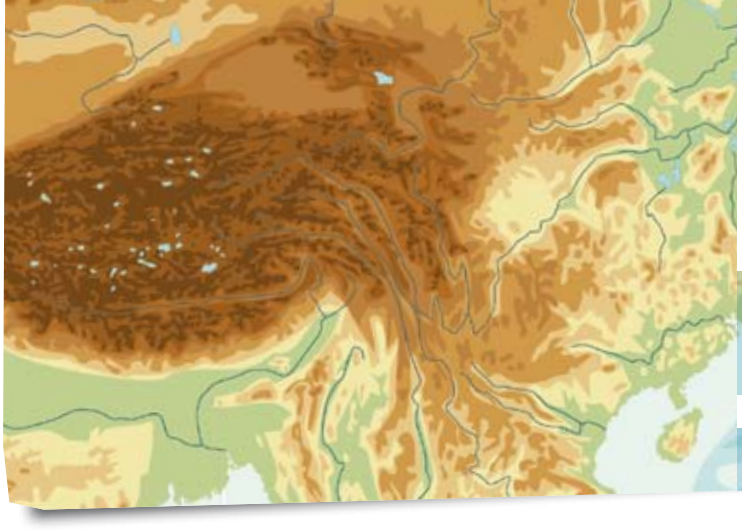


ASIA
NORTHERN CHINA

INDEX TEMPERATURE
YEAR 2080-2099 RELATIVE TO 1980-1999
SCENARIO A1B

Reference: WG1 2007. Tebaldi et al. (2006). Weisheimer and Palmer (2005)

1 Major temperature trends

Throughout the 21st century, climate warming will be higher (with a 66-90% probability) than average warming in central Asia, on the Tibetan plateau and in northern Asia, but also in eastern, southern and southeast Asia[1], will be higher (with a 66-90% probability) than average global mean. Temperature projections in China are consistent between the different climate models, whether in winter or summer (see FIGURE 2 of the global temperature sheet).

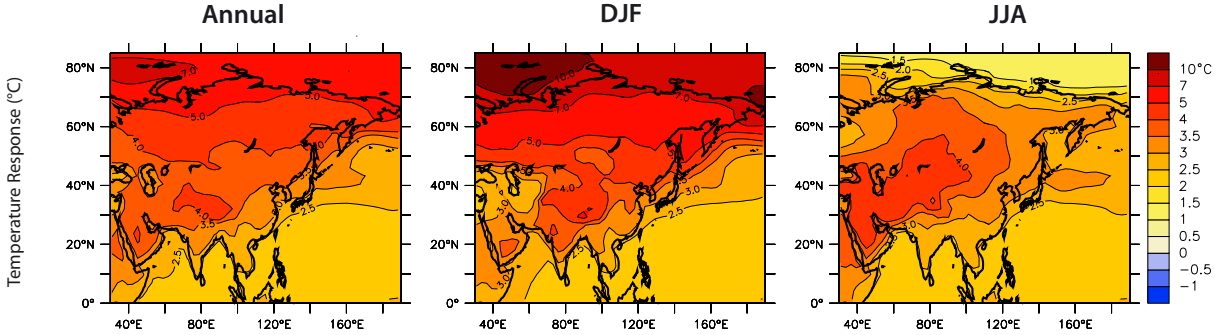
In China, the annual temperature estimated by the A1B scenario is 3.5 to 4°C higher in 2080-2100 than in 1980-1999 (see FIGURE 1). Furthermore, this increase is more marked in winter (around 4-5°C) than in summer (around 3-4°C).

Few very cold days are expected (with a 90-99% probability) in east and south Asia. Summer heat waves tend to intensify (with a 90-99% probability): their duration increases, and they are more intense and more frequent in east Asia.

The temperature increase is greater in winter due to the winds[2] from high latitude continental zones that are warming the most. Likewise, the amplitude of warming is smaller in summer, as the winds come from the tropics and have less than those from high northern latitudes (they come from the Indian Ocean, and oceans warm less, and air flows contains more moisture but without great temperature variation).

1. See the global temperature sheet for the physical explanation of these phenomena.

2. See the sheet on global precipitation for an explanation of the monsoon phenomenon.



MODIFIED AND BASED ON WORKING GROUP I CONTRIBUTION TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE. CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS. FIGURE 11.9. CAMBRIDGE UNIVERSITY PRESS.

FIGURE 1 Temperature changes over Asia from the multi-model data set-A1B simulations. Top row: Annual mean. DJF and JJA temperature change between 1980 to 1999 and 2080 to 2099, averaged over 21 models.

2 Percentiles of temperature distribution

TABLE 1 shows changes in temperature (in °C) projected by the A1B scenario and between 2080-2099 and 1980-1999 for several percentiles[3] of the probability distribution. Winter and summer trends are represented over two regions of Asia: Tibet and eastern China.

TABLE 1

		Percentiles				
Region	saisons	5	25	50	75	95
Tibet	DJF	3.3	4.0	4.5	4.9	5.6
	JJA	2.8	3.5	4.0	4.4	5.0
Eastern China	DJF	2.2	3.1	3.6	4.1	4.8
		2.3	2.6	2.9	3.2	3.7

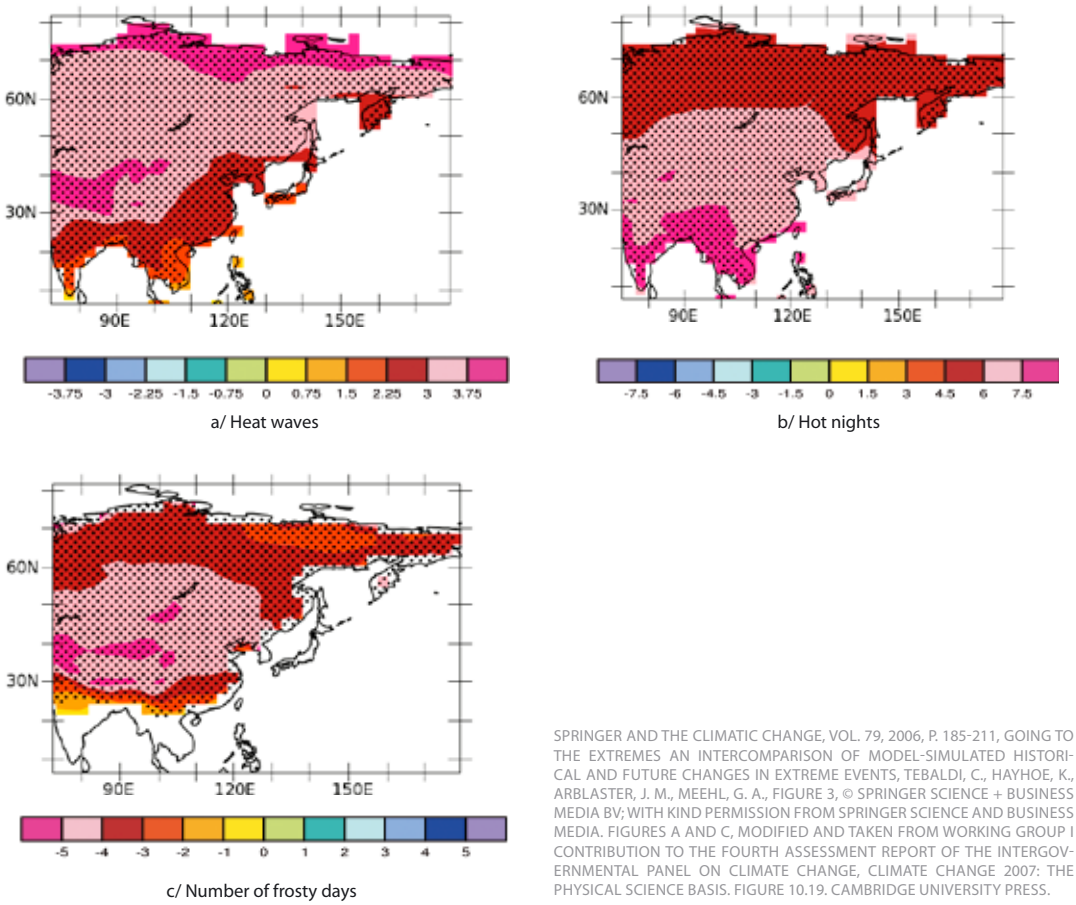
In the Tibet region, the different percentiles show that temperatures are rising more in winter than in summer (see FIGURE 1). The median value of the temperature increases is quite close in both seasons, as it is 4.5°C in winter and 4.0°C in summer. The difference between the 5th and 95th percentiles is the same in winter (2.3°C) and in summer (2.2°C). The 5th and 95th percentiles tell us that the high temperature values (95th percentile) increase more than the low values (5th percentile), whether in winter (5.6°C and 3.3°C) or in summer (5°C and 2.8°C).

The situation in eastern China appears more varied. The percentiles indicate that temperatures increase more in winter than in summer (see FIGURE 1), as in Tibet. The median value of the temperature increases is 3.6°C in winter and 2.9°C in summer. The difference between the 5th and 95th percentiles is slightly higher in winter (2.6°C) than in summer (1.4°C). The increase of the lowest values (5th percentile) is the same in summer and in winter (2.3°C and 2.2°C). On the other hand, the extreme temperature highs (95th percentile) increase more in winter (4.8°C) than in summer (3.7°C).

3. See paragraphs 1.1 and 1.2 of the technical sheet for further information.

3 Temperature climate indices

In China, the majority of models indicate an increase in the number of heat events and hot nights, and a decrease in the number of frost days (see FIGURE 2).
More specifically, the number of heat waves increases more in the north of the country than in the south; hot nights increase noticeably in the south of the country, and the number of frost days probably decreases in the interior of the country and near the Himalayas. Furthermore, the probability of experiencing very hot winters by 2081-2100 increases by 40 to 60% in eastern China (Weisheimer and Palmer 2005). In the south of the country and on the Tibetan plateau, this probability is lower, at 20 to 60%.



SPRINGER AND THE CLIMATIC CHANGE, VOL. 79, 2006, P. 185-211, GOING TO THE EXTREMES AN INTERCOMPARISON OF MODEL-SIMULATED HISTORICAL AND FUTURE CHANGES IN EXTREME EVENTS, TEBALDI, C., HAYHOE, K., ARBLASTER, J. M., MEEHL, G. A., FIGURE 3, © SPRINGER SCIENCE + BUSINESS MEDIA BV; WITH KIND PERMISSION FROM SPRINGER SCIENCE AND BUSINESS MEDIA. FIGURES A AND C, MODIFIED AND TAKEN FROM WORKING GROUP I CONTRIBUTION TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS. FIGURE 10.19. CAMBRIDGE UNIVERSITY PRESS.

FIGURE 2 Changes in extremes based on multi-model simulations from nine global coupled climate models, adapted from Tebaldi et al. (2006). Changes in spatial patterns of simulated (a) heat waves, (b) warm nights, and (c) frost days, between two 20-year means (2080–2099 minus 1980–1999) for the A1B scenario. Stippling denotes areas where at least five of the nine models concur in determining that the change is statistically significant. Extreme indices are calculated only for land areas. Frost days are only calculated in the extratropics. Extremes indices are calculated according to Frich et al. (2002). Each model's time series was centred around its 1980 to 1999 average and normalised (rescaled) by its standard deviation, computed (after de-trending) over the period 1960 to 2099. The models were then aggregated into an ensemble average, both at the global and at the grid-box level. Changes are thus given in units of standard deviations (see paragraph 1.3 of the technical fact sheet for further information).