# Salt tide

Under the effect of astronomical high tide, the South China Sea might have a higher chance of occurence of salt tide every year in February. When sea water rise and flow upstream. the salinity of water at the estuary and lower course is increased, this is called salt tide.

Human need freshwater to maintain the normal functions of organs and excrete the waste. Salt tide increase the salinity of drinking water supplied to the lower course, which is harmful to human. If someone kept drinking water in high salinity, he might suffer from renal failure.

The main factor for the formation of salt tide is the astronomical high tide. However, the development along the riverside enhance the effects of salt tide as well.

## 17.2.1 Cause of salt tide I - Tides

The gravitational attractions of Moon and Sun pull water on the Earth's surface to their sides. When the Sun and Moon are at different position, the gravitational attractions excerted on Earth will be different, the water level will be different as well.

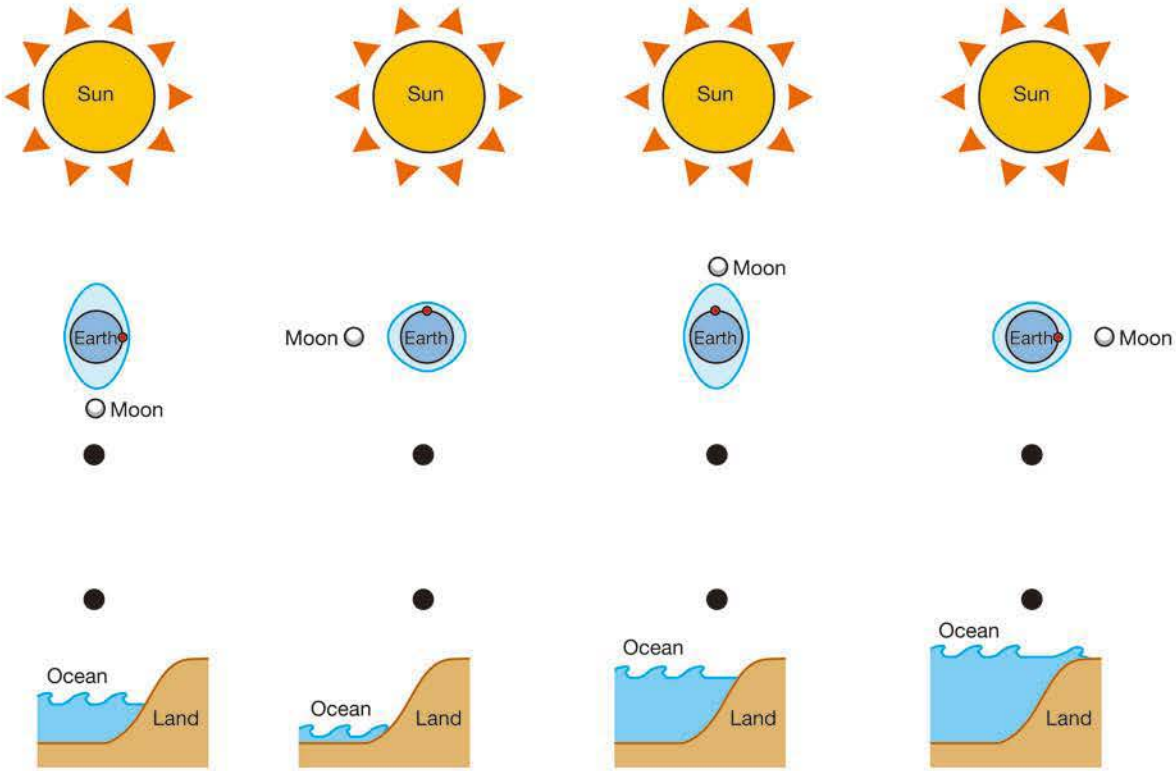
### Case I

When the Earth, Moon and Sun are aligned along a straight line, the range of the high tide and low tide will be the greatest. This is called a spring tide.


### Case II

When the Earth, Moon and Sun are at right angle to each other, the range of the high tide and low tide will be the least. This is called a neap tide.

Four cases are illustrated in the pictures below. The Sun, Moon and red spot on the Earth are at different position. Assuming the red spots in the pictures below represent a particular place on the Earth.
Match the tide level of the red spot to the position of the Sun and Moon.




## 17.2.2 Cause of salt tide II - Discharge volume decrease

Apart from the tide, decrease in volume discharge of river worsen the effects of salt tide.

**Base on the common sense, answer the following questions.**

**A. What happen to the flow rate of the river if rainfall decreases?**

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**B. If the flow rate decrease how did the salinity of estuarine water change?**

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**c. If the flow rate decrease, and there is a strong flow upstream, how did the dilution effect of the river change?**

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**D. Apart from decrease in rainfall, what other reason(s) that lower the dilution effect of the river?**

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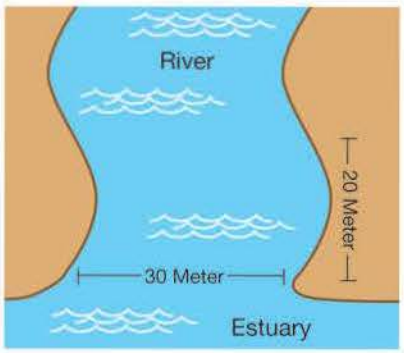
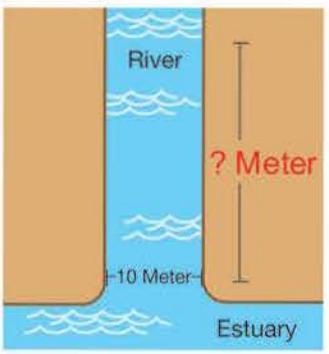
## 17.2.3 Cause of Salt tide III - Channelization

Expansion of population and development of the community increase the demand of land. Sometimes, watercourse is channelized and narrowed. In such case, same volume of salty water backflow to the estuary might reach farther towards the upperstream. The effect could be demonstrate through a simple exercise.

**The picture on the left is a natural river while the picture on the right is a channelized river. Assumed both rivers have the same depth and same gradient of slope, and the curvature of river bank could be neglected. You could see the difference of backflow seawater before and after channelization.**




For a 30 meters wide river,
the backflow of seawater
reach 20 meter far from the estuary.




For a 10 meters wide river,
how far will the backflow of seawater reach?

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**17.2.4 Try to collect information on the causes and effects of salt tide and possible solutions to the problems associated. Express your thought on the salt tide incident in South China in the space provided.**