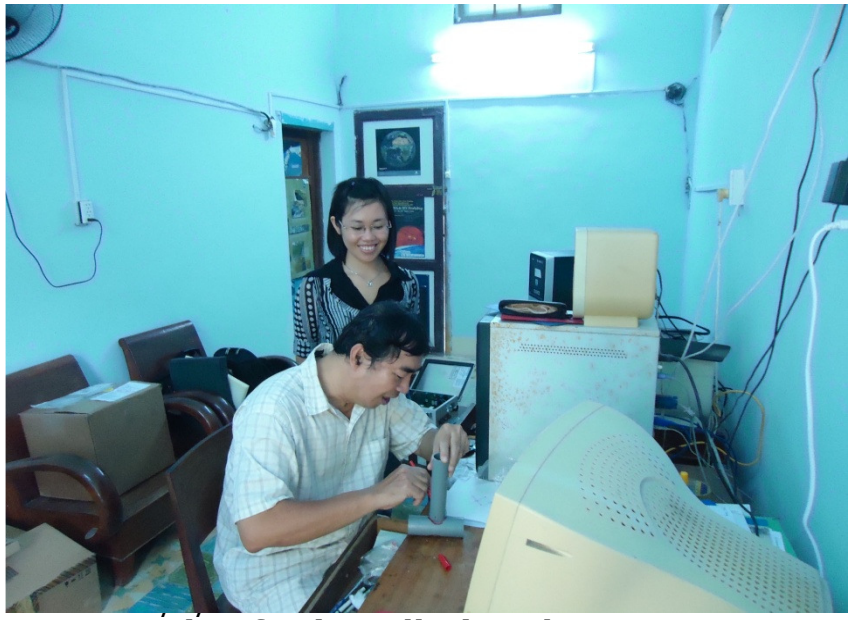
Computer



The Antennas gather the necessary data for recording. The Preamplifier and the line Receiver process the signals and pass them to the computer

The installation was executed by Vietnam AWESOME Group
with instructions remotely from Dr. Morris Cohen (leader of AWESOME Stanford Team).

Checking all the components before installation



Preparing for installation the VLF antenna

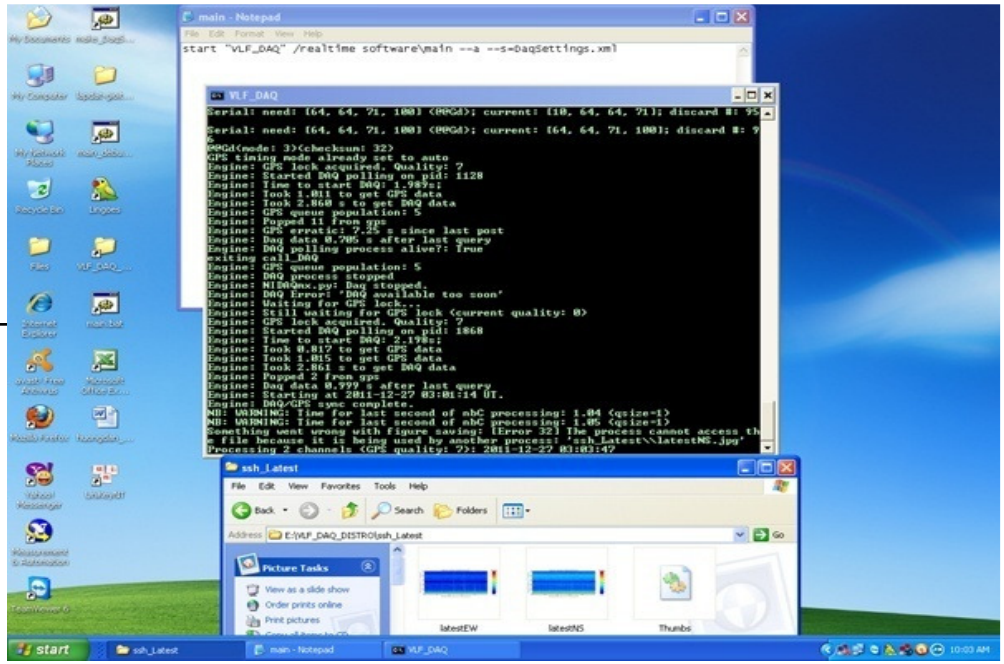
Setting up the GPS antenna

Assembly the VLF Antenna

Mounting the Preamplifier Box to the VLF Antenna

The installed GPS and VLF Antennas

Assembly all the parts and Computer



Installing software

Discussing problems with the Internet transfer data

The AWESOME started working from January, 2012

11/5/2012

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Vietnam AWESOME Team:

1. Dr. Hoang Thai Lan, leader.
5. MSc. Vinh Hao, responsible for AWESOME operating

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2. Ms. Tien (Nha Trang Institute)
3. Ms. Tam (Ho Chi Minh Institute)
4. Mr. Vinh (Ho Chi Minh Institute)
6. Mr. Tue (Nha Trang Institute)
7. Mr. Thang (Nha Trang Institute)
8. Mr. Thao (Nha Trang Institute)
9. MSc. Tuat (Nha Trang Institute)
10. Dr. Vinh (Nha Trang Institute)

Vietnam AWESOME Team wants to thank Stanford AWESOME Team for all they did to make the VLF Receiver setting up in Vietnam successfuly.

Special thanks to Dr. Morris Cohen for doing so much to solve the problems in sending the instrument and during the time of installation it .

We also would like to express sincere thanks to Prof. Hans Haubold for his very valuable supports in this cooperation.

4. Some lessons from practical experience

1. In fact, in the developing countries the Government policy shows interest for Space Sciences insignificantly. Lots of people think that when the country is still poor, the Space Science is not of great value to the country. The benefits of the Space Science are not appreciated enough. Thus, the Space Science Projects in the most developing countries always run into difficulties. So, each ineffective working instrument will be a big difficulty for us to report at the end of the financial year.

- Myself was in trouble when I reported to the VAST for installation an AWESOME in Ho Chi Minh, but the sending the instrument from Stanford delayed one year. So I have to change the instrument's installation to Nha Trang, far from Ho Chi Minh city 450 km.

- And now, there is a technical problem with our AWESOME in Nha Trang for 3 month already, but we have not any respond from Stanford AWESOME Group.

It is critical!

⇒ It should be a more **Effective Cooperation modality** between the Lead scientists and the Host scientists

Some lessons from practical experience

2. The Internet Data Transmission Protocol of ISWI instruments and use of these data for research is a major challenge for our young researchers and students. They are very enthusiastic, but they have a gap in instrumental and scientific knowledge. And these two things run into difficulties for operation and maintainance the instruments in good conditions.

There happened a situation with our AWESOME: students using Team View to download data from the AWESOME's computer. In this case, the software crashes and the instrument stops collecting data until we find out.

→ **Training to the young students and researchers is very important when we install new instruments**

Some lessons from practical experience

3. ISWI has conducted many programs and school for training young students and researchers. But many people have got support to attend do not directly work with ISWI instruments.

For example:

There was the ISWI and MAGDAS School in Indonesia in September. I think that the people working with MAGDAS in Bac Lieu must be go to this school, but in fact none of them was attending. A student received support of the school is not related to MAGDAS!

Why?

5. Some Comments

1. The human factor always is a deciding factor. For this reason, the role of the National Coordinators is very important here. The National Coordinator should be a person which has a sense of responsibility to realize the goals of an International Program at the National scientific level.

2. Of course, the scientists from developing countries need International helps and supports for necessary conditions to carry out successfully the scientific missions.

→ Therefore should be regular meetings between the Instrument Leaders and the National Coordinators.

3. **UNOOSA has very important role in establishment connections between developed and developing countries into Space Weather activities such as BSS, IHY, ISWI.**

→ **UNOOSA should not be missing in the next step!**

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