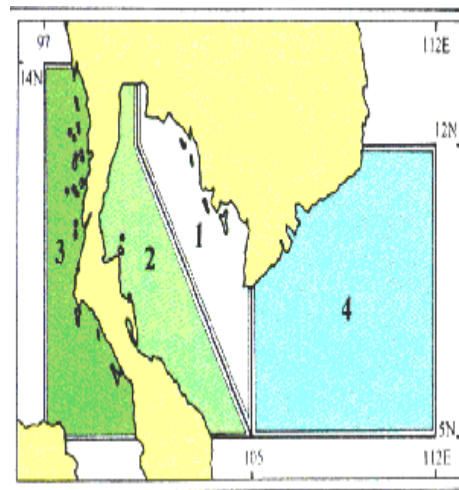
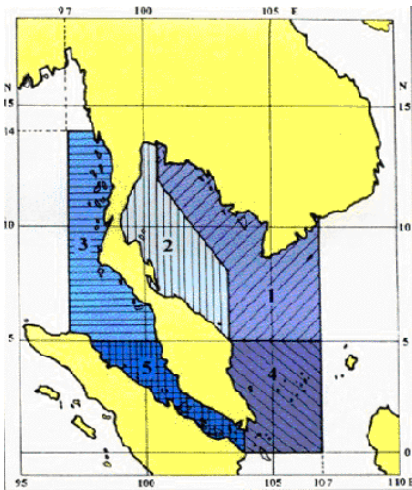


Thailand National Report

The importance of meteorology for more advanced navigation has been recognized since it was introduced to Thailand for the first time by the Royal Thai Navy. Somehow, safety in all weather conditions is the most desirable factor sought after by hectic ferry and barge operations for both domestic and international trades as well as related industries which are the foundation of the national prosperity nowadays. For that reason, the Thai Meteorological Department (TMD) provides the marine meteorological services to serve international shipping, marine fisheries, oil-drilling industry, water transportation, and offshore recreation.

Marine weather forecasts for shipping are issued twice a day at the TMD's Headquarters in Bangkok. They contain warnings of wind forces at the sea surface level and above, a synopsis of significant meteorological features, and 24-hour forecasts of weather and sea states of 5 marine areas in the Gulf of Thailand and the Andaman Sea. The Boundaries of areas used in weather bulletins for merchant shipping and coastal weather are shown on the left. These forecasts are broadcasted via NAVTEX, an international broadcasting system for disseminating navigational information by the coastal radio broadcasting stations for ships in the region.

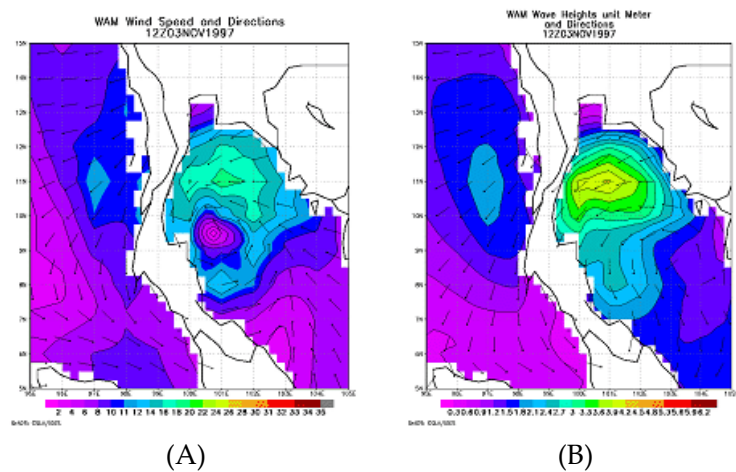


Once a tropical cyclone entered the tropical cyclone warning areas under the responsibility of Thailand (bounded by the latitudes 5 °N and 14 °N and the longitudes 97 °E and 112 °E) as shown in the left figure, the TMD issues additional warnings for shipping at the 3-hourly intervals giving detailed information on the location, intensity, and forecast movement of the tropical cyclone together with wind and wave conditions associated with it. Such information is also broadcasted by NAVTEX.

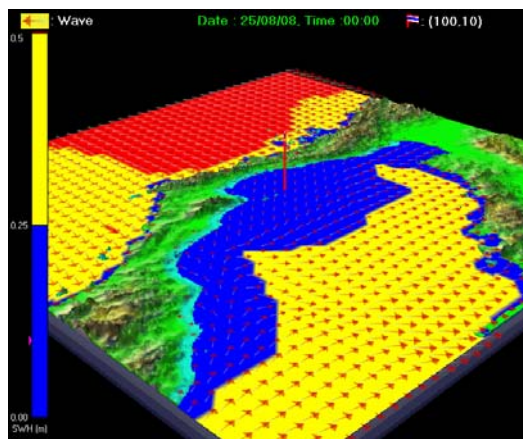
Weather bulletins for coastal waters in the Gulf of Thailand and the Andaman Sea are prepared 6 times a day and broadcasted by local radio stations. They contain warnings of strong winds, fog and hazardous weather, 24-hour forecasts of wind, significant weather, sea state as well as a further outlook for the next 24 hours for 7 fishing areas along the coasts of the Gulf of Thailand and the Andaman Sea. The latest weather reports from selected coastal and island stations are also included in the bulletins.

In addition, the forecasts are cautiously issued to meet the special users' needs. Specialized forecasts of weather and sea states up to 7 days ahead are made available, upon request, to oil rigs operating in the offshore waters of the Gulf of Thailand and the Andaman Sea. Since 1997, the Marine

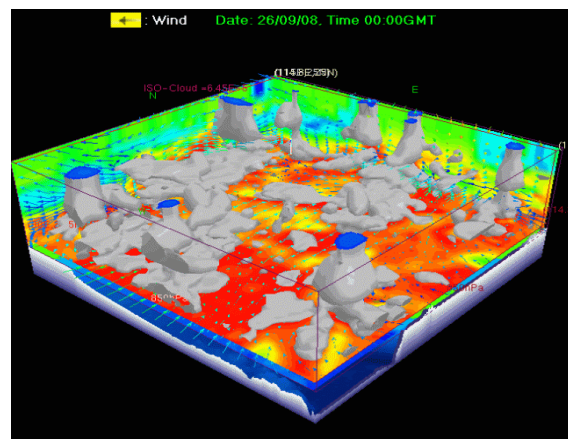
Meteorological Center (MMC) has been using numerical wave models as supportive tools for specialized forecasting service to forecast wave conditions over the Gulf of Thailand, the South China Sea, and the Andaman Sea as shown on the right. Figure (A) illustrates wind field at 10 meters winds from NOGAPS while Figure (B) depicts significant wave height from the WAM model which is developed at MMC.



Besides, the MMC has been developing the VirtualWeather3D and VirtualWave3D Program as tools to present the results from the ocean wave and weather forecasts into the virtual displays of which the examples can be seen below.



VirtualWave3D



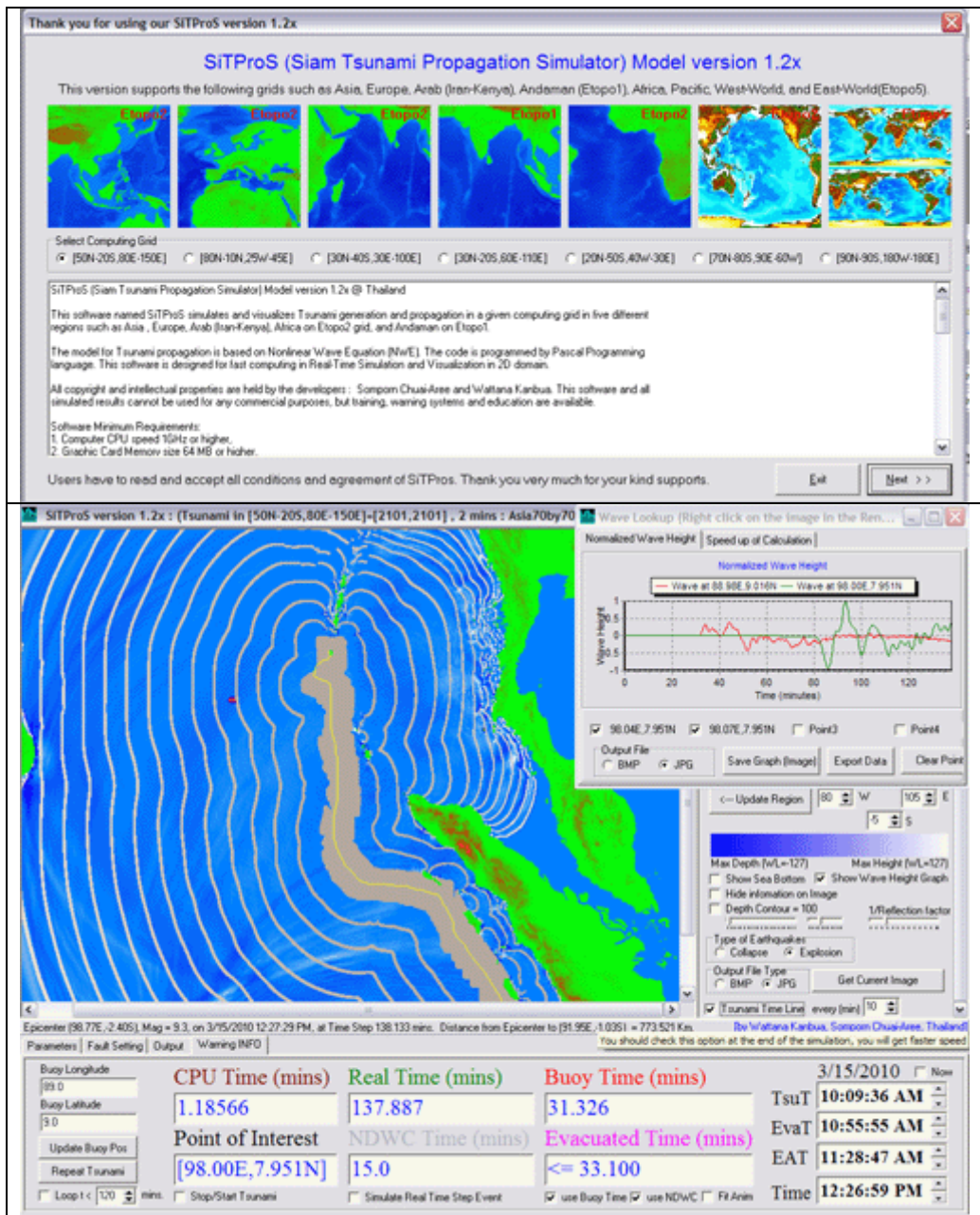
VirtualWeather3D

MMC has an intention to implement the VOS ships by Thailand in the future. However, the implementation may have to be collaborated by concerned authorities in the country, i.e. Thai Meteorological Department, Port Authority of Thailand and Marine Department, and required an appropriate procedure to enable the registered ships in Thailand to apply to be member of Voluntary Observing Ships (VOS) scheme in order to observe marine meteorological elements and transmit them to the center. We will further keep you informed if there is any significant progress on this matter.

TMD has provided weather information for shipping via ship radio frequency as voice at 06765.1 and 08743 kHz and facsimile frequency at 07395 kHz which facsimile frequency has serviced both of them such as graphical of weather maps and text also.

In case of Tsunami model MMC has been cooperating and developing model with Dr.Somporn Chuai-Aree lecturer at Prince of Songkla University, Pattani Campus. The model is so called SiTProS "Siam Tsunami Propagation Simulator". We deduce the shallow water wave equation, nonlinear wave equation and the continuity equation that must be satisfied when a wave encounters a discontinuity in the sea depth by selecting a computation grid from the Etopo2. A tsunami struck the shores of southern Thailand and along the Andaman coast on the December 26, 2004. The hardest-hit area of affected

provinces is given based on the shoaling, refraction, diffraction and reflection phenomenon. The SiTProS can run for any given regional or global grid with a prescribed topographic dataset as Etopo2. The finite difference method is used to solve the equation. The SiTProS is designed for interactive simulation and user friendly.



SiTProS Model

After, tsunami struck the shores of southern Thailand and along the Andaman coastline on the December 26th, 2004. NOAA built the deep-ocean assessment and reporting of tsunamis (DART) buoy was part of a two-year, \$16.6 million U.S. contribution to the Indian Ocean tsunami warning system. The DART buoy was deployed on the ocean floor, at 9 degrees north latitude, 89 degrees east longitude, halfway between Thailand and Sri Lanka. It uses sensitive water pressure sensors on the ocean floor to detect tsunami waves that are generated after large undersea earthquakes and send data by satellite to scientists about three minutes after an earthquake occurs. The DART system was being deployed through a partnership between the United States and the Royal Thai government as a contribution to the Indian Ocean tsunami warning system.

NOAA provided technical assistance during deployment and initial operation, and the National Disaster Warning Center (NDWC) in Bangkok has shared responsibility for the deployment and long-term buoy operation and maintenance. Marine Meteorological Center and Department of Mathematics and Computer Science, Faculty of Science and Technology, Prince of Songkla University, Pattani Campus, Pattani, Thailand have created tsunami model in order to compute arrival time of tsunami and Also created DART viewer program in order to monitor tsunami from DART system around the world. Royal Thai government by NDWC is being installed tsunami detection system in Indian Ocean on the end of this year. The system consists of 2 surface buoys and 2 BPRs. The surface buoy receives transmitted information from the BPR via an acoustic link and then transmits data through a satellite link to central stations. In order to confirm whether the earthquake has actually triggered a Tsunami or not, it is essential to measure the change in water level in the open ocean with high accuracy in real time. The network is designed to detection, measurement and monitoring tsunamis. The network comprises of 2 BPRs transmitting real time data through satellite communication to NDWC and TMD at Bangkok simultaneously for processing and interpretation.