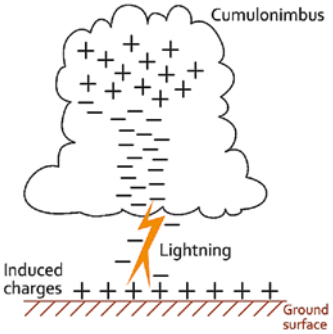
The formation & threats of Thunderstorms

Cover Photograph: Dicky Kwok

香港天文台
HONG KONG OBSERVATORY

What are thunderstorms?

Thunderstorms are intense convective weather phenomena which commonly occur during April to September in Hong Kong. Thunderstorms are characterized by flashes of lightning and claps of thunder.



Due to vigorous turbulence inside a cumulonimbus cloud, water droplets and ice pellets in the cloud will become electrically charged in the convective motion. When the electric field arising from the piling up of charges reaches a certain breakdown value, lightning discharges take place between clouds or between cloud and the earth's surface. The explosive expansion of the surrounding air produces the rolling sound of thunder. Since light travels much faster than sound, if the sound of thunder reaches an observer three seconds after a lightning flash, the thunderstorm is about 1 kilometre away.

Thunderstorm can generate a violent form of downdraft called the microburst - a strong downrush of winds which often radiate outward from the thunderstorm upon striking the ground surface. Microburst is short-lived and relatively compact, but it is hazardous to aircraft during landing and take-off.

Points to note during thunderstorms

Stay indoors. Seek shelter in buildings if you are working outdoor.

Beware of lightning strike, don't stand on hill tops or near any highly conductive objects. Keep away from trees or masts which are likely to be struck by lightning. Since lightning current is conducted away through the ground, you should not lie down especially when the ground is wet. Instead you should crouch down to minimize the area of contact between you and the ground.

Don't swim or engage in other water sports. Leave the water & seek shelter. Don't take shower too.

Managers of outdoor sports facilities, playgrounds, lifeguards at swimming pools should be vigilant about changes of weather, make reference to "Lightning Location Information" webpage, and give appropriate instructions to users of the facilities.

Avoid using telephone or other plugged-in electrical appliances, including computers.

What are the dangers of thunderstorms?

Thunderstorms will bring about the risk of lightning strikes. Severe weather phenomena such as rainstorms, hails, squalls/ violent gusts (derecho), and even waterspouts or tornados may also come with thunderstorms.

Rainstorms

Most thunderstorms form in cumulonimbus clouds and are normally associated with heavy downpours. In the vicinity of active weather systems such as low pressure troughs, cumulonimbus clouds may develop continually, and thunderstorms will be more widespread and persistent. Under certain favorable meteorological conditions, cumulonimbus clouds may merge to form severe thunderstorms and rainstorms, which will further trigger disasters such as flooding, flash flood and landslips.

POINTS TO NOTE

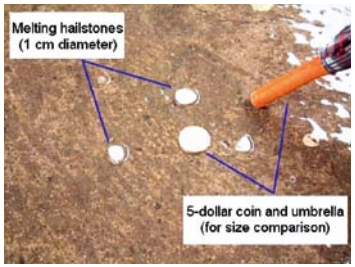
Heavy rain may bring about flash floods. People should stay away from watercourses.

Flooding may occur in some low-lying and poorly drained areas, people who are likely to be affected should take necessary precautions.

Hikers and people engaging in outdoor activities should be aware of the latest weather information issued by the Observatory and change or cancel the activities as necessary.

Don't get close to steep slopes and retaining walls. Drivers should avoid driving in hilly areas or on roads with landslip warning signs.

Hail



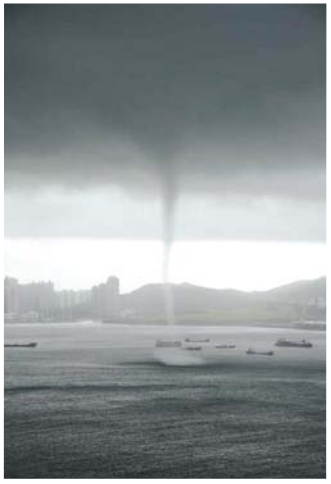
Hailstones observed at the Observatory headquarters on 9 April 2001

Hailstones are hard pellets of ice usually of only a few millimeters in diameter though larger stones occasionally occur. They are formed in well-developed thunder-bearing cumulonimbus clouds. Hails mainly occur in spring and the average frequency of occurrence is once every one to two years.

POINTS TO NOTE

Seek shelter in buildings. Large hailstones can damage crops, break windows, glass houses and windscreens of cars.

Waterspout/Tornado



Waterspout appearing near Siu Sai Wan on 22 July 2010

Under very unstable weather conditions, severe convection in thunderstorms facilitates the formation of intense columnar vortices in the shape of funnel clouds. When the vortices touch the ground, they are called tornadoes, while those touching the sea surface are called waterspouts. Winds are very strong with very low pressure near the centre of the vortices. Waterspouts or tornadoes are not common in Hong Kong and there is one report of tornado or waterspout every one to two years on average.

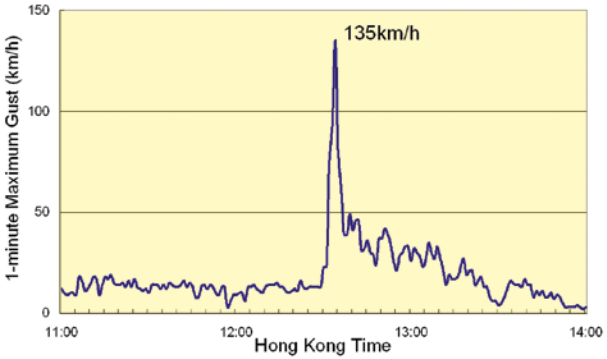
POINTS TO NOTE

People on small boats on the open sea should watch out for the approach of squalls or waterspouts.

If you encounter a tornado, seek shelter in a sturdy building. Stay away from windows, crouch to the floor and protect your head with your arms or thick padding. In the outdoors, stay away from trees, cars and other things that can be blown up by the tornado.

"Shi Hu Feng" (Severe Gust/Derecho)

"Shi Hu Feng" is a local description of the severe gust associated with squall lines. A squall line is a cluster of severe thunderstorms or storm cells along a line. Squall lines are fast moving and destructive, and will lead to sudden changes in the wind direction with an abrupt increase in wind speed. The severe gust associated with squall lines can exceed 100 kilometres per hour, but usually is not persistent.



During the passage of the squall line on 9 May 2005, the gust at Kwai Chung rose sharply from less than 15 km/h to 135 km/h within a few minutes

Under the influence of "Shi Hu Feng", dozens of containers blown off by squalls at the Container Terminal in Kwai Chung
(Photo by Wen Wai Po)

POINTS TO NOTE

Pay attention to the special announcements issued by the Observatory.

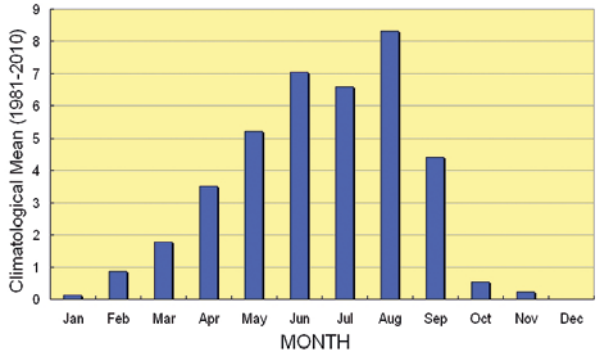
Secure all loose objects, particularly on balconies and roof tops. Secure hoardings, scaffoldings and temporary structures.

Container terminal operators should secure all stacks of containers, different cranes and lock all containers.

Drivers using highways/flyovers should be alert to intense gusts.

People on small boats should take precautions to prevent their boats from capsizing due to the approaching squalls.

Monthly mean number of days with thunderstorms in Hong Kong (1981-2010)



Hong Kong Observatory Information

Take note of the latest weather information through the following means:

- Broadcasts on radio and TV
- "Dial-a-Weather" Information Enquiry System: 1878 200
- Hong Kong Observatory Websites
  http://www.weather.gov.hk or http://www.hko.gov.hk
- Mobile Websites
  http://m.weather.gov.hk or http://m.hko.gov.hk
- Lightning Location Information webpage
  http://www.weather.gov.hk/wxinfo/llis/gm_index.htm
- "MyObservatory"
  http://www.weather.gov.hk/myobservatory_e.htm
  use a QR code reader to scan the QR code below

iPhone/iPad Android

- For further information on Thunderstorm Warnings, please refer to
  http://www.weather.gov.hk/publica/gen_pub/ts.pdf