Advances in Climate Change Research

Contents

Vol. 4 No. 6

Impacts of Climate Change on Water Resource of Miyun Reservoir and Adaptation Managements

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Abstract: A screening framework for assessing impacts of climate change on water resource of Miyun reservoir is briefly introduced. It is a systematic step-by-step scheme for assessing the impact of climate change and its adaptation responses. The assessment shows that water inflow to Miyun reservoir has been decreasing in recent years due to rainfall change and human activities. Climate change is projected to increase the reservoir's inflow in the long term (2050), but the inflow may continue to decline in the medium term (2025) under the SRES A2 scenario, necessitating adaptation measures to assure water supply to Beijing. Suggested comprehensive measures for adaptation management include: 1) converting paddy fields in the upper reaches to rain-fed farming land, with compensation paid to farmers; 2) constructing a water diversion channel of 160 km from the Luanhe River to the Chaohe River, which feeds Miyun reservoir; 3) constructing sewage treatment plants to increase effluent re-use.

Key words: impacts of climate change; Miyun reservoir; water resource; adaptation management

Impacts of Climate Change on Flood Control and Land Drainage Management Project in the Huaihe River Basin and Adaptive Measures

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Abstract: The Huaihe River Basin Flood Management and Drainage Improvement Project was taken as the study object. The characteristics of the geography, climate, economy, society, river systems and flood control systems etc. within the Huaihe River basin have been comprehensively analyzed. It is realized that, among the three types of floods in the Huaihe River basin, the flood caused by consecutive rainfall for more than one or two months may have the most obvious negative effect on the agricultural development in the low-lying areas and on the benefits of the project under the impacts of climate change. A semi-quantitative analysis for possible impacts of climate change is presented, and some adaptive measures of both enhancing the drainage capacity and raising the adaptive ability are put forward.

Key words: climate change; Huaihe River basin; flood control and land drainage; low-lying area; adaptive measures

Impacts of Climate Change on the Comprehensive Restoration Plan of the Shiyang River Basin

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Abstract: The Shiyang River Basin (SRB) Comprehensive Restoration Plan is a key strategy for protecting Minqin from desertification. Based on the SRES A2 and B2 scenarios, the trends of future climate changes and their impacts on the runoff of the SRB were analyzed. A water resource macroeconomic model was used to investigate the impacts of different runoff change scenarios on the SRB plan. It shows that if the runoff in the SRB reduces 15% in the future, the economic development (GDP) in present mode and in the restoration mode will be 29.8% and 7.2% lower than the normal, respectively. The comprehensive restoration of the SRB could enhance the capacity of resisting climate change risks, and mitigate climate change impacts on the socio-economy.

Key words: Shiyang River basin; river basin governance; climate change; impacts

Water Shortage and Adaptation Measures Under Climate Change: Simulation Analysis in the Haihe River Basin

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Abstract: Water shortage under climate change in the Haihe River basin and the effectiveness of adaptation measures were simulated and analyzed using China's Water Simulation Model. It shows that, with socio-economic development, water shortage in the Haihe River basin will increase by 25% in 2030, and climate change will further increase the shortage in water resources by 2%-4%. Both supply management measures and demand management measures can play important roles in mitigating water shortage. However, based on the multi-criteria assessment results, it is more feasible to implement demand management measures than supply management measures. For demand managements, the best policy is the mix water price policy through increasing both irrigation and industry water prices, and the next is adopting agricultural water-saving technology.

Key words: climate change; water shortage; adaptation measures; Haihe River basin

Influence of Climate Warming on the First Song Date of Cicadas in Henan Province

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Abstract: By using the climate and cicada (Cryptotympana atrata) phenological data in Zhumadian, Shenqiu and Taikang Prefectures of Henan Province in 1990-2004, the impact of climate warming on the first song date of cicadas was analyzed. The results show that the first song date of cicadas has advanced at each of the three sites under the climate warming. The mean temperature over March-June had a marked impact on the first song date of cicadas which was closely related to the effective accumulated temperature above 5℃ from Jan. 1 to the average first song date. The first song date of cicadas in each of the three sites was simulated and predicted using accumulated temperature method with 5℃ as the developmental threshold temperature and the first day when the daily mean temperature was above 5℃ as the start date. This method is superior to the average date method. However, the accuracy of the effective accumulated temperature method depends on the stability of effective accumulated temperatures.

Key words: climate warming; first song date of the cicada; phenology; accumulated temperature; simulate

Spatial and Temporal Variations in Windy Days over Category 5 in China During 1975-2005

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Abstract: Based on the daily maximum wind speed (10-minute mean) data of 397 stations in China, the climatological characters and the linear trends of windy days over category 5 were analyzed during 1975-2005. The results show that winds over category 5 occurred in most of northern China and in some local areas and the narrow coastal zone of southern China. The windy days were the most in spring, the next in summer, and the least in autumn. The ratio of annual windy days for category 5 to the total number of windy days over category 5 was greater in southern China than in northern China, but the opposite was true for the ratio of category 6. The windy days over category 5 generally showed linear decreasing trends during the past 30 years, and the decreasing trend was more remarkable in spring than in other seasons. The linear deceasing trend for category 5 was more distinctive than that for the other categories.

Key words: windy days; climatological characters; spatial distribution; trend

Simulation of Changes in Cold Events in Southern China Under Global Warming

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Abstract: Multi-decadal climate change simulations have been conducted over China using a regional climate model (the ICTP RegCM3) under the IPCC SRES A2 emission scenario. This paper focuses on future changes in cold events in southern China. The results show that the climate warming will lead to generally less cold days over the study region, but slightly increased consecutive cold days in some local areas of northern parts of Guangdong and Guangxi; and to less snow days and consecutive snow days, but increased intensity of snow events and consequently wider snow coverage over Jiangxi Province and parts of other southern provinces. The day number of ice rain will decrease in Hunan Province and the eastern part of Guizhou Province, while increase around the eastern edge of the Tibetan Plateau.

Key words: regional climate model; cold and snow events; southern China

Climate Change Due to Greenhouse Effects in Changjiang-Huaihe River Valley Projected by a Regional Climate Model

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Abstract: A regional climate model (PRECIS), developed by the UK's Hadley Center for Climate Prediction and Research, was used to simulate the climate in the Changjiang-Huaihe River valley. PRECIS' capacity for simulating present climate over the valley was firstly validated by comparing the simulations of temperature and precipitation with the observations during 1961-1990; the model was then used to project the climate change over 2071-2100 in the valley. The results give a regional annual average surface warming of 2.9℃ and a somewhat increase in precipitation under the SRES B2 emission scenario by the end of the 21st century (2071-2100). The results also present more extremely high temperature events during summer and fewer extremely cold events during winter. The number of days with heavy rain (especially above 120 mm/d) will be likely to increase.

Key words: climate change; regional climate model; PRECIS; CO_2; projection

Technologies for Monitoring Subsurface CO_2 Distribution and Local Environmental Effects of CO_2 Geological Storage

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Abstract: The geological storage of CO_2 is one of mitigation measures for greenhouse effect. In order to guarantee the effectiveness, safety and durability of the storage, some essential monitoring and management measures should be implemented for drilling wells (including injection wells and abandoned wells), subsurface CO_2 distribution and migration conditions, local environment effects of leaks from CO_2 reservoirs, and so on. On the basis of reviewing the related references, various monitoring technologies during CO_2 geological storage are summarized.

Key words:CO_2; geological storage; subsurface distribution; environment effects; monitoring technologies

Arguments on Oceanic Carbon Cycle of IPCC Assessments—A Test Using δ13C Budgets

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Abstract: By comparing the global carbon cycle of the IPCC assessment reports in 1990, 1996, 2001 and 2007, it is found that despite the estimated sizes of the main carbon reservoirs and the fluxes between them in four reports were similar, the estimated carbon fluxes between surface and intermediate-deep sea water were quite different. The d13C budget was used to test the reasonable range of these fluxes. It shows that the IPCC assessment reports in 1996 and 2007 have overestimated, whereas those in 1990 and 2001 underestimated the fluxes between surface and intermediate-deep sea water.

Key words: IPCC; CO_2 budgets; $\delta^{13}C$; isotope fractionation

Empirical Study on the CO_2 Environmental Kuznets Curve Based on Production- and Consumption-based CO_2 Emissions

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Abstract: Based on the perspectives of production and consumption, the intrinsic relationship between per capita GDP and CO_2 emissions per unit GDP has been analyzed

empirically. The panel unit root and co-integration property of per capita GDP and CO_2 emissions per unit GDP in 44 countries during 1990-2004 were firstly analyzed. It shows that the panel data is consistent with the general regression model. Then, the CO_2 environmental Kuznets curves (EKC) were simulated, and the simulation results indicate that whether it is production- or consumption-based CO_2 emission, the income-emission curve displays an inverted-U shape, which is conformed to the EKC. For most developing countries, the consumption-based CO_2 emission is significantly lower than the production-based CO_2 emission, indicating the net export of CO_2 emission embodied in the international trade, which has brought great challenges to the statistic system of CO_2 emissions only based on production perspective. Finally, based on the analysis of the CO_2 EKC, some suggestions for climate change mitigation and adaptation in China were put forward.

Key words: production-based CO_2 emission; consumption-based CO_2 emission; international trade; panel data; environmental Kuznets curve

Greenhouse Gas Emission Trend and Performance Progress of Annex I Countries

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Abstract: The latest data of greenhouse gas emissions published by UNFCCC Secretariat were analyzed using statistical methods. Results show that the total greenhouse gas emission of Annex I countries exhibited an overall decrease trend compared with 1990. The total emission of greenhouse gases from economies in transition (EIT) showed an obvious decease trend, but the total emission from non-EIT countries displayed a gradually increase trend. Especially, the greenhouse gas emissions of energy sector in the United States and Canada in 2005 increased by 19.2% and 28.6%, respectively, relative to 1990. However, the greenhouse gas emissions in Britain and Germany distinctively reduced by 7.8% and 17.4%, respectively. The actual greenhouse gas emissions in 2005 are lower than the target emissions in more than half of the Annex I countries, which is in good performance condition.

Key words: greenhouse gases; reduction of emissions; Annex I Parties; climate change; performance negotiations

Holocene Cold Events in the North Atlantic

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