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## **Forecasting of Consumption and Emission of HFC-134a Used in Automobile Air Conditioner Sector in China**

Hu Jianxin<sup>1</sup>, Wan Dan<sup>1</sup>, Li Chunmei<sup>2</sup>, Zhang Jianbo<sup>1</sup>, Yi Xu<sup>3</sup>

(1 College of Environmental Sciences & Engineering, Peking University, Beijing 100871, China;

2 Beijing Environmental Protection Supervision Team, Beijing 100044, China;

3 China Automobile Industrial Association, Beijing 100823, China)

**Abstract:** HFC-134a is the most important alternatives for CFC-12 used in automobile air-conditioning sector in China, and the consumption has been increasing rapidly in recent years; the consumption of HFC-134a is the largest one of HFCs consumptions. Choosing 2005 as the base line year, future consumption and emission amounts of HFC-134a are estimated through scenario analysis: use of non-HFC-134a blends, technology promotion, good practice in servicing, and government policies. The analysis shows that HFC-134a consumption and emission will continue increasing in the next 10 years; the estimated HFC-134a consumption will approach to 20 kt and 35 kt in 2010 and 2015, and the estimated emission will approach to 16 kt and 30 kt, amounting to 21.0 MtCO<sub>2</sub>-eq and 39.0 MtCO<sub>2</sub>-eq emissions, respectively. Compared with the BAU scenario (under the current policy and no recovery management), the emission reductions in 2010 and 2015 will be 6.7 MtCO<sub>2</sub>-eq and 13.0 MtCO<sub>2</sub>-eq, respectively.

**Key words:** automobile air-conditioner; greenhouse gas emission; HFC-134a emission reduction

## **An Analysis on Characteristics of Regional Acid Rain over China in 2007**

Hou Qing, Zhao Yanxia

(Key Laboratory for Atmospheric Chemistry, Centre for Atmosphere Watch and Services, Chinese Academy of Meteorological Sciences, China Meteorological Administration, Beijing 100081, China)

**Abstract:** Based on the observations of the acid rain network of China Meteorological Administration (CMA) from 1993 to 2007, after carefully contrast analysis, this paper draws the following three conclusions: firstly, the area of acid rain regions south of the Yangtze River in 2007 remained virtually unchanged in comparison with the past, while the intensity of acid rain in some stations reached a peak value; secondly, the rain acidity in northern China, especially in North China, increased markedly, and the frequencies of acid rain and severe acid rain in some of the stations in 2007 reached the maximum; thirdly, the average acid rain days and the ratio of acid rainfall to the total precipitation drastically increased year by year from 2004 to 2007. The average acid rain days in 2007 was the highest in the past 15 years, when the systemically observation data were available.

**Key words:** China; the year 2007; acid rain; characteristic

## **Analysis of Surface Air Temperature Change in Macau During 1901-2007**

Fong Soikun<sup>1</sup>, Wu Chisheng<sup>2</sup>, Wang Anyu<sup>2</sup>, He Xiajiang<sup>3</sup>, Wang Ting<sup>3</sup>, Leong Kacheng<sup>1</sup>, Lai Unman<sup>1</sup>, Leong Biqi<sup>2</sup>

(1 Macau Geophysical and Meteorological Bureau, Macau, China; 2 Departure of Atmospheric

Sciences, Sun Yat-Sen University, Guangzhou 510275, China; 3 Guangdong Meteorological Bureau, Guangzhou 510080, China)

**Abstract:** The climate change was studied on the basis of daily series of temperature observations over the period 1901-2007 in Macau. The result shows that annual mean surface air temperature in Macau as a whole rose by about 0.71 °C, with a warming rate of about 0.066°C/10a. The warming is far lower than the average values of the world. The most evident warming occurred in spring and winter. The interdecadal variations of the seasonal mean temperature in summer and winter appeared as a series of waves with a time scale of about 30 years and 60 years, respectively. Minimum temperature increased about twice as fast as maximum temperature, resulting in a broad decline in the diurnal temperature range. The interdecadal variations of maximum temperature are obviously different from those of minimum temperature. It appears that the recent trends in maximum temperature may be part of slow climate fluctuations, whereas the recent trends in minimum temperature are consistent with long-term trends.

**Key words:** surface air temperature change; climate warming; maximum temperature; minimum temperature; Macau

### **Reconstruction of the October Mean Temperature Since 1796 at Wuying from Tree Ring Data**

Yin Hong<sup>1,2</sup>, Guo Pinwen<sup>1</sup>, Liu Hongbin<sup>2</sup>, Huang Lei<sup>2</sup>, Yu Hongmin<sup>3</sup>, Guo Shiyou<sup>3</sup>, Wang Fang<sup>4</sup>

(1 Department of Atmosphere Sciences, Nanjing University of Information Science & Technology, Nanjing 210044, China; 2 National Climate Center, China Meteorological Administration, Beijing 100081, China;

3 Climate Center of Heilongjiang Province, Harbin 150001, China; 4 Meteorological Bureau of Yichun City, Yichun 153000, China)

**Abstract:** The growth of *Pinus koraiensis* at the Fenglin national natural reserve of Wuying, Heilongjiang Province, is significantly correlated with the local October temperature of previous year. The mean temperature of October in Wuying was reconstructed for the period of 1796-2004 using residual tree ring chronology. In addition, the temperature in the late dekad of April also affected the tree ring radial width to some extent. In the past 209 years, there were 4 colder periods and 4 warmer periods in the reconstructed series; the most significant period of 3.33 years was detected by the power spectrum method. The abrupt changes on 30-year time scale were also detected in the reconstructed series by the smoothing T-test, the smoothing F-test and the Lepage-test; the significant abrupt changes in mean value were presented in about 1871 and 1900, and the significant abrupt changes in standard deviation in about 1851.

**Key words:** Wuying; climate change; tree ring; temperature reconstruction

### **Spatial-Temporal Variations of Hazes in Shandong Province and Its Relationship with Climate Elements**

Wang Yehong<sup>1,2</sup>, Sheng Chunyan<sup>2</sup>, Yang Xiaoxia<sup>2</sup>, Gao Huijun<sup>2</sup>, Zhang Hua<sup>3</sup>

(1 Shandong Institute of Meteorology, Ji,nan 250031, China; 2 Shandong Provincial

Meteorological Observatory, Ji,nan 250031, China; 3 Laboratory for Climate Studies, National Climate Center, China Meteorological Administration, Beijing 100081, China)

**Abstract:** The characteristics of spatial-temporal variations of hazes in Shandong Province were analyzed by using the surface observation data from 1961 to 2005 and employing the EOF method as well as other statistical methods. The results indicate that the average annual haze days was higher in the middle and south of Shandong Province and lower in the north of Shandong Province and most of the Shandong Peninsula. Hazes mainly occurred in autumn and winter. Hazes showed a generally rising trend over the past 45 years, but a slightly falling trend after 2000. The inter-annual variation of hazes was obvious. When a haze occurred, the visibility mostly ranged from 5 to 10 km, and the relative humidity ranged from 70% to 90%. The day number of hazes was proportional to temperature, but inversely proportional to wind speed.

**Key words:** haze; EOF analysis; spatial-temporal variation; Shandong Province

### **Spatial-Temporal Variations of Solar Global Radiation in Yunnan Province During 1961-2007**

Wang Xuefeng, Zhu Yong, Fan Lizhang, Yang Pengwu, Yang Xiaopeng  
(Yunnan Climate Center, Kunming 650034, China)

**Abstract:** Based on the observation data of solar global radiation at 7 stations and relative sunshine at 113 stations of Yunnan Province, the time series of solar global radiation over the whole province during 1961-2007 were calculated. The characteristics of the spatial-temporal distribution and variation of solar global radiation were studied in the province as well as in the 4 climate subareas, which were determined by using the rotated principal component method. The main results are as follows: annual mean solar global radiation was more in the central part (I), next in the southwest part (IV), and least in the east part (II) and the northwest part (III) of Yunnan Province. The annual solar global radiation fluctuatedly declined at a mean rate of  $-0.64\%/10a$  in 1961-2007; it remarkably decreased in the central part and the east part, but slightly increased in the southwest part. Two abrupt climate changes of solar global radiation took place in the period of 1961-2007; the first abrupt decrease occurred in about 1986, and the second abrupt rise occurred in about 1993. The analysis results show that relative humidity and total cloud cover are the two important factors influencing the variations of solar global radiation.

**Key words:** Yunnan Province; solar global radiation; climate trend; abrupt change

### **Characteristics of Urban Heat-Island Intensity in Nanning City**

Chen Yeguo, Nong Mengsong  
(Guangxi Meteorological Observatory, Nanning 530022, China)

**Abstract:** An analysis was performed on the meteorological data from 10 auto-weather stations located in the urban and suburban areas of Nanning City from 2003 to 2006. It shows that urban heat-island intensity (UHI) in Nanning City had evident variations on daily, monthly and seasonal scales. On average, the UHI was larger for night-time, dry season (September-next January) and

autumn than that for day-time, wet season (February-August) and summer, respectively. Using different temperatures as indexes for HUI resulted in slight difference: HUIs for the minimum, maximum and mean temperature over 2003-2006 were 1.43°C, 0.94°C, and 0.28°C, respectively. According to the gray analysis of the meteorological factors for HUI effect, small wind speed and small relative humidity may result in a strong UHI in Nanning City.

Key words: heat-island effect; heat-island intensity; Nanning City

### **The Changing Tendency on the Depth and Days of Snow Cover in Northern Xinjiang**

Wang Qiuxiang<sup>1,2</sup>, Zhang Chunliang<sup>3</sup>, Liu Jing<sup>1</sup>, Liu Weiping<sup>1</sup>

(1 Xinjiang Meteorological Information Centre, Urumqi 830002, China; 2 Institute of Desert Meteorology, China Meteorological Administration, Urumqi 830002, China; 3 Xinjiang Weather Modification Office, Urumqi 830002, China)

Abstract: Based on the meteorological observations at 20 representative stations in Northern Xinjiang in 1961-2006, trends of snow cover (including the maximum depth, days of snow cover and steady snow cover) were investigated using the methods of autoregressive moving average model, second order principal value function, and correlation analysis. The results show that the maximum depth of snow cover was significantly positively correlated with winter precipitation; the maximum depth increased at an average annual growth rate of 0.8% in the past 46 years, which was smaller than that of winter precipitation. The day numbers of snow cover and steady snow cover were also significantly positively correlated with days of temperature steadily below 0 °C, but the increasing trend of snow cover days was not significant; the days of snow cover increased from the 1960s to the 1980s, but decreased after the 1990s.

Key words: Northern Xinjiang; snow cover; steady snow cover; maximum depth of snow cover; multi-year variations; tendency

### **Sulfate Aerosol's Effects on Global Hydrological Cycle**

Wu Pengping, Liu Yu

(Chinese Academy of Meteorological Sciences, Beijing 100081, China)

Abstract: The Community Atmosphere Model Version 3 (CAM3.0)'s simulation ability was evaluated by comparing its simulation results with the related satellite observation data. It was found that the CAM3.0 is able to satisfactorily reproduce the main characters of cloud distribution and its seasonal variations. The direct climate effect of sulfate aerosols on hydrological cycle was investigated through coupling the sulfate cycle with radiation and dynamic processes. The changes in the mass concentration and distribution of sulfate aerosols were simulated well. Sulfate aerosol's effects on hydrological cycle are different in different seasons and regions: the effect in the Northern Hemisphere is greater than that in the Southern Hemisphere in summer because the sulfate mass concentration is greater in the Northern Hemisphere. The trends of changes in cloud fraction, precipitation, and special humidity are mostly similar, indicating that there are close relationships among them.

Key words: sulfate aerosol; hydrological cycle; cloud fraction; precipitation; special humidity

### **Progress in Studies on Influences of Climate Change on Forest Fire Regime**

Zhao Fengjun<sup>1</sup>, Wang Mingyu<sup>1</sup>, Shu Lifu<sup>1</sup>, Wang Chunyi<sup>2</sup>

(1 The State Forestry Administration's Key Open Laboratory of Forest Protection Institute of Forest Ecology, Environment and Protection, Chinese Academy of Forestry, Beijing 100091, China; 2 Chinese Meteorological Society, Beijing 100081, China)

**Abstract:** In the last few years, the influence of climate change on forest fire regime has become a hot topic of research in China and overseas. The progress in this field has been reviewed from the aspects of data source, study methods, major research contents and conclusions. The current global warming has already had an important influence on forest fire regime. The forest fire frequency and intensity has increased in most areas of the world. Under expected warmer climate conditions in the future, the fire situation will be more serious with more and stronger fires in most areas of the world. However, the fire regime changes in some areas are still not clear due to the difference in regional climate change. The uncertainty of the conclusions under projected climate scenarios is introduced in this paper. The research gap in this field between China and foreign countries and its possible reasons are also discussed. Finally, future research directions are suggested.

**Key words:** climate change; forest fire regime; fire weather; fuel

### **The Year 2008: Global Warming Continued, Extreme Events Occurred Frequently**

Xu Yuqing, Miao Qiuju, Shen Yongping

(National Climate Center, China Meteorological Administration, Beijing 100081, China)

**Abstract:** The year 2008 is likely to rank as the 10th warmest year on record since the beginning of the instrumental climate records in 1850. The global combined sea-surface and land-surface air temperature for 2008 is currently estimated at 0.31°C above the 1961-1990 annual average of 14.00°C. Ten of the warmest years were all among the recent 12 years, indicating a continuous trend of global warming. Arctic sea ice extent during the 2008 melt season dropped to its second-lowest level since satellite measurements began in 1979. Climate extremes, including devastating floods, severe and persistent droughts, snow storms, heatwaves and cold waves, were recorded in many parts of the world. La Nina conditions gradually weakened from their peak strength in February, and near-neutral conditions prevailed during the later half of 2008. Antarctic ozone hole in 2008 is larger than that in 2007.

**Key words:** the year 2008; climate status; extreme event

### **Solar Constant**

Wang Shaowu: swwang@pku.edu.cn