

Review of the 2009 Typhoon Season

- Hong Kong, China

I. Overview of tropical cyclones which have affected/impacted Member's area in 2009

1. Meteorological Assessment (highlighting forecasting issues/impacts)

Eight tropical cyclones affected Hong Kong in 2009. They were:

- (a) Severe Tropical Storm Linfa (0903)
- (b) Tropical Storm Nangka (0904)
- (c) Tropical Storm Soudelor (0905)
- (d) Typhoon Molave (0906)
- (e) Severe Tropical Storm Goni (0907)
- (f) Tropical Storm Mujigae (0913)
- (g) Typhoon Koppu (0915)
- (h) Typhoon Ketsana (0916).

The highest tropical cyclone warning signal issued in the year was the Increasing Gale or Storm Signal No. 9 during the passage of Molave in July. Goni and Koppu necessitated the issuance of the No. 8 Gale or Storm Signal while Nangka, Soudelor and Mujigae necessitated the issuance of the No. 3 Strong Wind Signal in Hong Kong. Details are given in the following paragraphs. Figure 1 shows the tracks of these tropical cyclones.

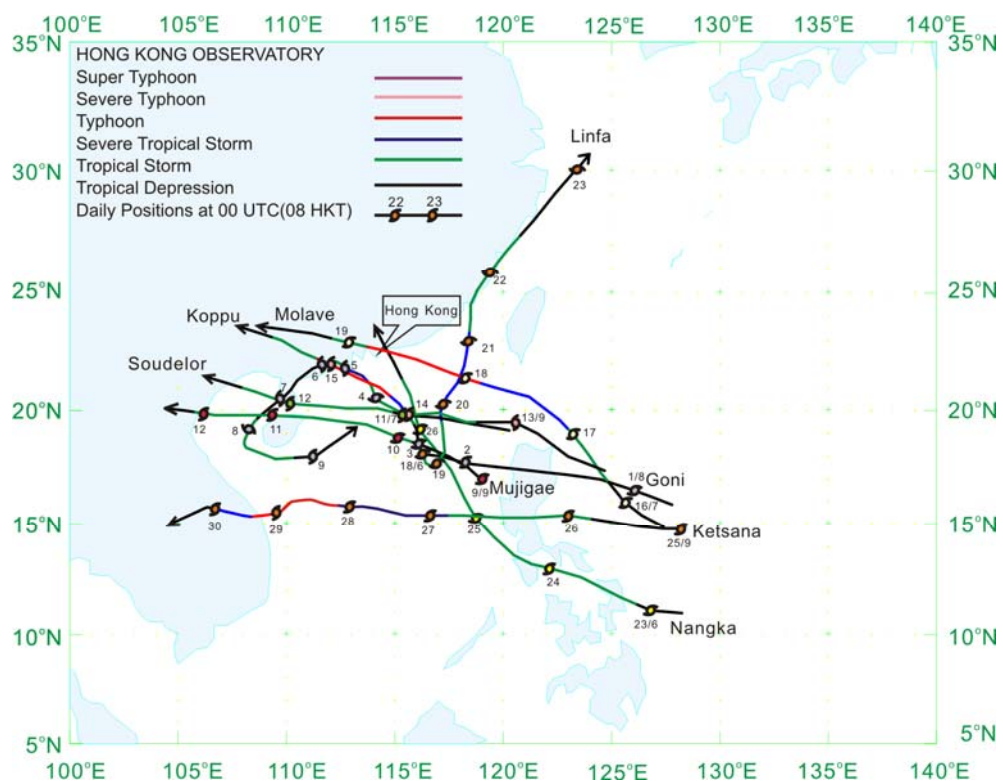


Figure 1 Hong Kong Observatory best tracks of tropical cyclones that affected Hong Kong, China from 1 January to 31 December 2009.

Severe Tropical Storm Linfa (0903)

Linfa formed over the northern part of the South China Sea on 17 June and became a severe tropical storm on 19 June. The track of Linfa is shown in Figure 2. Early on 20 June, Linfa moved towards the south China coast and posed a threat to Hong Kong. Local winds were light, mainly from the west to northwest on that day. Linfa was closest to Hong Kong at around 2 p.m. that day when it was about 380 km to the east-southeast. Linfa gradually moved away from Hong Kong on 21 June.

The weather in Hong Kong was hot with sunny periods on 20 June, but there were isolated showers in the New Territories that evening. It was mainly cloudy with isolated thundery showers the next day.

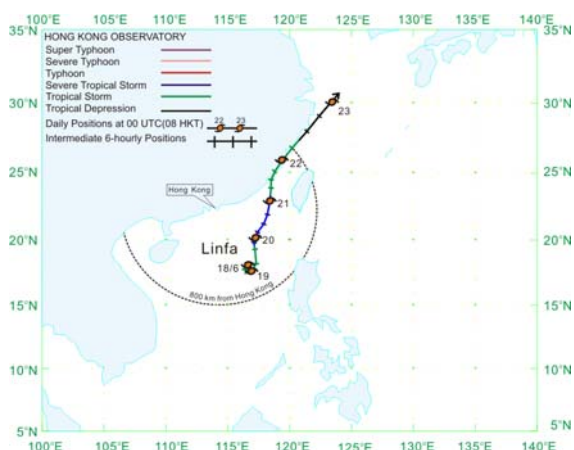


Figure 2 Track of Linfa (0903) on 17 - 23 June 2009.

Tropical Storm Nangka (0904)

Nangka formed over the western North Pacific on 23 June and intensified into a tropical storm that afternoon. The track of Nangka is shown in Figure 3. Tropical Storm Nangka weakened slightly after entering the South China Sea but continued to move closer to the south China coast, posing a threat to Hong Kong. Local winds were moderate to fresh easterlies at first on 26 June and strengthened in the afternoon to become occasionally strong offshore and on high ground. The winds gradually turned to the northwest at night. Nangka was closest to Hong Kong between about 11 p.m. on 26 June and 1 a.m. the following day when it passed about 60 km to the northeast of the Hong Kong Observatory. Local winds subsided as Nangka made landfall and weakened over Guangdong.

The weather in Hong Kong was cloudy at first with squally showers developing during the day on 26 June. There was occasional heavy rain and a few squally thunderstorms on 27 June.



Figure 3 Track of Nangka (0904) on 23 - 27 June 2009.

Tropical Storm Soudelor (0905)

Soudelor formed over the South China Sea on 10 July and intensified into a tropical storm on 11 July. The track of Soudelor is shown in Figure 4. In Hong Kong, winds were light to moderate westerlies on 10 July. Winds strengthened on 11 July becoming fresh easterlies that afternoon and up to strong offshore and on high ground. Soudelor was closest to Hong Kong at about 2 p.m. that day when it passed about 240 km to the south. Soudelor gradually moved away from Hong Kong and local winds weakened that evening, although there were still occasionally strong winds offshore and on high ground. Soudelor moved further away from Hong Kong and local winds gradually moderated on 12 July.

The weather in Hong Kong was fine and very hot on 10 July. Under the influence of the outer rainbands of Soudelor, there were occasional squally showers the next day. With showers easing off, it became mainly fine and hot on 12 July.

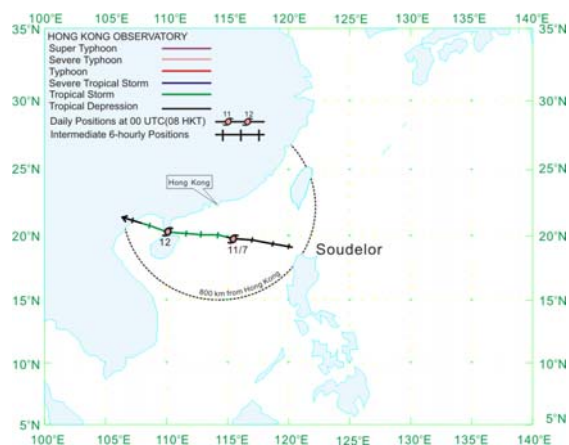


Figure 4 Track of Soudelor (0905) on 10 - 12 July 2009.

Typhoon Molave (0906)

Molave formed over the western North Pacific on 15 July and became a typhoon

on 18 July. The track of Molave is shown in Figure 5. In Hong Kong, winds were mainly light to moderate west to northwesterlies on 17 July. Local winds freshened from the northwest and strengthened gradually on 18 July. They became generally strong, reaching gale force on high ground towards midnight. Winds strengthened significantly in the early hours of 19 July. Gale force winds from the west to northwest generally affected Hong Kong, reaching storm force offshore and on high ground. Molave was closest to Hong Kong between about 2 a.m. and 3 a.m. on 19 July when it passed about 40 km to the north-northeast of the Hong Kong Observatory. Molave started to move away from Hong Kong thereafter and local winds changed to gale force southwesterlies, reaching storm force offshore and on high ground. Gales gradually subsided around dawn. As Molave continued to move further away from Hong Kong and weakened, local winds gradually moderated that morning.

The weather in Hong Kong was sunny and very hot on 17 and 18 July. There was some haze on 18 July. Under the influence of the outer rainbands of Molave, squally showers and a few thunderstorms affected Hong Kong that evening. Heavy rain with squalls affected Hong Kong on the morning of 19 July.



Figure 5 Track of Molave (0906) on 15 - 19 July 2009.

Severe Tropical Storm Goni (0907)

Goni formed over the western North Pacific on 1 August and became a severe tropical storm in the late afternoon of 4 August. Under the influence of Typhoon Morakot over the western North Pacific, Goni changed its direction of movement abruptly during the night of 8 August. Figure 6 shows the track of Goni. Winds in Hong Kong were moderate to fresh easterlies, occasionally strong offshore and on high ground on 3 August. As Goni moved closer to Hong Kong on 4 August, winds strengthened in the afternoon and became generally strong east to southeasterlies, occasionally reaching gale force offshore and on high ground in the evening. Goni strengthened into a severe tropical storm and continued to move closer to Hong Kong that evening. Winds were strongest in the western part of Hong Kong with gales offshore and on high ground. Goni was closest to Hong Kong between about 8 p.m. and 10 p.m. when it passed about 110 km to the southwest. With Goni moving gradually away from Hong Kong thereafter, local winds became southeasterlies and gradually subsided. Goni

weakened into a tropical storm overland in the afternoon of 5 August and local winds continued to subside.

The weather in Hong Kong was mainly fine and very hot at first on 3 August. Under the influence of the outer rainbands of Goni, there were squally showers and thunderstorms in the afternoon. It was mainly cloudy with squally showers on 4 August and the following day. Heavy rain affected Hong Kong during the evening of 5 August.

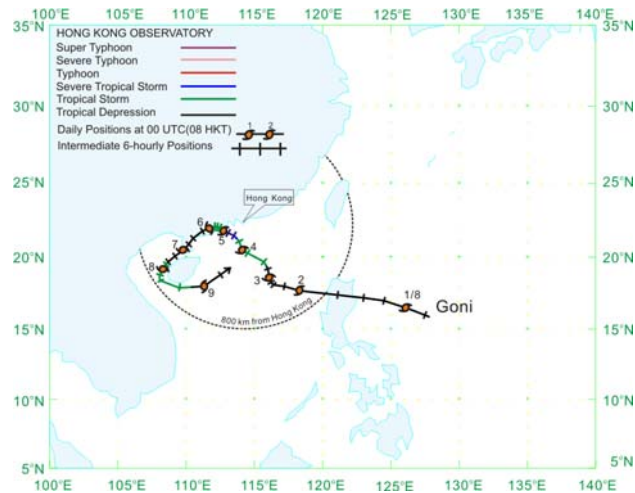


Figure 6 Track of Goni (0907) on 1 - 9 August 2009.

Tropical Storm Mujigae (0913)

Mujigae formed over the central part of the South China Sea in the morning of 9 September and intensified into a tropical storm on 10 September. Figure 7 shows the track of Mujigae. Winds in Hong Kong were moderate to fresh northeasterlies, strong offshore and on high ground in the morning of 10 September. Mujigae was closest to Hong Kong at about 2 p.m. passing about 330 km to the south. Local winds strengthened from the east in the afternoon. Winds became generally strong in the late afternoon and at night, occasionally reaching gale force offshore and on high ground. Local winds gradually moderated in the small hours of 11 September as Mujigae moved away from Hong Kong.

The weather in Hong Kong was mainly cloudy at first on 10 September. Scattered squally showers started to affect Hong Kong during the day. The weather remained cloudy with occasional rain and isolated squally thunderstorms on 11 September.



Figure 7 Track of Mujigae (0913) on 9 - 12 September 2009.

Typhoon Koppu (0915)

Koppu formed over the western North Pacific on 12 September and became a typhoon in the afternoon of 14 September. Figure 8 shows the track of Koppu. Winds in Hong Kong were moderate easterlies in the night of 13 September. Local winds freshened from the northeast in the morning of 14 September and were occasionally strong offshore and on high ground. As Koppu continued to move closer to Hong Kong, the northeasterlies became generally strong in the afternoon, with occasional gales offshore and on high ground. Easterly gale affected the territory at night, wind strength reaching storm force offshore and on high ground. Winds gradually changed its direction to the southeast in the small hours of 15 September. Koppu was at its closest to Hong Kong at around 1 a.m. that day at about 130 km to the south-southwest. Gales from the southeast persisted until around dawn and gradually subsided in the morning. Winds subsided further thereafter.

The weather in Hong Kong was sunny on 13 September but squally thunderstorms affected Hong Kong in the evening. It was cloudy with squally showers on 14 September. Heavy squally showers affected Hong Kong on 15 September.

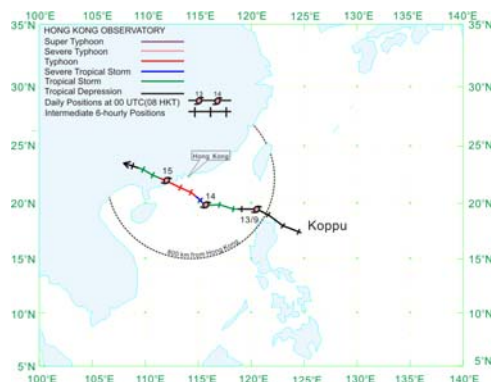


Figure 8 Track of Koppu (0915) on 12 - 16 September 2009.

Typhoon Ketsana (0916)

Ketsana formed over the western North Pacific on 25 September and became a typhoon in the morning of 28 September. Figure 9 shows the track of Ketsana. Under the combined effect of Ketsana and the northeast monsoon, winds in Hong Kong were moderate to fresh northeasterlies, occasionally strong offshore and on high ground, with rough seas and swells over Hong Kong waters on 27 September. Ketsana was closest to Hong Kong at about 2 a.m. on 28 September when it passed about 720 km to the south. Ketsana gradually moved away from Hong Kong during the day.

The weather in Hong Kong was mainly cloudy with sunny intervals during the day on 27 September. Under the influence of the outer rainbands of Ketsana and the northeast monsoon, it was cloudy with rain on 28 September and the rain was heavy at times in the afternoon.



Figure 9 Track of Ketsana (0916) on 25 - 30 September 2009.

2. Hydrological Assessment (highlighting water-related issues/impact)

During their passages, Typhoon Molave, Severe Tropical Storm Goni and Typhoon Koppu each brought over 100 millimetres of rainfall to Hong Kong and necessitated the issuance of rainstorm warnings. The storm surge of Koppu coincided with high tide and caused flooding in low-lying areas. On the other hand, Tropical Storms Soudelor and Mujigae brought only about 20 millimetres of rainfall to the southern part of Hong Kong.

During the passage of Linfa, only a few millimeters of rainfall were recorded in most parts of Hong Kong but over 100 millimetres of rainfall were recorded in Mui Wo on Lantau Island in the southwestern part of Hong Kong on 21 June.

Around 50 millimetres of rainfall were recorded over most parts of Hong Kong during the passages of Nangka and Ketsana.

During the passage of Koppu, heavy squally showers affected Hong Kong on 15 September and brought more than 100 millimetres of rainfall to many parts of Hong Kong. The storm surge of Koppu arriving during high tide raised the sea level to a maximum of 3.43 metres at Tai Po Kau in the northeastern part of Hong Kong, which was one of the highest sea levels recorded in the past decade. Eight reports of flooding were

received, with Tai O, a small fishing village in western Lantau Island, being worst hit. At Tai O, storm surge and heavy rain together with high tide resulted in flood waters reaching 1.5 metres deep, bringing damage to goods and equipment in the shops there. Around ten people had to be evacuated. There were also many incidents of vehicles being affected by flooding. In urban Kowloon, four drivers had to be rescued by firemen when their taxis were affected by flood waters.

3. Socio-Economic Assessment (highlighting socio-economic and DPP issues/impacts)

No significant damages were reported in Hong Kong during the passages of Linfa, Nangka and Ketsana.

There were 20 reports of fallen trees in Hong Kong during the passage of Soudelor. A large 20-metre tall tree fell in urban Kowloon and caused temporary disruptions to the traffic.

Five people were injured during the passage of Molave. There were at least 425 reports of fallen trees and three reports of collapsed scaffolding. In the New Territories over the northern part of Hong Kong, a 10-metre tall tree toppled and damaged the roof of a dwelling nearby. Six people were forced to evacuate their wooden house after it was damaged by a fallen 14-metre tall tree. Another large tree fell on private vehicles parked there. In Kowloon, a 20-metre tall tree collapsed and damaged the electric cables and rooftop of a house, interrupting the electricity supply to seven households nearby. The windscreens of a bus and a lorry were smashed by a collapsing tree in the urban areas and the New Territories respectively. Three yachts ran aground in Hong Kong waters. At the Hong Kong International Airport, 11 flights were cancelled, 31 flights were delayed and one flight was diverted.

Four people were killed and ten people were injured during the passage of Goni. Two men were drowned and one was injured when a barge capsized during squally thunderstorms. Two other men were killed when they fell off from a scaffolding. A tree was reported collapsed in the New Territories but no one was injured. At the Hong Kong International Airport, 4 flights were cancelled and 17 flights were delayed.

A glass sheet fell from a building in the urban areas during the passage of Mujigae and a passer-by was injured by the debris of glass.

At least 74 people were injured, four of them seriously during the passage of Koppu. There were 48 reports of fallen trees. There were also five reports of loose scaffoldings and one report of a fallen external wall. In the New Territories, a large tree fell and damaged a warehouse nearby. A scaffolding was blown off by strong winds, damaging four vehicles nearby. In the urban areas, strong winds damaged the door of a commercial building and a person was injured by pieces of broken glass. At the Hong Kong International Airport, eight flights were diverted.

4. Regional Cooperation Assessment (highlighting regional cooperation successes and challenges)

Telephone consultation between Hong Kong, China; Macao, China and China to exchange forecast assessments and warning information was conducted during the passage of Nangka, Soudelor, Molave, Goni and Koppu.