

the status of sea level measurement in vietnam

*Bui Thai Hoanh
Marine Hydrometeorological Center
Hanoi, Vietnam*

I. INTRODUCTION

Vietnam is located on the Indochina Peninsula of Southeast Asia, with different characteristics of natural geographic conditions and topography between areas; $\frac{3}{4}$ of its square is mountains and only $\frac{1}{4}$ is plains.

Vietnam has a dense River system and long coast line exceeding 3200 km with the shape of letter "S" stretching from the North to the South. There are many big and small islands, one of them is far from the coast about 600 km. Also some mountains stretch from inland to the sea directed West - East, they create different climate conditions between the areas.

Population of Vietnam is 79,930,000 people (seventy nine millions, nine hundred and thirty thousand), (according to statistics in July 2002), they are living mainly in the plains. More than a half of GDP comes from the sea, mostly from oil and gas exploitation, sea products, marine transportation etc. ...

Vietnam has a typical bi - seasonal tropical monsoon climate regime. Yearly, it is influenced by natural calamities, as typhoons, monsoons, storm surge, floods and droughts that damage Human and estates.

Therefore, forecasting and warning of calamities are very important. There in, sea level measurement and monitoring are necessary to service forecasting and warning.

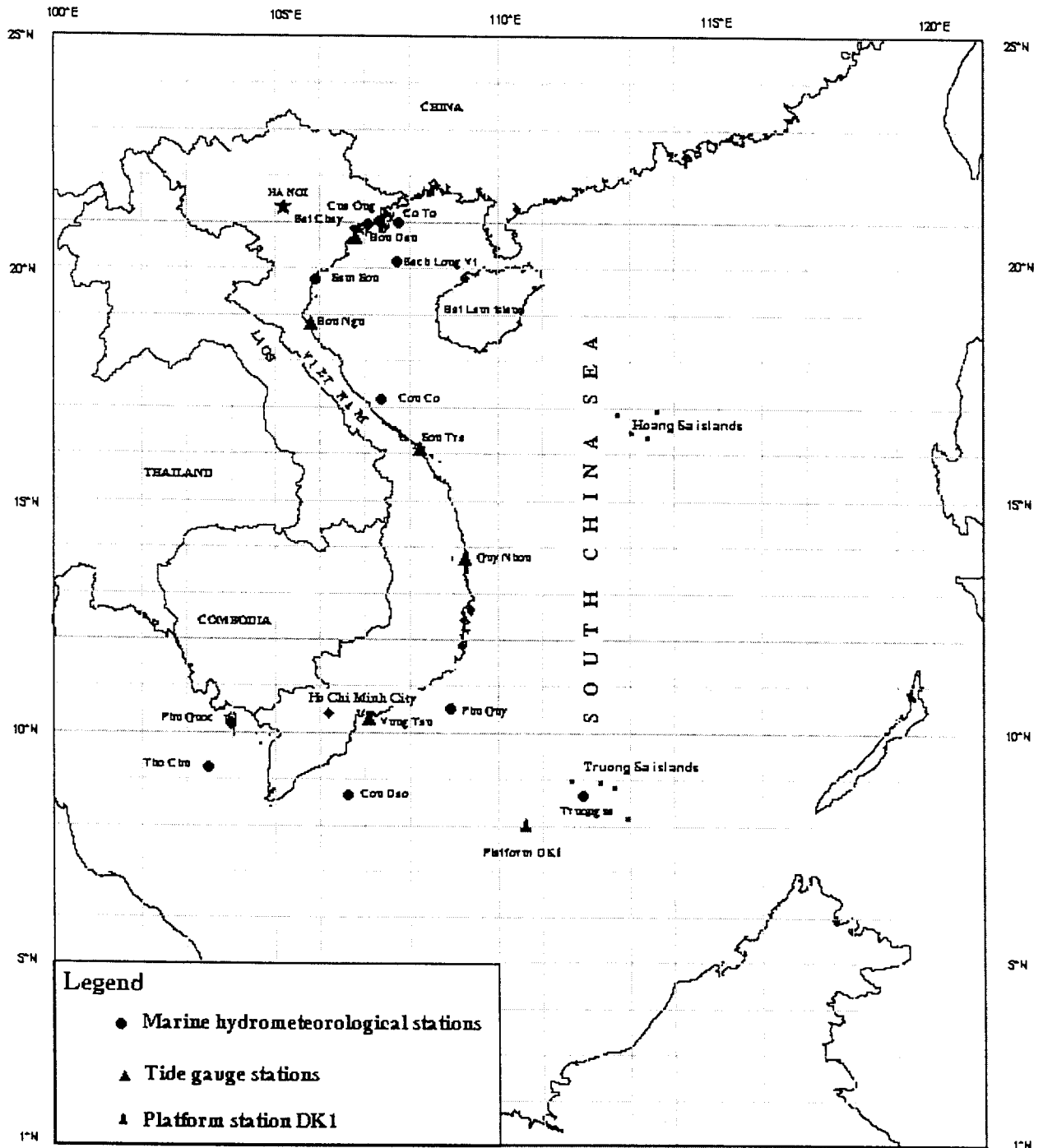
II. MARINE HYDROMETEOROLOGICAL OBSERVING SYSTEM

2.1. Station network system

Sea level measurement and monitoring are one of the important tasks of the Marine Hydrometeorological Center.

The Marine hydrometeorological observing system of Vietnam consists of 17 stations (see fig 1) located along the coast and on islands. The observation parameters are main meteorological (Wind, Pressure, Air temperature, Humidity...) and oceanographic (wave, sea level, salinity, water temperature ...). The parameters are observed four times per day at 01, 07, 13 and 19 o'clock, local time.

Fig 1. SCHEMA OF MARINE HYDROMETEOROLOGICAL STATION NETWORK



Among 17 stations there are 6 Tide gauges recording sea level every one hour. Those stations have been established for long time: Vung Tau station has been built since 1918, Hon Dau - 1928, Son Tra - 1959, Qui Nhon - 1959, Hon Ngu - 1961 and platform DK1 - 1989.

Apart from 17 stations, a system of four automatic oceanographic buoys which have been deployed since 1995. The buoy system is operating under the national Project " Typhoon forecasting and warning" funded by Norwegian Government. At present, only one buoy is in operation.

The observation system also includes a thousand ton vessel "Marine Research". Annual, the vessel carries out two oceanographic surveys in the Vietnamese waters. The vessel will be able to participate in regional or International Cooperation program. In the second half of 2003, the vessel will carry out a joint survey in South Vietnam waters with Institute of Oceanography of Germany.

Marine Hydrometeorological Center is government institution and responsible for operation and maintenance of the observation system in Vietnam.

Marine Hydrometeorological Center is planning to have a Project "Modernization and Automation of the Marine hydrometeorological observing system" period 2003 - 2010. The purpose of the Project is to enhance the station network and improve quality of data collection.

2.2. Equipment

Before, in the station network are installed tide gauge recorders CYM type made by Russia, they were operating on mechanical principle with high accuracy, it is a float - operated recorder that provides a permanent, continuous, long - term graphic record of water level fluctuations. Schema is entwined a drum and changed every day.

Now, some equipment were old and had been changed by tide gauge recorders Stevens type A71, A90 and A91 made by USA. The Stevens type A is a float - operated recorder that provides a permanent, continuous, long - term graphic record of water level fluctuations also. A precision clock movement controls the rate at which the strip chart is advanced. The rise and fall in of the float moves a marking stylus laterally across the chart, the stylus will reverse at each margin so that any range of water level recording ratio, called "gage scale", is also selectable.

Chart drive is normally accomplished by use of one of several drive methods: a battery - operated Quartz Multispeed or An optional AC synchronous moto drive is also available.

There are some kinds of tide gauge (on tide recorders) using in the network:

- Onshore type: - CYM (made by Russia)
 - Stevens (made by USA)
- Offshore type: - OT - 600 (made by France)
 - WRL (made by Norway)

2.3. Sea level data processing

Hourly sea level data recorded by the tide gauges are checked carefully at stations, after that they are sent to Marine Hydrometeorological Center, in here the data will be analyzed, processed by ORKAN (European), TIDE (Canada) software and results are mainly stored in paper formats, CD and floppy disks. They are very available and convenient for using.

Based on historical data measured in different areas along the coast, sea level rise has been calculated. The determined rate was considered in making strategy of Social Economic development of Vietnam.

III. TRAINING

Mostly observers working at Marine hydrometeorological stations are trained with term of four years at University or Hydrometeorological College in Hanoi.

Apart from, yearly, observers of the station network are trained in short term by Marine Hydrometeorological Center on professional knowledge, sea level measurement and data processing, permanent maintenance and management equipment, with a purpose of enhancing quality and professional knowledge for better with every passing day.