APPLICATION OF RS/GIS FOR MONITORING TYPHOON AND STORM IN THAILAND

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ABSTRACT

A monsoon storm monitoring system aims at developing a database in which various geographical data oceanographic data, meteorological data and remote sensing data from diverse sources into a unified database. The system has been implemented to monitor the three major typhoon events namely; Linda, Muifa and tropical storm Washi. The information obtained from the system can provide more knowledge and understanding on occurring movement of a storm, which could not be gathered directly by surveying or hand-held instruments. The benefit of integrated data will also lead to a better understanding of the relation of climate change and marine environment.

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1. Introduction

GISTDA currently operates a marine environmental monitoring system that integrates data from buoy network, multi parameter sensors (YSI 6600 series and SD 200) and satellite derived marine information images (http://ocean.gistda.or.th) to interested operators and/or authorities. Geographical Information System (GIS) today is an essential tool for decision making. GIS in marine environment is a new integrating method of digital. The capacity of integrating marine GIS with data from oceanographic buoy and satellite derived image to monitor natural multi hazard has a great impact value in marine environment management particularly recovering after the natural disaster and supporting consequently it is also administration for sustainable marine environmental development.

2. Integrated marine GIS data

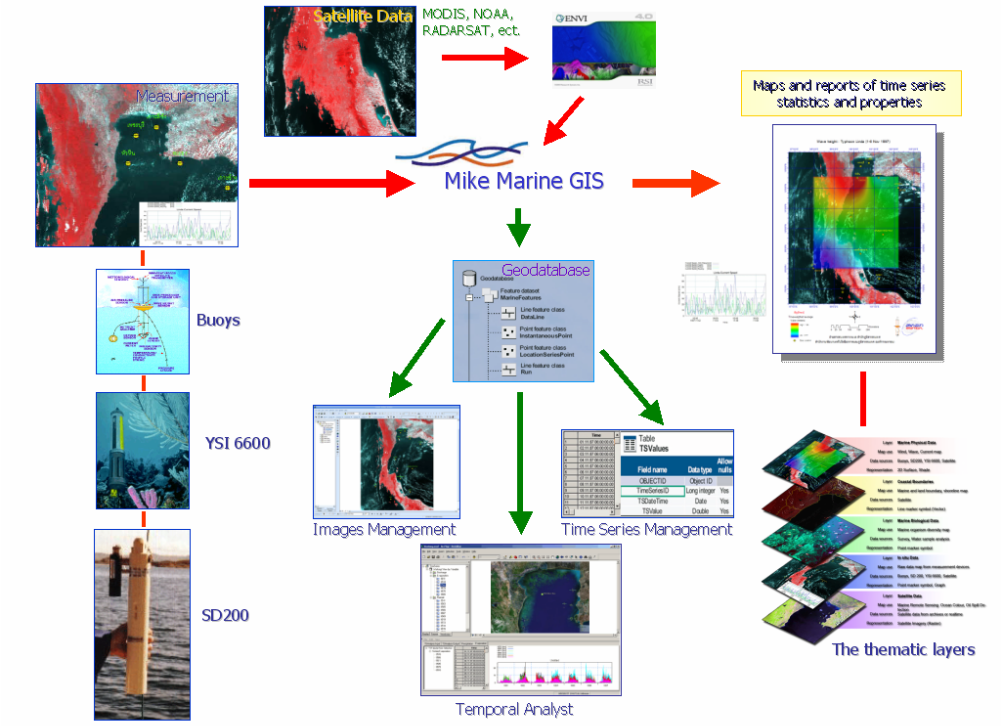


Figure 1: Diagram of combining marine information layers for natural hazard monitoring.

Managing marine data can benefit immensely from GIS, because these software tools are designed to bring together spatial data from various sources into a unified database. The database can employ a variety of digital data structures, and represent spatially varying phenomena as a series of data layers, all of which are in spatial register, meaning that they overlap correctly at all locations. By manipulating maps, digital images and tables of geocoded (geographically located) data items, such as results of oceanographic surveys, satellite images, seafloor mappings and biogeochemical studies in the open ocean GIS, provides tools for analysis and modeling interrelationships between these individual layers of spatial data.

3. General Climate conditions

The climate of Thailand is under the influence of monsoon winds of seasonal character i.e. southwest monsoon and northeast monsoon. The southwest monsoon which starts in May brings a stream of warm moist air from the Indian Ocean towards Thailand causing abundant rain over the country, especially the windward side of the mountains. Rainfall during this period is not only caused by the southwest monsoon but also by the Inter Tropical Convergence Zone (ITCZ) and tropical cyclones, which produce a large amount of rainfall. May is the period of first arrival of the ITCZ to the Southern Part. It moves northwards rapidly and lies across southern China around June to early July that is the reason of dry spell over upper Thailand. The ITCZ then moves southerly direction to lie over the Northern and Northeastern Parts of Thailand in August and later over the Central and Southern Part in September and October, respectively. The northeast monsoon which starts in October brings the cold and dry air from the anticyclone in China mainland over major parts of Thailand, especially the Northern and Northeastern Parts which is higher latitude areas. In the Southern Part, this monsoon causes mild weather and abundant rain along the eastern coast.

The onset of monsoons varies to some extent. Southwest monsoon usually starts in mid-May and ends in mid-October while northeast monsoon normally starts in mid-October and ends in mid-February.

4. Season

From the meteorological point of view the climate of Thailand may be divided into three seasons as follows:

- Rainy or southwest monsoon season (mid-May to mid-October). The southwest monsoon prevails over Thailand and abundant rain occurs over the country. The wettest period of the year is August to September. The exception is found in the Southern Thailand East Coast where abundant rain remains until the end of the year that is the beginning period of the northeast monsoon and November is the wettest month

- Winter or northeast monsoon season (mid-October to mid-February). This is the mild period of the year with quite cold in December and January in upper Thailand but there is a great amount of rainfall in Southern Thailand East Coast, especially during October to November.

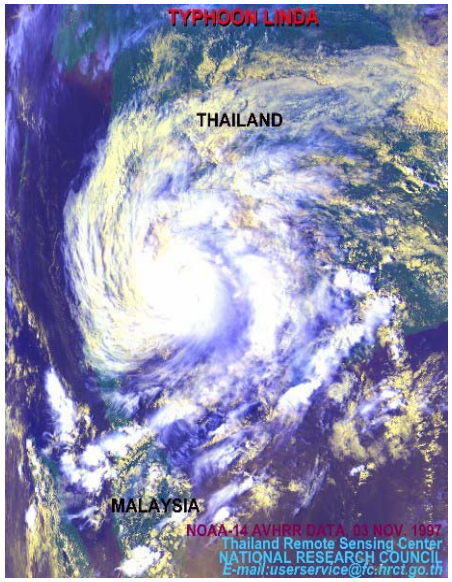
- Summer or pre-monsoon season, mid-February to mid-May. This is the transitional period from the northeast to southwest monsoons. The weather becomes warmer, especially in upper Thailand. April is the hottest month.

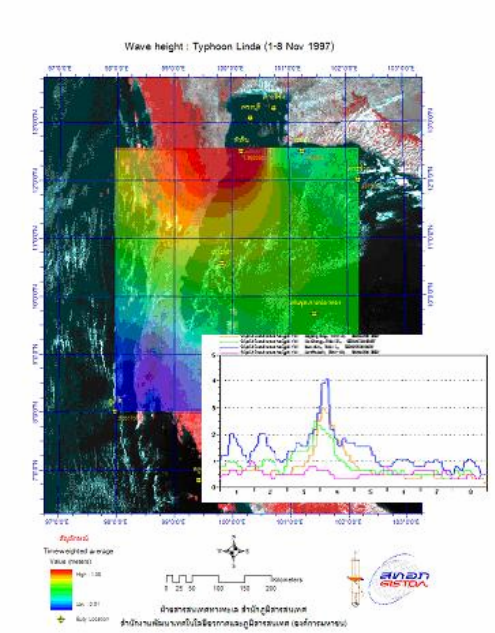
5. Conclusions and Recommendations

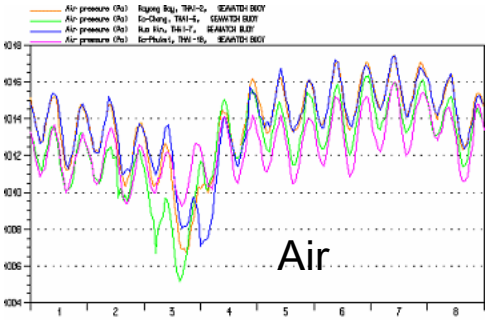
Climate change creates a series of problematic issues for marine environment. Understanding how and predicting the impacts of changing marine environments is becoming widely used and imperative for planning. The best way to mitigate risk is to understand the parameters of risk in a given location. Each region is faced with a unique and dynamic set of potential hazards. Monitoring changes using GIS to integrate many different data sets and information systems can create an overview of how a natural hazard will impact a community. We hope this that the system developed will help to plan for proper preparedness or at least giving knowledge on natural hazard cycle in Thailand.

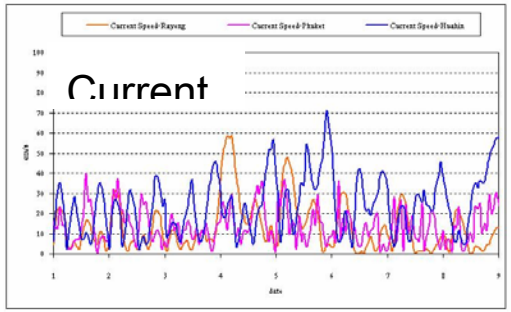
References

1. Meteorological department of Thailand, http://www.tmd.go.th/climate/climate02.html
2. Geo-Information and Space Technology Development Agency. 2003. Buoy data yearly report in 1997. Bangkok, Thailand, 388 pp.
3. _____ . 2005. Buoy data yearly report in 2004. Bangkok, Thailand, 271 pp.
4. _____ . 2006. Buoy data yearly report in 2005. Bangkok, Thailand, 236 pp.









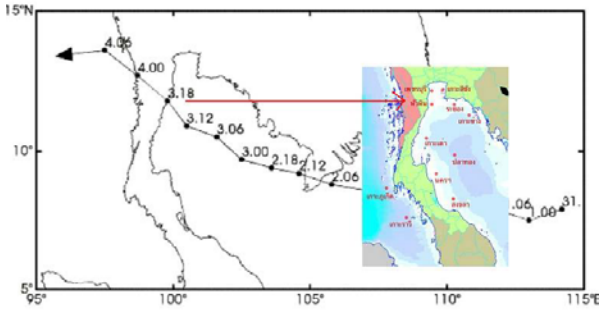
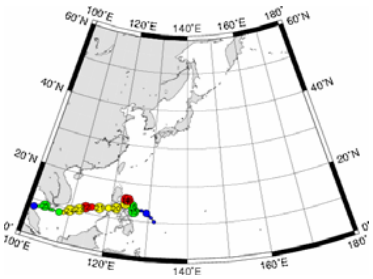


Figure 2: Passage of Typhoon Linda which formed in the South China Sea and moved across the southern tip of Vietnam before hit Thailand's southern coastal provinces on the 3 of Nov 1997. At least 330 people were killed in Vietnam and Thailand with approximately 2250 people still missing.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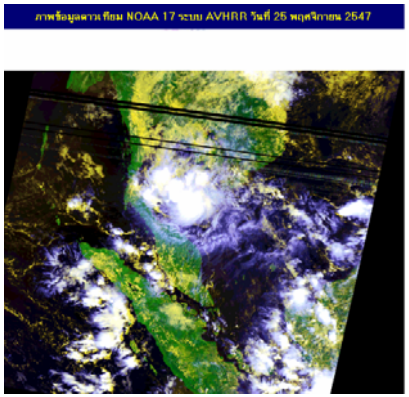
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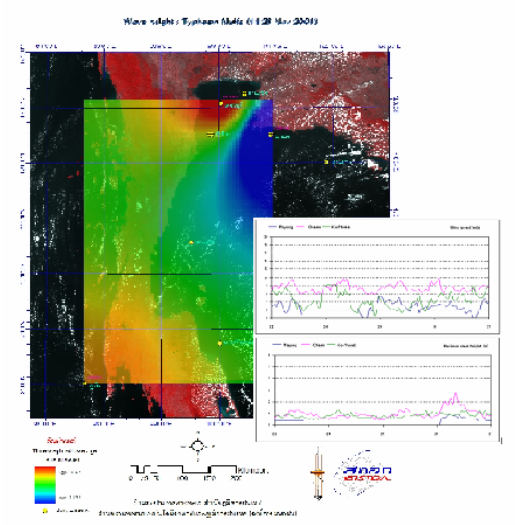
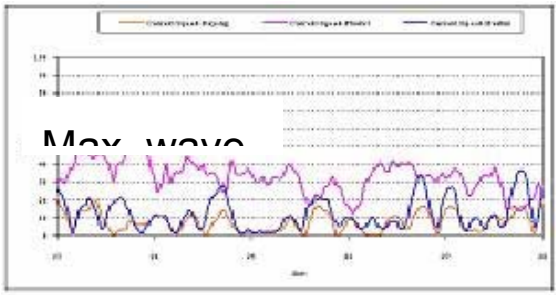
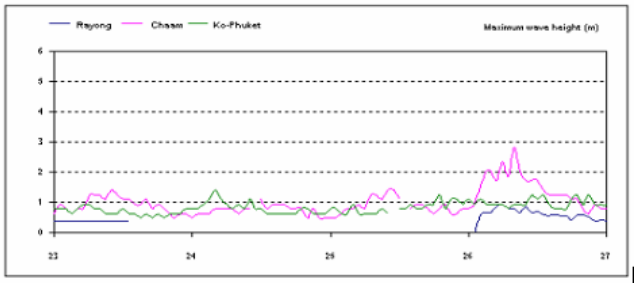


Current


Max. wave



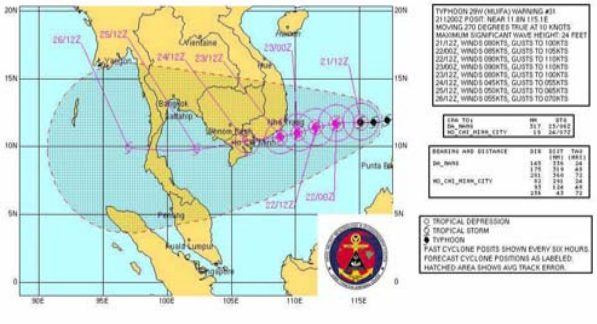
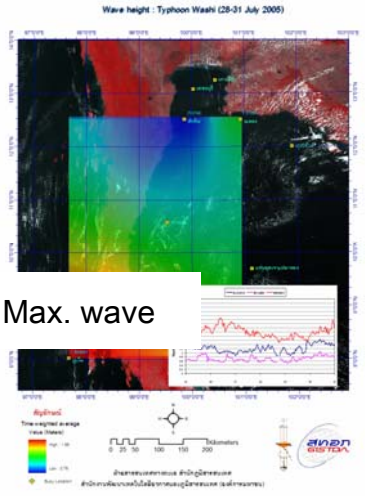
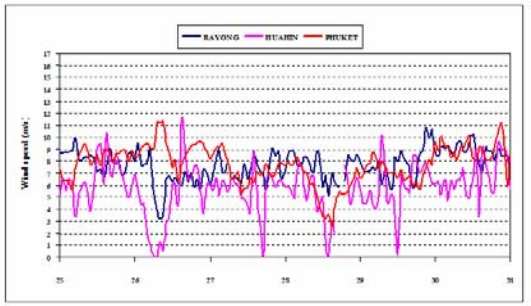
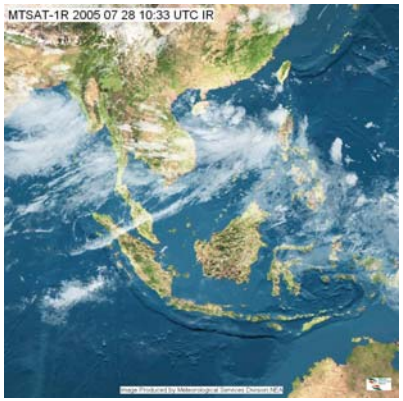


Figure 3: Typhoon Muifa on th25 of Nov 2004, Muifa first became a tropical depression o slands in the West Pacific and became a major typhoon on November 18, with maximum sustain : (132 mph). Fortunately the center remained offshore. Typhoon Muifa slowly organized into a tr ıtthani province with maximum wind speed 55 km/hr.







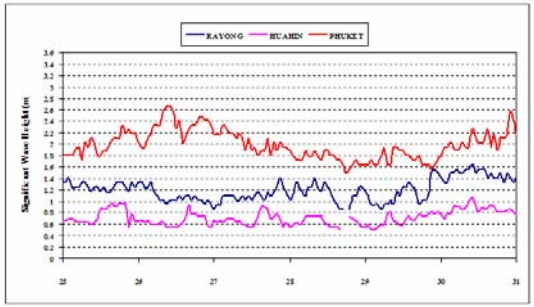


Figure 4: Tropical Storm Washi formed as a tropical depression about 215 nautical miles (400 km) south of Hong Kong.Tropical storm“ Washi ” had made landfall at upper Vietnam and maximum wind near the center about 80 km/hr. It is moving west-northwest about 15 km/hr. Heavy to very heavy rains and flash flood were expected over upper northeastern and eastern part of northern Thailand during 28-31 Jul 2005. An intense southwest monsoon prevailed over the Andaman Sea, southern Thailand and the Gulf. High waves were in the Andaman Sea and the Gulf.