來自海洋的危險
Dangers of the Sea

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Calamity inflicted by the Sea

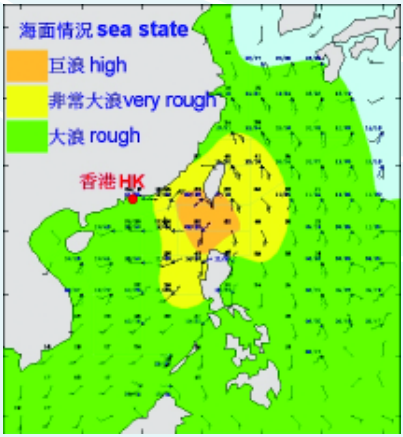
The raging sea at Tsim Sha Tsui during the approach of Typhoon Lucy on 22 July 1971 (Courtesy Information Services Department)

The sea offers the opportunity for a whole range of recreational activity for the good of the body and mind. But behind all its virtues, we should never lose sight of the might of the raging sea in inflicting harm and damage.

With the South China Sea on our doorstep, the success story of Hong Kong has been punctuated by poignant memories of calamity inflicted by the sea. Notably in 1906 and 1937, rapid rise in sea level associated with two typhoons killed more than 10 000 people in Hong Kong in a single night. In recent decades, because of improved city planning and engineering, as well as timely forecasts and warnings, it is unlikely that catastrophes of such magnitude would occur again in Hong Kong. Unfortunately, casualties continue to occur to people engaged in activities at or near the sea during the approach of typhoons, in many cases even when the typhoon is quite far away from Hong Kong. These activities include swimming, fishing, surfing and strolling along the seaside. Occasionally people are thrown overboard from the ships on which they worked or lived.

As Hong Kong people often travel overseas, people may be harmed by other forms of disasters which are rare in Hong Kong. For example, the South Asia tsunami in December 2004 took the lives of more than 30 Hong Kong people.

It is therefore important to understand in what ways the sea can kill and stay away from these hazards.



Severe tropical storm Sanvu made its presence felt when it was about 600 kilometres east of Hong Kong on the night of 12 August 2005. There were rough seas in the Hong Kong waters and very rough seas to the east.

Waves and Swells

The force of winds causes motion of sea surface, the stronger the winds, the stronger the motion. Waves are raised by winds blowing locally while swells are caused by winds far away.

Huge waves are usually whipped up by high winds associated with tropical cyclones, and occasionally, by strong monsoon winds. When waves enter shallow waters, their heights would increase. These waves can pose hazards to the people staying close to the shoreline or engaging in water sports. In the coastal waters, the rough seas are often the cause for capsizing fishing vessels. In the open sea, huge waves have known to sink ocean liners and even supertankers. Some of those accidents took place so quickly that there was no time for the crew to send out distress signal.

Severe swells are usually produced by high winds of a distant tropical cyclone. These swells travel at speeds much faster than the movement of tropical cyclones. When a tropical cyclone is a few hundred kilometres away, local weather may be deceptively fine. However, severe swells generated by the tropical cyclone could have already reached the coastal areas, often catching people by surprise. Thus when the Standby Signal No. 1 is in force, the Observatory often makes it a point to warn the public of the impending danger of swells in the tropical cyclone bulletins.

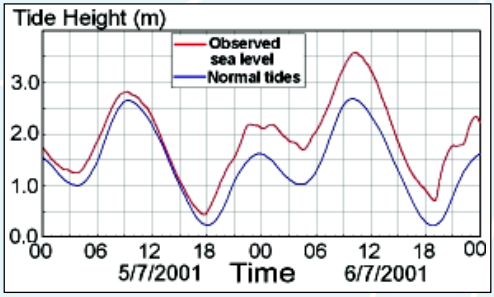
Against these and other weather-related hazards, weather bulletins for the south China coastal waters are issued to warn fishermen of strong winds, rough seas and fog. To ensure the safety of ocean-going ships, the Observatory issues marine weather forecasts advising the ships of gale or stronger winds, and providing forecasts of the sea state in the South China Sea and the western North Pacific. In the presence of a tropical cyclone, warning bulletins giving information on the location, intensity and forecast movement of the tropical cyclones are issued at regular intervals.

Precautions against waves and swells

- stay away from the shoreline and do not engage in water sports;
- owners of small vessels and fishing vessels in coastal waters should seek shelter and secure them properly with moorings;
- ships in the open sea should take heeds of weather forecasts and warnings and avoid the sea area with the most treacherous conditions.

Storm Surge

Storm surge is an anomalous rise of the sea level causing flooding along the coast as a result of the low pressure and strong winds of a tropical cyclone.



An exceptional rise in sea level at Tsim Bei Tsui on 6 July 2001 due to storm surge associated with Typhoon Utor

If a storm surge occurs during astronomical high tide, particularly the spring tide, the resultant sea level can be very high. Historically, storm surge caused serious casualties and damages in Hong Kong by destroying embankment and flooding coastal villages, notably in 1906, 1937 and 1962. Learning

from these lessons, the coastal design of built-up areas in Hong Kong has catered for storm surges to protect the coastal areas from inundation. However, the possibility of minor sea flooding due to a storm surge still exists in low lying areas and residents might need to be evacuated for safety reasons.

The Observatory predicts the level of storm surges based on forecasts of the movement and intensity of the approaching tropical cyclone. If the sea level is expected to reach the thresholds, the Observatory will advise members of the public about the threat of sea flooding through the tropical cyclone warning bulletin.

Precautions against storm surge

- stay away from the coast and reach for high ground during the approach of tropical cyclones;
- if you live or work in coastal areas, listen to radio or TV broadcast for warning of high sea levels. Contact your nearest police station in emergencies.

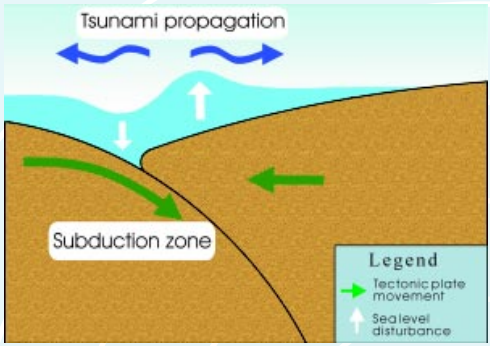
Tsunami

A tsunami is a series of sea waves generated by a large impulsive displacement of the sea level such as submarine earthquakes, massive coastal or submarine landslides, volcanic eruptions under the sea and meteor impacts on the ocean. Over 90% of all tsunamis are caused by submarine earthquakes.

In deep oceans, tsunami heights are often less than 1 metre and the waves travel at speeds as fast as that of jet planes. On approaching the coast, tsunami waves slow down and the push behind the wave front piles up the water onto the shore, increasing the tsunami height. In some extreme cases, tsunami heights have reached ten metres or higher. The shape of the sea floor, coastline configuration and travelling direction of the tsunami waves all affect the height of tsunami.

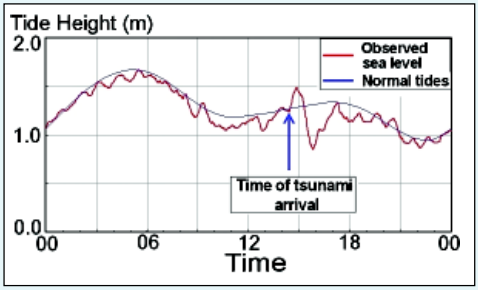
Inundation, wave impact on structure and erosion are the main causes of damage by a tsunami. Strong currents of the tsunami lead to the erosion of foundations and the collapse of structures. Floatation and drag forces move houses and cars. Floating debris also pose severe danger. A retreating tsunami often erodes the coastline.

Hong Kong has never been affected by any significant tsunami as the Philippines and Taiwan act as natural barriers for tsunamis coming from the Pacific. Since the 1950s, the Observatory has detected four minor tsunamis, all



A tsunami generated by submarine earthquake

with amplitudes less than 0.5 metre. But the chances of a destructive tsunami reaching Hong Kong cannot be ruled out.



Sea level fluctuations at Quarry Bay due to an earthquake at Luzon Strait on 24 June 1988

Based on tsunami warning messages issued by the Pacific Tsunami Warning Centre (PTWC), the Observatory assesses whether a tsunami would reach Hong Kong, and if so, the estimated time of arrival. On anticipating a significant tsunami reaching Hong Kong, the Observatory will issue tsunami warnings to the public. For severe earthquakes in the South China Sea close to Hong Kong, it will take only a short time for any tsunami generated to reach Hong Kong. A warning will be issued as soon as practicable even before receiving any tsunami message from PTWC. In such cases, the Observatory assesses the possibility of a significant tsunami in Hong Kong using information of the intensity of the tremor and the location of the earthquake as determined by the Observatory's own seismograph network. Even if a tsunami is judged to be insignificant, the Observatory will inform the public through tsunami information bulletins about the tsunami to maintain public awareness and preparedness.

Precautions against tsunami

- Stay away from beaches and low-lying coastal areas. If you are there, move to high ground or upper floors of a concrete building;
- When you are at the beach and feel an intense earth tremor, or notice a sudden retreat of seawater, immediately move to high ground;
- Do not engage in water sports;
- Small vessels in deep waters should stay away from the shore or shallow waters;
- Observe these precautions until the Observatory issues a final tsunami warning bulletin.

封面圖片

2004年12月26日蘇門答臘北部以西的印度洋海底發生大地震，所引發的海嘯對泰國蔻立造成嚴重破壞（圖片由天文台黃永德博士提供）

Cover Photograph

A great earthquake occurred in the Indian Ocean west of northern Sumatra on 26 December 2004. A tsunami was generated which caused severe damage in Khao Lak, Thailand (Courtesy Dr. W.T. Wong, Hong Kong Observatory)

二零零五年八月 August 2005

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