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Atlantic Thermohaline Circulation and Abrupt Climate Changes

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Abstract: It is a highly controversial issue that there will be an abrupt and large climate change induced by the reorganization of the Atlantic thermohaline circulation in a warming climate. In order to understand this issue, the past abrupt climate change events and some hypotheses on the causes are first reviewed. Some recent research results from the McGill Earth System Modelling group on the past abrupt climate changes are then presented. Also, Southern-Northern Hemispheric teleconnections related to the reorganization of the Atlantic thermohaline circulation are summarized. Lastly, a discussion on our ability to predict such a future abrupt climate change is also given.

The studies on the past abrupt thermohaline circulation changes show that the background climates that are responsible for past abrupt thermohaline circulation changes are different from the modern climate and the future warm climate. Therefore, it is not possible to conclude that there will be such a future abrupt climate change, based on paleoclimate studies.

Although some climate models predict that the Atlantic thermohaline circulation will be weakened or even shut down by increased atmospheric CO₂ levels, we are still not sure that such an abrupt climate change will happen because more observational data are needed for us to validate model results and there are significant uncertainties in climate models.

Key words: Atlantic thermohaline circulation; abrupt climate changes; Southern-Northern Hemispheric teleconnections; McGill Earth System Modelling

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Responses of Oceans to Global Warming and Observation Evidence in the South China Sea

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Abstract: This paper reviews the observational results about the long-term variations of sea level, heat content, sea temperature, salinity and coral proxy, etc. in both the global ocean and regional basins. Moreover, the long-term variabilities of the temperature and salinity of the South China Sea (SCS) are analyzed. The results demonstrate that the sea water of the SCS intermediate layer become fresher significantly since the 1960s.

Key words: long-term variability; thermohaline; global warming; the South China Sea

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Latest Advances in Studies of the Global Temperature Variations for the Last Millennium

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Abstract: The report of National Research Council of the National Academies on the title of "Surface Temperature Reconstructions for the Last 2000 Years" is reviewed. Discussion is concentrated upon the following issues: the new evidence of global warming, three special periods (20th century warming, LIA, and MWP), and numerical simulations of temperature variations in the last millennium.

Key words: last millennium; temperature variations; 20th century warming; LIA; MWP

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Mechanisms and Simulations of Greenhouse Climate in the Cretaceous: A review

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Abstract: The Cretaceous is a typical period for greenhouse climate in geological history and has become an important paleoclimate simulation period in international paleoclimate modeling community. This paper reviews a series of Cretaceous climate simulations, discusses the climate model's developing, the paleoclimatic boundary conditions and the experiment designs, and analyzes the impacts and feedbacks of atmospheric greenhouse gases, topography, oceans and terrestrial ecosystems on the Cretaceous climate system. These simulations focused on the major factors driving Cretaceous climate changes and the critical time periods of the climate change, and tested the internal and external forcing in the earth climate system and the feedback effects among various spheres of the earth system, thus providing us an understanding of the mechanism of greenhouse climate and an important scientific basis for projection of the future climate changes.

Key words: the Cretaceous, greenhouse climate, paleoclimate simulation, driven mechanism

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Changes of Warmer Winter and Winter Temperature over China in the Past 50 Years

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Abstract: A reasonable warmer winter index (IWWI) in the framework of the three equiprobability categories (i.e. warmer, normal and colder categories) is proposed based on the winter temperature data observed at 565 stations in China during 1956-2005, where the IWWI is defined as the ratio of the station number of warmer category over the total number of stations. The results suggest that the trend of IWWI was consistent with that of the winter temperature on decadal time scale, and their rates of change were 10%/10a and 0.4°C/10a, respectively. It is found that only 13 warmer winter events in total were detected by IWWI over the past 50 years, and 85% of them occurred after 1986.

Key words: warmer winter index; winter temperature; interdecadal variation

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Tendency of Summer Rainfall at the Southern Foot of the Yanshan Mountains

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Abstract: Based on the summer rainfall data at the southern foot of the Yanshan Mountains and NCEP reanalysis data, by using statistical methods and contrast analysis, the evolutionary tendency of summer rainfall at the southern foot was analyzed. The results show as follow: the summer rainfall has shown an obviously linear decreasing tendency of 29 mm/10 a during the past 55 years, an abrupt climate change took place in the later 1970s. And change periods of the summer rainfall differ from those of the East Asian summer monsoon. The decrease of summer rainfall at the mountain foot is mainly due to the change of atmospheric circulation patterns over mid-latitudes of Asia and the Arctic region.

Key words: southern foot of the Yanshan Mountains; summer rainfall; East Asian summer monsoon

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Changes in Snow Covers and Snow Disasters in Winter in the South of Qinghai Province

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Abstract: Based on the data of air temperature, rainfall, and snow cover observed by meteorological stations in the pasturing area in the south of Qinghai Province from 1961 to 2005 and using the climate diagnosis method, the evolutionary characteristics of climate elements and the cause of change of snow disasters are analyzed. The results indicate that the station-times for occurrences of moderate snow, heavy snow and snow disasters showed a gradually increasing tendency in the pasturing area in the south of Qinghai from the 1960s to 1990s, and the snowfall and mean surface snow cover climatologically increased by 1.253 mm/10a and 8.246 cm/10a, respectively. The snow cover of single-stations about 4100 m altitudes increased significantly. And such a change is closely related to the decadal oscillations of climate.

Key words: snow cover; snow disasters; climate change; the south of Qinghai Province

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Variations of Spring Extreme Temperature Indexes in Northeast China and Their Relationships with the Arctic Oscillation

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Abstract: The long-term variation features of the spring temperature and extreme temperature indexes in Northeast China are analyzed and their contemporaneous and time-lagged relationships with the Arctic Oscillation (AO) index are investigated by using the daily temperature data from 1957 to 2000 at 32 stations in Northeast China. The results show that the spring daily temperature anomaly generally increases from higher latitudes to lower latitudes and from the east to the west, and it has been increasing in the recent years. The cold days and cold nights in spring exhibit decreasing tendencies, while the warm days and warm nights increasing ones. There is a closely positive correlation between the spring temperature in Northeast China and the spring AO index on yearly time scale. Besides, AO index and extreme temperature indexes have the same period and abrupt change date.

Key words: Northeast China; temperature in spring; the anomaly of daily temperature; skewness coefficient; extreme temperature index; Arctic oscillation index

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Climate Change and Its Impacts on Grain Production in Jilin Province

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Abstract: The climatological observation data, reanalysis data and grain/soybean yields per unit area are used to analyze and interpret the impacts of climate change on grain production in this paper. The results show that Jilin Province is the most remarkably temperature increase area in the growing season (May to September) in the Northern Hemisphere's middle latitudes after 1948. The region of the mid-west and south of Jilin Province and Liaoning Province is a distinctively, linearly decreasing trend area of annual precipitation, where climate change showed a dominant warm/drought trend; but the east of Jilin is a notably linear increase area of annual precipitation. The climate warming played an important role in the persistent increase in grain/soybean yield per unit area since the 1980's in Jilin's main production areas of grain, however, this beneficial function has become greatly weakened, and the grain/soybean yield per unit area starts to oscillate with annual precipitation from the end of 20th to the beginning of 21st centuries.

Key words: Jilin Province; climate change; grain production

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Extremely Climatic Change in 2006—A record year

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Abstract: Based on the World Meteorological Organization's (WMO) preliminary report on global climate for 2006 released on December 14, 2006, the main features of climate for 2006 are reviewed. The year 2006 is currently considered to be the fifth warmest year on record and it's been marked by warmest autumn in Europe, severe drought in Australia, extreme drought and heavy flooding in the Greater Horn of Africa, torrential rainfall in the Philippines and shrinking sea ice in the Arctic, etc.

Key words: the year 2006; climate change; extreme weather and climate events; the globe

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Progress on Negotiations About Reducing Emissions from Deforestation in Developing Countries

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Abstract: Deforestation especially in tropical developing countries is an important greenhouse gas emission source, secondary only to fossil fuel combustion. Reducing deforestation can contribute to the mitigation of the greenhouse gas emissions. Proposed by some enthusiastic countries, deforestation reduction in developing countries has been and will be in a long term, one of the hot topics of the Conference of Parties (Item 6). This paper reviews and analyzes proposals from parties on the deforestation reduction, and puts forward some issues deserved for consideration.

Key words: developing countries; deforestation reduction

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UK Greenhouse Gas Emissions Trading Scheme: Introduction and review

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Abstract: Greenhouse gas Emissions Trading Scheme (ETS) is a market-based environmental management. It gives companies flexibility to deliver emission reductions in a most cost-effective way. This paper details the framework of UK ETS, reviews its effectiveness and some existent problems.

Key words: greenhouse gas Emissions Trading Scheme (ETS); climate change; UK

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