

The Socialist Republic of Viet Nam  
**Ministry of Natural Resources and Environment**

**National Hydro-Meteorological  
Service of Vietnam**

***National Center for Hydro-Meteorological  
Forecasting***

**Trung tâm Dự báo Khí tượng Thủy văn Trung ương**



***<http://www.nchmf.gov.vn>***  
***<http://www.kttv.gov.vn>***

# MISSIONS

- **Monitor Hydro-Met. conditions in Vietnam territory and the related areas.**
- **Perform operational forecasts and disseminate Hydro-Met forecasts, warnings, and information.**
- **Organize and construct Hydro-Met. info. network for national forecasting and international data dissemination (GTS)**
- **Provide Hydro-Met services on requests of different national and international organizations**



# MISSIONS

- **Apply new technologies and carry out researches to improve forecast skill and quality.**
- **Participate in training, guiding, and improving professional skills on Hydro-Met. forecasts and information.**
- **Construct and compile the guidelines and technical procedures for Hydro-Met. forecasting operations.**
- **Collaborate internationally on Hydro-Met. forecasting and related issues.**



# Structure

## Ministry of Natural Resources and Environment national Hydro-Meteorological Service of vietnam

**National Center for Hydro-Meteorological Forecasting**

**Short-range Weather  
Forecast Div.**

**Hydrological  
Forecast Div.**

**Research &  
Development Div.**



**Med. & Long range  
Met. Forecast Div.**

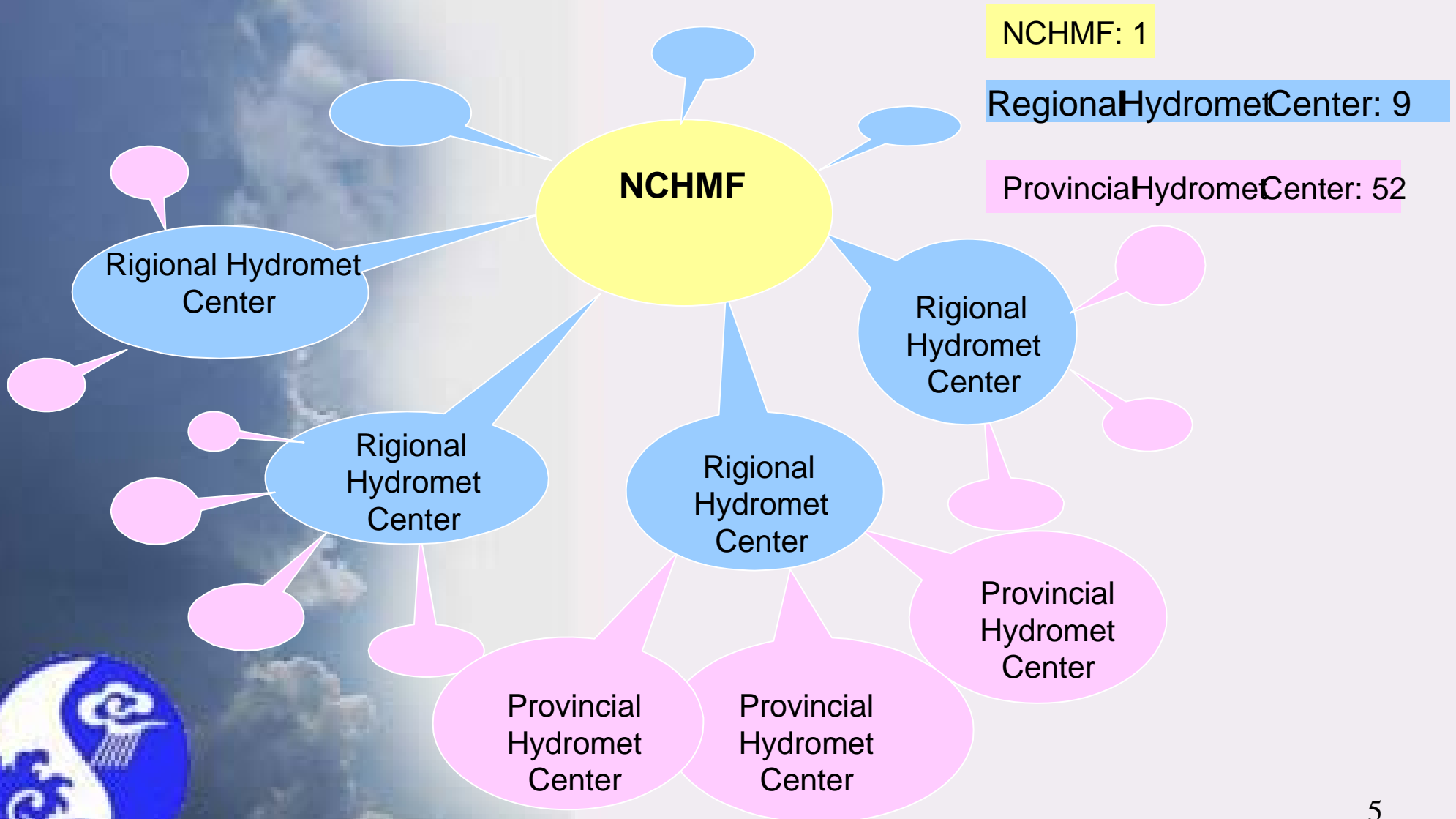
**Information  
System Div.**

**Computer System  
Div.**

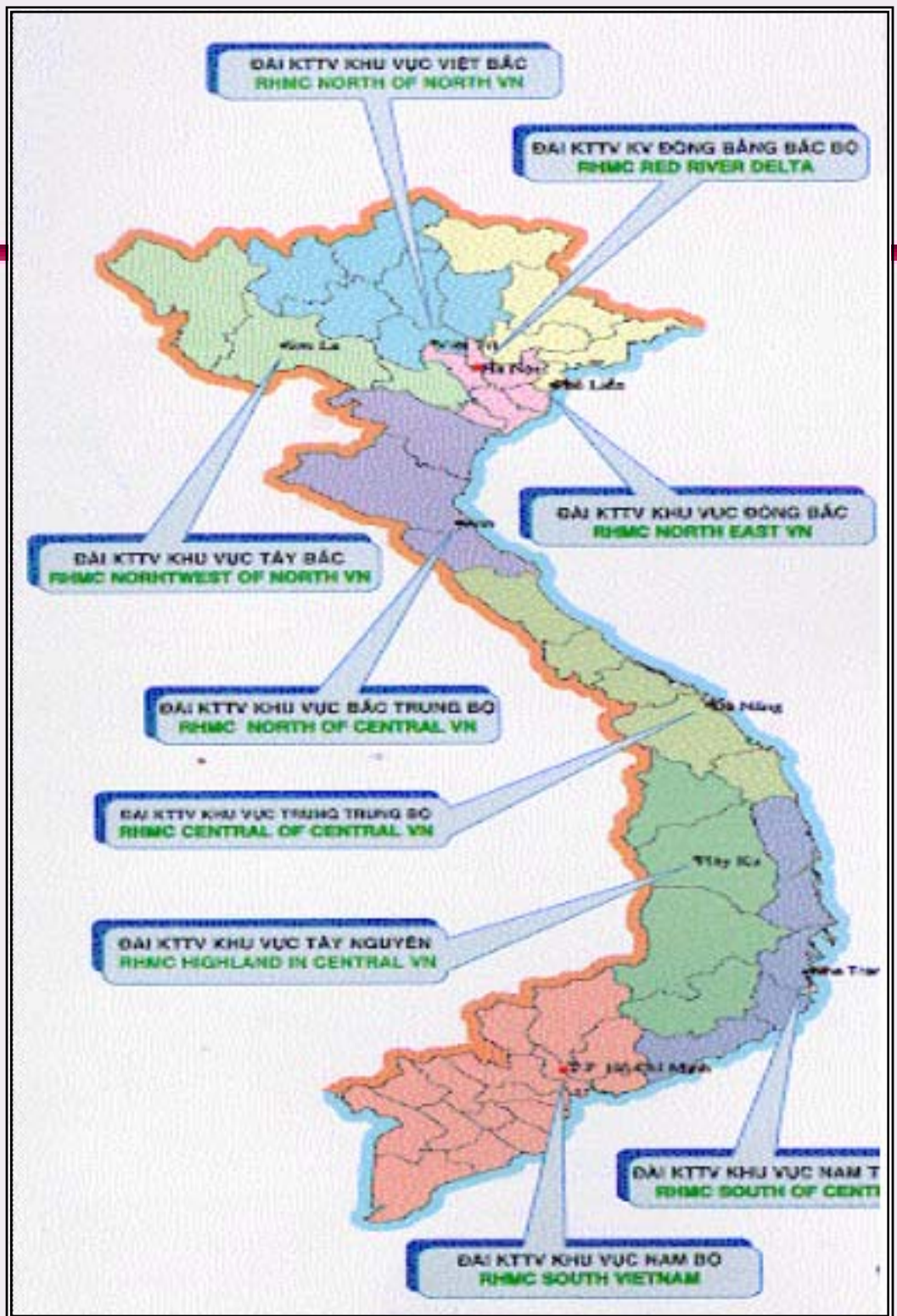
**Administration  
Division**



# Three level system of HYDRoMeteorological Forecast in Vietnam



# Map of regional hydro-meteorological centers





# System of hydro-meteorological forecasts

**NCHMF** is responsible for providing information on hydro-meteorological, marine forecasts for the needs of natural disaster prevention and preparedness, social and economic activities.

The system of hydro-meteorological forecasts includes three levels:

- Central level realized by National Center for Hydro-Meteorological Forecasts
- Regional level realized by Regional Hydro-Meteorological Forecasts Centers
- Provincial level realized by Provincial Hydro-Meteorological Forecast Stations

# Data information collection, processing for operational forecast

-International Station Network

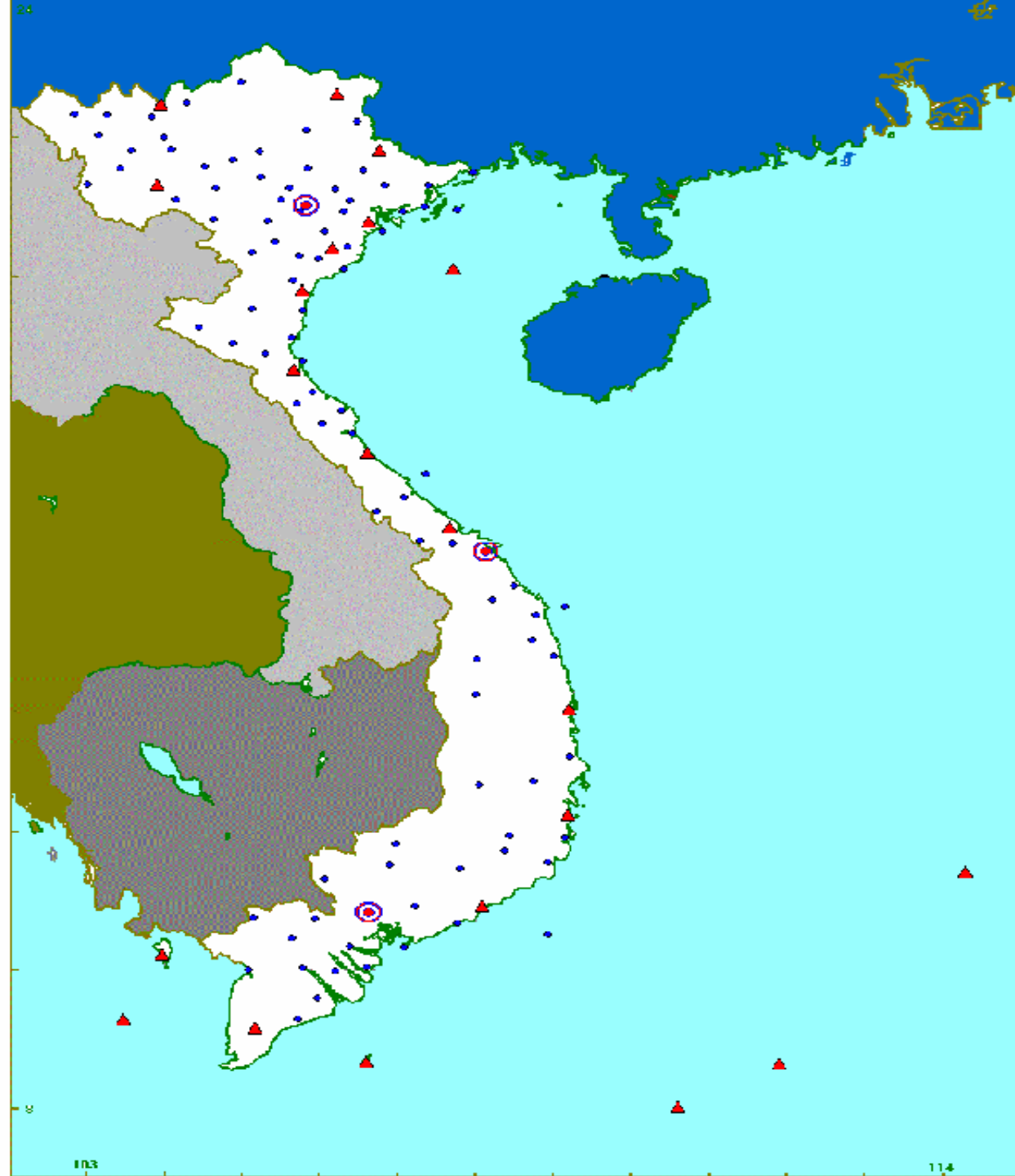
-National Telegraphic Station Network consisting of:

+ 132 synoptic stations.

+ 76 rainfall stations.

+186 hydrologic stations

+21 ocean-meteorological stations



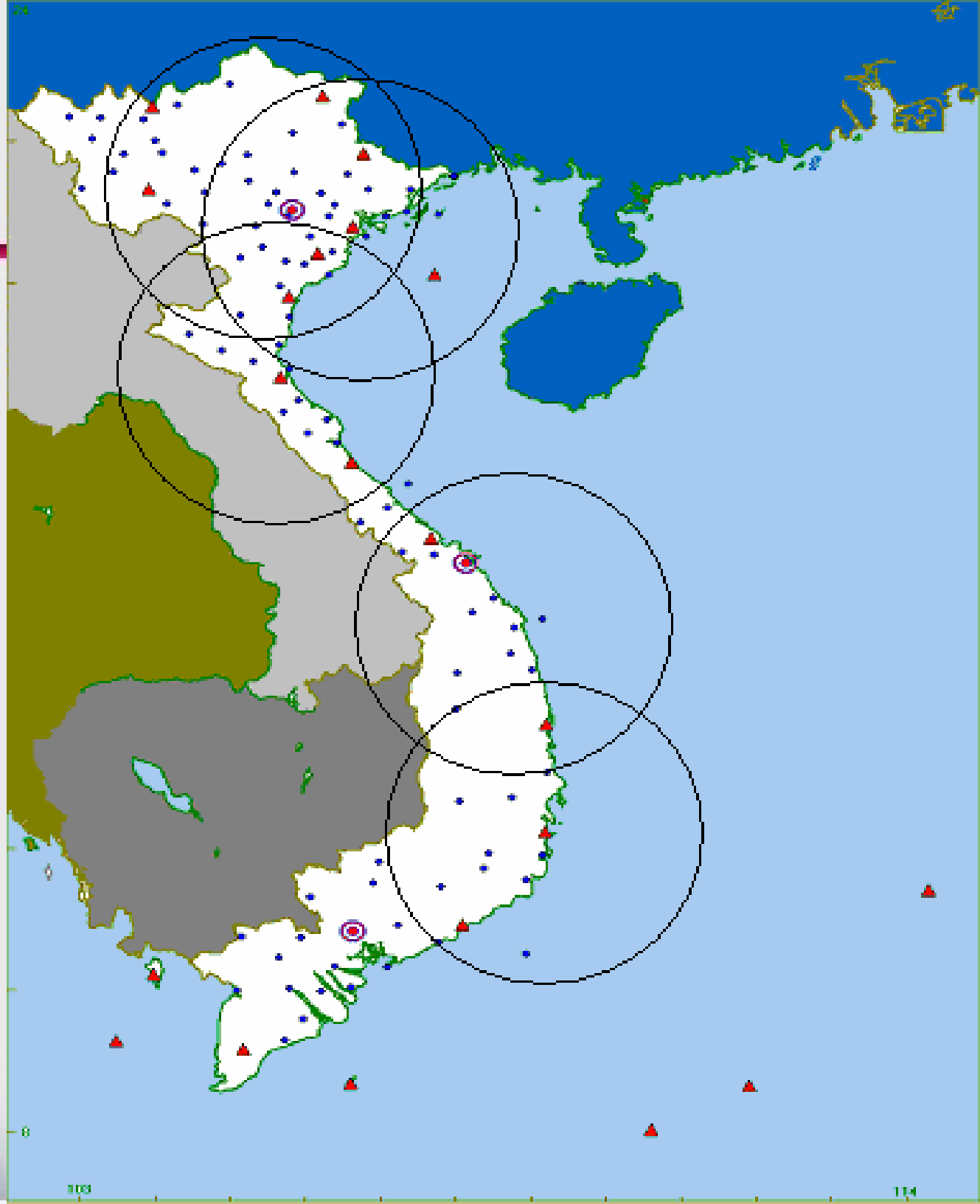
- Các trạm khí tượng bề mặt
  - Các trạm khí tượng bề mặt phát báo quốc tế
  - Các trạm khí tượng bề mặt + cao không phát báo quốc tế
- 125 trạm
  - ▲ 26 trạm
  - ⊙ 3 trạm



+ 5 weather radar stations.

+ 3 low resolution satellite stations

+ 1 high resolution GMS and NOAA satellite stations.



# communication

3 channels connected to GTS:

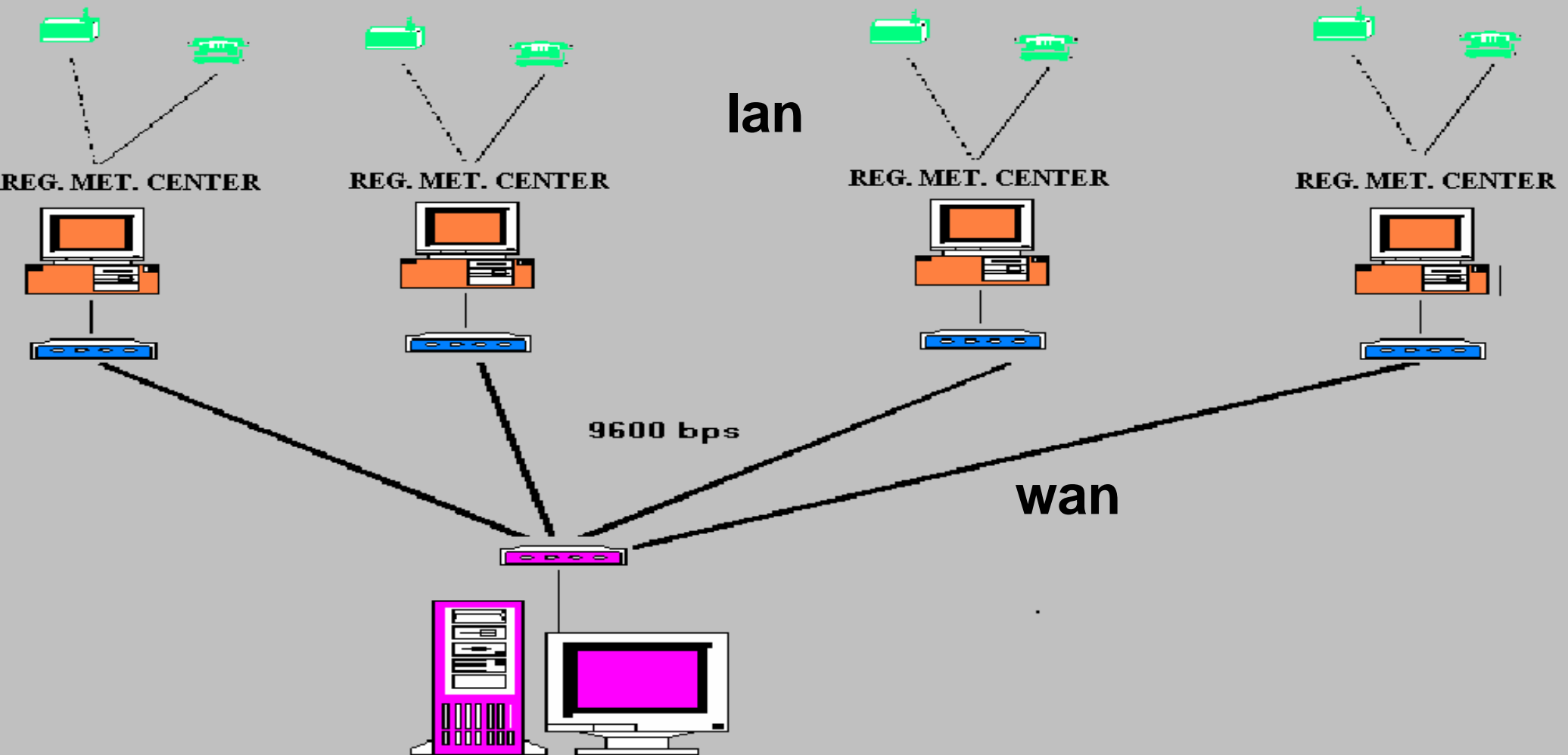
- Hanoi - Moscow: 100 baups
- Hanoi - Beijing: 75 baups
- Hanoi - Bangkok: 1200bps
- PCVSAT: Hanoi - Beijing: 9600bps



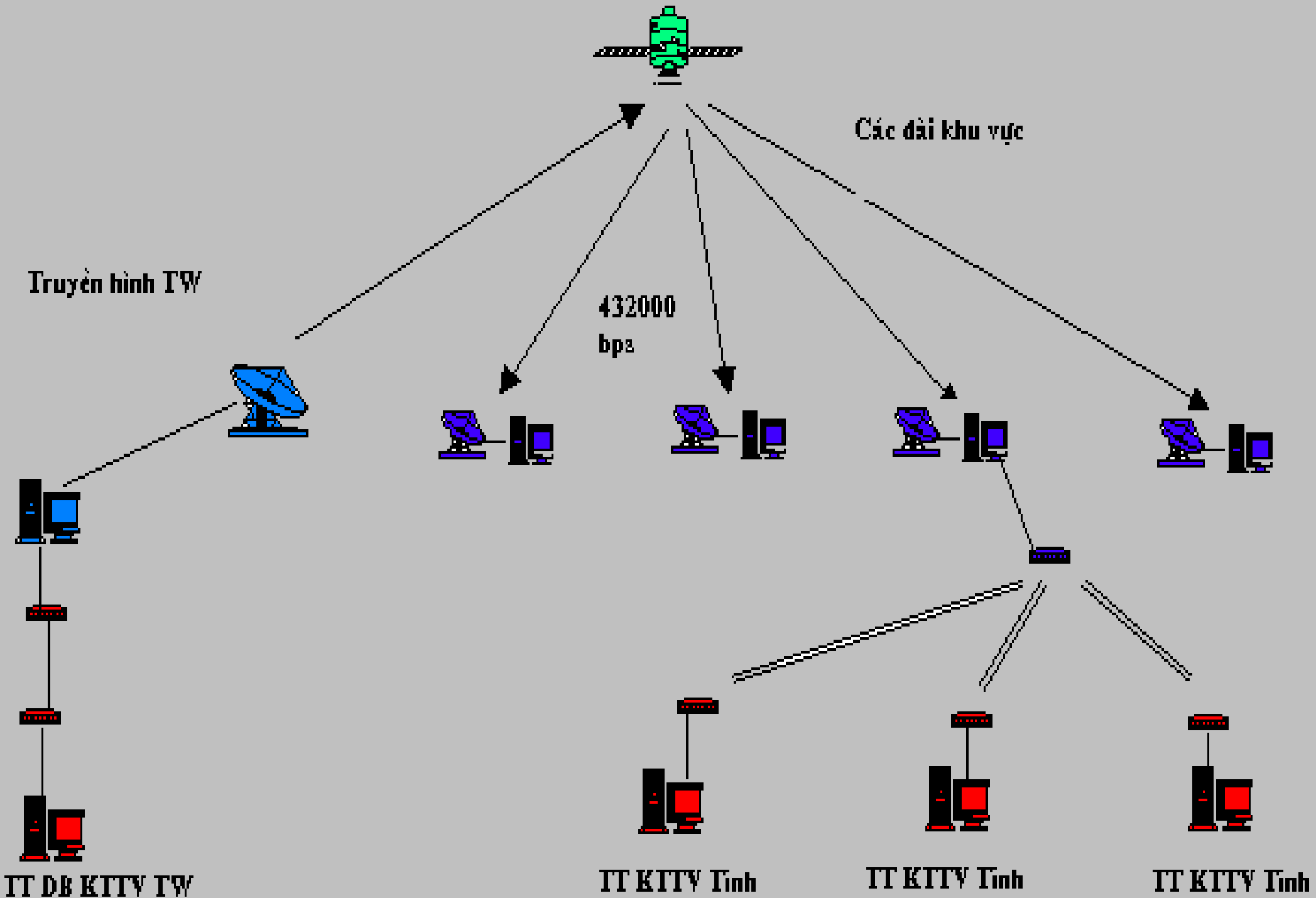
# National communication network

(9 REG. MET. CENTERs)

The hydrometeorological data from all stations can be received within 30 minutes through information computer LAN and WAN network

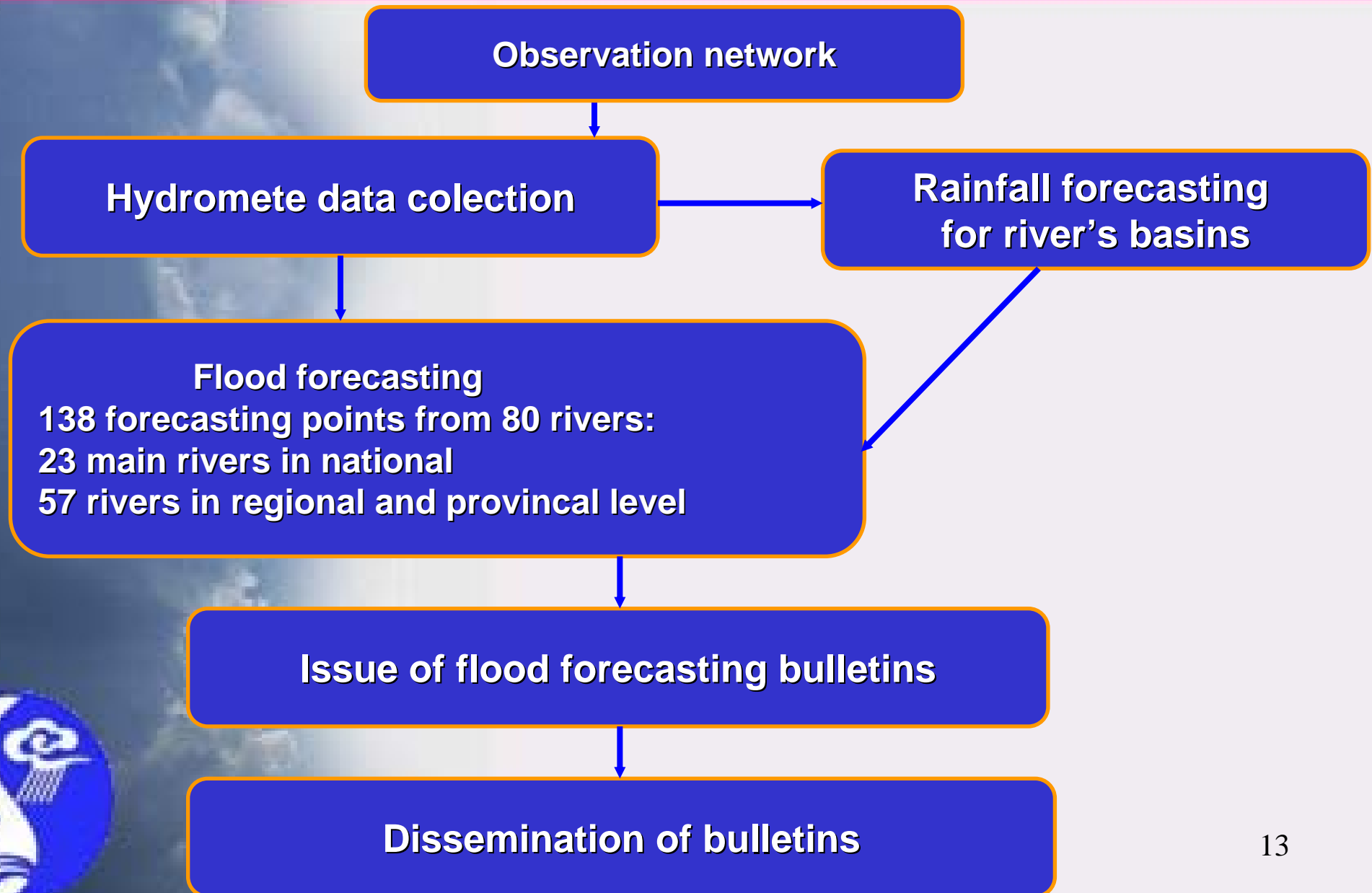


NATIONAL CENTER FOR HYDROMETEOROLOGICAL FORECASTING



Inserting Hydromet data into TV Satellite

# Flood forecasting system



# Hydrological bulletins

- During flood season: 1 time/day
- Flood summary: According typhoon-flood alert regulation
- Medium-term flood forecast: 1 time/5 day (during flood season), 1 time/10days (during dry season)
- Monthly and seasonal forecasts
- Drought forecast





# Dissemination of forecasting bulletin

- Weather, flood forecasting and information on tropical storms and depression bulletin is provided to TV, Radio broadcasting agencies, some central daily newspapers as well as posted on the website of [www.nchmf.gov.vn](http://www.nchmf.gov.vn)
- Regional hydromet centers and provincial hydromet forecasting centers daily provide provincial flood and storm control committees, local TV and radio broadcasting agencies with hydromet forecasting bulletin.
- Information bulletin on storm, tropical depression and flooding is delivered directly to leading communist party bodies, National Assembly, Government and relief providing organizations



# Flood forecasting in lower part of Mekong river

NCHMF has been carrying out flood forecasting along the mainstream Mekong River. Water level forecasts are produced for 2 stations of Tan Chau and Chau Doc for 5 days in advance and disseminated to the Central Committee for Flood and Storm Control and Governmental Authorities and to RHMC South Vietnam.

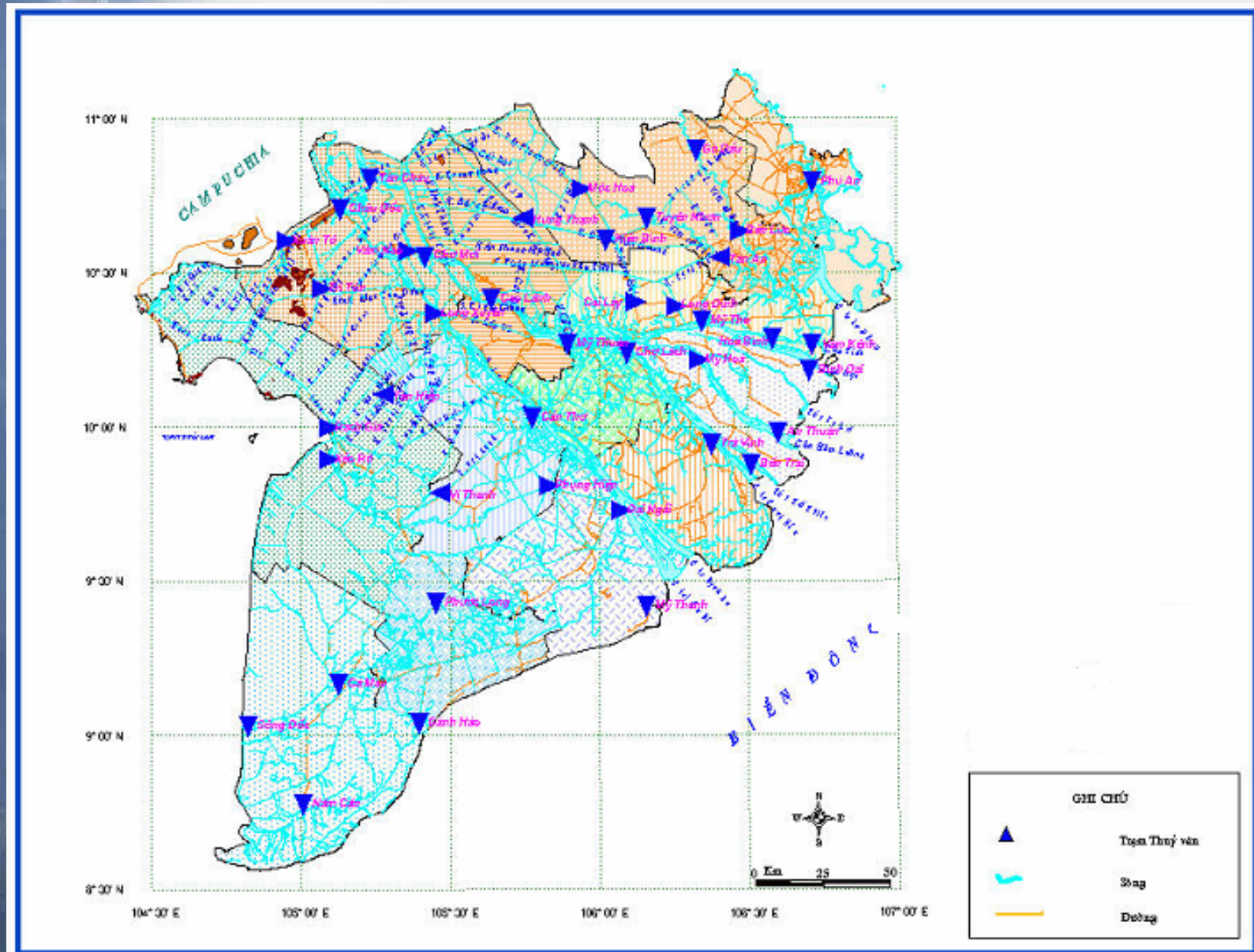


# *Collection of hydrometeorological data*

For the flood operational forecasting activities in lower Mekong, the National Centre for HMF collects data from about 60 water level stations and 70 rain-gauge sites (on the mainstream Mekong River, on highland and in MK delta of Vietnam) from other sources.



# Hydrological station network in Mekong delta in vietnam



# Meteorological station network in Mekong delta in vietnam



# Flood Forecasting in Mekong delta in vietnam

The temporal nature of forecast information for floodplain management need to be considered at three different scales

- **Short-range flood forecast bulletins:**

  - 5-day River's water level forecasts

- **Medium range forecasts bulletins:**

  - 10 – 15 days

- **Long range forecasts bulletins:**

  - Long-term hydro-met forecasting bulletin is released monthly and seasonal**

  - Flood forecasting is done daily from June to November**



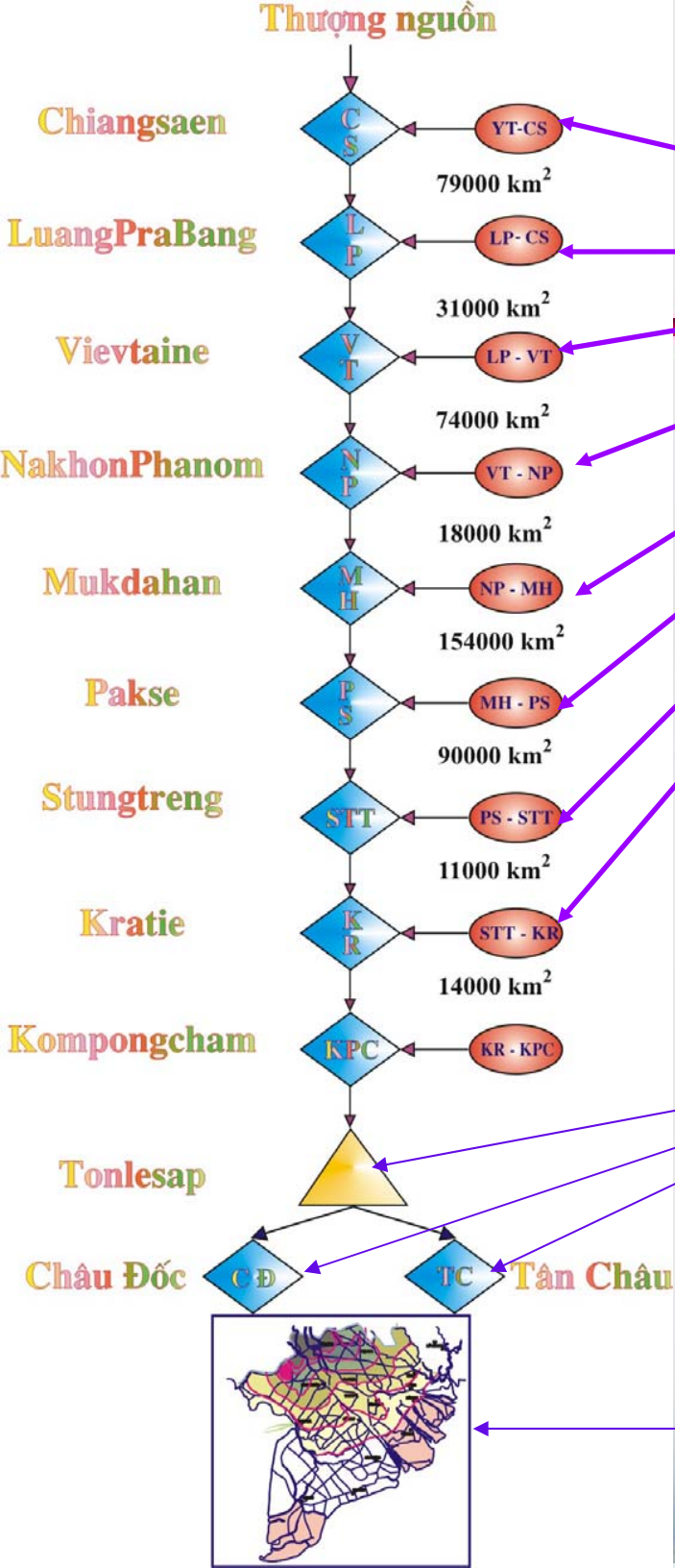


# Forecasting techniques

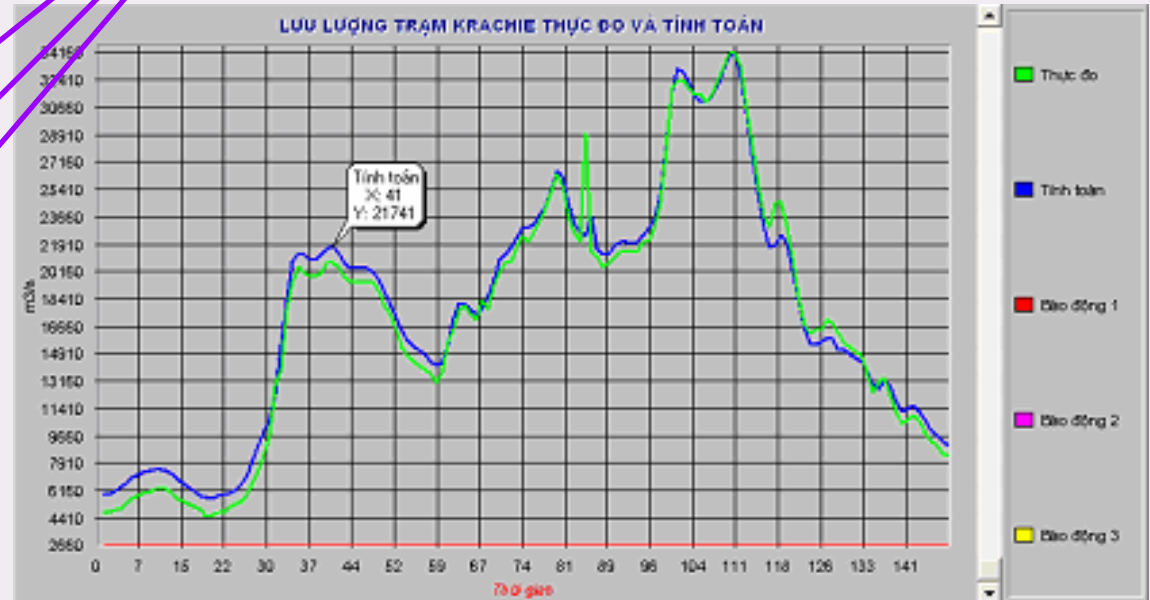
- Meteorological forecasting mainly made using synoptic methods in combination with world meteorological forecasting products.
- Numerical Rainfall Forecasting models such as HRM, ETA have been applied in VN .
- Rainfall-runoff models, method of corresponding stage and multivariable regression have been used to produce short-term river forecasts.
- In recent years, different models like SSARR, TANK, NAM and Hydrodynamic models have also been used in forecasting water level in lower of Mekong river



# Model in Mekong river

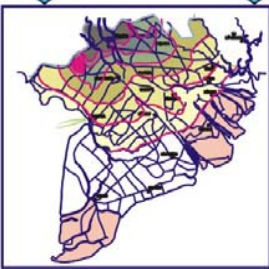


Nam and MUSKINGUM models



flood Routing model

HydroGIS model  
Nguyen Huu Nhan



**operational rainfall and flood  
forecasting for disaster  
prevention and mitigation in  
2005**



# Introduction

- Flood season of 2005 - peaceful creating favourable conditions to the riparian people, particularly, those in the lower parts of the Mekong Basin
- It caused some damage to Cuu Long Delta: 44 deaths, mostly were children, 2,723ha cultivated land was submerged and damaged.



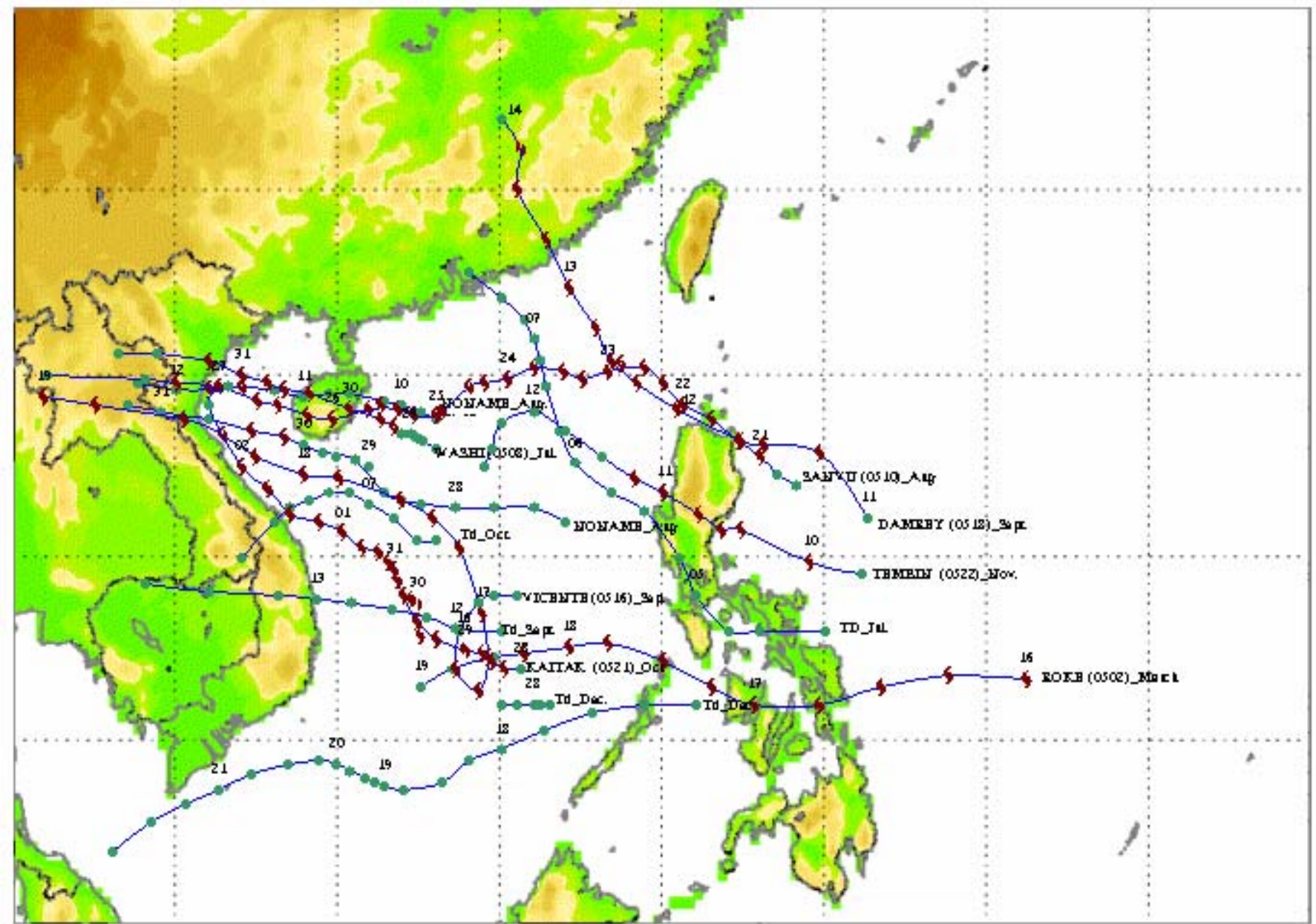
# 1. Overview on 2005 rainfall and flood in the lower mekong delta

## The weather condition

- There were 9 storms, 5 tropical depressions in the East Sea, of which 5 storms and 2 tropical depressions affected directly to the Lower Mekong river basin;
- Tropical converging band was not as strong as that in the years with relatively big flood;
- South-westerly wind took place in one moth later than long-term average and was normal one.







Tracks of the tropical cyclones over the South China sea in 2005





# Raifall

- 2005 rainfall amount was not high.
- Rainfall total of the rainy months was of annual average, some areas in middle part of the basin - higher than annual average;
  - June - September rainfall total : 800 - 1200mm;
  - Most rainfall was occurred in the middle part of the Mekong river basin, meanwhile downstream part- with least rain;
  - 9 heavy rainfall events of 3-7 days;
  - 2 heavy rainfall events occured over large area.

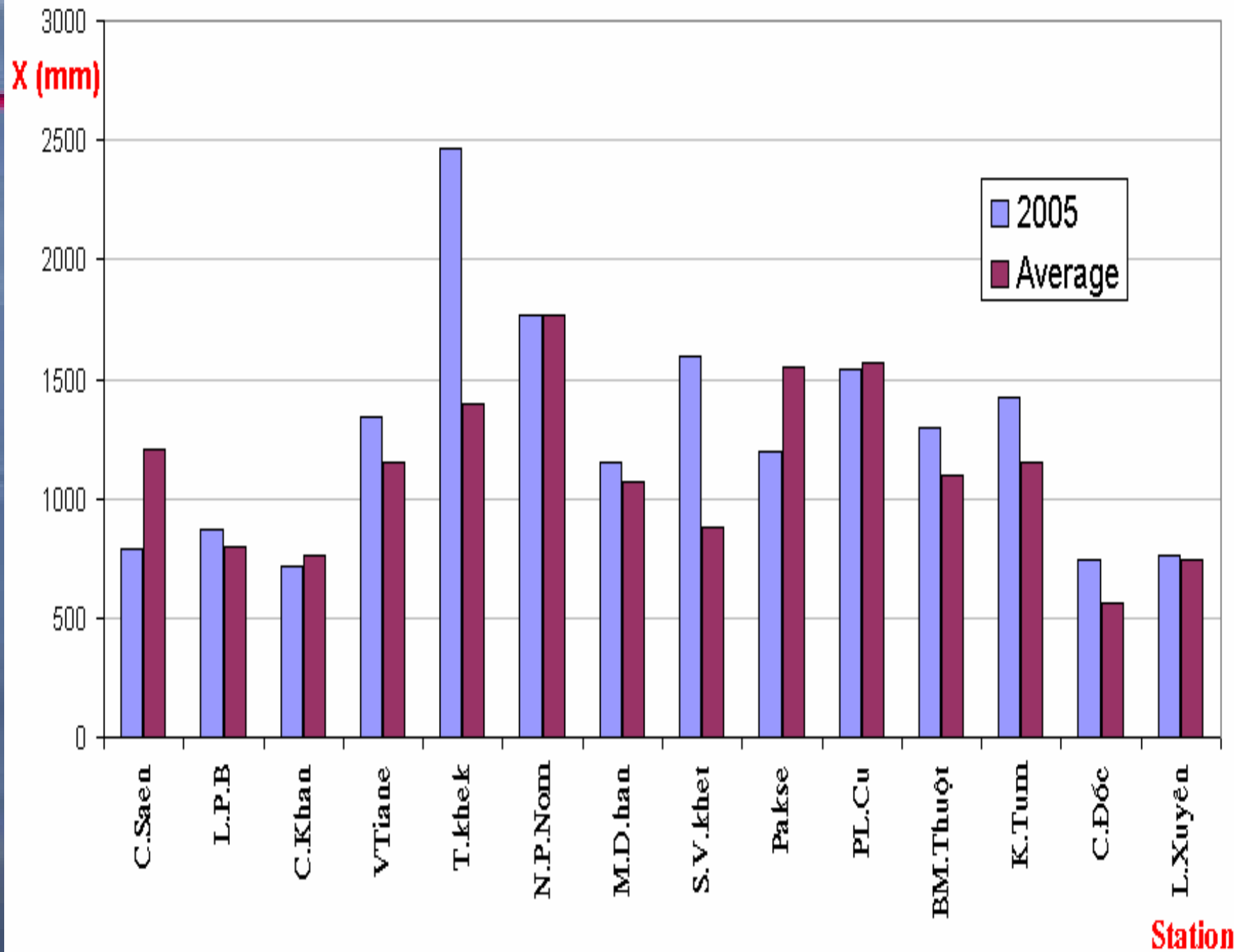


TABLE 1: TOTAL MONTHLY AND PERIOD FLOOD SEASON RAINFALL ON THE MEKONG BASIN

Month	Year	Stations																
		C.Saen	L.P.B	C.Khan	V.Tiane	T.khek	N.P.Nom	M.D.kan	S.V.khe	Pakse	Stungtrek	Kratie	PPBasa	PL.Cu	BM.Thuê	K.Tum	C.çêc	L.Xuy <sup>a</sup>
		r(mm)	r(mm)	r(mm)	r(mm)	r(mm)	r(mm)	r(mm)	r(mm)	r(mm)	r(mm)	r(mm)	r(mm)	r(mm)	r(mm)	r(mm)	r(mm)	r(mm)
	2000	314	268	205	340	452	373	222	195	308			422	292	332	83	254	
	2001	100	148	81	176	678	409	366	448	474	252	243	125	352	208	286	102	223
	2002	139	156	89	288	888	754	250	270	605	270	327	103	443	263	301	93	149
Jun	2004	150	179	178	369	380	226	91	114	315			174	694	134	399	188	169
	2005	164	208	187	373	619	335	125	190	211	117	77	28	185	128	151	104	125
	Mean	243	163	171	277	356	442	261	237	356				346	220	257	96	151
	2000	250	286	110	214	597	542	227	205	694	177	200	125	570	321	538	138	130
	2001	306	400	355	314	545	482	316	275	348	305	143	13	297	171	240	98	159
	2002	369	384	218	277	729	766	354	482	624	274	125	32	515	88	321	70	142
Jul	2004	206	273	164	355	401	235	480	377	315			142	290	359	262	66	129
	2005	216	326	39	186	760	506	378	622	336	216	375	251	481	325	473	302	224
	Mean	309	224	160	267	366	446	228	216	393				388	284	288	154	210
	2000	262	230	147	244	472	518	206	288	512	281	199	84	415	256	385	309	265
	2001	416	396	420	340	613	472	424	386	666	455	115	134	604	786	408	209	188
	2002	455	259	272	411	482	523	360	448	385	220	351	163	368	527	360	121	265
Aug	2004	337	222	166	194	913	758	335	351	441			211	349	257	421	88	165
	2005	98	187	193	379	705	601	360	434	395	210	180	206	569	224	382	125	117
	Mean	386	254	209	311	422	581	322	257	484				471	311	315	178	192
	2000	188	250	55	248		443	152	267	233	220	64	73	286	368	329	150	124
	2001	294	457	209	218	216	256	303	321	248	55	12	231	204	157	235	138	177
Sep	2002	205	386	327	295	334	209	281	179	491	107		170	445	287	438	98	143
	2004	268	105	219	278	469	390	210	96	146				208	302	304	260	298
	2005	309	145	297	403	381	325	289	350	259	287	319	256	302	615	413	210	296
	Mean	268	156	217	298	249	297	261	172	316				360	283	295	138	191
Sum	2005	787	866	716	1341	2465	1767	1152	1596	1201	838	951	741	1537	1292	1419	741	762
Jan-Sep	Mean	1206	797	757	1153	1393	1766	1072	882	1549				1565	1088	1155	566	744



## Total rainfall of period flood season and mean on the Mekong basin



## 1.2. Hydrological condition

### At commencement of flood season:

- Flow in the main Mekong and its tributaries was much lower than long-term annual average;
- In the Mekong Delta in Viet Nam salinity intrusion penetrated far upper and lasted for long duration.

### During flood season:

- Flow in the main Mekong and its tributaries was at its long-term annual average.



# In the upper reaches of the Mekong

- The flood occurred almost one month later than usual;
- During June and July, flow was lower than long-term annual average, even lower than that of 2003;
- End of July, since heavy rain, water levels rose rapidly with high rate of 35-45 cm/day on average, some days: 100-150 cm/day;
- In middle August, water level at the stations consecutively attained peaks, which were 1m higher than 2004 ones.



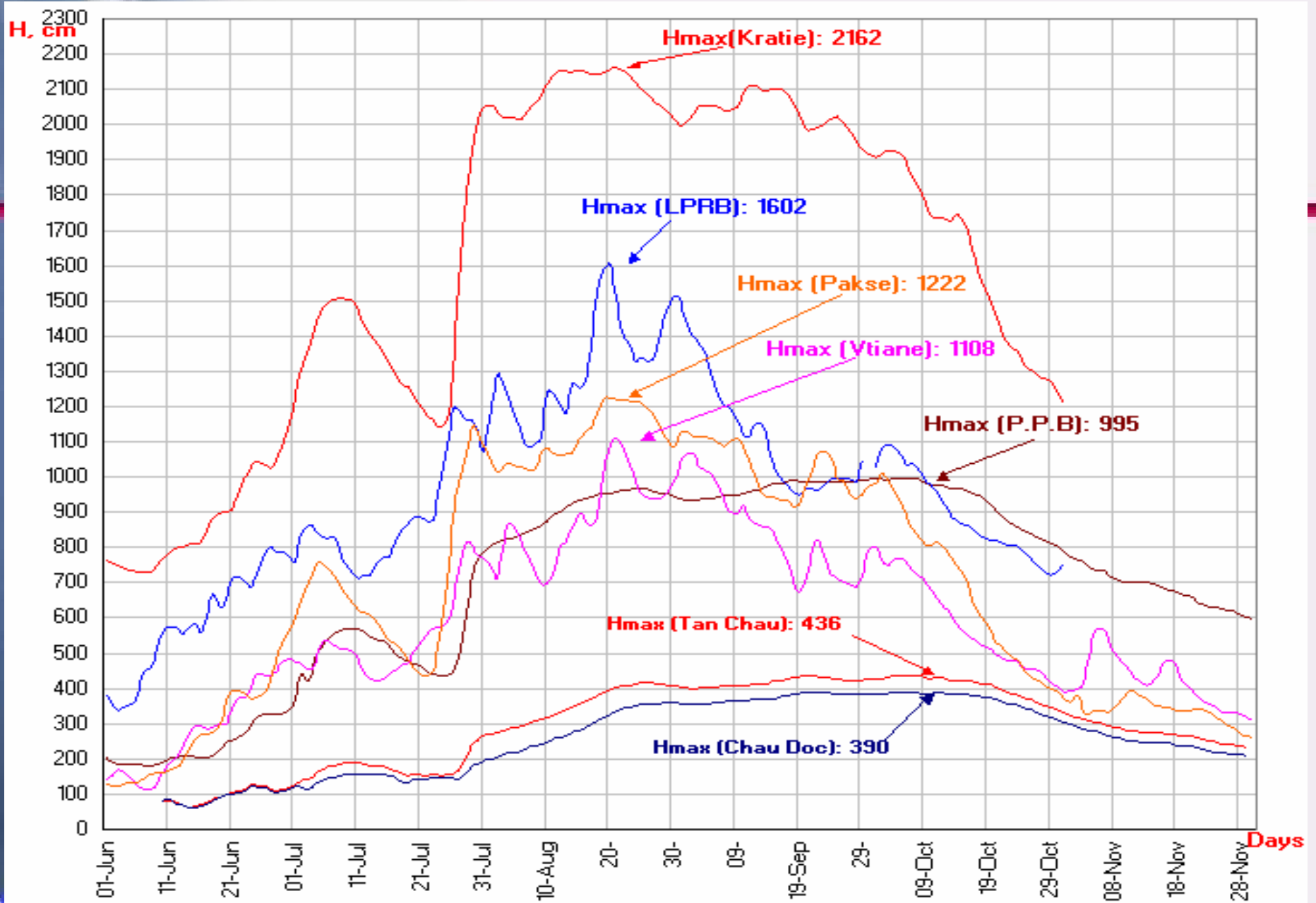


Fig. 3: Flood hydrographs at main stations on the Mekong river in 2005



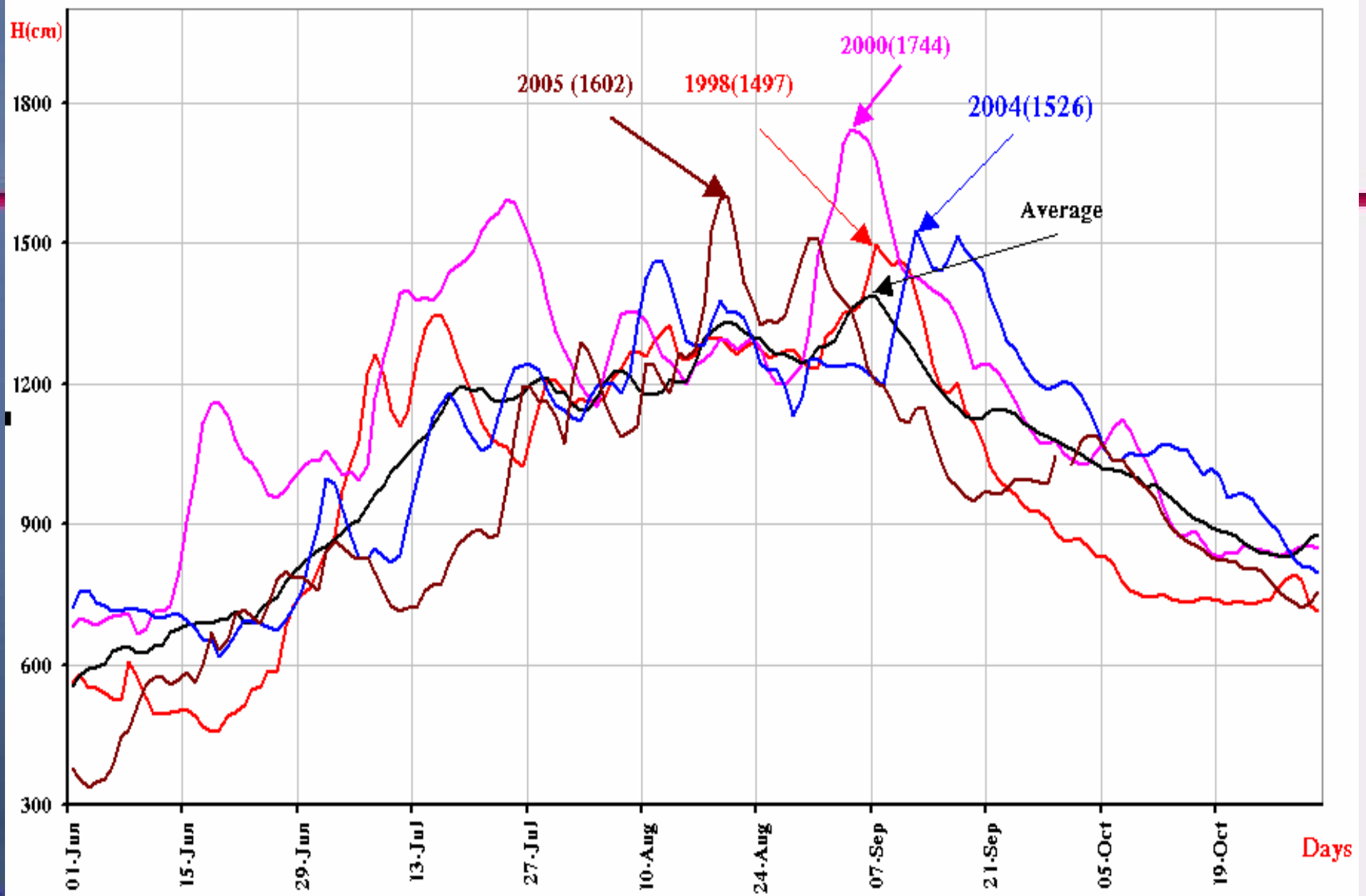


Fig 4: Flood hydrographs at Luang Prabang Station on the Mekong river in 1998, 2000, 2004, 2005 and average

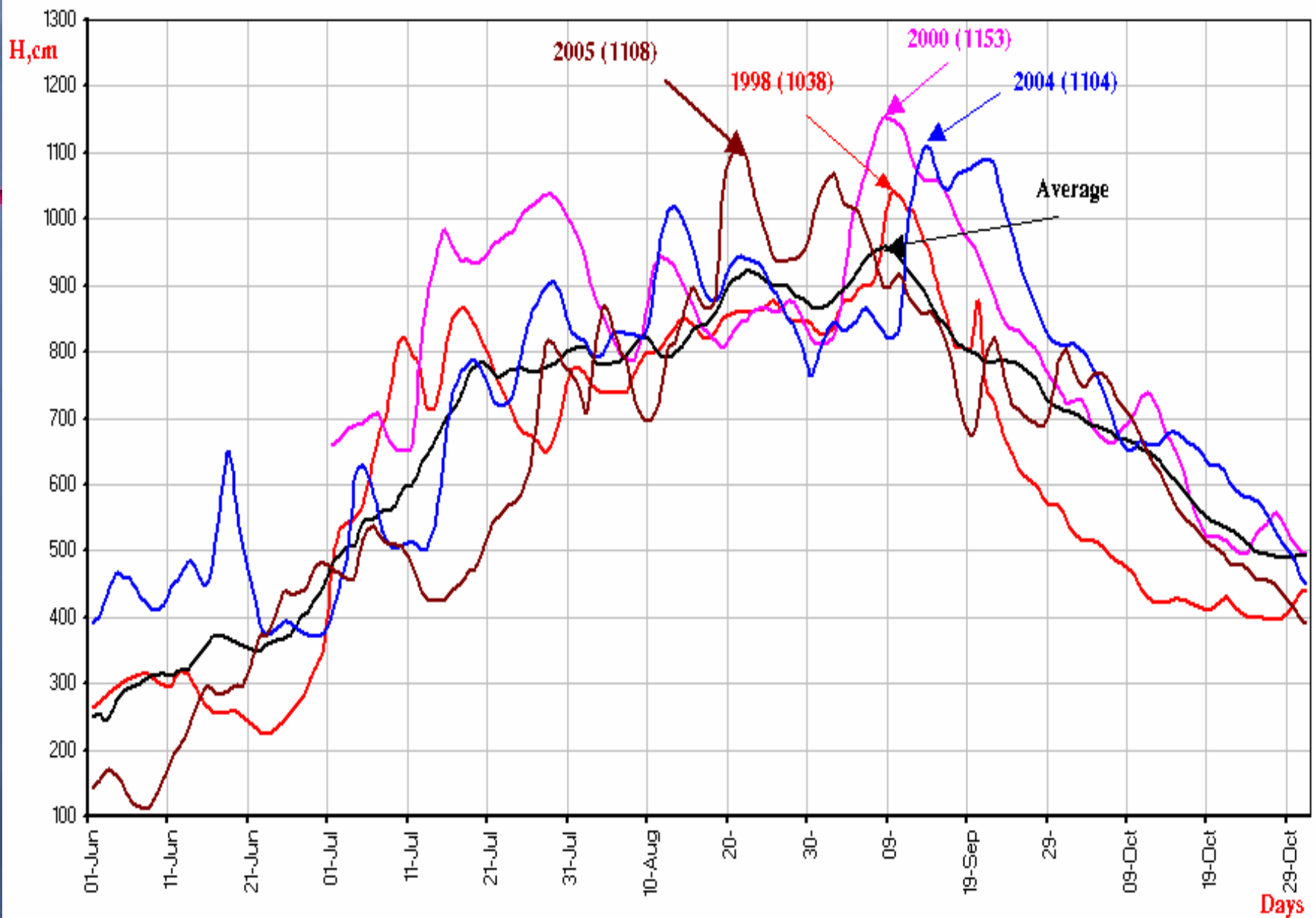


Fig 5: Flood hydrographs at Vientiane Station on the Mekong river in 1998, 2000, 2004, 2005 and average

## In the middle reaches

- In early July a flood with a peak in 2 m higher than long-term annual average occurred;
- In the end of July, water level rapidly increased with average rate at 0,5-1,0m, highest was 1,80m at Pakse station.
- Peaks of the year occurred in middle August, which were by 2-4 meters higher than long-term annual average peaks and by 1 meter lower than 2000 flood peaks;



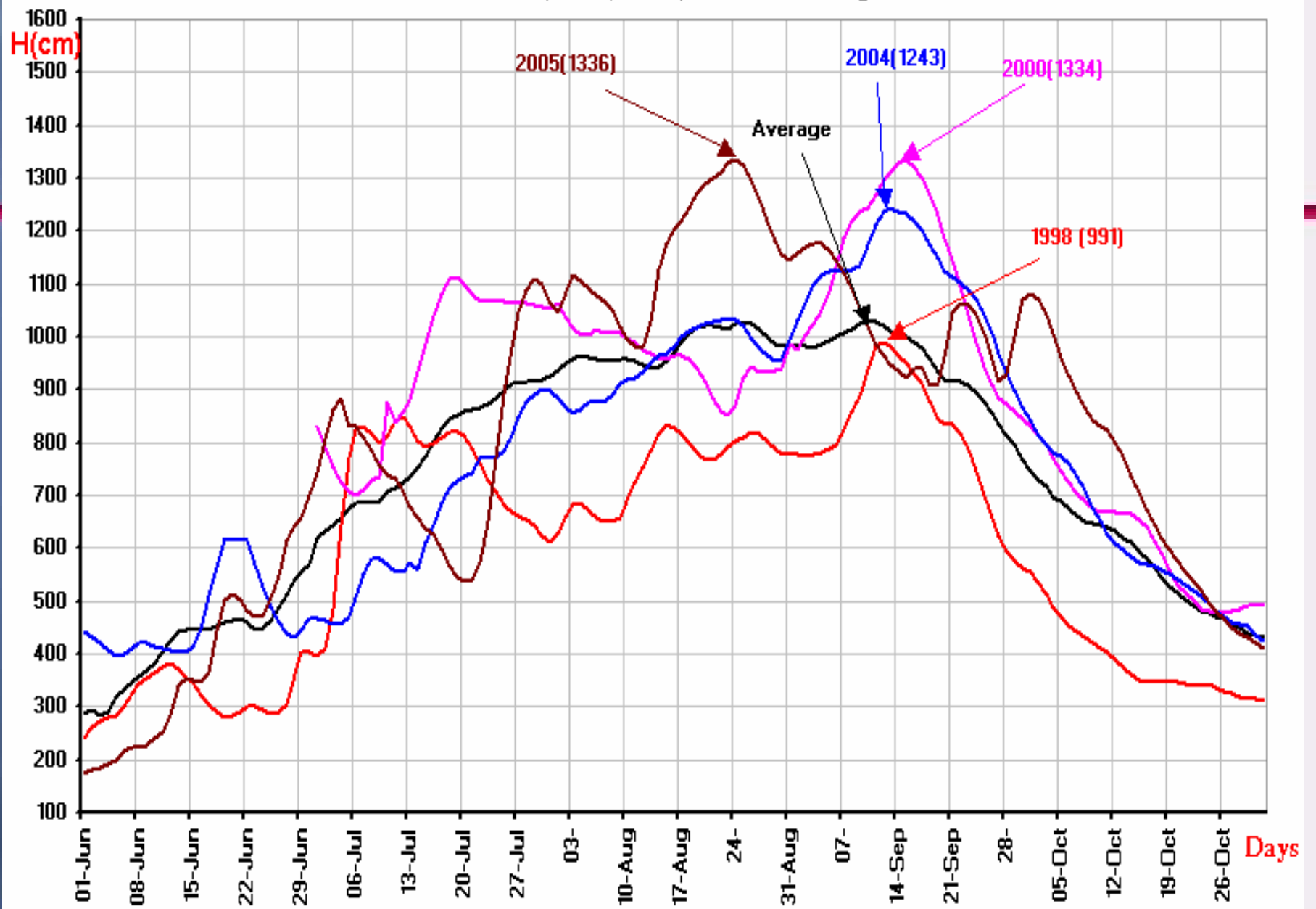


Fig 6: Flood hydrographs at Mukdahan station on the Mekong river in 1998, 2000, 2004, 2005 and average

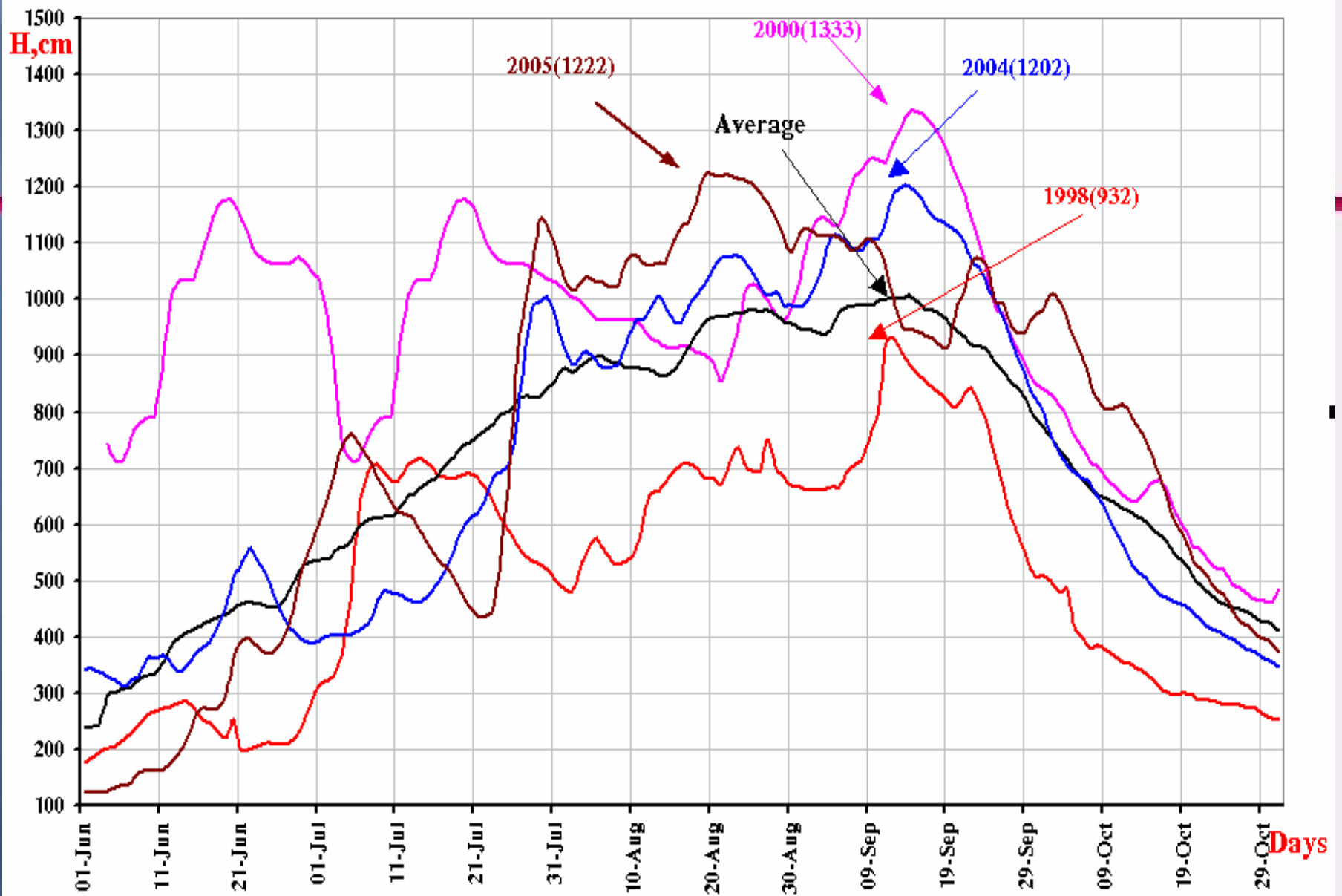


Fig 7: Flood hydrographs at Pakse station on the Mekong river in 1998, 2000, 2004, 2005 and average

# Flood flow in the Mekong

- Flow of the Mekong during the early flood season months (June and July), was 10-20 % lower than that of long term annual average
- In main flood course months and the end of flood season, flow was higher than long-term annual average;
- Flood water volume of the main flood course months (June to September) as well as of the whole flood season in the upstream was about 7-10% lower than long term annual average.



Table 4: Monthly and annual flow and total volume at the main station on the Mekong river in 2000 - 2005

TT	Station	Year	Monthly flow in the flood season (m <sup>3</sup> /s)					Total flow volume (km <sup>3</sup> )			
			VI	VII	VIII	IX	X	VI-IX	VII-IX	VII-X	VI-X
1	Chiang Sean	Mean	2430	4640	6460	5450	3870	50.2	43.9	54.1	60.5
		2000	6870	7210	6720	7890		75.6	57.8	57.9	
		2001	4800	10300	7190	7370	4530	78.4	65.7	78.1	90.5
		2002	2706	7062	9225	4026	3530	61.1	53.8	63.1	70.5
		2004	2676	5149	5941	6509	4231	53.5	46.7	58.0	64.8
		2005	2160	3730	6000	4530	3500	43.4	37.9	47.0	52.8
2	Vientiane	Mean	3490	6960	11810	11040	6870	87.9	79.2	97.2	106
		2000	4770	10280	12280	12380	5398	105	92.7	107	119
		2001	5260	9980	13140	11880	6142	106	92.9	109	123
		2002	3635	10863	15310	9427	5050	104	94.4	108	117
		2004	3746	6991	10514	12109	6430	88.0	78.7	95.6	105
		2005	2030	4930	10600	9710	5470	72.0	67.2	81.3	86.7
3	Mukdahan	Mean	7050	13960	21440	20920	12060	167	150	181	200
		2000		19700	20300	25700	10300		174	202	
		2001	11420	19840	26800	23130	11400	214	185	215	245
		2002	11110	21850	27390	21660	9680	217	188	213	243
		2004	7397	12062	20110	25397	10423	171	153	180	199
		2005	5600	14900	27300	22300	12800	185	171	205	220



4	Pakse	Mean	8660	17120	26820	27640	16600	212	190	234	256
		2000	15880	29600	28180	39500	16045	298	258	301	341
		2001	13530	24580	36060	34450	16439	287	253	296	331
		2002	11997	26923	34500	31370	15700	277	246	288	319
		2004	8581	14534	28239	32540	12073	221	200	232	253
		2005	5580	17300	34400	30000	16700	231	217	261	275
5	Stungtreng	Mean	10800	20590	32910	37378	23310	268	242	303	331
		2000	20700	42400	37700	53100	24800	406	353	420	472
		2001	17400	32590	50790	45540	23000	386	342	403	448
		2002	15464	34271	49948	47477	22900	389	350	410	450
		2004	13064	19316	41426	43290	16840	309	277	320	354
		2005	6780	21600	51100	43200	23300	324	309	368	387
6	Kratie	Mean	11280	25630	38350	39940	23860	304	276	339	368
		2000	21440	44050	40990	53940	30448	423	368	450	505
		2001	16810	33660	48840	48680	28252	391	348	423	466
		2002	15294	33642	48584	49043	26400	387	349	418	458
		2004	12555	18361	42645	45210	19365	313	283	333	365
		2005	5810	20600	49200	46100	26700	322	309	378	393
7	Ban Don	Mean	206	248	375	504	591	3.51	3.00	4.57	5.09
		2000	307	398	399	649	1408	4.61	3.84	7.61	8.38
		2001	220	230	695	506	395	4.36	3.81	4.83	5.42
		2002	179	147	607	655	362	4.18	3.76	4.69	5.15
		2004	172	189	453	281	173	2.89	2.46	2.90	3.36
		2005	107	173	288	776	372	3.52	3.30	4.28	4.52





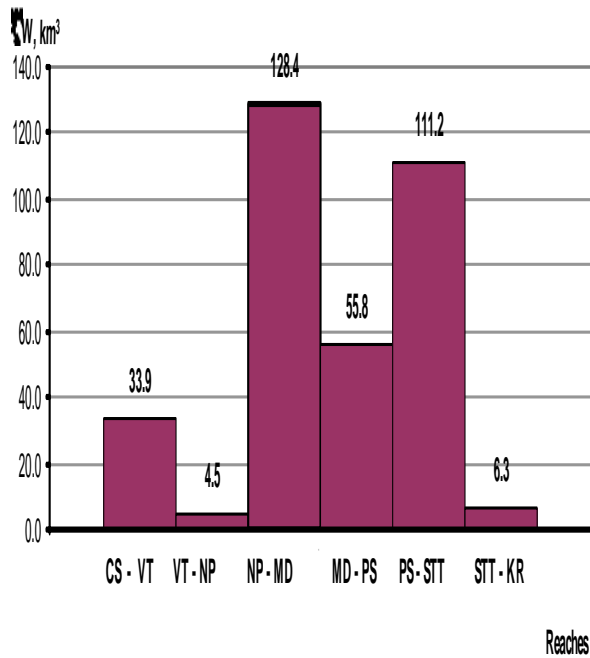
Table 5: Monthly flow and total flow volume at the main stations on the mekong river in 2005

Station	Monthly flow (m <sup>3</sup> /s)					Total flow volume (km <sup>3</sup> )				
	Jun	Jul	Aug	Sep	Oct	Jun-Sep	Jul-Sep	Jul-Oct	Jun-Oct	Highets Flood
Chieng Sean	2160	3730	6000	4530	3500	43.4	37.9	47.0	52.8	12.2
Vientiane	2030	4930	10600	9710	5470	72.0	67.2	81.3	86.7	60.2
Local inflow						28.6	29.3	34.3	33.9	48.0
Percent (%)						39.7	43.6	42.2	39.1	79.7
Vientiane	2030	4930	10600	9710	5470	72.0	67.2	81.3	87	60.2
Nakhonpanon	5800	14200	26900	22200	12200	183	200	162	91	106.0
Local inflow						111	133	81.0	4.5	45.8
Percent (%)						60.6	66.4	49.9	5.0	43.2
Nakhonpanon	5800	14200	26900	22200	12200	183	200	162	91	106
Mukdahan	5600	14900	27300	22300	12800	185	171	205	220	101
Local inflow						2.7	-28.5	42.3	128.4	-5.0
Percent (%)						1.4	-16.6	20.7	58.5	-5.0
Mukdahan	5600	14900	27300	22300	12800	185	171	205	220	101
Pakse	5580	17300	34400	30000	16700	231	217	261	275	143
Local inflow						45.4	45.9	55.9	55.8	42.0
Percent (%)						19.7	21.1	21.5	20.3	29.4
Pakse	5580	17300	34400	30000	16700	231	217	261	275	143
Strungtreng	6780	21600	51100	43200	23300	324	309	368	387	124
Local inflow						93.6	91.2	107.8	111	-19.0
Percent (%)						28.9	29.6	29.3	28.8	-15.3
Strungtreng	6780	21600	51100	43200	23300	324	309	368	387	124
Kratie	5810	20600	49200	46100	26700	322	309	378	393	119
Local inflow						-2.8	0.1	9.3	6.3	-5.0
Percent (%)						-0.9	0.0	2.5	1.6	-4.2

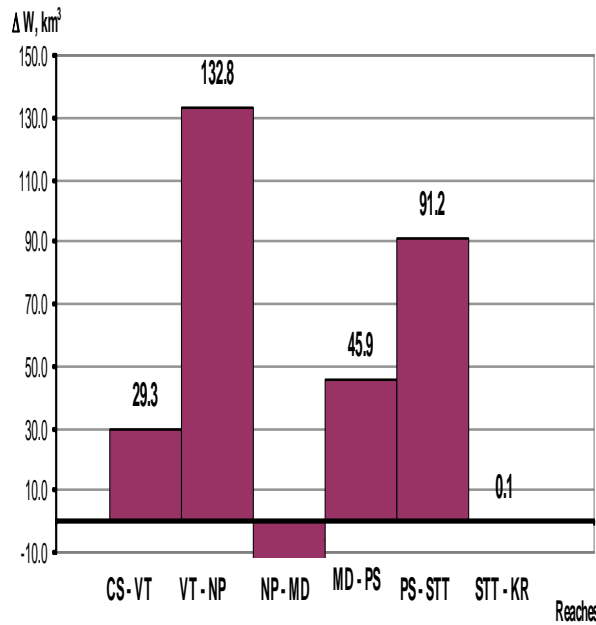


# Local inflow on the Mekong

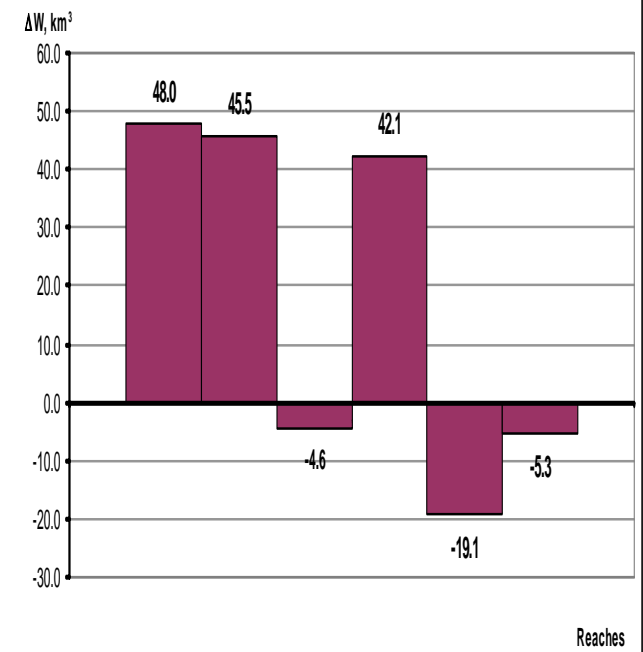
June - October



July - September



Period of food height in 2005



Mark: CS - Chiang Saen; VT - Vientiane; NP - Na Khon Phanom;  
MD - Mukdahan; PS-Pakse; STT-Stungtreng; KR-Kratie



# Downstream and the Mekong Delta

- During first months of the flood season, water levels at all stations were lower than the same period average by 20 to 50 cm, at some station this difference was 100 cm
- The first flood peak appeared late and occurred in early July.

## Flood peak in 2005

Flood amplitude of rising limb was relative high, about 3 - 7m was recorded in Cambodia, but in Mekong Delta in Viet Nam it was only 2.0-2.5m

The flood peak of the year at Kratie and at Kompongcham, 0,3 - 0,5 m higher than that in 2004;

first peak in the mid of Sep and the second peak in early of October. The 2005 flood peak at Phnom Penh Bassac was 9.95m, at Tan Chau: 4.36m , at Chau Doc: 3.90m , approximate to that of 2004 and by 0.16-0.40 m higher than the alarm level 3;

In far downstream, due to affected by the high tide, flood peak occurred later, in the mid October.



**TABLE 2. CHARACTERISTICS OF THE HIGHEST FLOOD ON THE MEKONG RIVER IN 2005**

Station	Starting flood			Peak flood			$\Delta H$ (cm)	T <sub>r</sub> (Days)	Intensive flood		
	Day	H	Q	Day	H	Q			I <sub>max</sub>	Day	I <sub>1/2max</sub>
	Month	(cm)	(m <sup>3</sup> /s)	Month	(cm)	(m <sup>3</sup> /s)			(cm/day)	Month	(cm/day)
<b>Up Stream</b>											
Chiang Saen	07 VIII	503	4190	29 VIII	843	9390	340	12	51	18 VIII	28
LuangpraBang	07 VIII	1088	7460	20 VIII	1602	15048	514	13	161	18 VIII	40
Chiang Khan	09 VIII	1005	7137	20 VIII	1396	15216	391	11	119	19 VIII	36
Vientiane	10 VIII	698	7220	21 VIII	1108	17871	410	11	161	19 VIII	37
Nakhon Phanom	12 VIII	936	19200	23 VIII	1288	36000	352	10	100	13 VIII	35
Mukdahan	12 VIII	978	20800	22 VIII	1336	34422	358	10	94	14 VIII	36
Khong Chiam	11 VIII	1225	25447	22 VIII	1480	34621	255	11	54	15 VIII	23
Pakse	07 VIII	1021	30000	19 VIII	1222	39477	201	12	42	15 VIII	17
Stungtreng	05 VIII	949	44900	11 VIII	1076	55296	127	6	38	09 VIII	21
<b>Down stream</b>											
Kratie	01 VIII	2014	45000	21 VIII	2162	52900	148	20	25	08 VIII	7
KompongCham	03 VIII	1388		22 VIII	1535		147	19	18	10 VIII	8
PhnomPenh Port	02 IX	838		01 X	903		65	29	19	11 VIII	2
PhnomPenh Bassac	02 IX	932		01 X	995		63	29	19	11 VIII	2
Koh Khel	02 IX	722		01 X	743		21	29	11	09 VIII	1
Neak Luong	03 IX	693		01 X	723		30	28	13	14 VIII	1
<b>Mekong River delta</b>											
Tan Chau	02 IX	400		05 X	436		36	33	6	15 IX	1
Chau Doc	02 IX	356		05 X	390		34	33	5	12 IX	1



**Table 3: Peak food level at the main stations on the Mekong River**

No	Station	2000			2004			2005			Mean	
		Day	H	Q	Day	H	Q	Day	H	Q	H	Q
		Month	(cm)	(m <sup>3</sup> /s)	Month	(cm)	(m <sup>3</sup> /s)	Month	(cm)	(m <sup>3</sup> /s)	(cm)	(m <sup>3</sup> /s)
<b>Up stream</b>												
1	Chiang Saen	6/IX	972	11600	16/IX	838	93100	19/VIII	729	6962	825	10600
2	Luang Prabang	7/IX	1740	23000	12/IX	1526	14900	20/VIII	1602	15048	1601	14800
3	Chiang Khan	8/IX	1514		13/IX	1396		20/VIII	1396	15216	1392	15900
4	Vientiane	8/IX	1153	17500	13/IX	1104	15600	21/VIII	1108	17871	1062	16400
5	Nakhon Phanom	14/IX	1270	33100	13/IX	1215	31800	22/VIII	1270	33224	1129	25200
6	Mukdahan	15/IX	1334	34500	13/IX	1243	30500	22/VIII	1310	34422	1161	27800
7	Khong Chiam	15/IX	1625		13/IX	1459		22/VIII	1480	34621	1382	34600
8	Pakse	15/IX	1333	51100	13/IX	1202	38900	19/VIII	1222	39477	1160	37500
9	Stung Treng	16/IX	1149	65100	15/IX	1022	52200	11/VIII	1076	55296	997	50400
<b>Down Stream</b>												
10	Kratie	17/IX	2261	61200	17/IX	2119	50500	21/VIII	2162	52900	2022	54700
11	Kompong Cham	18/IX	1591		17/IX	1505		22/VIII	1535		1442	
12	Cang Phnom Penh	20/IX	1009		25/IX	910		1/X	903		894	
13	Phnom Penh Bassa	21/IX	1120		25/IX	997		1/X	995		986	
14	Koh Khe				25/IX	753		1/X	743		734	
15	Neak Luong				25/IX	741		1/X	723		755	



## Me Kong river delta

16	Tân Châu	23/IX	506		27/IX	441		5/X	436		419
17	Châu Đốc	23/IX	490		29/IX	402		5/X	390		378
18	Hồng Ngự	23/IX	485		28/IX	422		21/IX	423		
19	Hưng Thạnh	24/IX	358		4/X	270		19/X	277		231
20	Mộc Hoá	25/IX	327		12/X	235		19/X	239		197
21	Kiến Bình	2/XI	266		15/X	175		23/X	188		170
22	Xuân Tô	25/IX	467		4/X	392		11/X	388		356
23	Trị Tôn	27/IX	298		7/X	276		11/X	269		256
24	Tân Hiệp	3/X	183		15/X	130		22/X	142		136
25	Cao Lãnh	27/IX	261		29/IX	232		19/X	237		
26	Long Xuyên	27/IX	263		29/IX	241		18/X	245		242
27	Mỹ Thuận	30/IX	180		29/IX	179		18/X	186		167
28	Cần Thơ	30/IX	179		29/IX	191		19/X	194		167
29	Tân An	30/IX	167		16/X	145		18/X	149		
30	Bến Lức	16/X	137		16/X	136		18/X	140		120



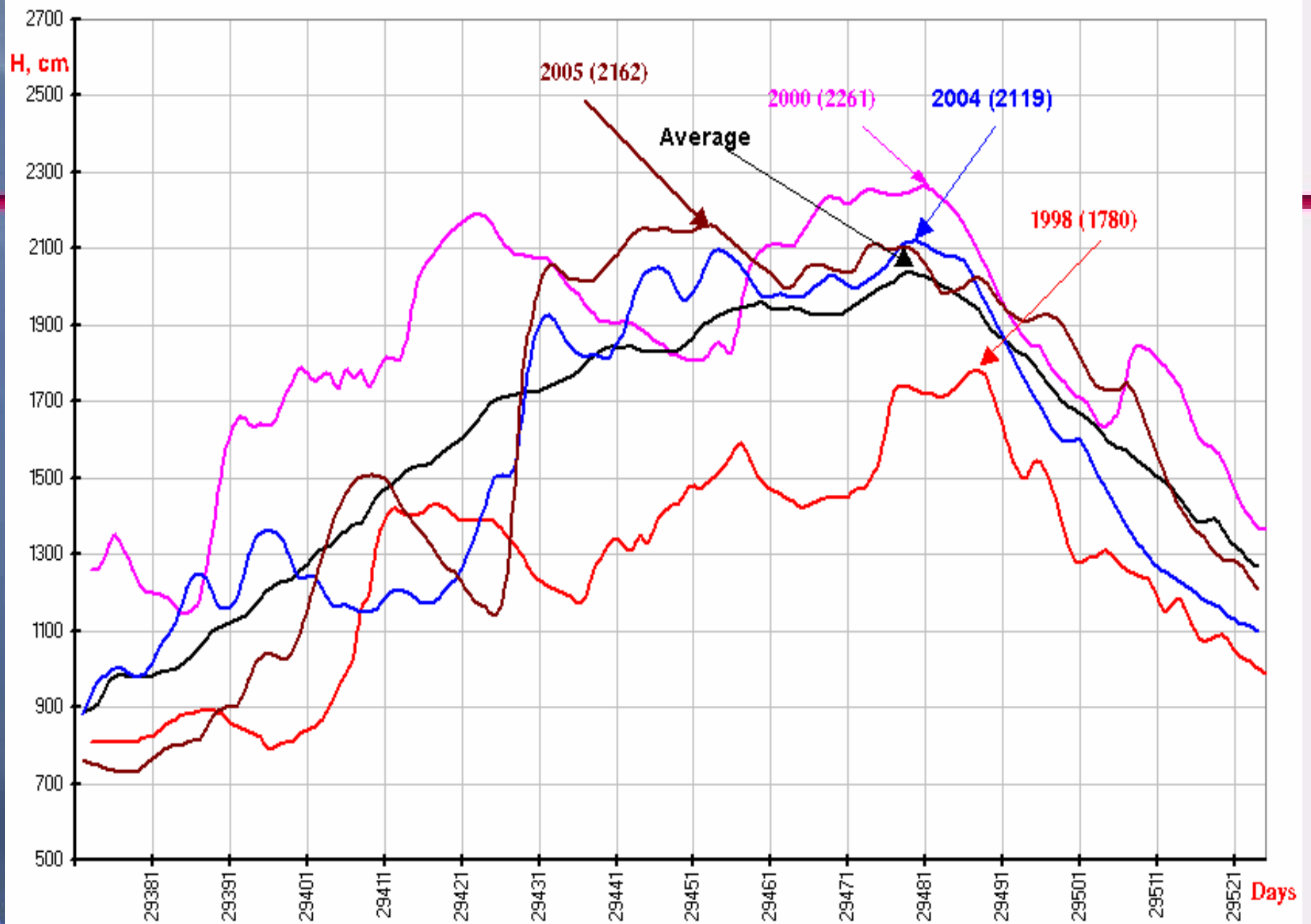


Fig 10: Flood hydrographs at Kratie Station on the Mekong river in 1998, 2000, 2004, 2005 and average



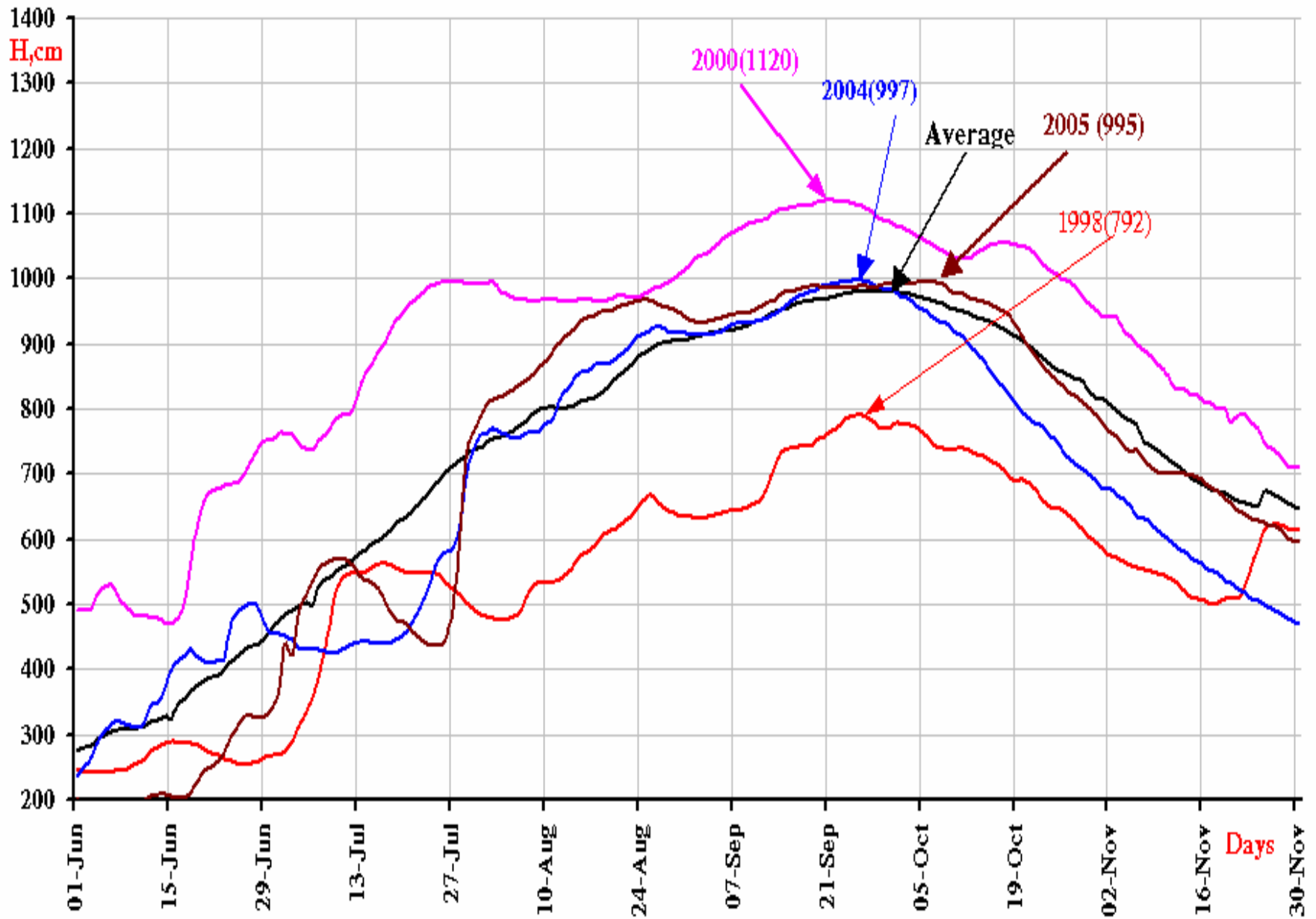


Fig 11: Flood hydrographs at Phnompenh Bassac on the Mekong river in 1998, 2000, 2004, 2005 and average

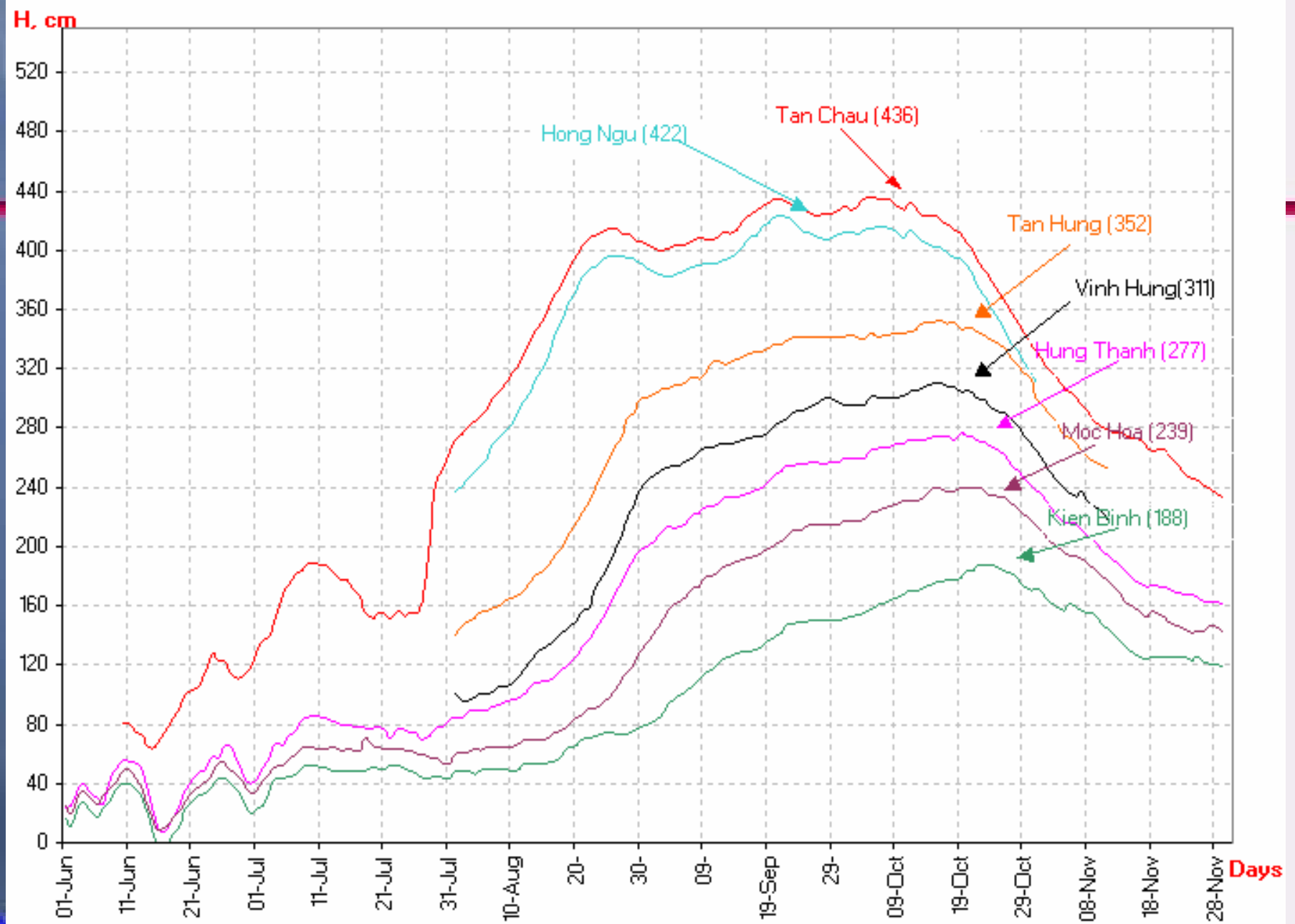


Fig 12: Flood hydrographs at main stations on the Tien River in the Dong Thap Muoi delta in 2005

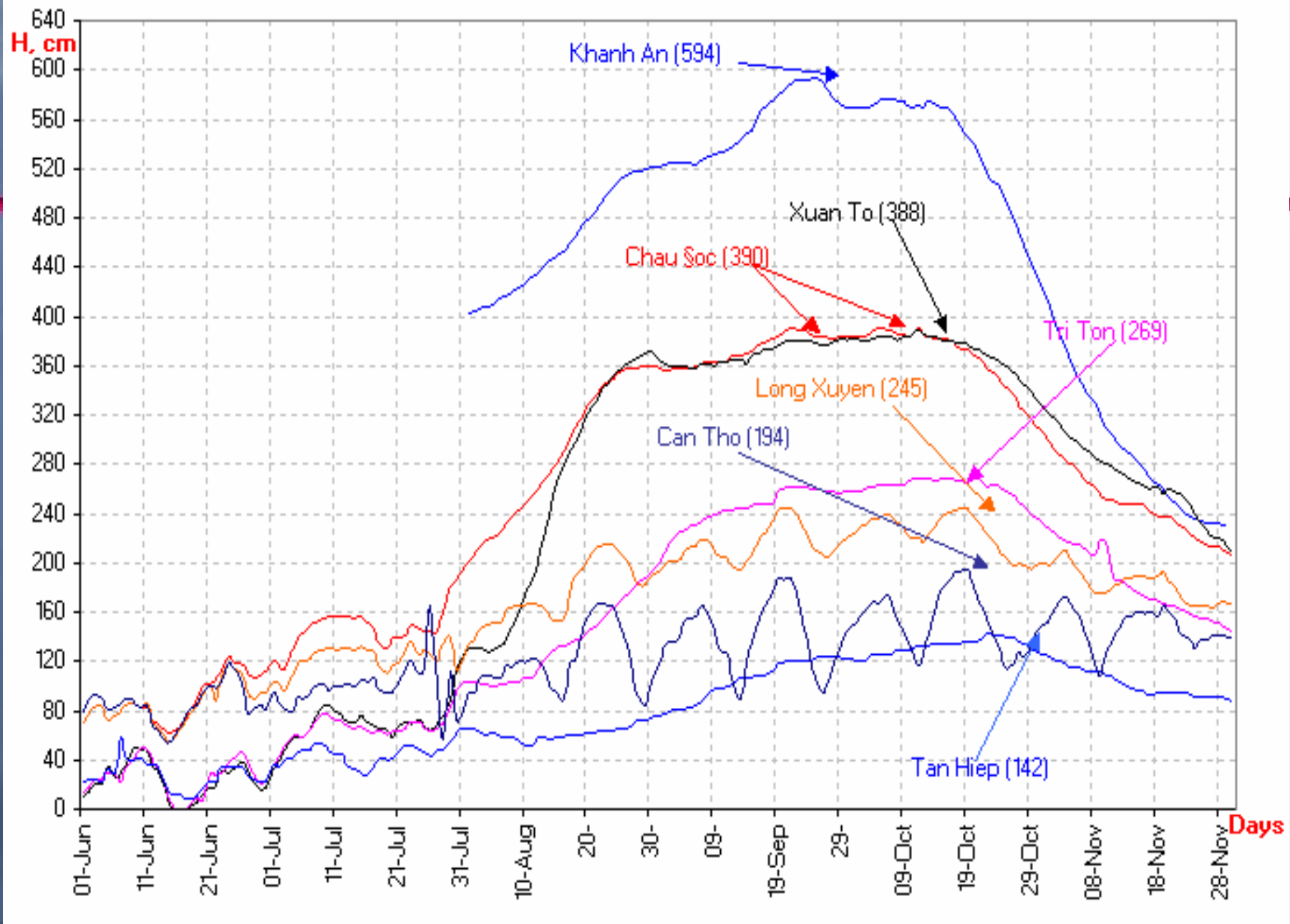


Fig 13: Flood hydrographs at main stations on the Hau River in the Tu Giac Long Xuyen delta in 2005

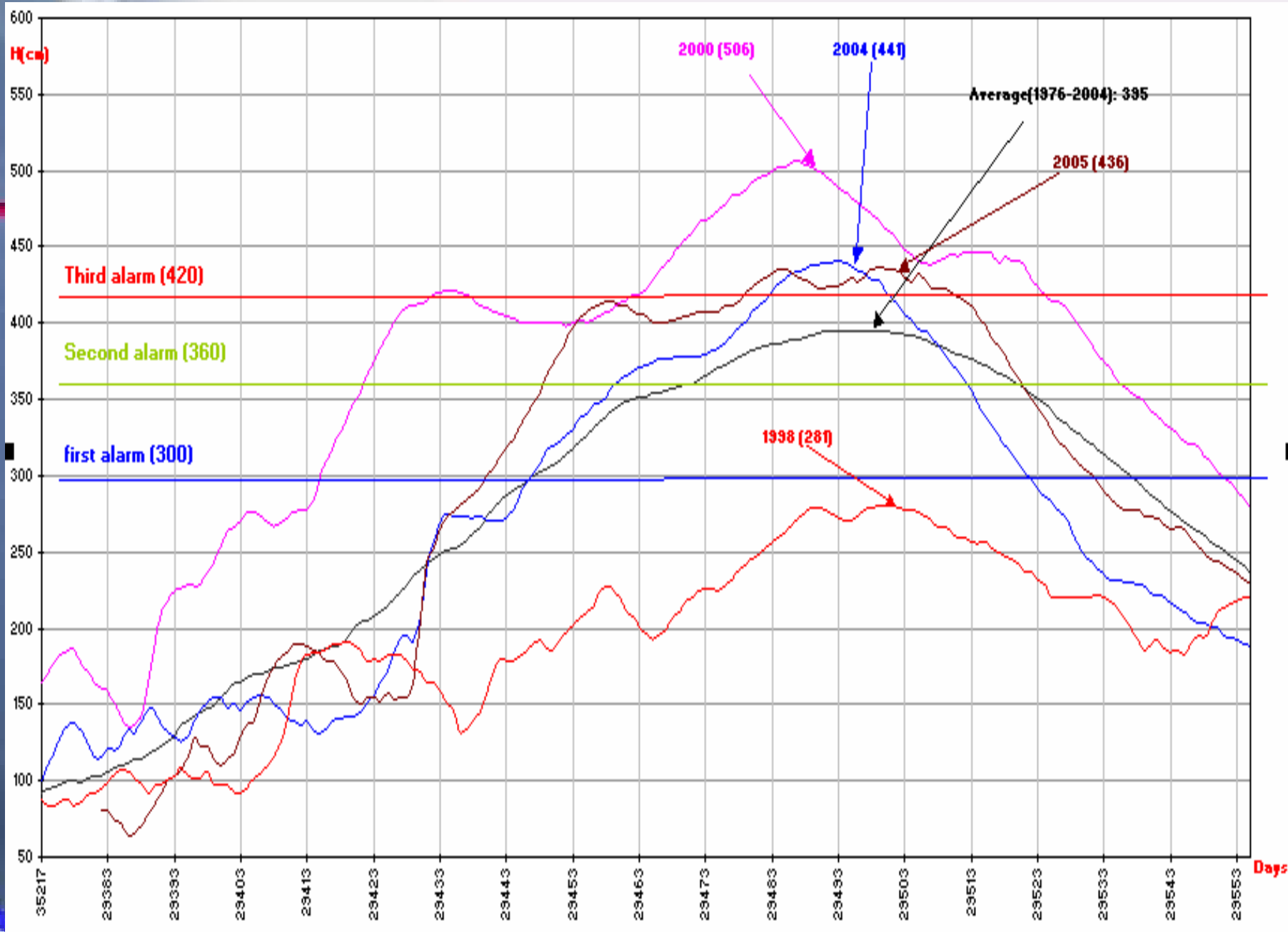


Fig 14: Flood hydrographs at Tan Chau Station on the Tien river in 1998, 2000, 2004, 2005 and average

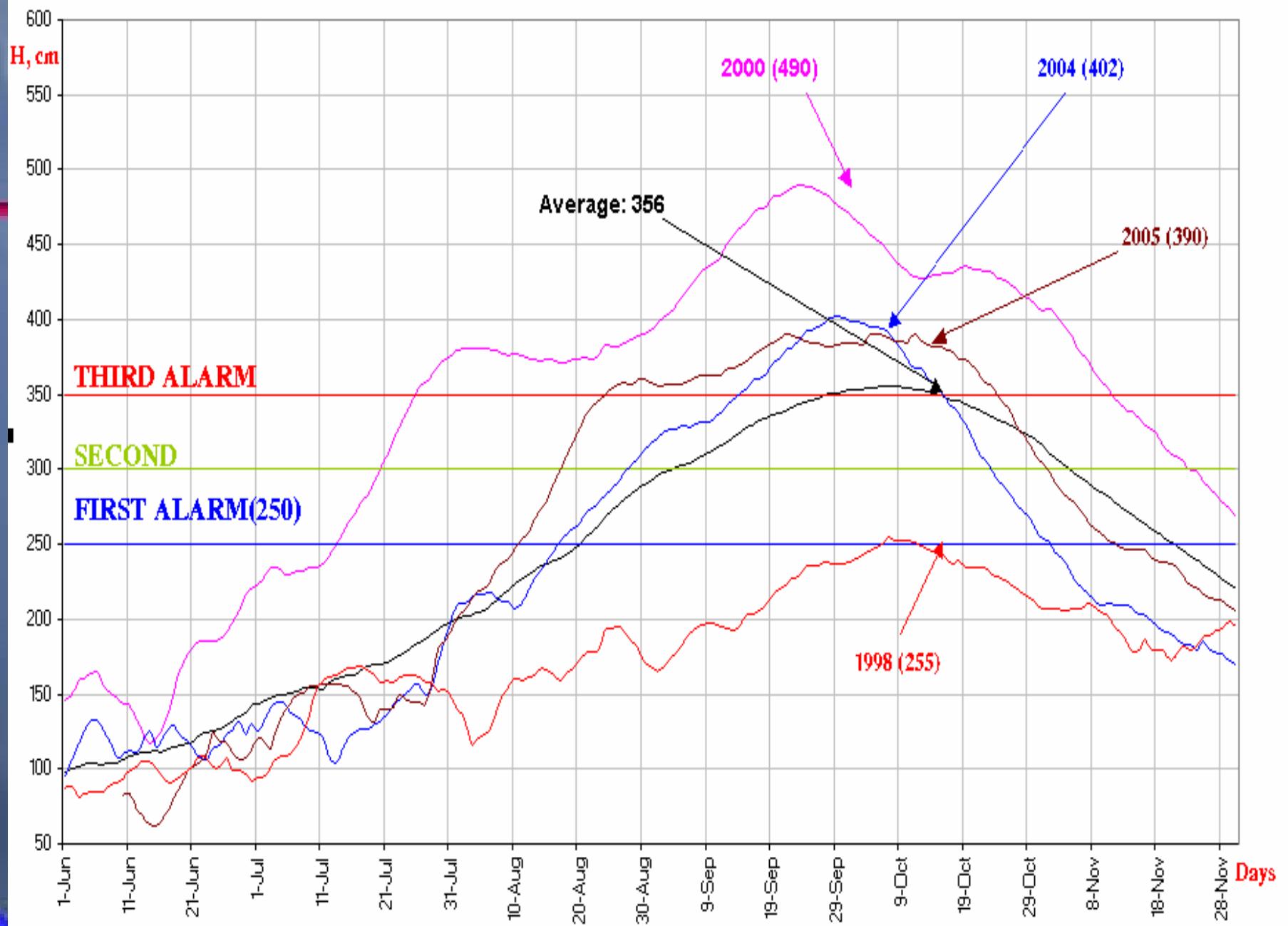


Fig 15: Flood hydrographs at Chau Doc Station on the Hau river in 1998, 2000, 2004, 2005 and average

## 2. Flood warning and forecasting PRACTICE

- The National Center for Hydrometeorological Forecasting closely monitored the hydromet conditions in the Mekong river and thanks to which timely warnings and high-accurate forecasts of water levels at the to key stations of Tan Chau and Chau Doc;
- 85% and 89% of 5-days ahead forecasts with permissible error of 15 cm were read accurate ones at Tan Chau and Chau Doc stations respectively;
- At Tan Chau, a one month ahead warning flood peak was by 14 cm in magnitude different from actually occurred one ;
- 12 flood and urgent flood bulletins as flood reached and exceeded alarm level 3, which all were given timely and with acceptable accuracy



## 2. Flood warning and forecasting PRACTICE

- Southern Regional Hydrometeorological Centre as well as provincial forecasting centers in Cuu Long delta has closely monitored the rainfall, flood situation and released number of accurate flood forecasts and warnings. 85-90% of total forecast number were read accurate;





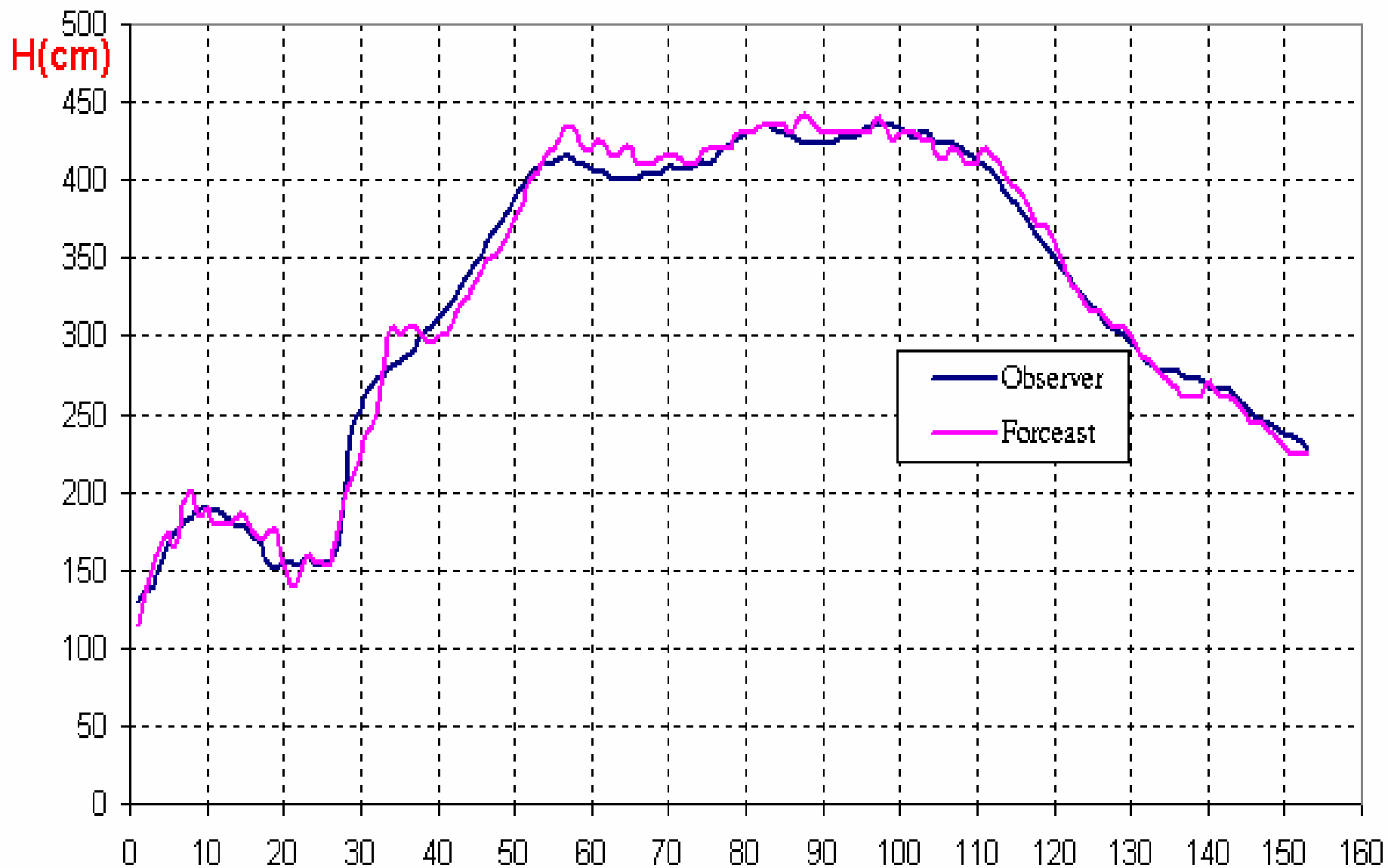


Fig 16: Flood hydrographs Observer and Forecast at Tan Chau Station on the Tien river in 2005



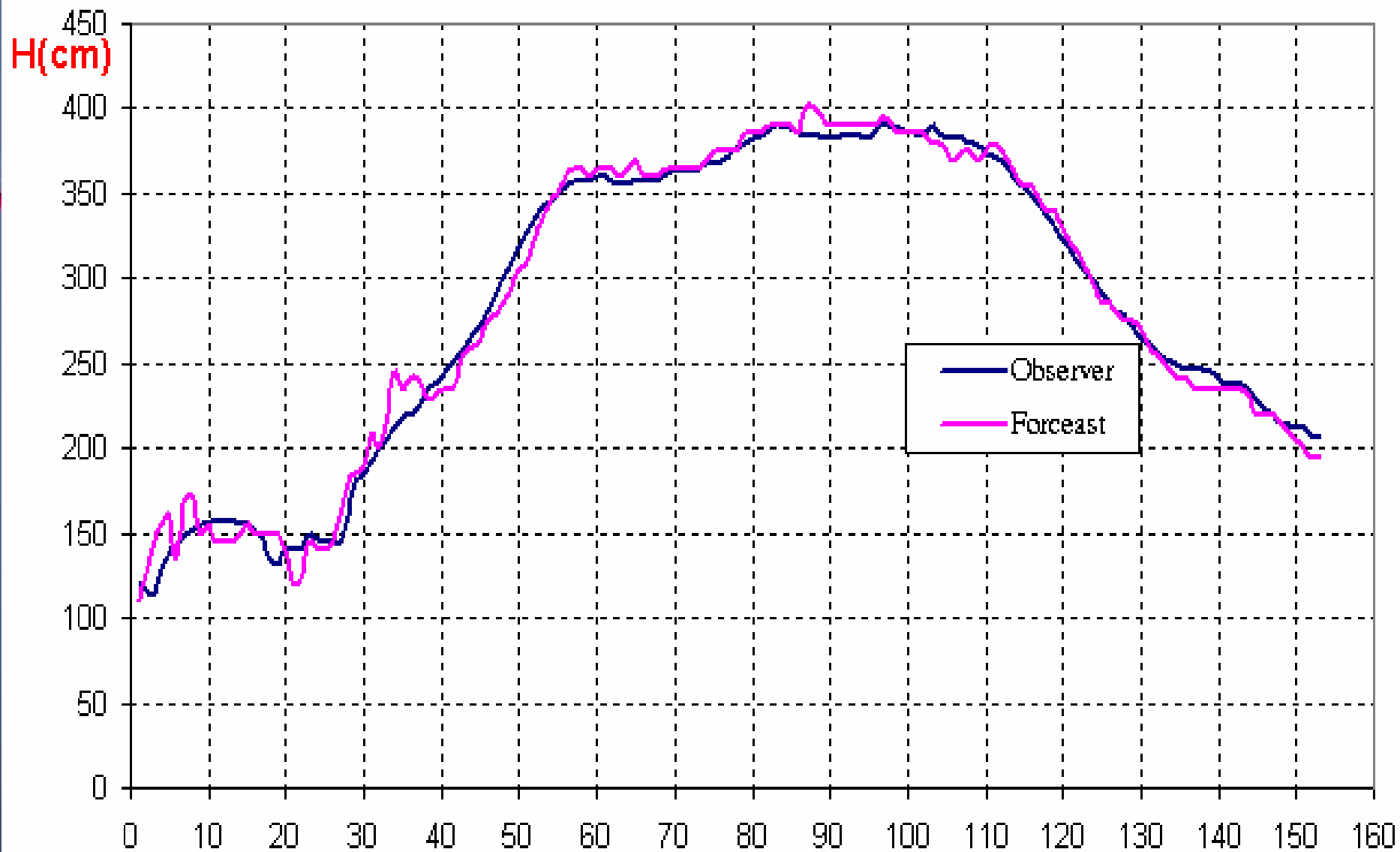


Fig 17: Flood hydrographs Observer and Forecast at Chau Doc Station on the Hau river in 2005



## Lessons learnt

- • Keeping close watch on the development of hydromet condition over the whole basin;
- • Proactively taking action on disaster preparedness;
- • Maximizing the utilization of benefit of flood water for economic development;
- • Enhancing and improving community education and awareness on flood and flood prevention and mitigation measures;
- • Firmly applying the necessary measures to minimize damage caused by disaster to the people, particularly to those living in flooding areas;
- • Constructing flood control structures/works to protect the people and key economic zones against flooding.



# 3. Recommendations

- • Installing more water level and rainfall telemetric stations in the whole Mekong River Basin, particularly in the upper reaches;
- • Hydro-met information and data in the basin and dissemination of necessary data for operational forecast to the riparian countries must be completed before 9h00;
- • MRC should provide early prediction on possible rainfall and flood water level forecasts, and the prediction should be made available not later than early April every year for the riparian countries to refer to prepare an operational flood forecasting plan;
- • MRC's daily forecasting bulletin should be released before 10 a.m so that it could be used by the riparian countries to make flood forecasts and warning in their own countries;
- • Frequently exchange information on Mekong water utilization and hydrometeorological forecasting and development in the basin;
- • Exchange and transfer of new hydromet forecasting technologies need to be carried out regularly;
- • Training courses for forecasters should be organized every two year.





**Thank you for  
attention !**