

# HEAVY RAIN OVER MID-CENTRAL REGION OF VIETNAM

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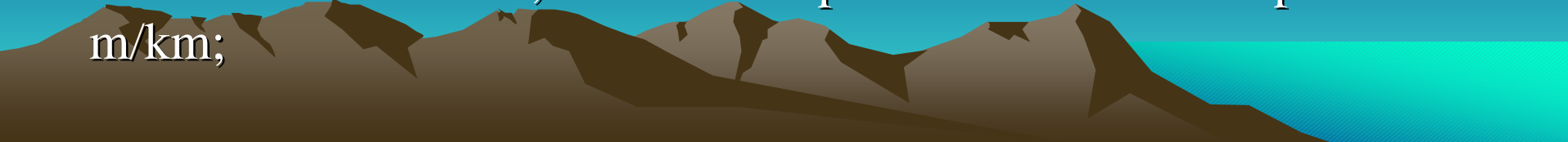
National Hydro – Meteorological Service of S.R. Vietnam

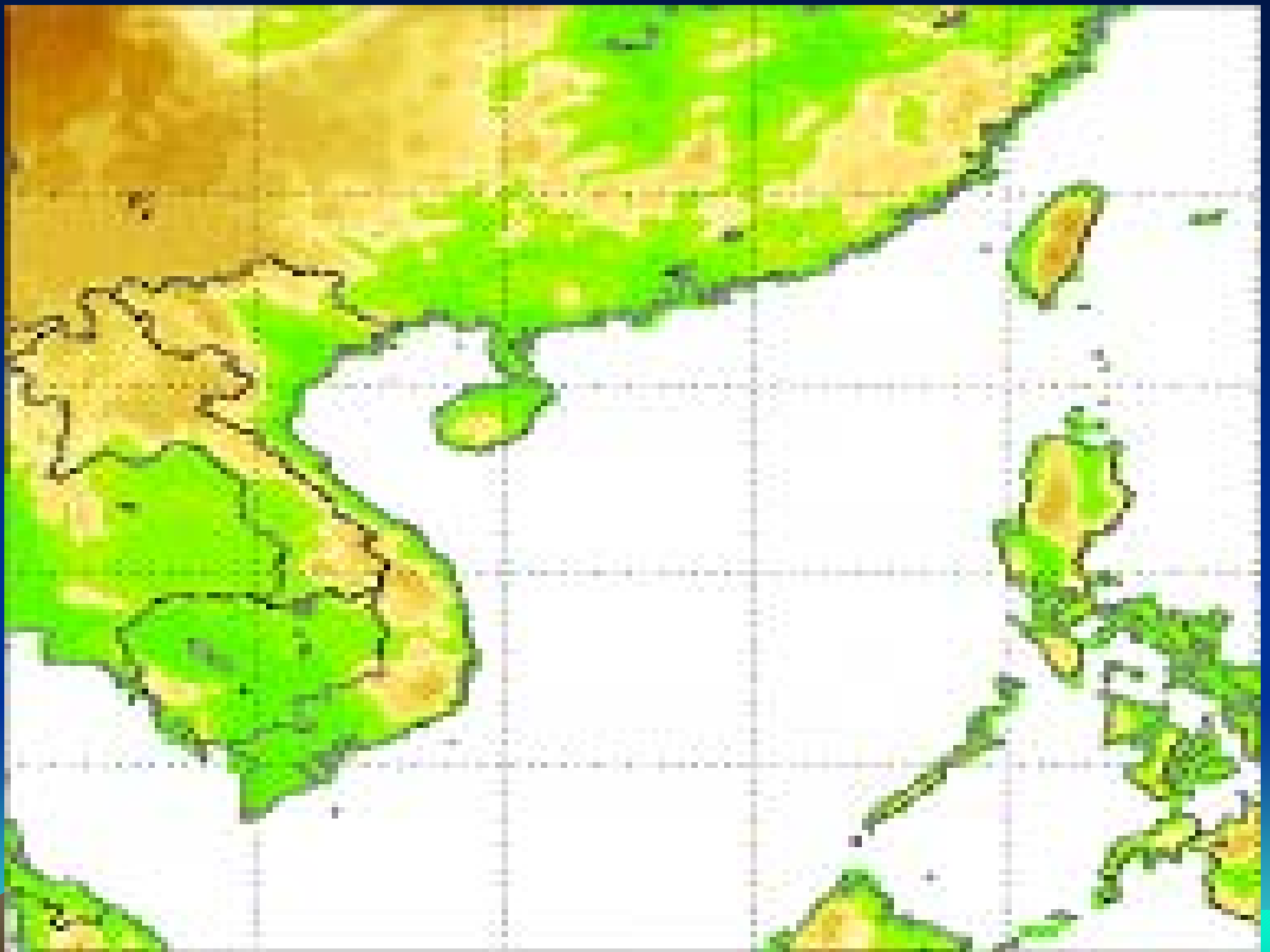
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# I. Introduction.

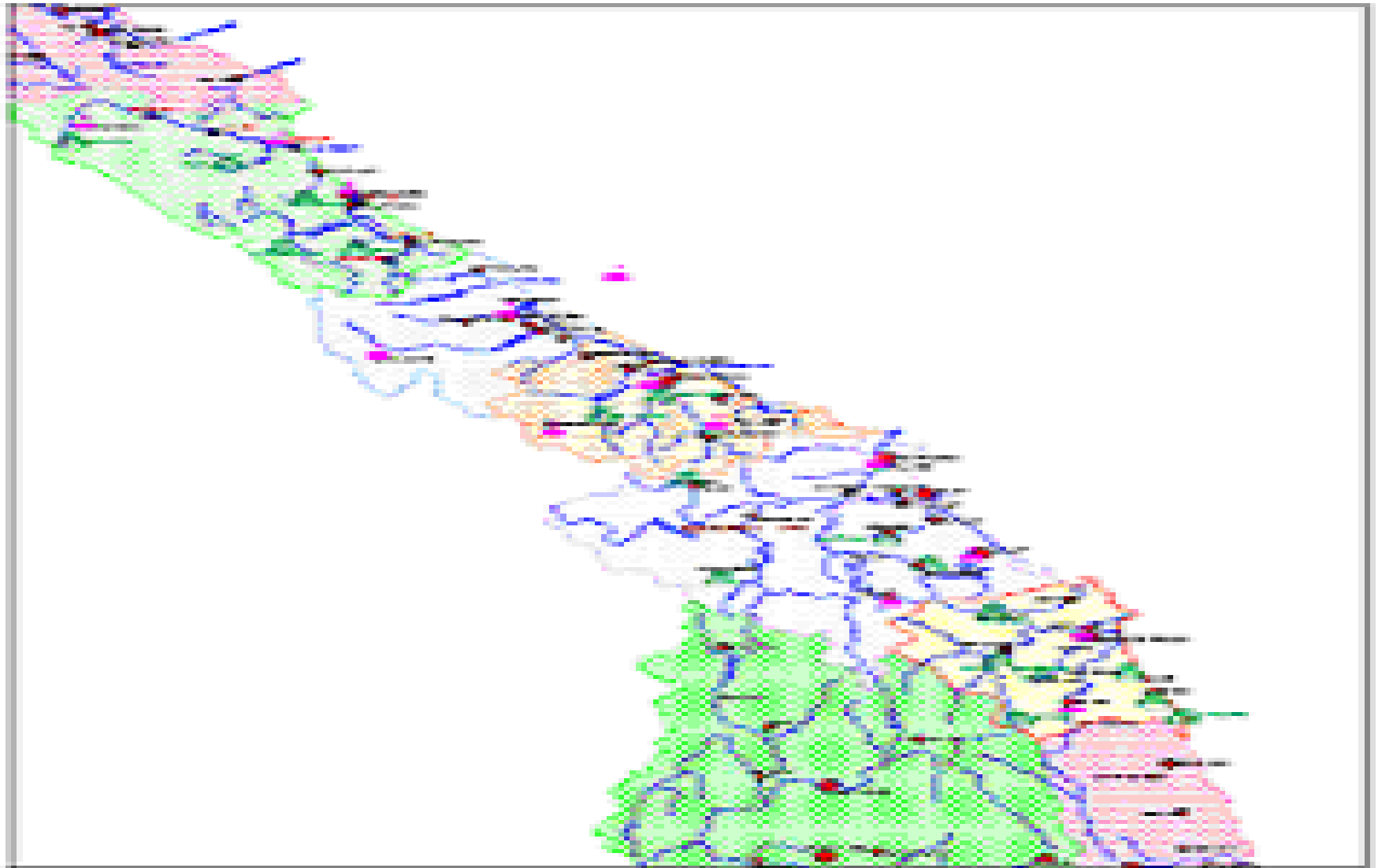
Mid-Central region of Viet Nam is located from  $14^{\circ}32' N$  to  $18^{\circ}06' N$ ,  $105^{\circ}37'$  to  $109^{\circ}05' E$ , including 5 provinces and 1 city: Quang Binh, Quang Tri, Thua Thien Hue, Quang Nam, Quang Ngai and Da Nang city. The narrowest distance from the coastal line to Viet - Lao border is 46,5 km, the largest is 125km. Mid-Central region is the coastal region with very sophisticated topography: narrow flat areas with some small and low hills on East and a part of Truong Son high mountain ridge on West with many mountain pass crossing to the east. The topography is quiet steeped from West to East, so rivers in the Region short and sloping: In the region there are 20 main rivers with 280 small rivers and branch rivers, but only 5 of them have length over 100km, and Thu Bon river is the longest about 205 km. Rivers in the Region are also sloping: The slope of rivers about 20-35 m/km in common, but in some places of river the slope are 40-45 m/km;






# ĐIỂM ĐỒ

MẠNG LƯỚI TRẠM KHÍ TƯỢNG THỦY VĂN Ở BIỂN HƯƠNG VÀ VÙNG TIỀN Đ



Climate of Mid-central region is monsoon-tropical climate. Monsoon and geography, especially high-long mountain range Truong Son play important role in forming climate characters:

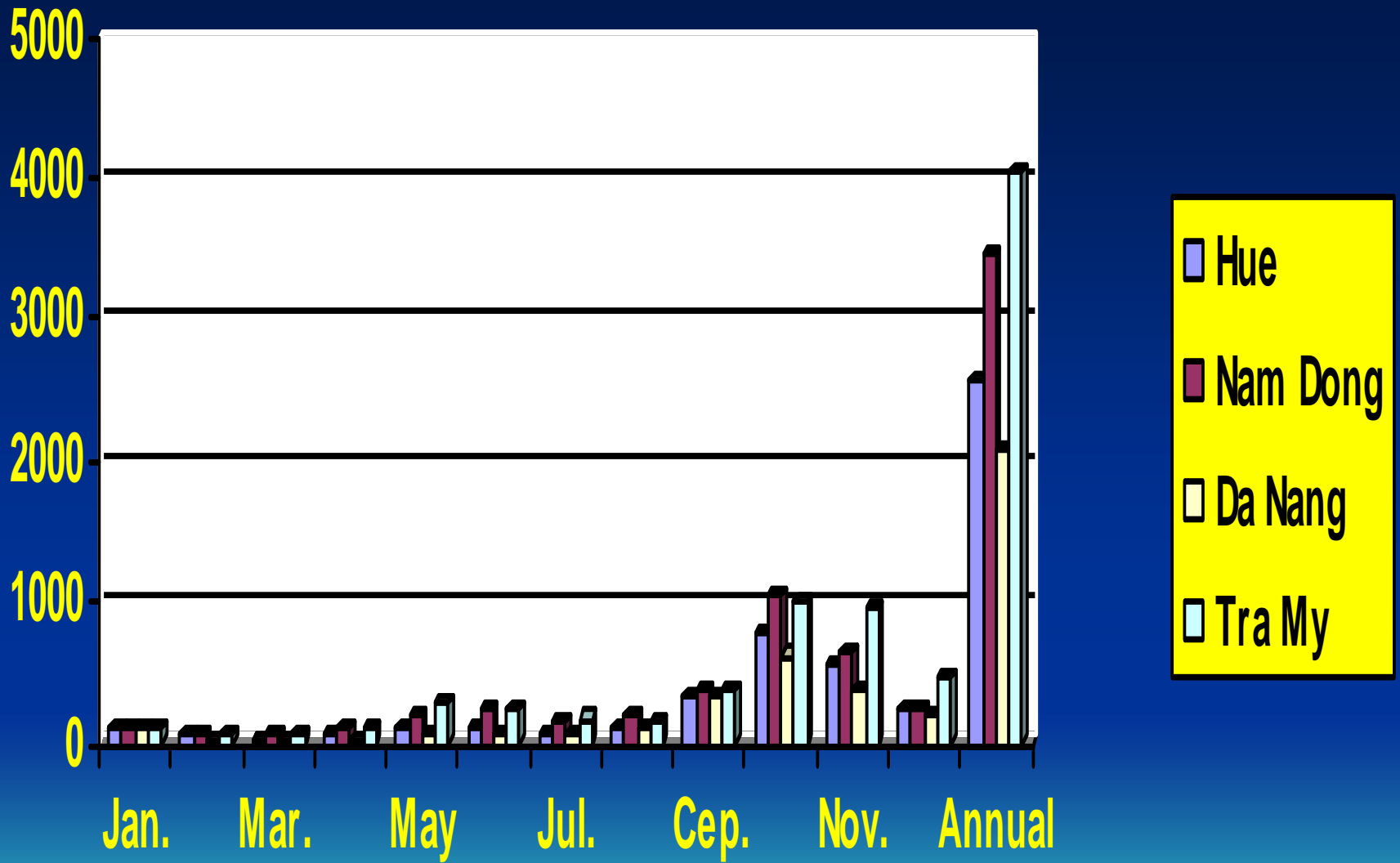
North-East monsoon, South-West monsoon and trading winds frequently prevailing Viet Nam and Mid-central region territory. So climate in Mid-central region has specific characters: there are two seasons: Dry season ( from Jan. to Aug.) and rainy season ( from Sep. to Dec.) The precipitation in the mountain areas is much more than in the flat-land areas.



*Table 1. Monthly and annual means of rainfall (mm) in some station of Mid- central Region.*

Stations	Jan.	Feb	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Hue	95	48	34	67	105	125	71	120	335	762	565	252	2550
A Luoi	65	32	62	42	227	202	170	181	398	900	611	251	3242
Nam Dong	97	47	52	99	210	250	171	204	392	1044	656	230	3454
Da Nang	96	13	22	29	70	84	85	109	340	624	383	196	2078
Tam Ky	84	47	40	45	111	100	69	98	322	725	559	295	2305
Tra My	127	62	61	93	282	257	178	174	371	1019	958	449	4022

(Note: A Luoi, Nam Dong, Tra My are mountain areas.)



In recent years significant weather events often occur in Viet Nam, especially in Mid-central Region, such as: Typhoon, storm surges, heavy rain causing river flood, flash flood... which strongly impact on economy and human life.





## II. Impact of heavy rainfall

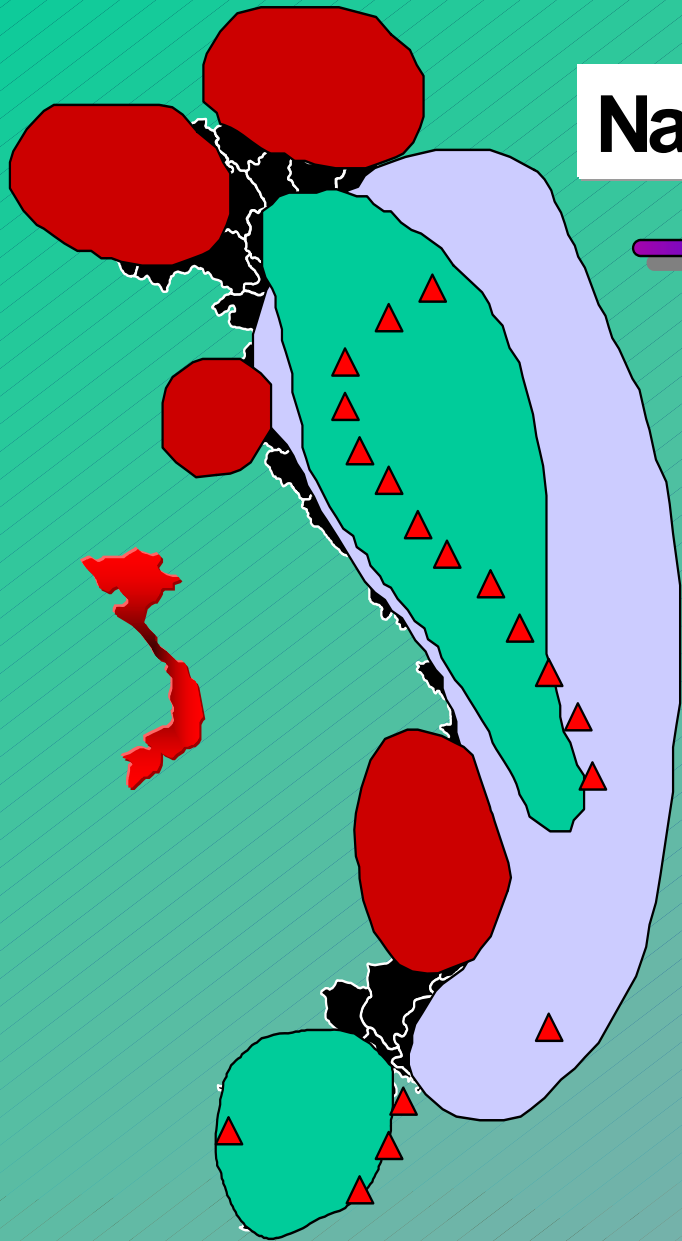
- Torrential rain often causes river flood, flash flood and landslide ... that lead to a lot of loss of human life and properties, for example the worst flood in early Nov. and Dec 1999 made more 700 deaths and loss 250 million USD; The flood in Nov, 2004 made 37 deaths...in over Mid-central Region.



In recent years , river flood and flash flood occur more often, even in place where haven not been before such as: Suoi Luong, a small stream in the suburban area of Da Nang City during heavy rain event 24th - 27th Nov, 2004 about 300 travelers had narrow escape from a big flash flood and in the same time in Tay Tra (Quang Ngai province) flash flood caused landslide, that kill 5 people.



# Natural Disasters in Vietnam



 River Flooding

 Flash floods

 Typhoons

 Storm Surges

- Not on map:
- Droughts
  - Salt water intrusion
  - Forest fire

- *Some pictures of damages caused by flood and flashflood.*





Picture 1. Railway after flash flood in Cong Bac - Thua Thien Hue (1999)



Picture 2. Landslide in Thuan An mouth



Picture 3. Flooding in Hue City Nov, 1999

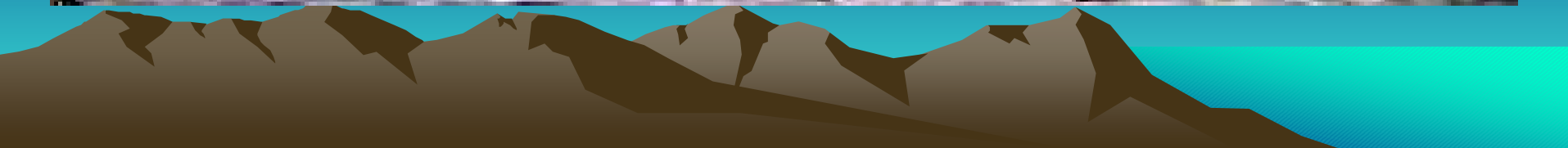


Picture 4. Flooding in Dong Ba market Nov, 2004





Picture 5. After flash flood in Suoi Luong





- Sorrow in a woman's face after flood

**III. Analyzing two  
significant heavy- rainy  
events: 1- 6<sup>th</sup> Nov, 1999  
and 23-27<sup>th</sup> Nov, 2004.**



# *a) The historical heavy-rainfall event 1<sup>st</sup>-6<sup>th</sup> Nov, 1999.*

- *Overview of synoptic situation*
- There was a NE monsoon with cold front on 1<sup>st</sup> Nov. at about 18 - 19<sup>0</sup>N, meanwhile a Intertropical Convergent Zone was existing in the South, at the latitude 11 - 12<sup>0</sup>N .
- On the upper levels the Easterlies wind strongly developed with velocity over 10 m/s. The humidity of the air was high on whole area of Mid - Central land of Vietnam.

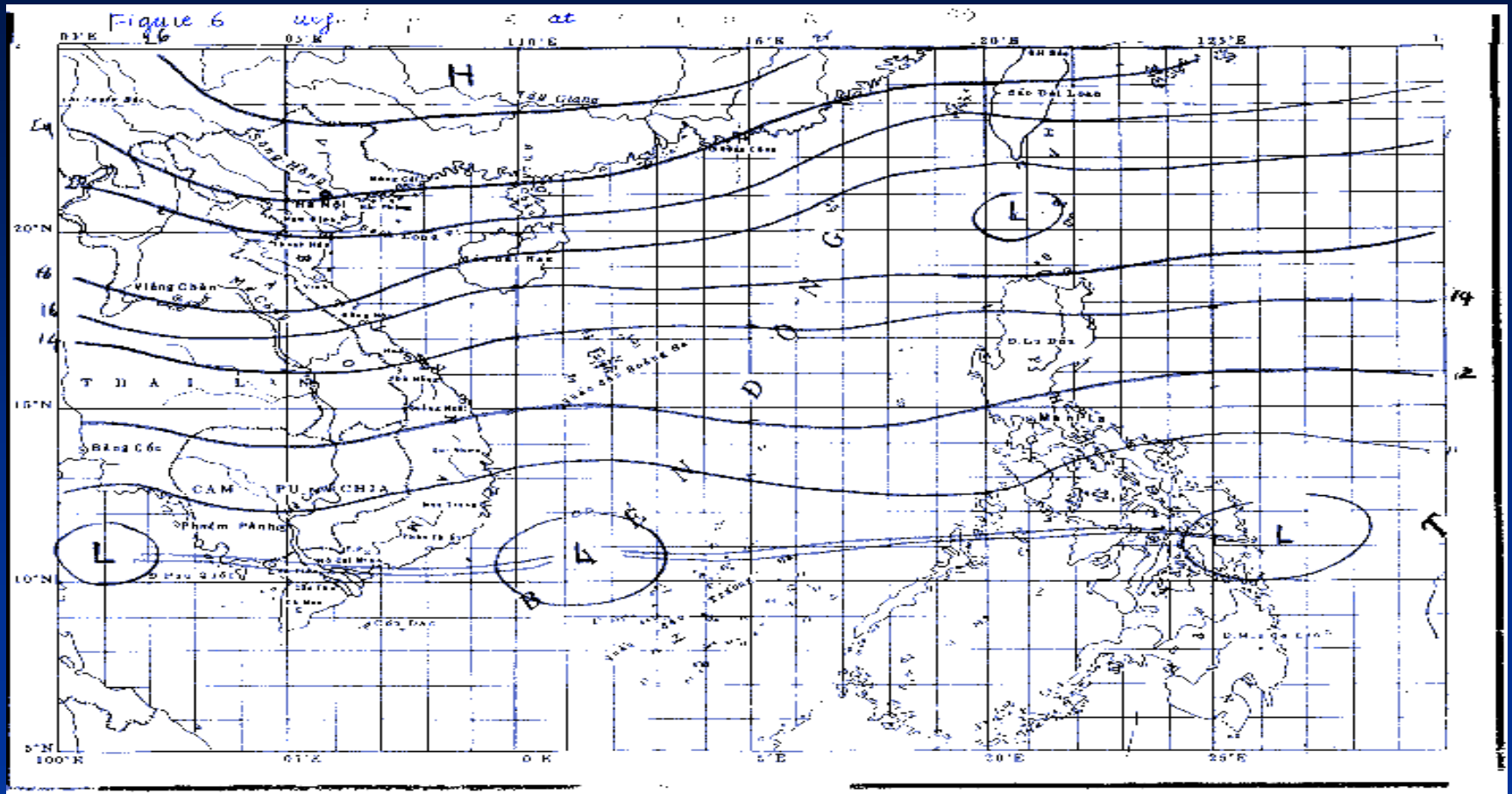


Fig 1. Surface map at 00 GMT 2<sup>nd</sup> Nov, 1999

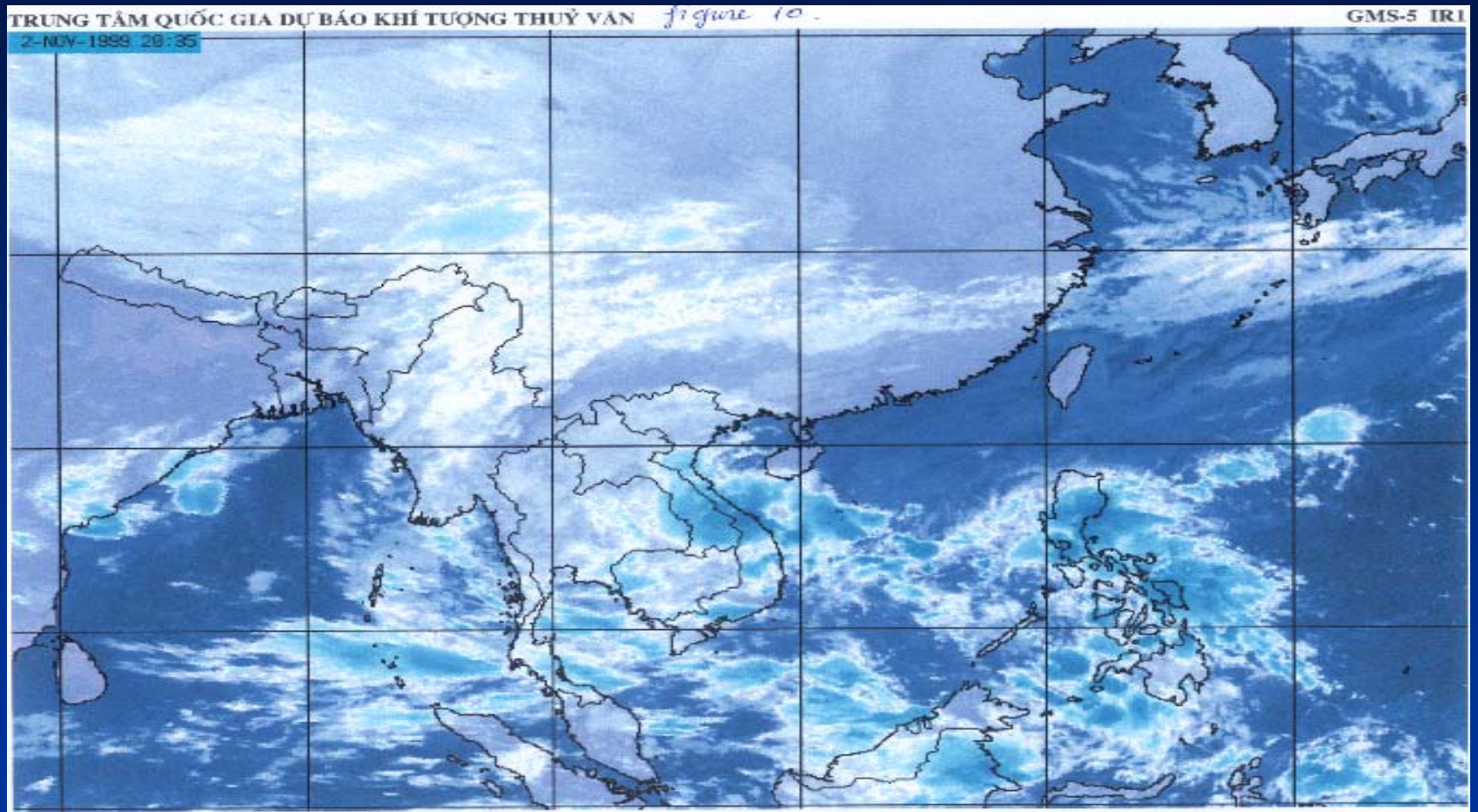


Fig 2. Satellite image at 00GMT on 2<sup>nd</sup> Nov, 1999

# Wind profile

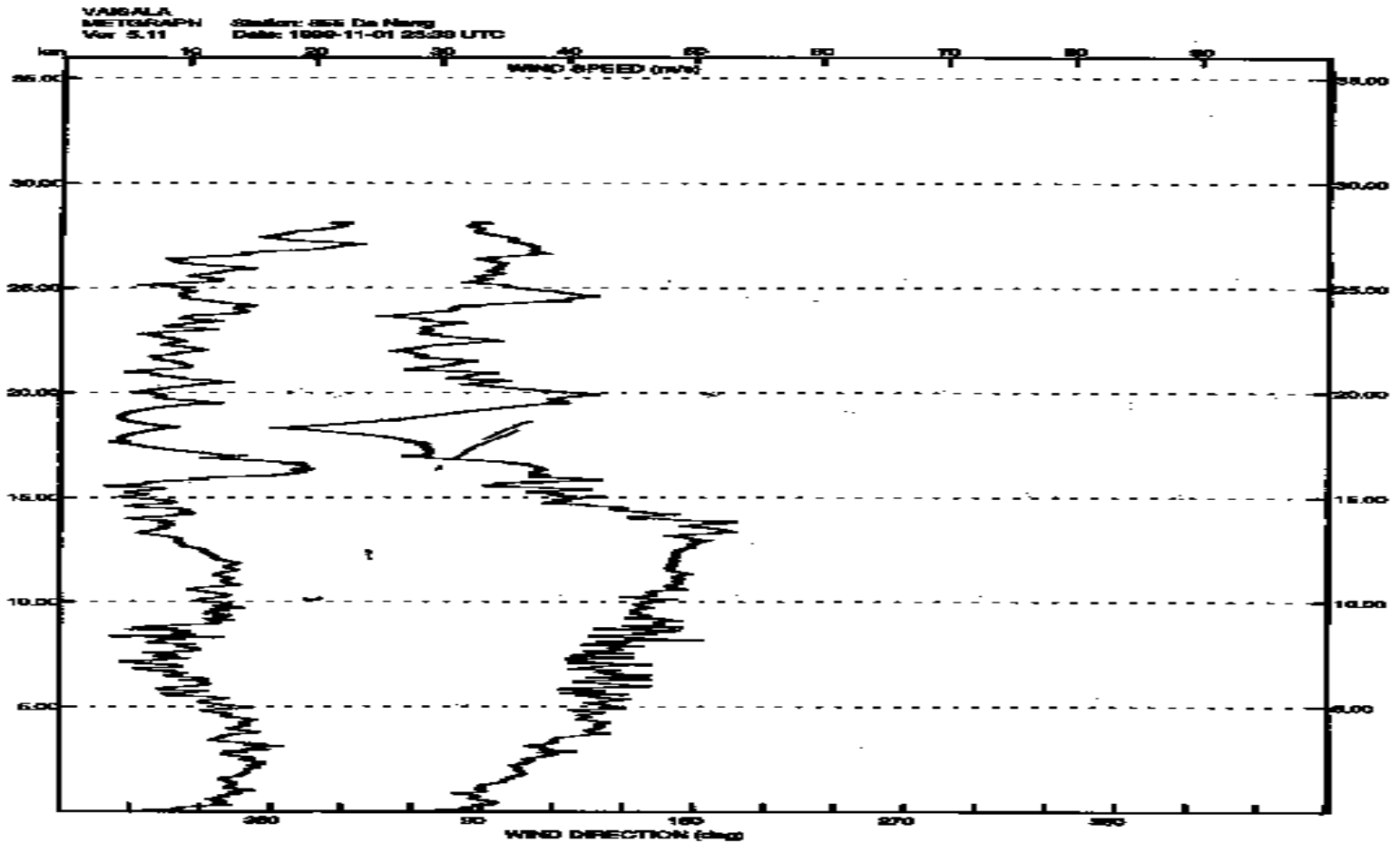




Table 2. The absolute humidity on the upper level 850hpa at 7h00 (00GMT) from Nov. 1<sup>st</sup> - 06<sup>th</sup>, 2003

Station/ date	Nov. 1 <sup>st</sup>	Nov. 2 <sup>nd</sup>	Nov. 3 <sup>rd</sup>	Nov. 4 <sup>th</sup>	Nov. 5 <sup>th</sup>	Nov. 6 <sup>th</sup>
Danang	13.3	14.8	14.8	12.0	12.5	12.0
Hoang Sa	12.5	14.8	14.8	14.0	12.5	12.7



Table 3. Precipitation (mm) at some station in Mid-central region From 1<sup>st</sup> to 6<sup>th</sup> Nov, 1999

TT	Stations	1 <sup>st</sup> Nov	2 <sup>nd</sup> No	3 <sup>rd</sup> Nov	4 <sup>th</sup> Nov	5 <sup>th</sup> Nov	6 <sup>th</sup> Nov	Total (mm)
1	Cua Viet	16	404	341	172	82	110	1125
2	Thach Han	33	464	361	269	142	77	1346
3	A Luoi	243	753	368	365	435	107	2270
4	Phu Oc	55	572	722	360	69	48	1825
5	Thuong	109	269	377	558	251	13	1578
6	NhatHue	87	864	978	272	22	64	2288
7	Da Nang	93	126	593	93	33	47	985
8	Thanh My	147	554	302	96	57	46	1202
9	Hoi khach	195	417	384	60	77	56	1129
10	Ai Nghia	283	269	496	76	80	96	1300
11	Cam Le	111	141	502	140	45	62	1001
12	Tra My	73	139	311	248	250	116	1137
13	Tien Phuoc	171	351	535	141	130	125	1453
14	Hiep Duc	261	459	400	79	100	71	1370,0
15	Son Tan	203	541	345	108	89	36	1322
16	Nong Son	205	366	364	105	82	72	1194
17	Giao Thuy	284	307	499	90	60	86	1326
18	Cau Lau	307	178	541	57	60	68	1211
19	Hoi An	295	178	648	66	46	50	1283
20	Tam Ky	217	77	390	116	77	116	993

- Very heavy rain occurred continuously from 1st to 6th Nov, 1999. All stations from Thua Thien Hue to Quang Ngai have daily rainfall much more than 100mm/24h, especially from 1<sup>st</sup> to 3<sup>th</sup> more than 50% of stations have rainfall more than 300mm, about 20% more than 500mm/24h. In particular in Hue City from 6 a.p 2<sup>sd</sup> to 6a.p 3<sup>th</sup> Nov. the rainfall is 1422mm. It's rainfall intensity is 120mm/60 min. In Nam Dong Maximum daily rainfall is 593mm ( 2<sup>sd</sup> Nov.), much more than maximum daily rainfall record.



## **b) The heavy-rainy event 24<sup>th</sup>- 27<sup>th</sup> Nov, 2004.**

- *Overview of synoptic situation:* From 23<sup>rd</sup> to 25<sup>th</sup> Nov, the weather in Mid - Central Region influenced by Southern part of high pressure and North part of typhoon Muifa. From 25<sup>th</sup> to 28<sup>th</sup> strong NE monsoon impacted to the area meanwhile in the upper levels Eastern wind from the South – West part of the Pacific high - really strong 10-15 m/s.



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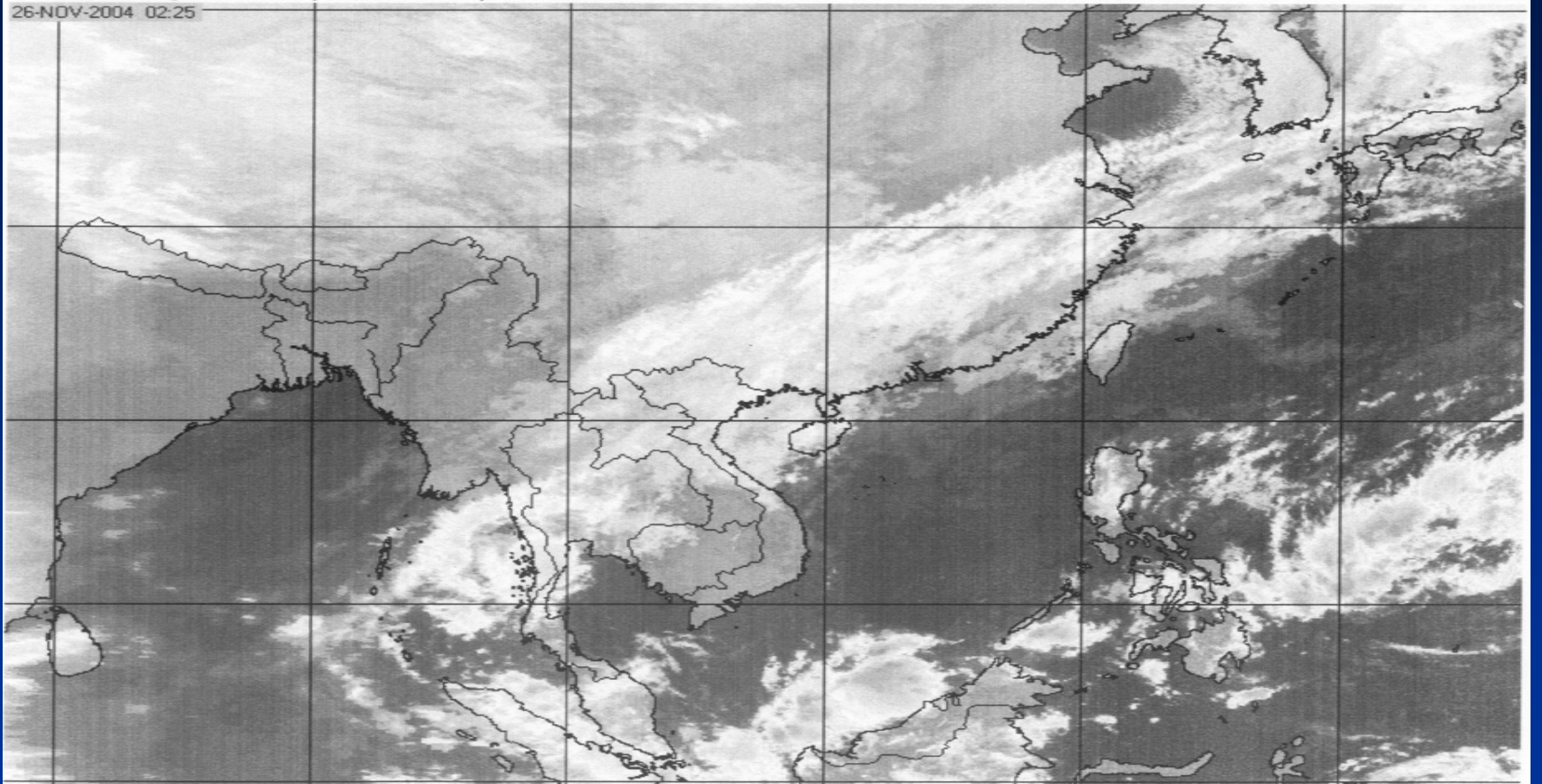


Fig 3. Satellite image at 00GMT on 26<sup>th</sup> Nov, 2004

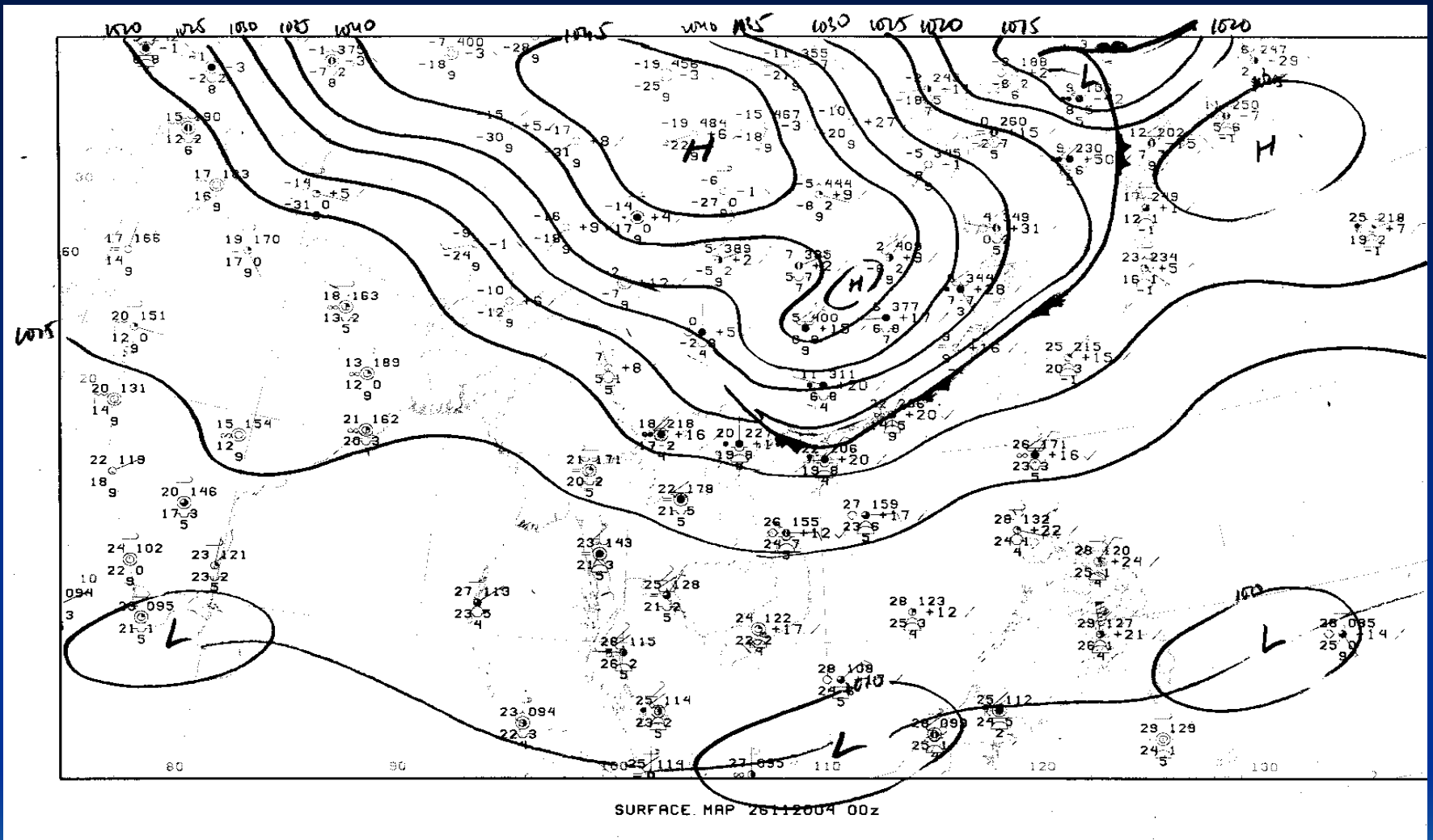
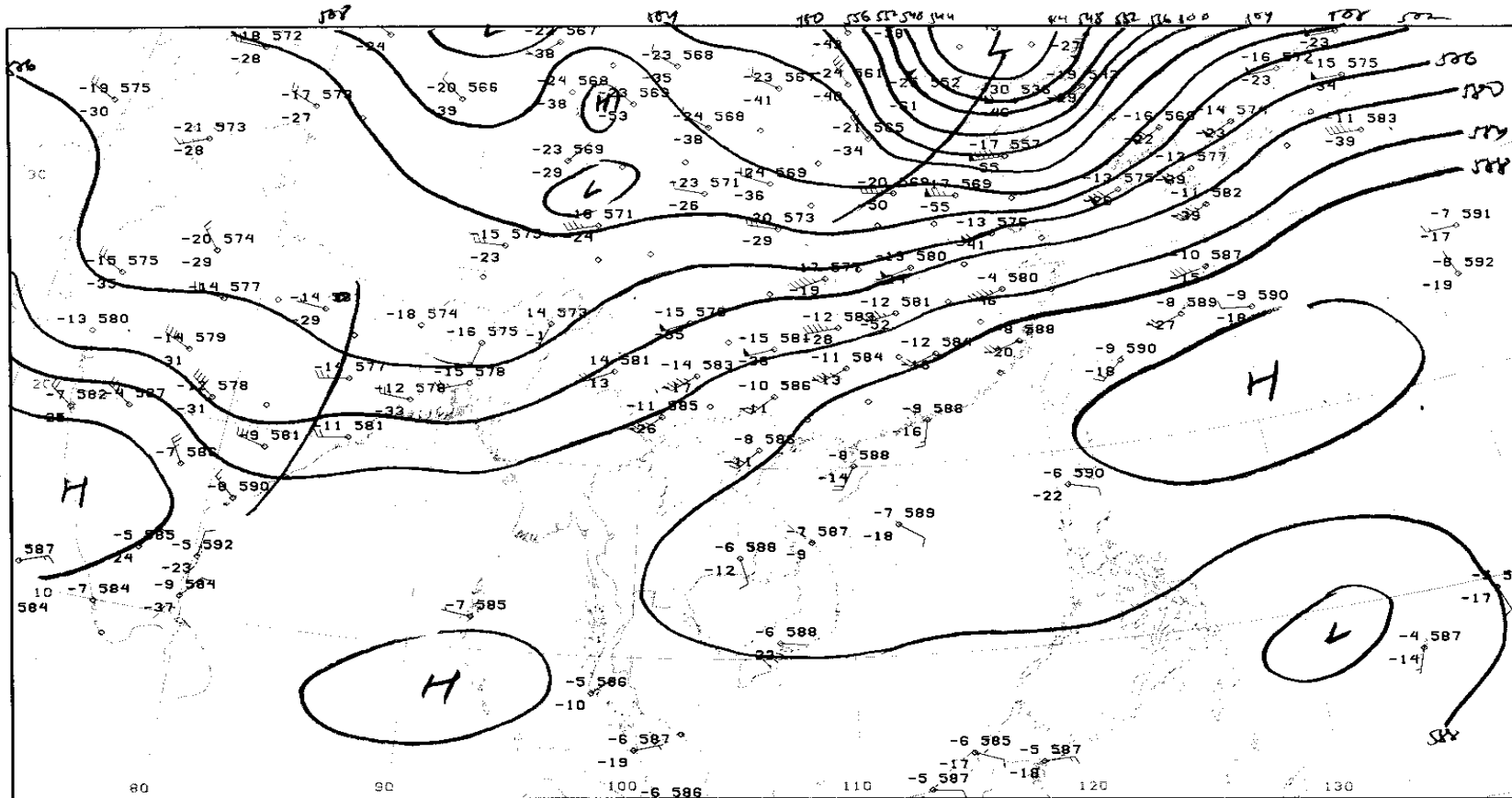


Fig 4: Surface map at 0z 26 Nov, 2004



UPPER AIR MAP 500mb 26112004 00z

Fig 5. upper level map 500hpa at 00 GMT 26<sup>th</sup> Nov, 2004

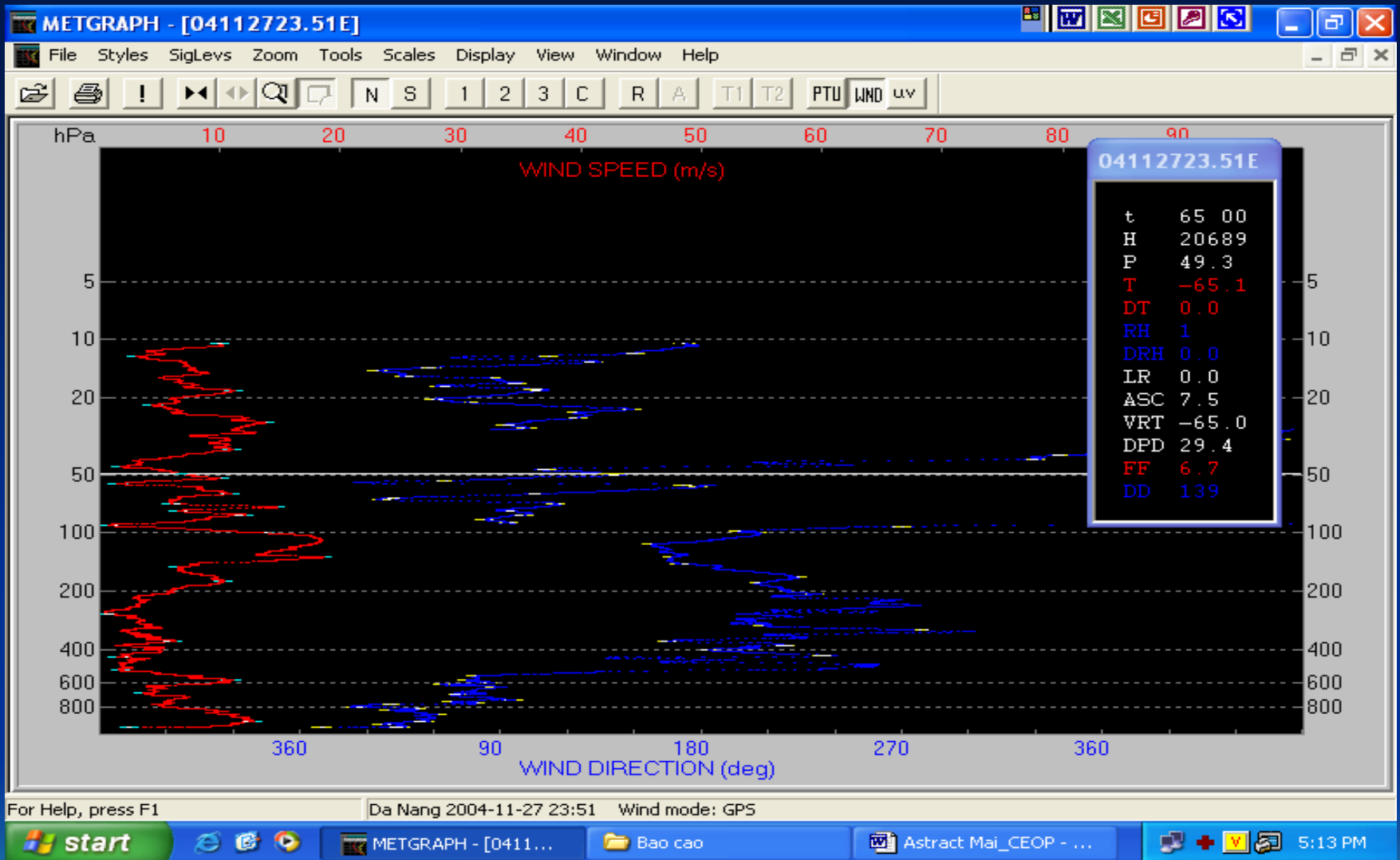


Fig. 6. Wind's profile at 26<sup>th</sup> Nov, 2004



**Table 4. Precipitation (mm) at some station in Mid-central region From 24<sup>th</sup> to 27<sup>th</sup> Nov, 2004**

	Stations¥ Days	24		25		26		27		Total (mm) (24-27)
		19-7h	7-19h	19-7h	7-19h	19-7h	7-19h	19-7h	7-19h	
1	A Luoi	10.0	56.0	244.0	67.0	177.0	74.0	90.0	52.0	770.0
2	Ta Luong	7.0	34.0	193.0	96.0	295.0	142.0	106.0	45.0	918.0
3	Nam Dong	17.0	260.1	265.0	50.0	162.0	107.0	476.0	40.0	1377.1
4	Khe Tre	22.0	230.0	261.0	48.0	159.0	126.0	353.0	40.0	1239.0
5	Thuong Nhat	13.0	217.0	366.0	29.0	119.0	54.0	273.0	88.0	1159.0
6	Binh Dien	3.0	25.0	116.0	109.0	254.0	424.0	47.0	9.0	987.0
7	Kim Long	1.0	34.0	59.0	204.0	359.0	255.0	31.0	4.0	947.0
8	KT Hue	2.0	33.0	90.0	379.0	382.0	300.0	39.0	4.0	1229.0
9	Da Nang	16.0	22.6	15.7	35.7	7.9	30.6	4.0	0.2	132.7
10	Tra My (KT)	72.0	82.0	41.0	62.0	65.0	73.0	265.0	32.0	692.0
11	Tien Phuoc	42.0	70.0	133.0	40.3	63.0	134.0	39.0	12.0	533.3
12	Hiep Duc	31.0	75.0	57.0	136.0	362.0	166.0	96.0	1.0	924.0
13	Gia Vuc	139.0	73.0	15.0	103.0	15.0	19.0	164.0	44.0	572.0
14	Son Tan	42.0	77.0	30.0	65.0	45.0	81.0	299.0	8.0	647.0
15	Son Giang	146.0	122.0	49.0	152.0	73.0	67.0	146.0	49.0	804.0
16	Ba To	62.0	44.0	206.0	139.0	19.0	73.0	138.0	24.0	705.0

- Through 2 particularly torrential rains we found that: the interaction between the Northeast monsoon and typhoon circulation or ITCZ creates unstable air mass over South China Sea. Southeast or Northeast winds bring that unstable airmass with much precipitation water to land, blocked by Truong Son Range pour heavy rain in Mid- Central Region territory.
- It is note that: Synoptic map from surface to 500hPa height, meteorological data, satellite images and radar products, numerical models are very useful for weather forecasting. In particularly, satellite and radar products are greatly helpful in predicting heavy rainfall.



# **IV. Conclusion and remark.**



Base on the present available data or information from the operational service, we could have some remarks:

- We can predict heavy rainfalls before 12-24h, and warning floods before 6-12h, but cannot predict flashfloods.
- The forecasting precipitation in numerical models about 50-100mm much less than real precipitation.
- The present surface observation network needs more automatic rain gauges on the basins of some narrow rivers where flash floods often occur.



- Weather radar products and satellite images are great helpful in heavy- rain prediction. The weather radar network should cover all the area with its effective radius for the rainfall measurement. And we need more satellite rainfall data.
- Heavy rain is very sophisticated phenomena; every event has different characters so it needs studying in more detail.
- Heavy rains cause flood. In recent years, river flood and flash flood occur more often, even in place where have not had before. This seemed to have a close relation to people's operation in the social – economic development likes the construction, the forest destruction, the destruction of vegetation layer...and it may involves in the climate change or ENSO event or greenhouse effect? It needs more study.
- Therefore, the National Hydro – Meteorological Service of Vietnam, in common, and the Mid - Central Regional Hydro – Meteorological Center, in particular, need to improve our capacity for the most effective service in the near future – it is the most demanding object of our short term and long term developing and modernization plan.



***THANK YOU***  
***for your attention***

