



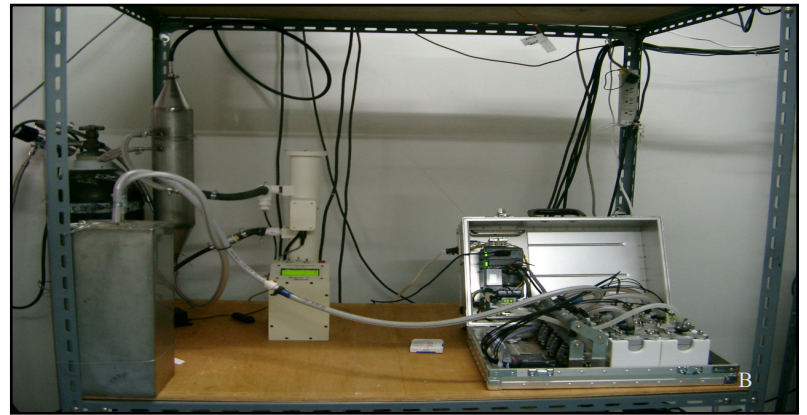
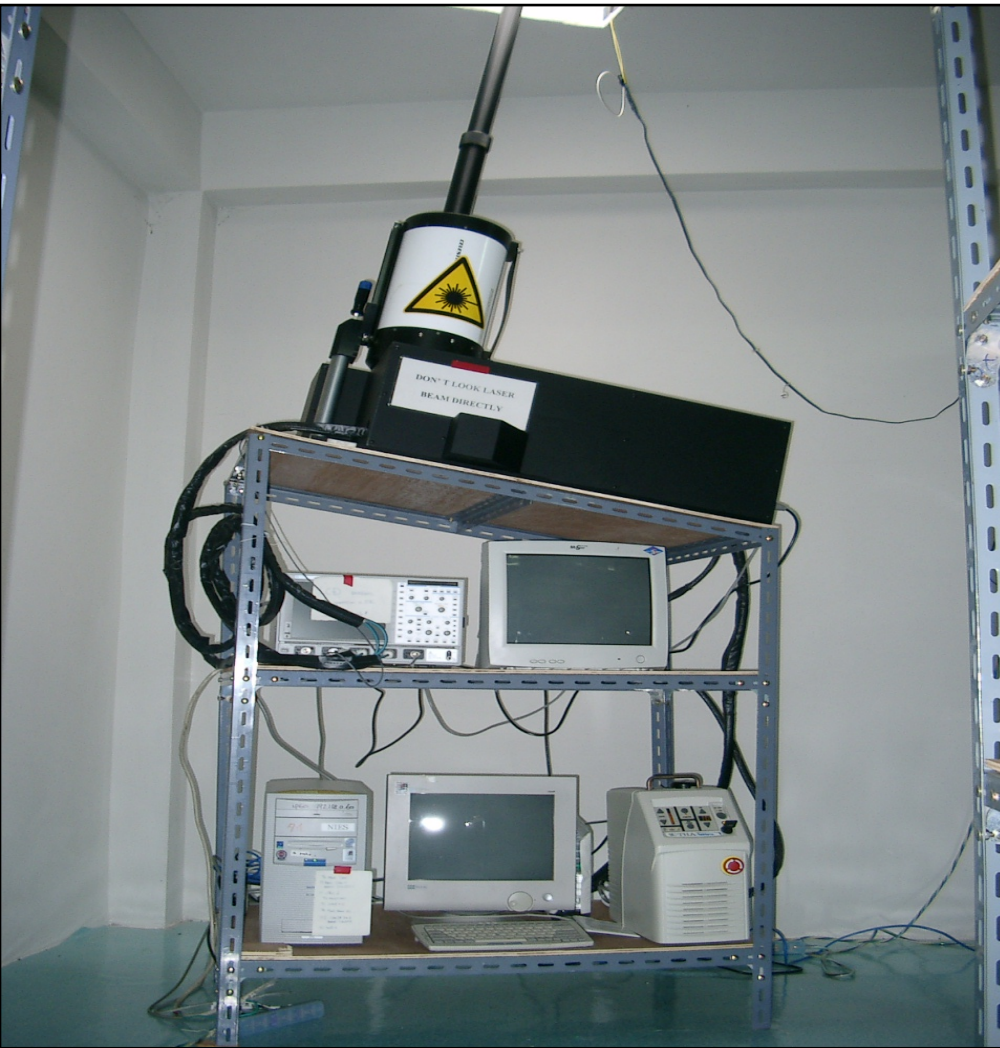
THE OBSERVATORY FOR ATMOSPHERIC RESEARCH AT PHIMAI

The Observatory for Atmospheric Research  
*autonomous non-attendant facility*

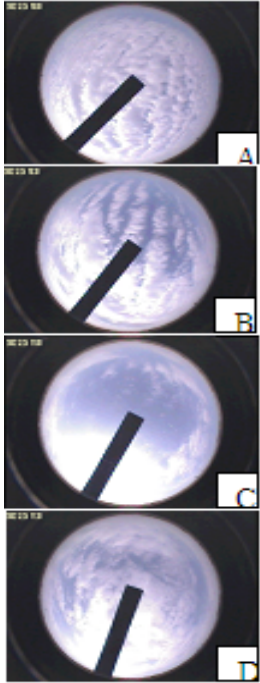
# ***Radiation and surface meteorological observation***



# Aerosol Observation



# *Cloud and Water Vapor Observation*

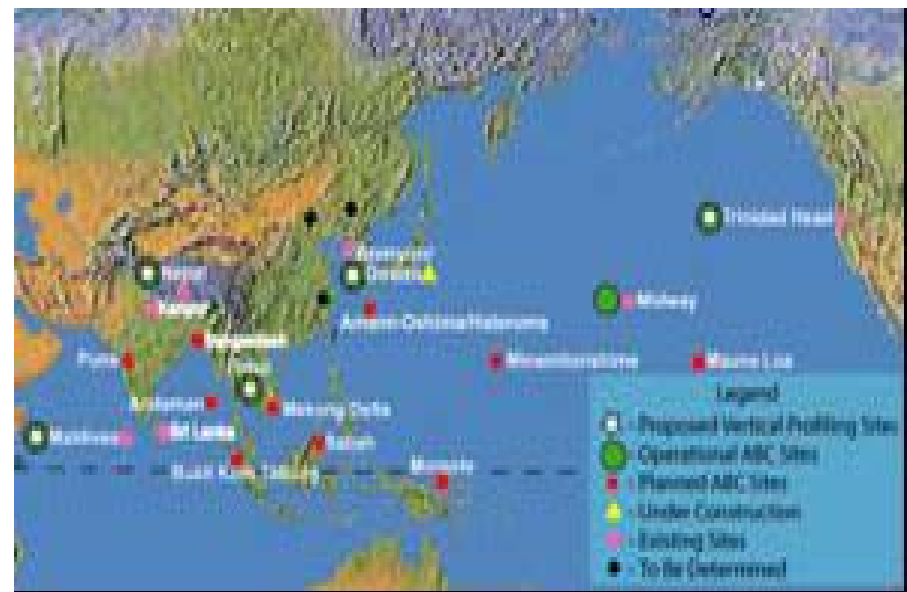


*Wind Profiler and Radio  
Acoustic Sounding System*



# Geomagnetic observation





# IPSTAR



Router



Antenna



# Monthly Cost in Thailand

## IPSTAR

1000 (Kbps)	2700B
512	2500
256	1500

## GPRS

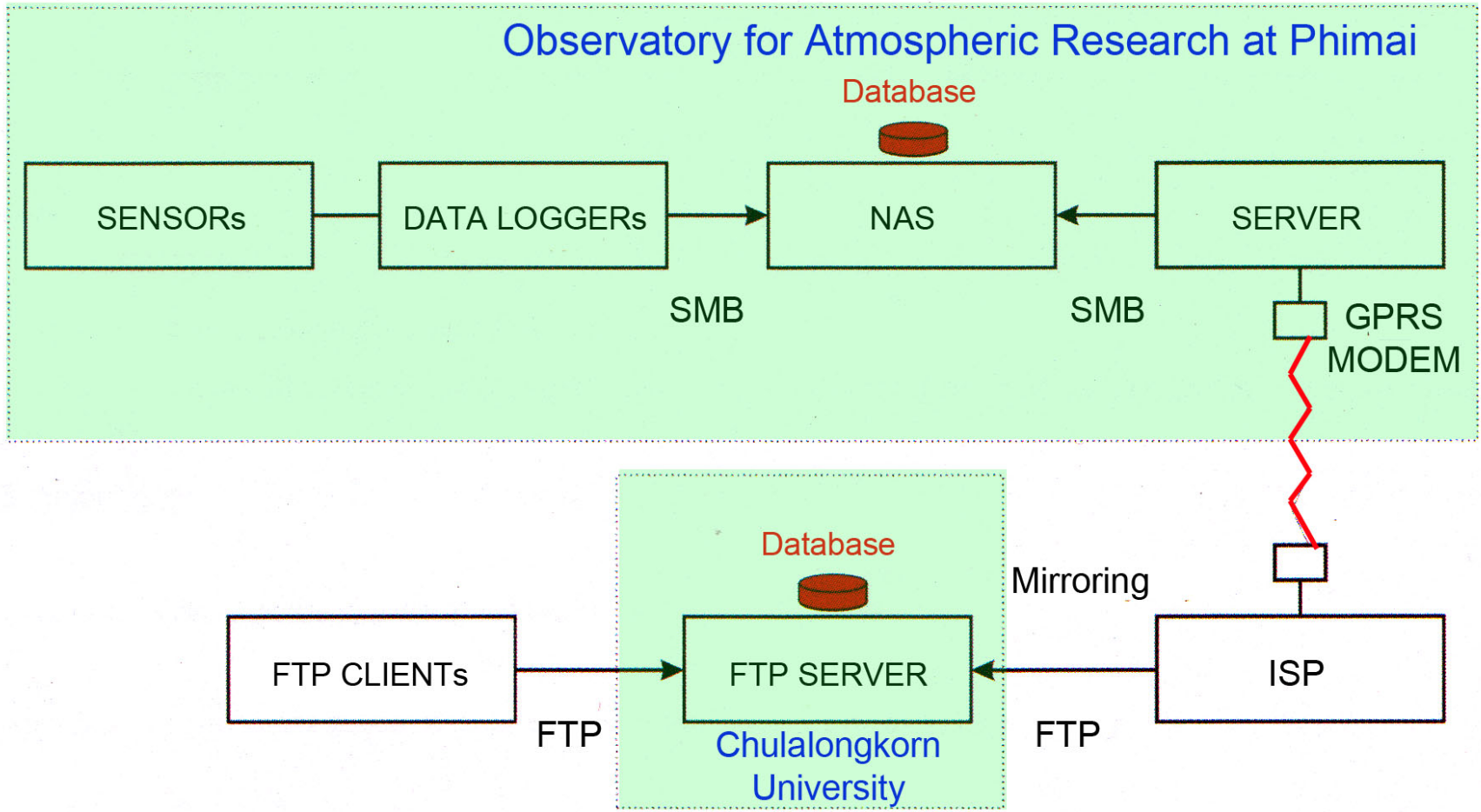
56 (50 MB)	350
(Unlimited)	1300

## ADSL

1000	1000
------	------

```
total 360
drwxr-xr-x  2 obsatrad users      4096 Jun  7 10:20 CO/
drwxr-xr-x  2 obsatrad users    32768 May  8 12:20 GPS_ZXII/
drwxr-xr-x  2 obsatrad users      4096 Jun  6 22:20 I_Sky/
drwxr-xr-x  2 obsatrad users    12288 Jun  7 03:50 MFR7PAR/
drwxr-xr-x  2 obsatrad users      4096 Jun  7 03:50 Microwave/
drwxr-xr-x  2 obsatrad users      4096 Jun  7 07:20 Neph_Neph/
drwxr-xr-x  2 obsatrad users      4096 Jun  7 07:20 Neph_photo/
drwxr-xr-x  2 obsatrad users      4096 Jun  6 20:20 Ozone/
drwxr-xr-x  2 obsatrad users      8192 Jun  7 01:00 PARwebcam/
drwxr-xr-x  2 obsatrad users      8192 Jun  7 09:50 RAIN/
drwxr-xr-x  2 obsatrad users      4096 Jun  7 00:50 Radiation/
drwxr-xr-x  2 obsatrad users      8192 Jun  7 09:50 Sky_Camera/
drwxr-xr-x  2 obsatrad users      4096 Jun  7 08:20 Skyradio/
drwxr-xr-x  2 obsatrad users      4096 Dec 27 07:10 Web_camera/
drwxr-xr-x  2 obsatrad users      4096 Aug 25  2005 WindProfiler/
drwxr-xr-x  2 obsatrad users      4096 Mar 18 13:00 WindProfiler_SpecMon/
drwxr-xr-x  2 obsatrad users      4096 Dec 27 07:10 WindProfiler_WindTemp/
drwxr-xr-x  2 obsatrad users    118784 Jan 16 20:20 lidar/
drwxr-xr-x  2 obsatrad users    32768 Jun  7 09:20 magnetometer_JCS207/
drwxr-xr-x  2 obsatrad users    49152 Jun  7 09:50 magnetometer_MB163/
-rw-r--r--  1 obsatrad users    38132 Jun  6 08:11 transfer_log.gz
drwxr-xr-x  2 obsatrad users      4096 Mar  7 12:32 update/
hashmich@mail:/ftproot/radiation/Phimai$
```

# Observatory for Atmospheric Research at Phimai



SMB: Server Message Block  
NAS: Network Attached Storage  
ISP: Internet Service Provider

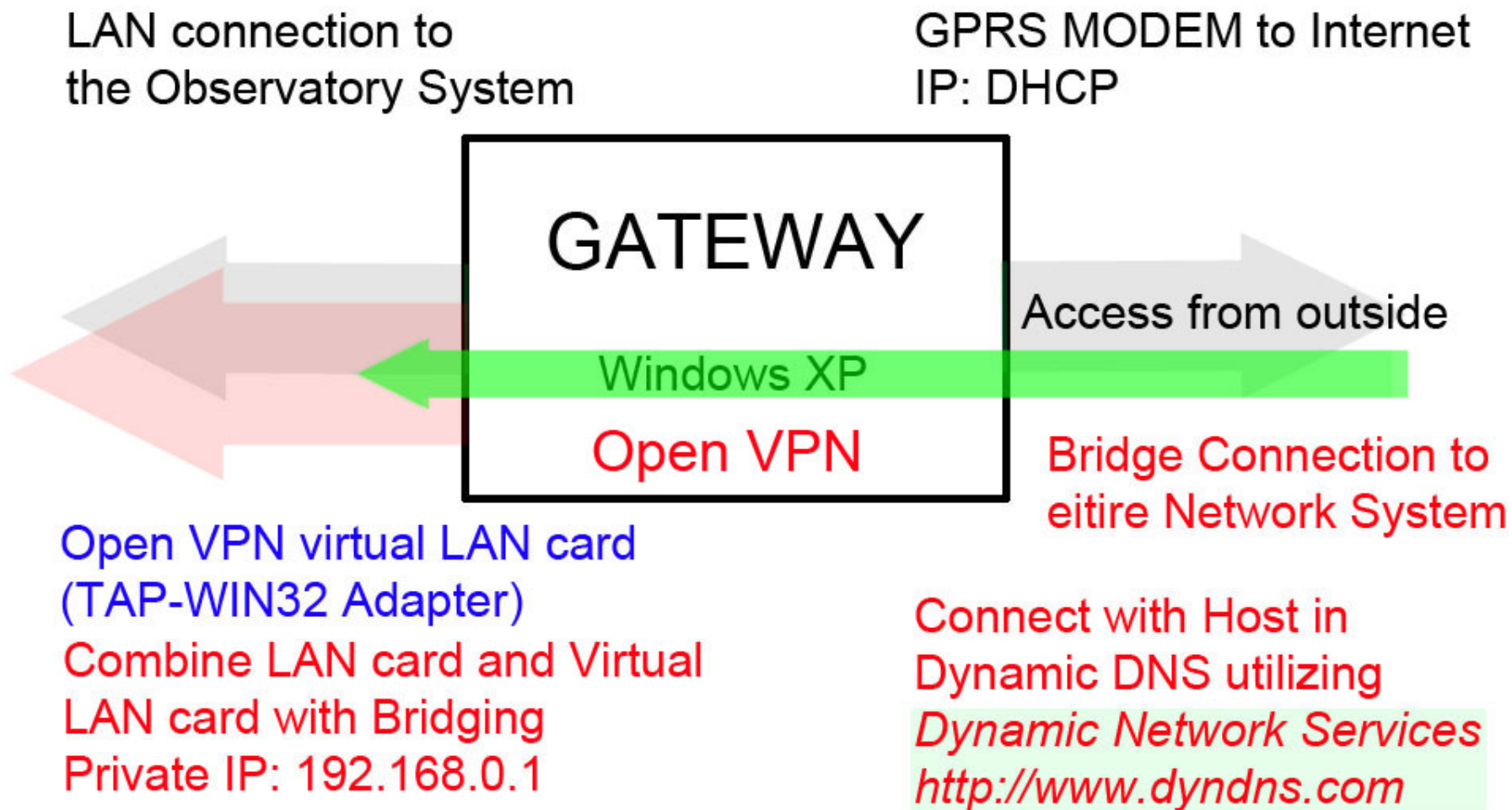
## *Normal Communication Flow*

LAN connection to  
the Observatory System  
Private IP: 192.168.0.1

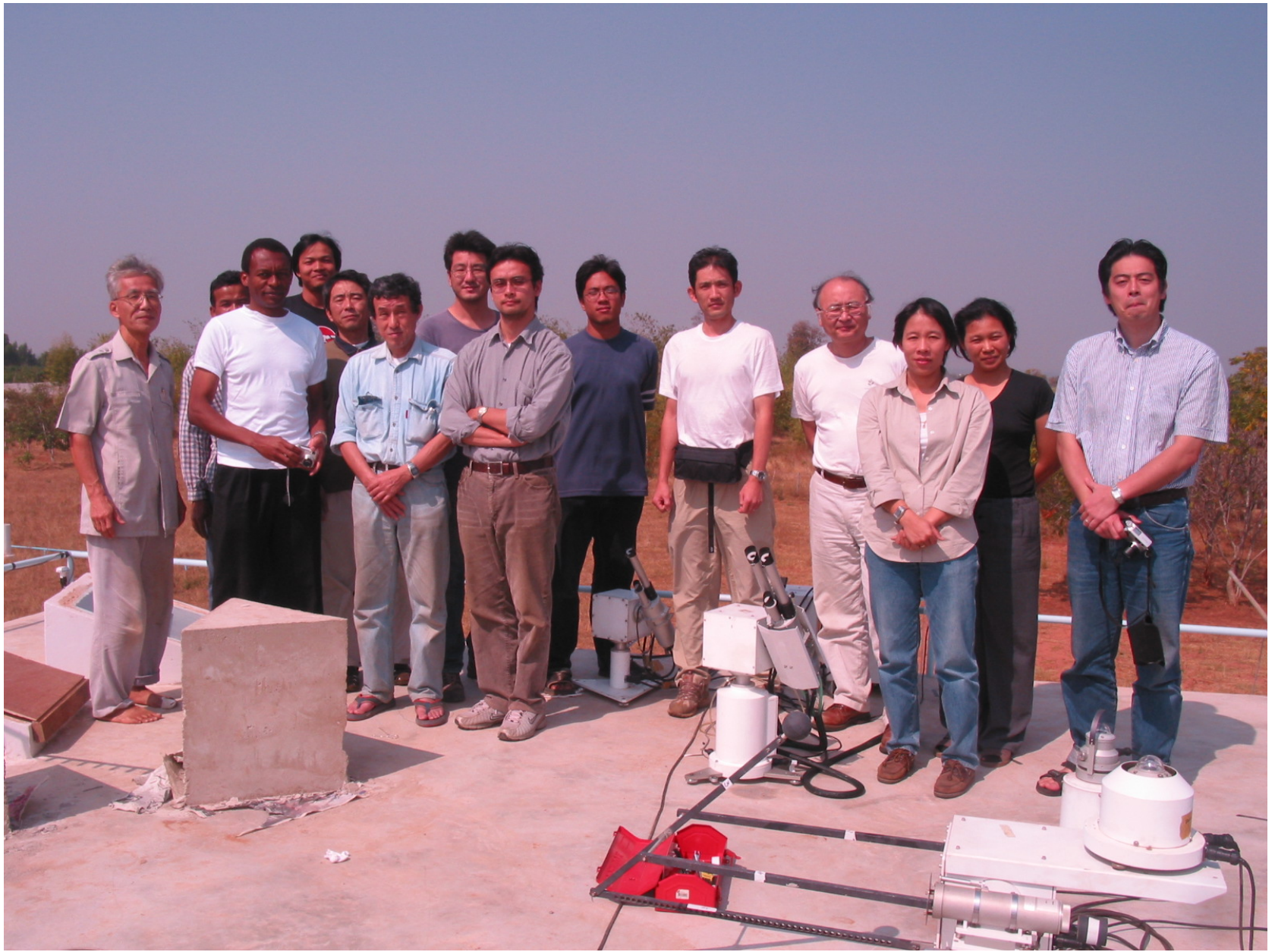
GPRS MODEM to Internet  
IP: DHCP  
Windows Bridge Connection



## VPN Communication Flow









Bangkok  
rungs Thep



Geology

Saraburi Saraburi



Observatory



Image © 2005 EarthSat

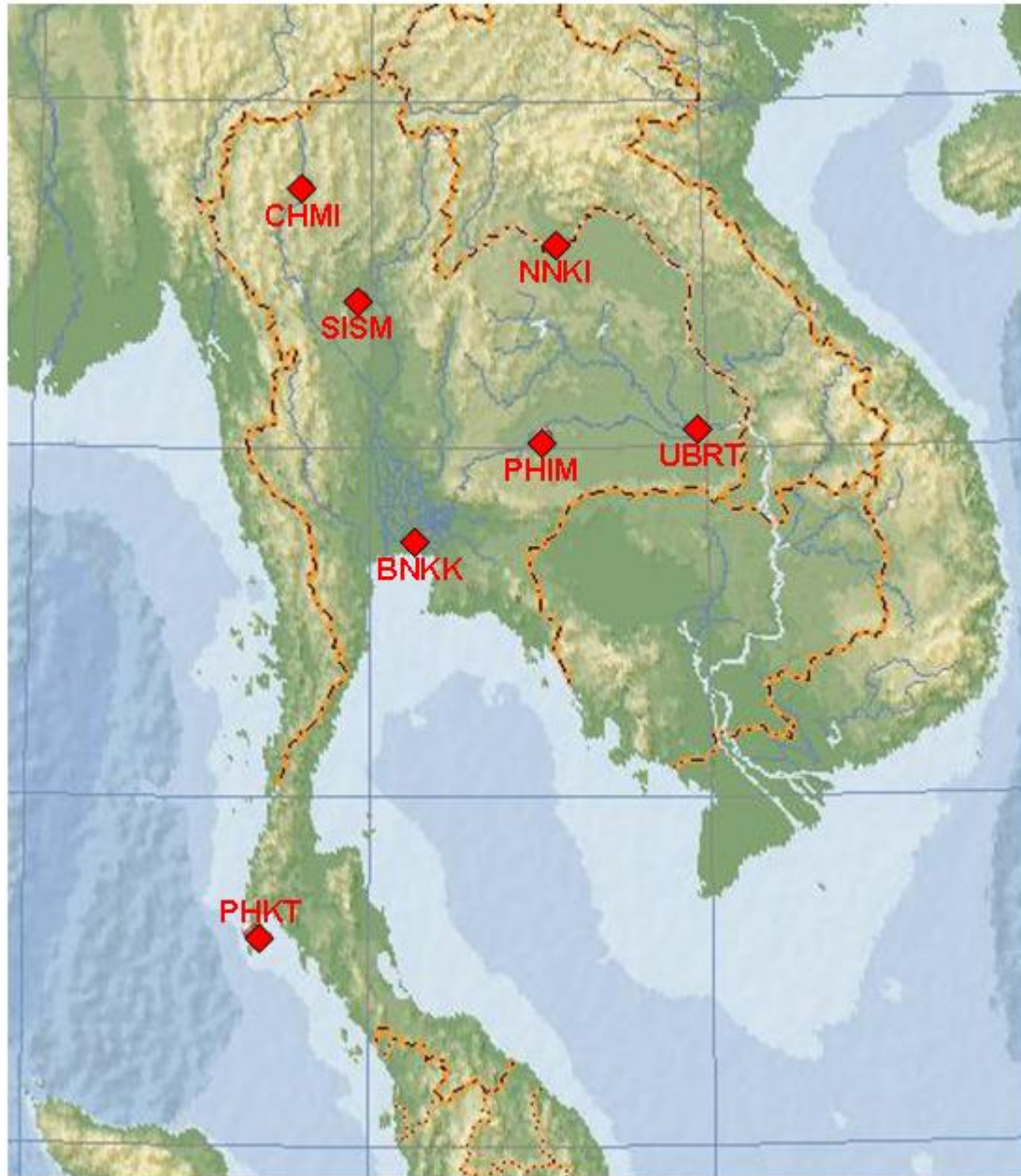
© 2005 Google

Pointer 14°30'28.30" N 101°27'20.61" E elev 409 m

Streaming ||||| 100%

Eye alt 181.07 km



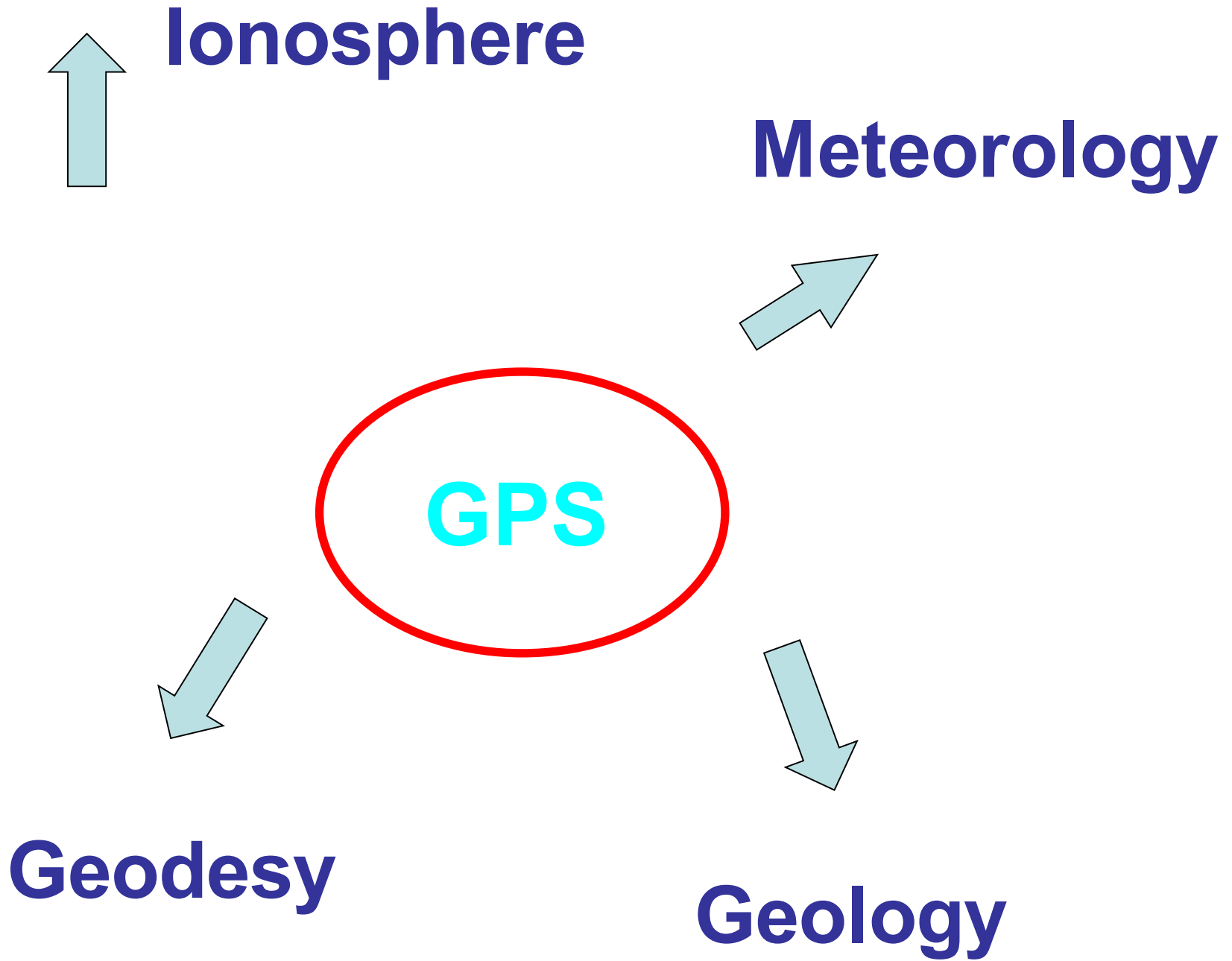


**GPS Station  
&  
Rain Sampling  
for  
Isotope Ratio**



**Rain Gauge**





**Ionosphere**

**Meteorology**

**GPS**

**Geodesy**

**Geology**

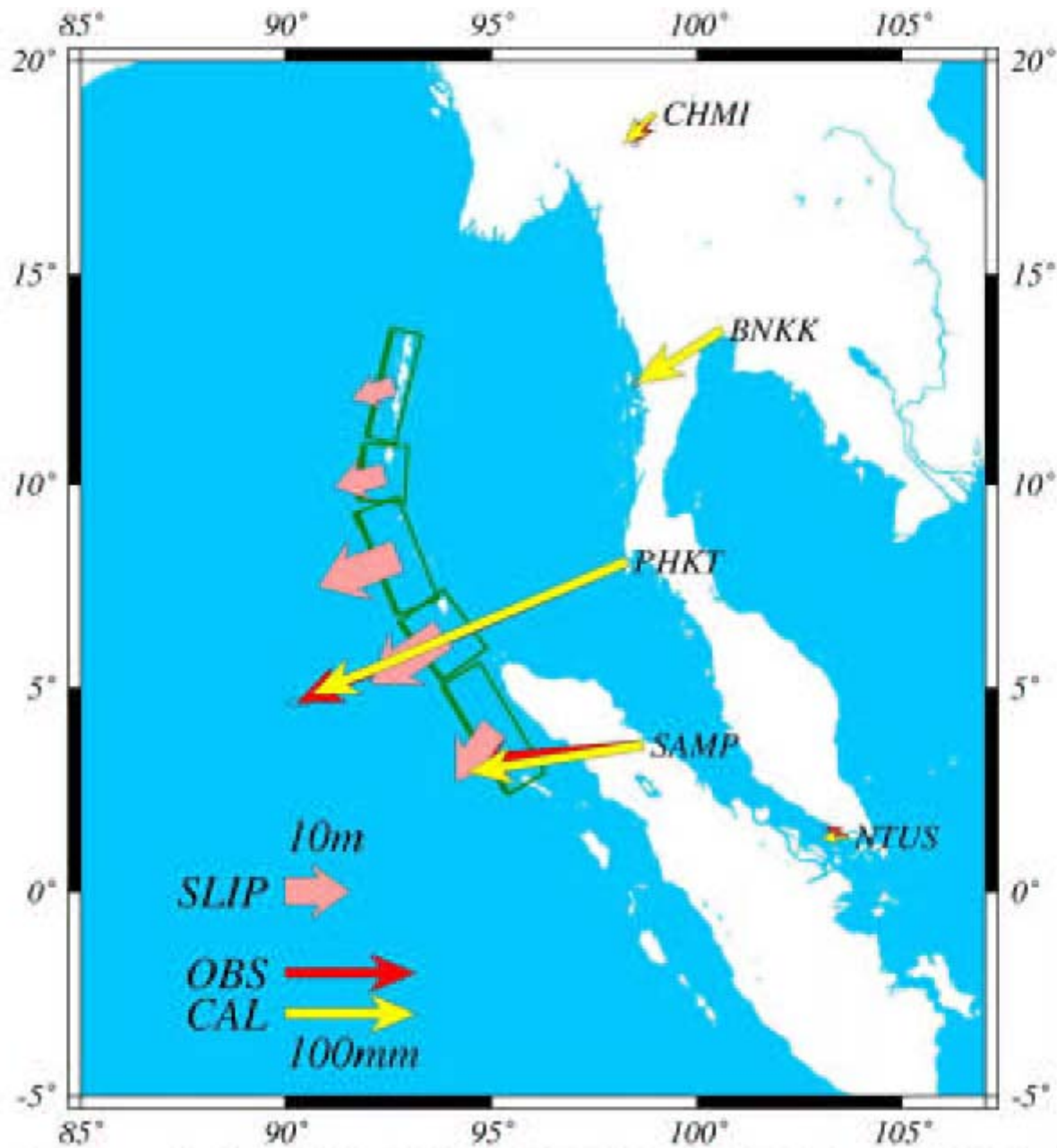
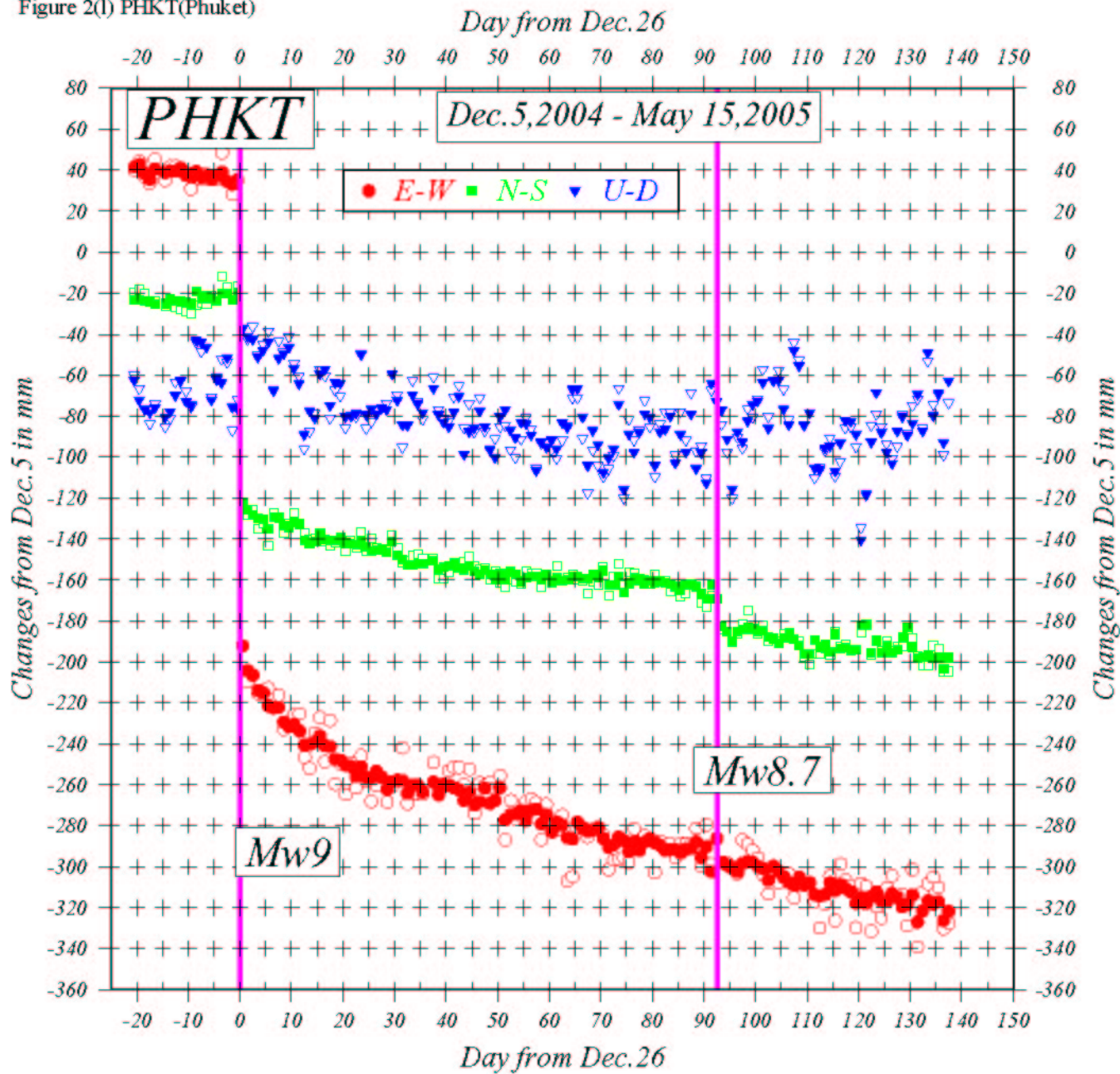
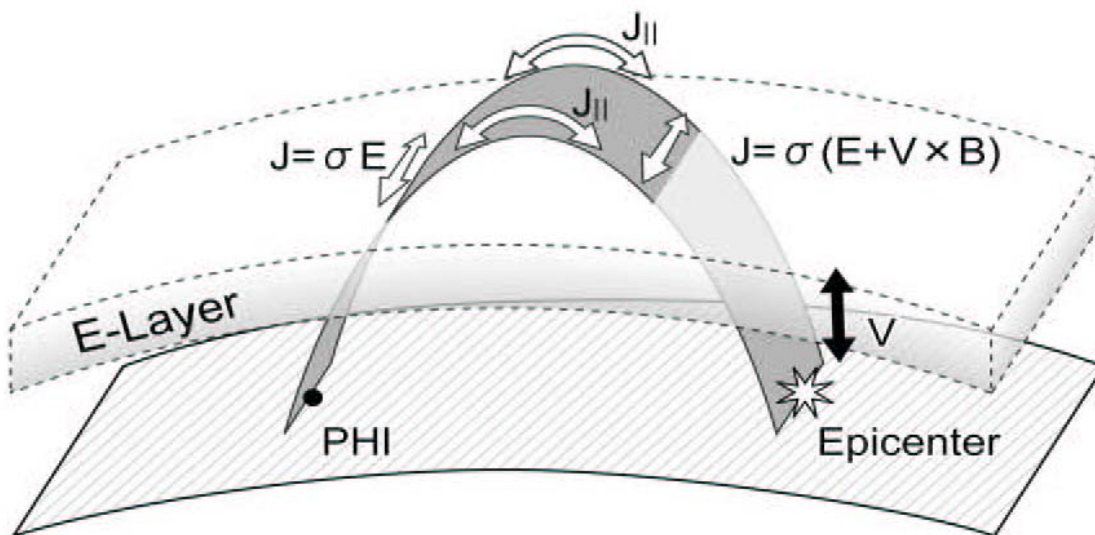
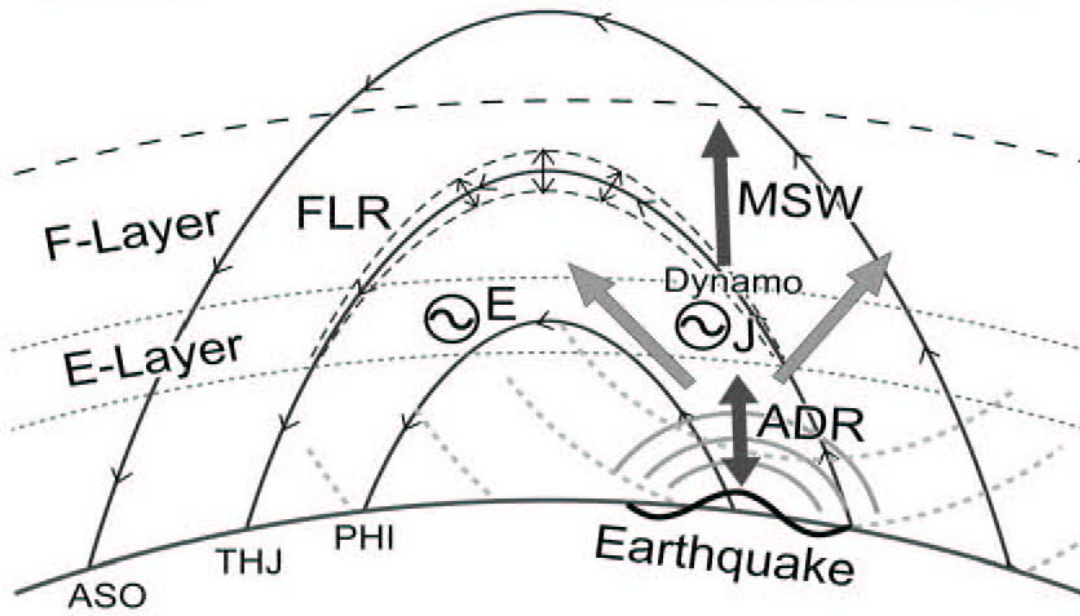


Figure 2(l) PHKT(Phuket)



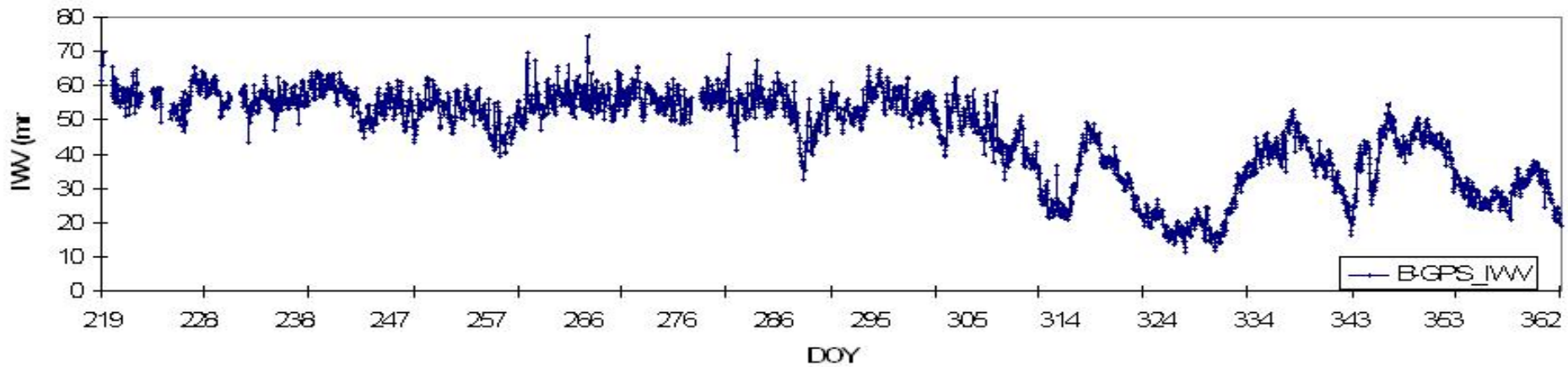
PHI: Phimai  
 THJ: Tong Hai  
 ASO: Aso

ADR: Acoustic Duct Resonance  
 MSW: Magneto-Sonic Wave  
 FLR: Field-Line Resonance

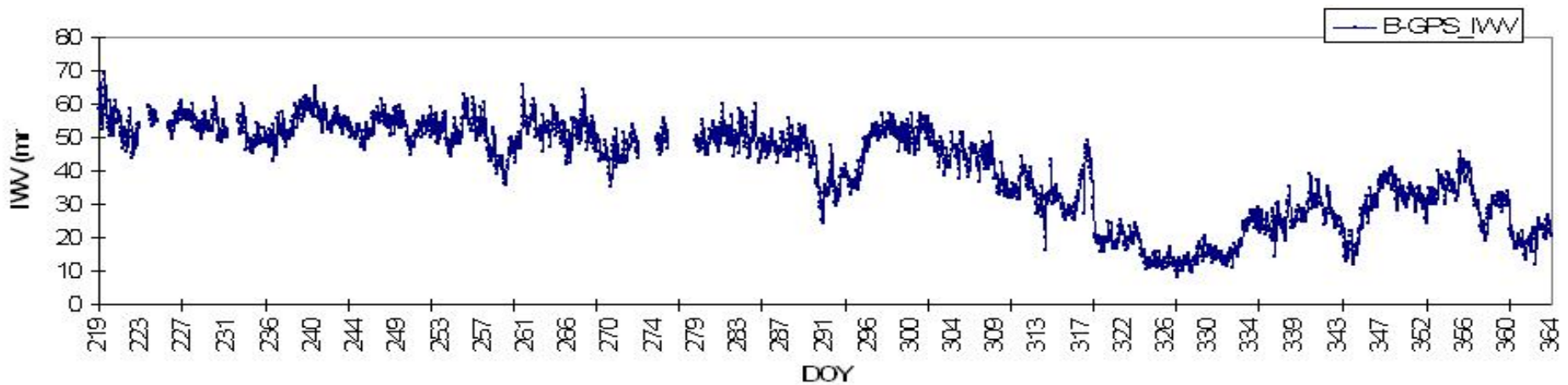


# The Results

**BNKK 2001**



**CHM 2001**



# Real time, mobile observation system for rain fall and PWC

- A real time, mobile observation system equipped with GPRS to measure Precipitable Water Content (PWC) in the atmosphere by GPS in combination with one minute sampling Rain Gauge.
- Rainmaking is an important industry in Thailand due to the different mechanism of rainfall compared to northern part of the earth and due to the positive relation between productivity of rice and quantity of precipitation.
- Investigation of effectiveness of rainmaking is an interesting subject.
- The prototype system we are presently developing is a small and low power consumption system with a dedicated built-in LINUX PC.

# Application of GPRS in Field Observations

- Michio Hashizume: *Department of Geology, Chulalongkorn University, Thailand*
- Yuji Nakanishi: *SciTech, Akiruno, Tokyo, Japan*
- Masahito Nose: *Data Analysis Center for Geomagnetism and Space Magnetism, Kyoto University, Japan*
- Akinori Saito: *Graduate School of Science, Kyoto University, Japan*
- Yasushi Agata: *Graduate School of Frontier Sciences, Univ. of Tokyo, Japan*
- Jun Matumoto: *Dept. of Earth & Planetary Science, Univ. of Tokyo/Institute of Observational Research for Global Change, Yokohama, Japan*
- Toshihiko Iyemori: *Data Analysis Center for Geomagnetism and Space Magnetism, Kyoto University, Japan*



# GPRS

## (General Packet Radio Service)

**GPRS** is available with wireless data service GSM network being able to connect from anywhere.

**GPRS** is based on Internet Protocols with thru-put rates of up to 40 kbps, similar to a dial-up modem

Monthly fare in Thailand (ex):

50MB	350Baht/month
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Unlimited	1,000Baht/month
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(Enable to connect 24Hrs)

# Mobile Observation System – MAHA6



**MainBoard: Armadillo**

**9**

**OS: Linux**

**Memory: 10GB CF**

**Power: 10VA**





