Ist-international Mahasriscience steering committee meeting (IMASSC) Bangkok, Thailand, October 19, 2006

#### Monsoon and HEAVY RAIN OVER

#### MID-CENTRAL REGION OF VIET NAM

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IGe ne ra s'in tro d'uc tio n

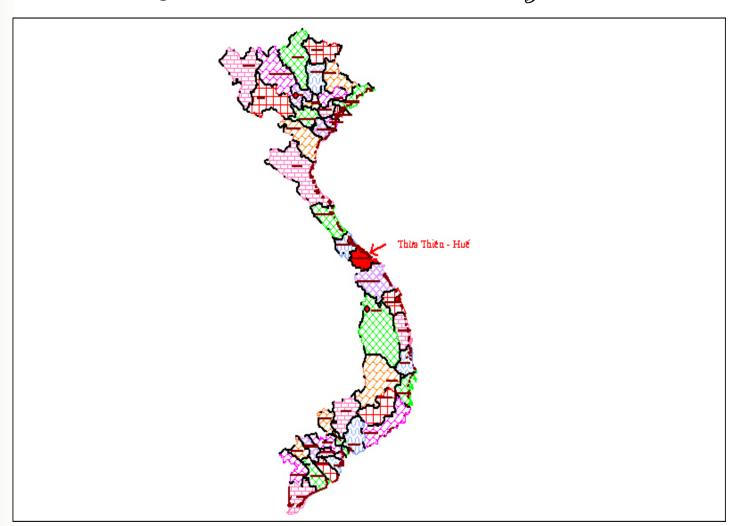
Home basic climate features and heavy rainfall events in central part of Viet
Nam

III. Impact of heavy rainfall.

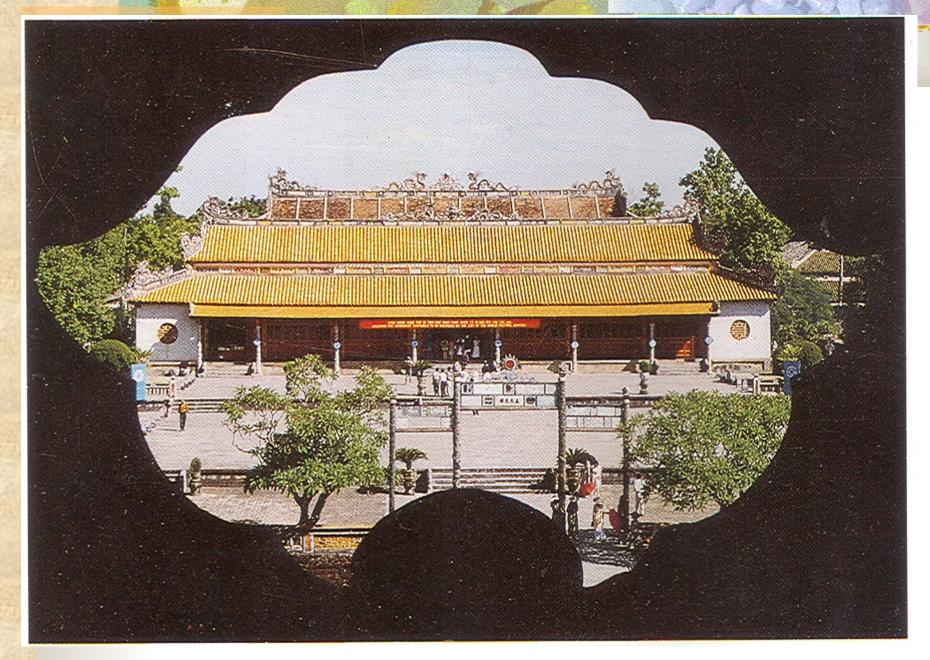
WObservation and forecasting capacity in Md-Gentral Region

VGonchision and remark

## 1. General Introduction + Including 5 provinces and a city



#### BIEU TUONG CO DO HUE- DI SAN VAN HOA THE GIOI



### I. General Introduction

- \_ Located from 14o32 N to 18o06 N and 105o37' to 109o05'E
- <sup>+</sup> Narrowest distance from sea line to Viet Lao bound is 46,5 km, the largest is 125km.
- + The topography is quiet steeped from West to East.
- + There are 20 main rivers with 280 small rivers and branch rivers, 5 of them have length over 100km
- + Rivers in the Region are short and sloping
- + Severe Climate: flood, typhoon, drought

# features and heavy rainfall events in central part of

### Viet Nam

- North-East monsoon, South-West monsoon and trading winds frequently prevailing Mid-Central Region territory
- There are two main seasons: Dry season and rainy season.
- The monsoon activities, in the interaction between Northeast monsoon and the tropical mesoscale disturbances create heavy rain in Mid-central Region territory

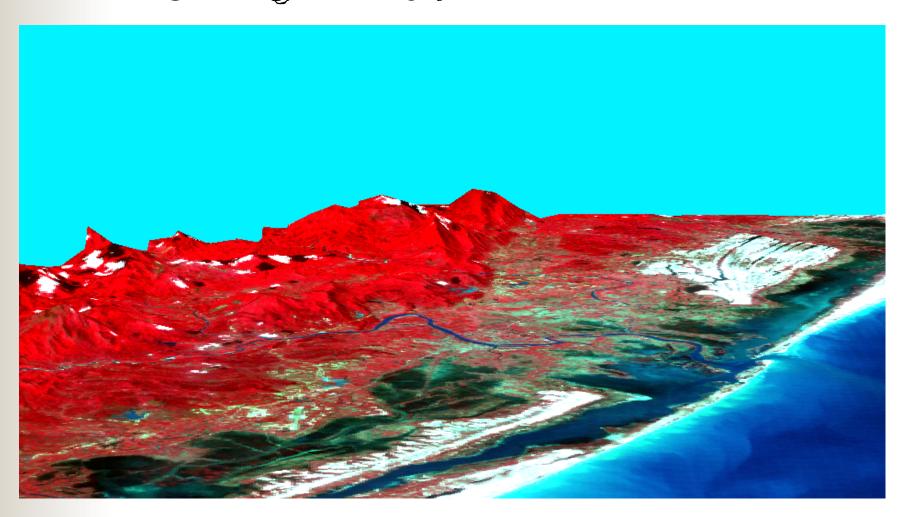
- There are 3-5 heavy rainfall events causing flood /year (in average) with precipitation quantity from 200-500mm in common, about 20% of them 400-900mm.
- Rainfall in the mountain areas much more than in the flat land areas.

# Heavy rainfall events causing severe flood in Mid-central Region.

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- The Floods in 19<sup>th</sup> Century: from 1801-
1888: 40 severe floods.
Specially: 1811, 1828, 1841, 1842,
1844, 1897
- The Severe Floods in 20<sup>th</sup> Century:
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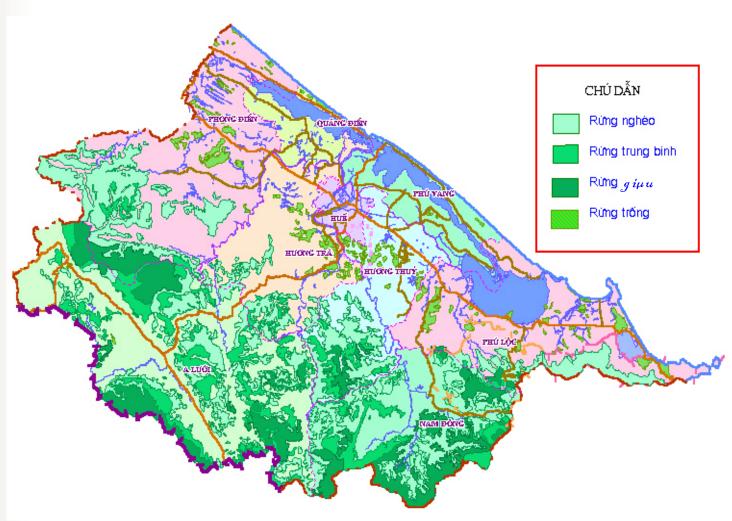
1953, 1975, 1983, 1999.

### + TOPOGRAPHY. So ping from West to East



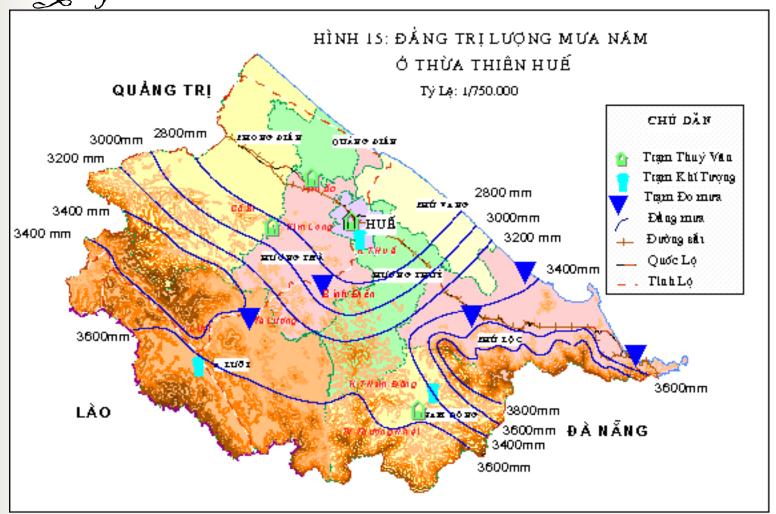
### The conditions for Formation of the flood

+ Forest cover.



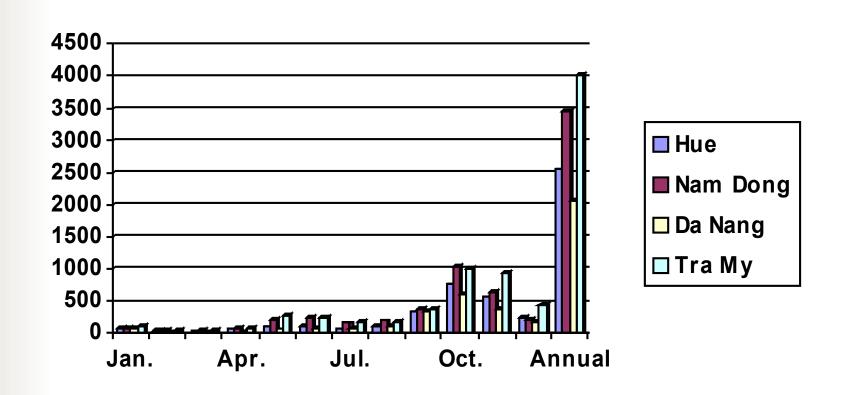
#### 2. Conditions for Formation of Flood

+ Rain fass:



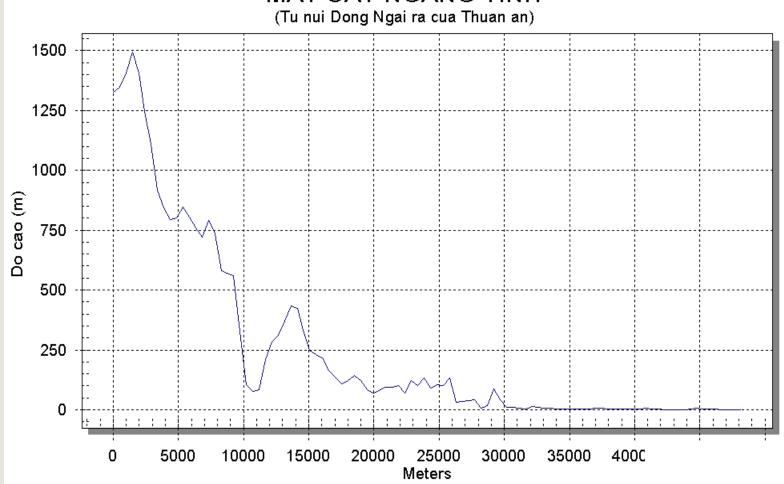
Average annual rainfall distribution in TT-H

## Monthly and annual means of rainfall (mm) in some station in the Mid-Central Region

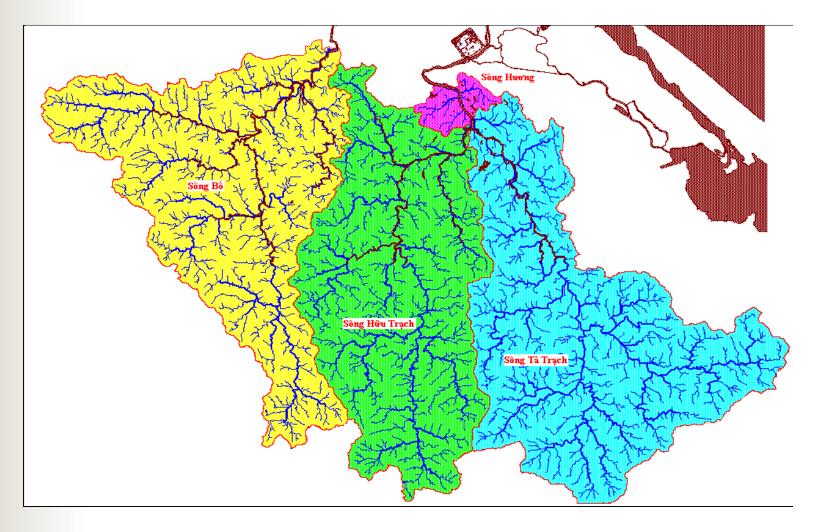


2. The Conditions for the Formation of flood + Steep Slope:

#### MAT CAT NGANG TINH



2. The Conditions for the formation of flood + River net:



. Huong Rivernet

### + Some flood pictures:



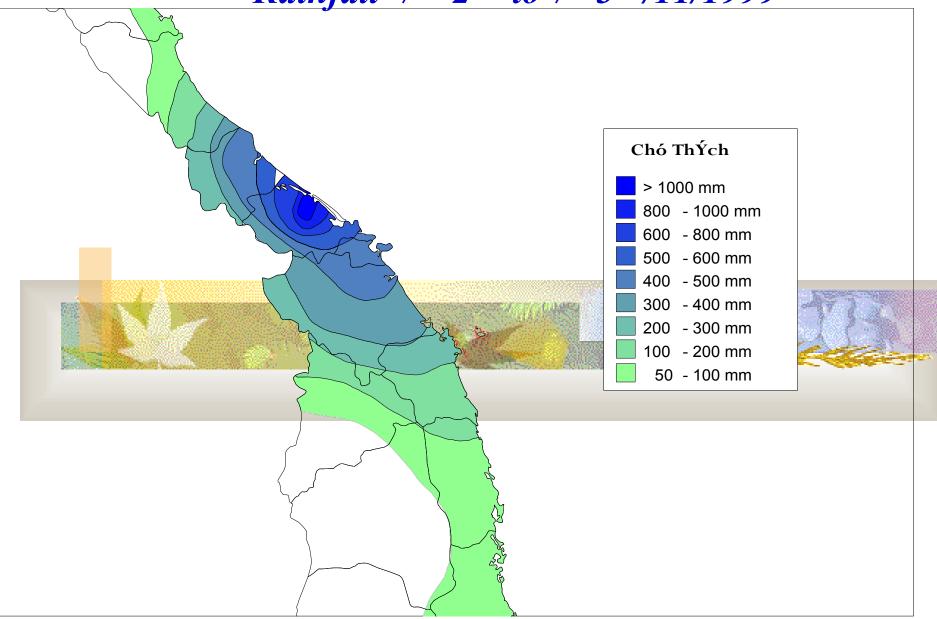


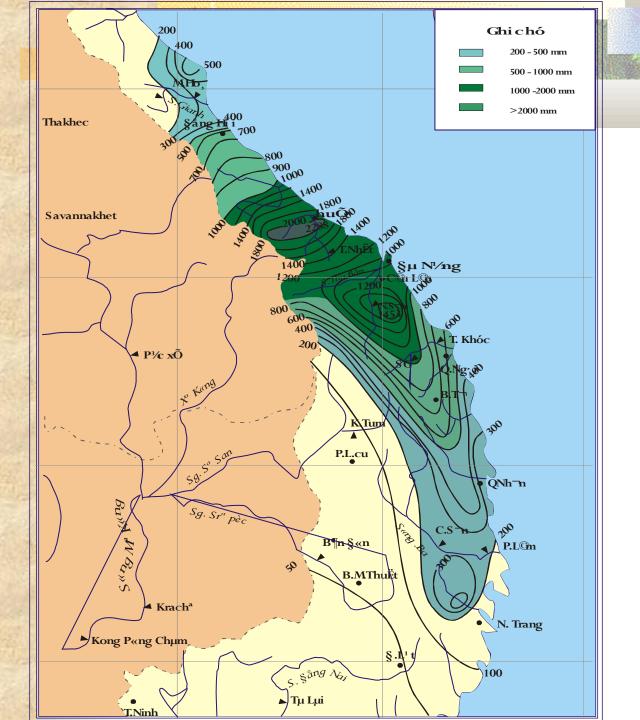




- Very heavy rain occurs continuously from 1st to 6th Nov, 1999.
- All stations from Thua Thien Hue to Quang Ngai have daily rainfall much more than 100mm.
- From 1st to 3rd more than 50% of stations have rainfall more than 300mm, about 20% >500mm/24h.
- In particularly in Hue City from 6 A.P 2sd to 6 AP 3rd Nov. the rainfall is 1422mm; Max intensity is 120mm/60 min.
- In Nam Dong the maximum daily rainfall is 593mm(on 2nd Nov.), more than maximum daily rainfall record (500mm).

### Rainfall 7 hr 2nd to 7 h 3rd /11/1999

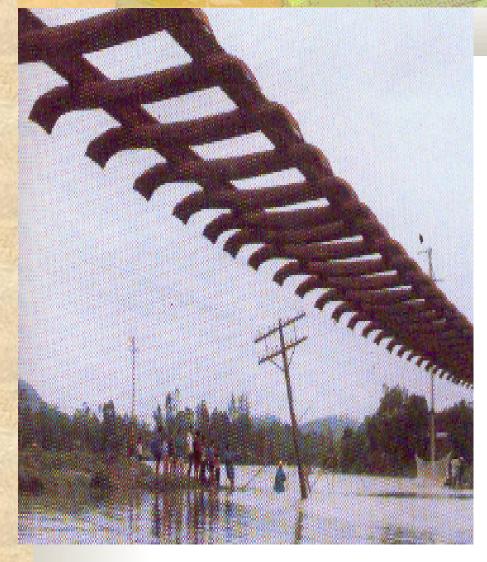


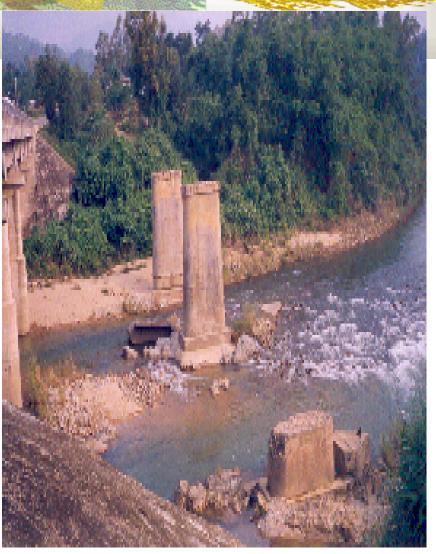


rainfall is ohyetal map (from 19h30.X to 7h

6.XI.1999)

#### Historic Flood in November 1999

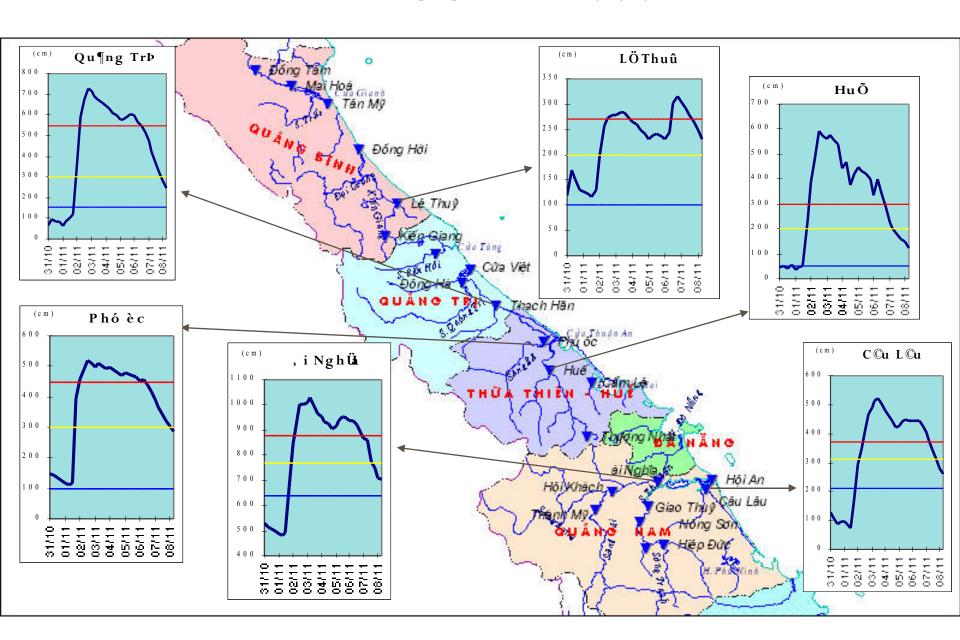




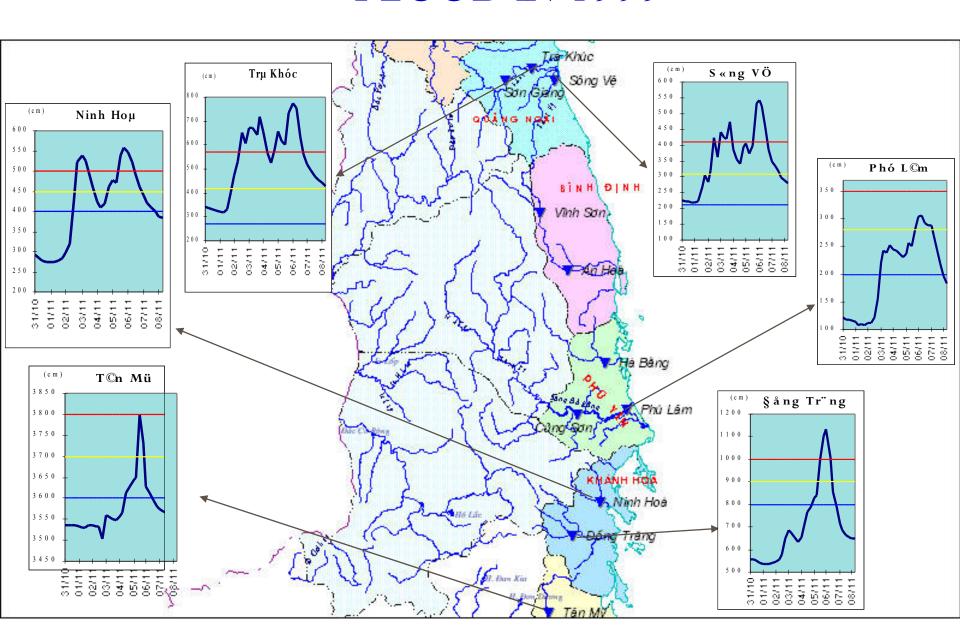
Flash Flood in Hue City

Flash flood in T $\mu$  L- $\neg$ ng

#### **FLOOD IN 1999**



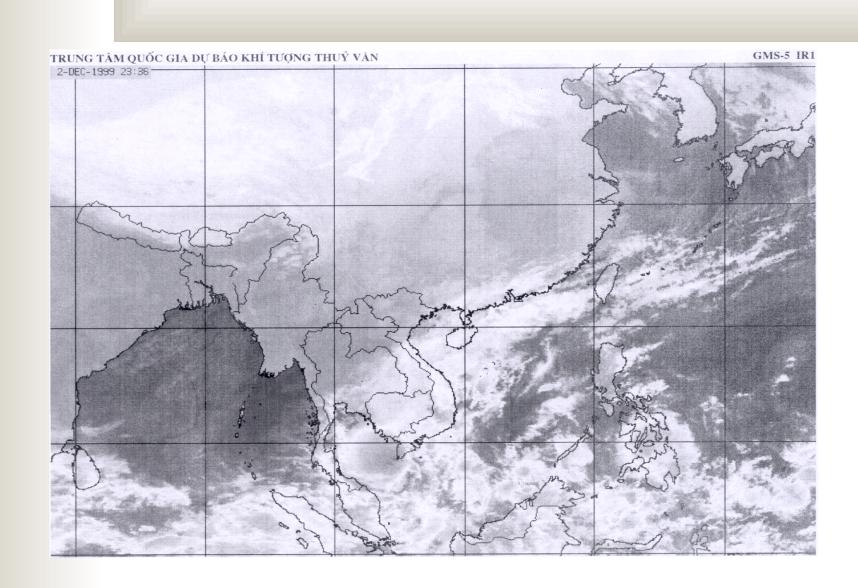
#### **FLOOD IN 1999**



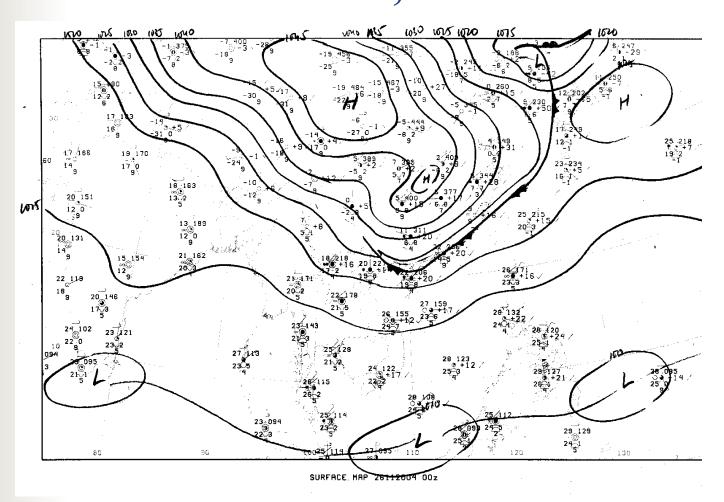
## Heavy-rainy event 1st-6th Dec,1999

### Overview of synoptic situation:

- There was existing ICTZ with tropical depression in 11oN-113oE
- In the same time strong Northeast monsoon move to southeast.
- In the upper level the High pressure over Pacific Ocean is strongly with Easterly wind velocity 10-15m/s



## Heavy-rainfall event on 24st-27th Nov, 2004.



## Table 1. Precipitation (mm) at some station in Mid-central Region From 24th to 27th Nov, 2004

	24 <sup>th</sup> Nov	25 <sup>th</sup> Nov	26th Nov	27 <sup>th</sup> Nov	Total (24-27)
A Luoi	66	311	251	142	770.0
Ta Luong	41	289	437	165	918.0
Nam Dong	277	315	269	516	1377.1
Khe Tre	252	309	285	393.0	1239.0
Thuong Nhat	230	395	173	361	1159.0
Binh Dien	28	225	678	56	987.0
Kim Long	35	263	614	35	947.0
KT Hue	35	469	682	43	1229.0
Da Nang	39	52	38	4.2	132.7
Tra My (KT)	154	103	138	297	692.0
Tien Phuoc	112	173	197	51	533.3
Hiep Duc	106	193	528	97	924.0
Gia Vuc	212	118	34	208	572.0
Son Tan	119	95	126	317	647.0
Son Giang	168	201	140	195	804.0
Ва То	106	345	92	162	705.0



## Heavy-rainfall event on 7th-13th Oct, 2005

- ICTZ with tropical depression that landed into Quang Nam territory,
- Northeast monsoon move to southeast
- Upper levels Easterly wind was very strong and substantial

## Bridge over Ben Hai River was destroyed by flood on 8th Oct, 2006



- -The interaction between the Northeast monsoon and the mesoscale disturbances such as typhoon circulation or ICTZ creates unstable air mass in East Sea.
- -Easterly winds bring that unstable air mass with much precipitation water to land, blocked by Truong Son Range pour heavy rain in Mid-Central Region's territory

### Flooding and after flood

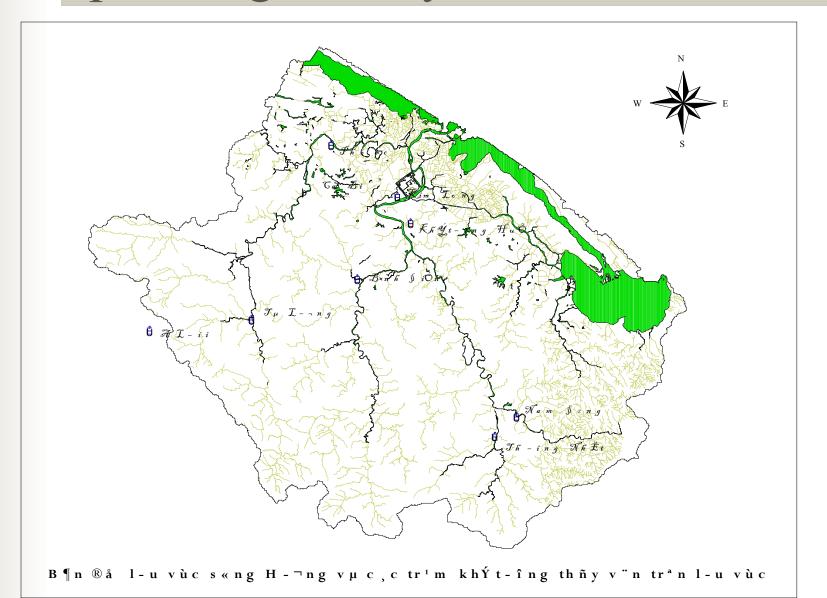




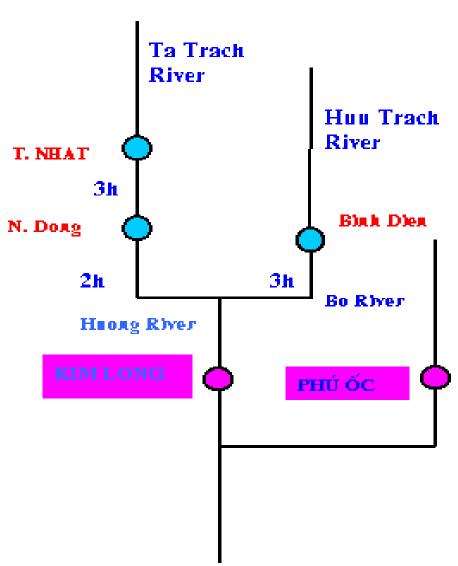
## III. Future International collaboration

- Developing an effective real time observation and flood warning system.
- Numerical operational high resolution forecasting model
- Fast responding system

### Map Huong river system (Area:2.830km²)



### Schematic Diagram Huong River System



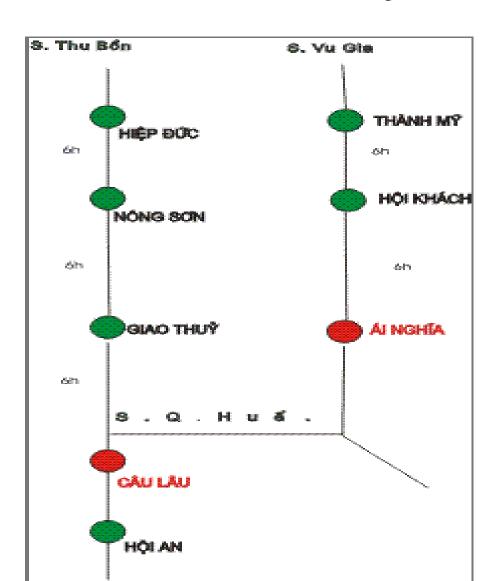
RIVER	Water level	Rainfall Station	Forecast
	station		Lead
			Time
	Thuong Nhat	A Luci, Thuong	o hr
		<b>N</b> hat	
HUNG	Non Dong	Thuong nhat, Nom	3 hrs
		Ding	
	Buh Den	ALwi, Buh Den	3 hrs
	Kim Tong	A Luci, Thuong	6 hrs
		Neat, Non Ding,	
		Buh Don, Kim	
		Long	
<b>1</b>	THEOG	Ta Lwng, Thu C	3 hrs

### Map of Thu Bon river system

(Area:10,350km<sup>2</sup>)



## Thu Bon River System

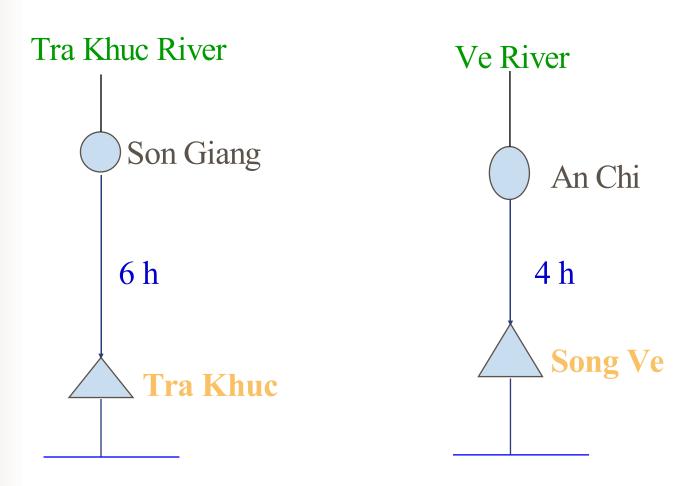


### Map rivers of Quang Ngai Province

(Area: Trµ Khóc: 3,240km², s «ng VÖ: 1,250km²)



### Schematic Diagram Tra Khuc and Ve River



River	Station	Water level station	Rainfall Station	Forecast Lead Time
Tra Khuc	Son Giang	Son Giang	Gia Vuc, Son Gian	0 hr
	Tra Khuc	Tra Khuc	Tra Khuc, Quang Ngai	6 hr
Song Ve	An Chi	An Chi	Ba To, An Chi.	0 hr
	Song Ve	Song Ve	Song Ve.	4 hr

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### IV Conclusion and remark

- In recent years flood and flash flood occur more frequently, this seemed to have a close relation to people's activities in social economic development like construction, forest destruction, land use/cover
- We can predict heavy rainfalls before 12-24h, and flood warning before 6-12h, but cannot predict flashfloods.
- The forecasting precipitation in numerical models about 50-100mm much less than real precipitation.

### IV Conclusion and remark (cont.)

- The present surface observation network needs more automatic raingauges, water level gauges combined with weather radar data for floods, flash floods warning
- High resolution, real time or near real time data (in-situ, remote sensing data) and data assimilation technique are needed.
- Improving HRM with the good initial and boundary conditions and parametrization.
- Automatic real time data collection
- Capacity building; national and international collaboration.

THANKYOU
FORyour attention!