

Projections of Hong Kong Climate for the 21st Century

Temperature projection

The Observatory utilizes data of a number of computer climate models in the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) and statistical method with urbanization effect on temperature incorporated to project the temperature changes in Hong Kong in the 21st century. Under the high greenhouse gas emission scenario (RCP8.5), the temperature is expected to rise by 1.5-3°C and 3-6°C in mid-21st century (2051-2060) and late 21st century (2091-2100) respectively, when compared to the 1986-2005 average of 23.3°C (Figure 1). Under the mid-greenhouse gas emission scenario (RCP4.5), the temperature is expected to rise by 1-2°C and 1.5-3°C in mid-21st century and late 21st century respectively, when compared to the 1986-2005 average.

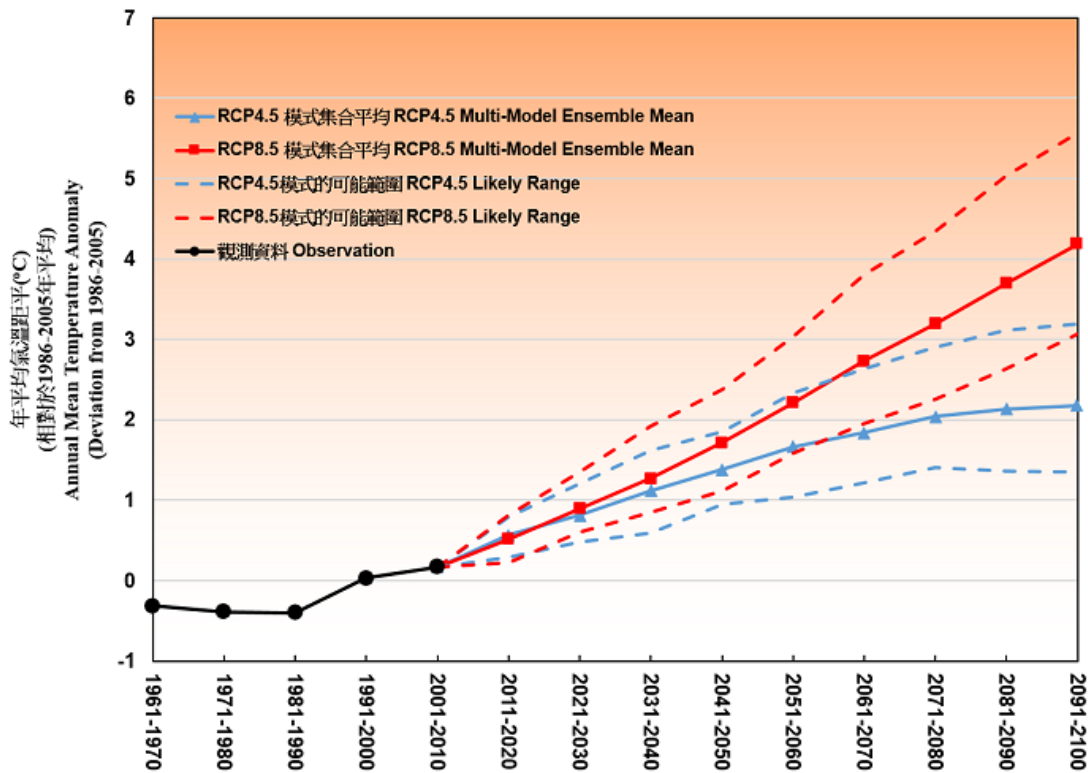


Figure 1 Past and projected annual mean temperature anomaly for Hong Kong (The projection is based on IPCC AR5 computer model data. Likely range means the 5th to the 95th percentiles of the multi-model ensemble.)

Rainfall projection

The Observatory utilizes data of a number of climate models in the IPCC Fifth Assessment Report (AR5) and statistical method to project the rainfall changes in Hong Kong in the 21st century. Under the high greenhouse gas emission scenario (RCP8.5), the number of extremely wet years is expected to increase from three in 1885-2005 to about 12 in 2006-2100, which is roughly the same as the previous projection (IPCC Fourth Assessment Report AR4). The number of extremely dry years would remain about the same (Table 1). Besides, the annual rainfall in late 21st century is expected to rise by about 150 mm when compared to the 1986-2005 average (Figure 2).

Table 1 Future changes in extremely wet and extremely dry years

	Observation in 1885-2005	Projection for 2006-2100
Extremely wet years (annual rainfall > 3168 mm)	3	12
Extremely dry years (annual rainfall < 1289 mm)	2	2

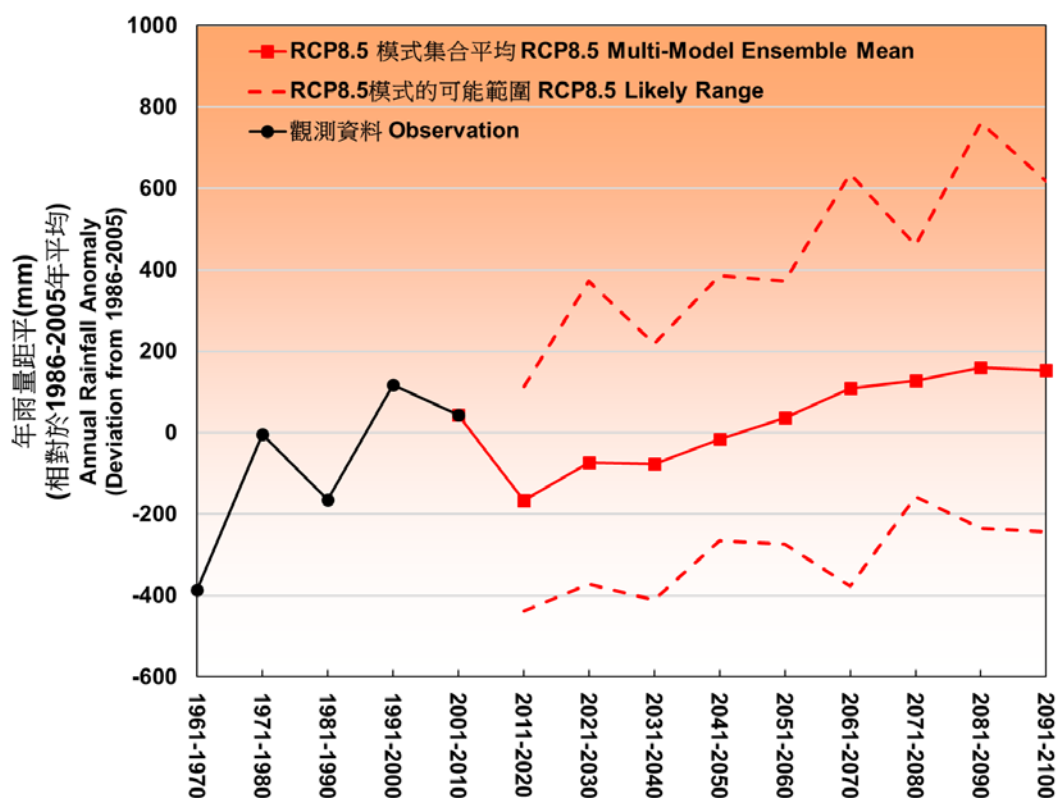


Figure 2 Past and projected annual rainfall anomaly of Hong Kong (The projection is based on IPCC AR5 model data. Likely range means the 5th to the 95th percentiles of the multi-model ensemble.)

Global mean sea level change

In the high greenhouse gas concentration scenario (RCP8.5) of IPCC Fifth Assessment Report (AR5), global mean sea level for mid-21st century (2046-2065) and late 21st century (2081-2100) will likely be in the range of 0.22 - 0.38 m and 0.45 - 0.82 m respectively above the 1986-2005 average (Table 2 and Figure 3).

Table 2 Likely ranges of projected global mean sea level rise

Scenario	2046-2065	2081-2100
RCP2.6	0.17 - 0.32 m	0.26 - 0.55 m
RCP4.5	0.19 - 0.33 m	0.32 - 0.63 m
RCP6.0	0.18 - 0.32 m	0.33 - 0.63 m
RCP8.5	0.22 - 0.38 m	0.45 - 0.82 m

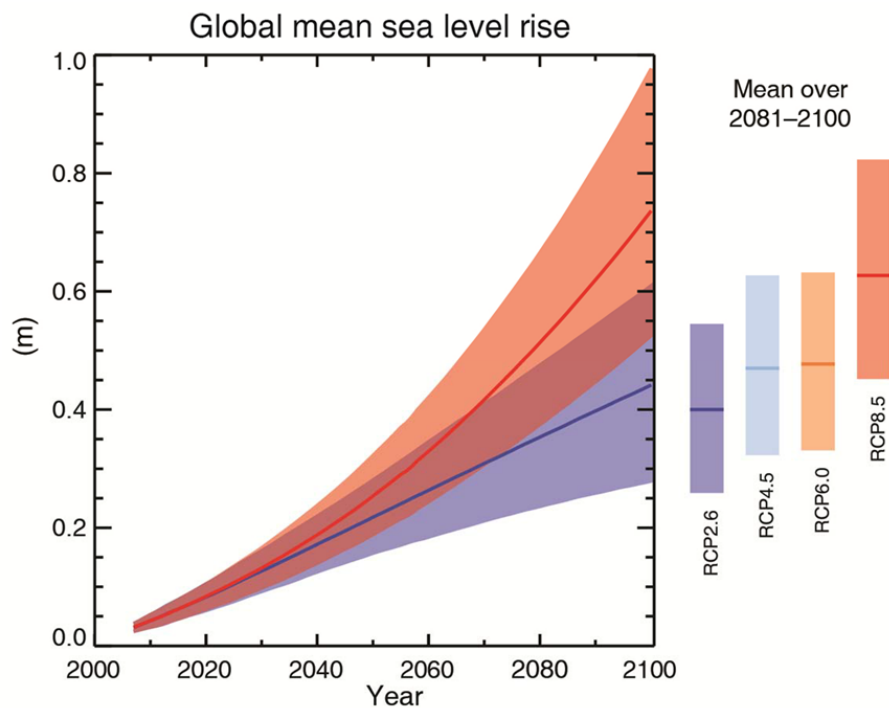


Figure 3 Projections of global mean sea level rise over the 21st century (relative to 1986-2005)

Changes in extreme sea level in Hong Kong

Based on the IPCC Fifth Assessment Report (AR5), for a mean sea level rise reaching 0.38 m in mid-21st century (2046-2065) and reaching 0.82 m in late 21st century (2081-2100) under the RCP8.5 scenario with the highest concentration of greenhouse gas emission, and assuming no change in storm characteristics, the return periods for various extreme sea levels in the Victoria Harbour will shorten as shown in the table below, meaning that the frequency of occurrence of a particular extreme sea level will increase.

Table 3 Changes in the return period of extreme sea level event in Victoria Harbour due to mean sea level rise

Return period (year)	Extreme sea level above Chart Datum [#] (m)		
	Current mean sea level	For a sea level rise reaching 0.38 m	For a sea level rise reaching 0.82m
1	2.7	3.1	3.5
2	2.9	3.3	3.7
5	3.1	3.5	3.9
10	3.3	3.6	4.1
20	3.4	3.8	4.2
50	3.5	3.9	4.4

Chart Datum is the level to which soundings or tide heights are referenced, and is approximately the level of lowest astronomical tide in the Victoria Harbour. Chart Datum is 0.146 m below the Hong Kong Principal Datum, the level to which land surveys in Hong Kong are referenced.

Using the example of an extreme sea level of 3.53 m in the Victoria Harbour brought by Typhoon Hagupit in 2008, its return period will shorten from around 50 years at present to around 5 years in mid-21st century (2046-2065), and even every year by late 21st century (2081-2100).