

# Characteristic Analysis of Climatic Change in the Himalayan Region of China in the Past 37 Years

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## Abstract

Global warming has influenced the natural ecological system and the development of social economy, so climate change gets more and more attention of scholars and governments all over the world. In China, Asia, and even the entire northern hemisphere, the Himalayan region as an important part of "The third pole" on the earth is the "start area" and "adjust area" of climate change, therefore, it is very important for understanding the climate change situation comprehensively to analyze the characteristics of climate change. It also contributes to predicting the future climate variation tendency, providing the scientific basis for the evaluation of vulnerability and adaptability, and for the formulation of adaptation measures. Thereby, it will serve for local economic construction in this region.

Due to the limited sites and data deficiency, for easy analysis, the Himalayan region in this paper includes the whole Tibet Autonomous Region of China, and according to the characteristics of the Himalayas mountain, the study area is divided into three sections (west section, middle section and east section) by  $81^{\circ}07'E$  and  $88^{\circ}54'E$ . By the using of the temperature and precipitation of the 24 sites from 1971 to 2007 in the Himalayan region of china, the spatial and temporal characteristics and the trends of climate change in this region are analyzed in detail by Area of weight method, Five years sliding average method and Linear regression method, and the significance of the variation tendency is tested by F test.

The results show: 1) During the period of 1971~2007, climate warming is significant in the Himalayan region, with a mean temperature rise of  $1^{\circ}C$ , and mostly happened after 1990. The rate of temperature rise in the past 17 years ( $0.76^{\circ}C/10a$ ) is over twice as much as that in the past 37 years ( $0.33^{\circ}C/10a$ ), during which the warmest period is 2001~2007. Climate warming is mainly characterized by temperature rise in a whole year; especially in winter the temperature rises remarkably, with an increase of  $1.5^{\circ}C$ . In the Himalayan region, there is a significant spatial difference in temperature rise. During the period of 1991~2007, the rates of temperature rise are  $0.69^{\circ}C/10a$ ,  $0.76^{\circ}C/10a$  and  $0.93^{\circ}C/10a$  in the eastern, middle and western sections, respectively. It shows that the high-elevation area is highly sensitive to climatic change.

2) During the period of 1971~2007, there is an increasing trend in annual precipitation in the Himalayan region but it is not obvious. In the past 37 years, the linearly-increasing rate of

annual precipitation is only 4.3mm/10a. Before 1991, the linearly-increasing precipitation rate is 12.3mm/10a, whereas after 1991 it is 26.4mm/10a and increases rapidly. The summer precipitation plays a dominant role in the variation of annual precipitation and has the greatest contribution to the increase in annual precipitation. In the Himalayan region, there is a significant regional difference in the variation of precipitation. In the eastern section, the precipitation increases significantly at the rate of 14.3mm/10a, whereas in the middle section it decreases slightly and in the western section it decreases at the rate of 11.7mm/10a. In the western section of the Himalayan region, the decrease in annual precipitation is mostly caused by that in summer precipitation; in the middle section the precipitation decrease is mainly attributed to the decrease in autumn precipitation, whereas in the eastern section the annual precipitation increase mainly results from the increase of precipitation in the four seasons.

3) In summary, during the period of 1971~2007, the climatic change in the Himalayan region is mainly characterized by the combination of warming and wetting but the regional difference is significant. In the eastern section, the temperature rise is slow relatively while there is an increasing trend in precipitation, showing the relatively significant variation in warming and wetting; in the middle section, the temperature rise is relatively fast while the precipitation decreases slightly and shows a warming-drying trend; in the western section, the temperature rise is the fastest, while the precipitation decreases considerably and the climate gets warmer and dryer significantly.

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