城市气象科技信息监测简报

2023 年 4 月 （总第 22 期）

北京气象学会
北京城市气象研究院
中国气象局城市气象重点开放实验室

2023 年 5 月 6 日

前 言

2021年7月，依托北京城市气象研究院行业信息监测与分析系统，北京气象学会与支撑单位北京城市气象研究院联合制作了《城市气象科技信息监测简报》，定期为会员提供科技信息服务。简报每月一期，每期分为文献和咨询两类。

目前，学会主要依据城市气象领域的关键词搜索信息，并形成每月简报。欢迎各位会员向我们提供相关科技领域信息及其搜索关键词，不断扩充简报的专业领域范围，丰富简报的内容，以更好地满足广大会员朋友们对快速更新科技信息的需求。

同时，热诚欢迎广大会员对简报的科技信息内容、展现形式、阅读体验和收获感悟等提出建议和点评。编辑团队将遴选出优秀建议和点评内容刊载在简报上。

2020年12月，学会换届成立了第21届理事会，现拥有52 家理事单位和 947 名会员。我们希望借助此简报，为广大会员朋友们提供高质高效的科技信息服务，同时在大家的支持和帮助下，我们共同将简报建设成为会员交流的友好平台。

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❖报告概述

✧监测周期：

2023 年 04 月 01 日 - 2023 年 04 月 31 日

✧监测主题：

行业动态——新闻资讯、文献信息；

❖行业动态

✧新闻资讯

本监测周期内，城市气象资讯信息共更新 9 条

1. BAMS: 超级干旱：概念，监测指数与在线产品平台

摘要：什么是干旱中的极端事件？这个问题看似很简单，实际上却是深刻复杂的。一方面，与极端降水和极端温度的研究不同，干旱的独特性表现在多时间尺度特征或多类型性。水资源以不同的形式贮存在自然界中，包括降水、土壤水分、地下水、河流水、湖泊水库水等。不同形式的缺水就引起了不同类型干旱，如果考虑不同类型的干旱，其干湿状态可以完全不同。对于同一区域同一时间段，当一个水资源系统处于极端干旱时，另一个系统可以处于正常甚至湿润状态。那么，这种情况该如何界定干旱中的极端事件呢？另一方面，针对近十几年发生的超强破坏力干旱，多数研究工作使用某个指标“创历史最低值”来阐明极端性。然而，某个指标出现极端低值并不是罕见现象，尽管量值不及“历史最低值”，但相差并不显著，因此“量值微小的差异”不能解释“干旱事件影响的巨大差异”。所以，某个指标“达到历史最低值”并不反映干旱中极端事件的本质特征。为了从根本上解决上述极端干旱监测的两点关键科学问题，建立了“超级干旱”的概念和监测指标体系。超级干旱的内涵是不同时间尺度干旱，即气象、农业、水文干旱相互叠加，引起干旱灾害负面效应成倍放大所致。

来源：大气物理所

发布时间：2023-04-28

数据类型：资讯

http://www.iap.cas.cn/gb/xwdt/kyjz/202304/t20230428_6747588.html

2. 清华大学地学系阳坤研究组揭示遥感蒸散发和地表温度产品在改善陆面模型水热耦合模拟中的适用性

摘要：由于陆面过程表达和模型参数设定的不确定性，现有陆面模型中的水热耦合强度存在较大偏差，从而进一步影响地球系统模式中的陆气相互作用模拟。卫星遥感资料为纠正该耦合强度提供了重要参考，其中土壤水含量与蒸散发或地表温度日较差之间的耦合关系常被用于反映陆面水热耦合过程。这两种耦合关系的物理基础一致，即土壤水含量增加往往导致蒸散发增加，同时减小地表温度日较差；反之亦然（如图 1 所示）。但是，遥感蒸散发与陆面模型都基于相似的地表能量平衡假设，遥感蒸散发数据可能存在与陆面模拟相似的误差结构且难以被识别；地表温度日较差虽然更容易反演获取，但它在陆面模型中模拟难度大，在应用于模型校正时需要协调复杂的模型不确定性。那么如何协调遥感资料和模型中的不确定性并应用于陆面模型的水热耦合强度优化呢？图 1 示例格点的遥感蒸散发（ET）和地表温度日较差（dT）随遥感土壤水含量（SM）变化的关系。为回答上述问题，清华大学地学系阳坤教授研究组博士后周建宏与合作者设计了两组方案对陆面模型 NoahMP 的参数进行优化，两组方案的优化目标分别设置为遥感土壤水含量与地表温度日较差的相关系数和遥感土壤水含量与蒸散发的相关系数。结果表明，基于遥感土壤水含量-蒸散发相关系数的参数优化（OPT_ET）不仅可同时提高陆面模型蒸散发和地表温度日较差的模拟精度，还能改进陆面模型中植被蒸腾与蒸散发的比例，而基于遥感土壤水含量-地表温度日较差相关系数的优化（OPT_dT）对它们的模拟改进则不明显（图 2）。图 2 NoahMP 以及两种优化方案下的蒸散发（ET）偏差，地表温度日较差（dT）偏差和植被蒸腾与蒸发比例（Etr/ET）偏差。ET 偏差基于 144 个通量站的观测值得到，dT 偏差基于 MODIS dT 反演值得到，Etr/ET 偏差基于遥感 ET 产品 PML_v2 得到。为什么 OPT_dT 和 OPT_ET 两种方案下的模拟结果存在明显差异？这主要有两方面原因：一是模型中地表温度模拟具有较大不确定性，会直接影响到模型中土壤水含量-地表温度相关系数的稳定性，在不同近地层传输方案下表现出较大差异（图 3a）。

来源：清华大学

发布时间：2023-04-27

数据类型：资讯

http://www.dess.tsinghua.edu.cn/info/1108/5846.htm

3. WMO annual report highlights continuous advance of climate change

摘要：Geneva, 21 April 2023 (WMO) - From mountain peaks to ocean depths, climate change continued its advance in 2022, according to the annual report from the World Meteorological Organization (WMO). Droughts, floods and heatwaves affected

communities on every continent and cost many billions of dollars. Antarctic sea ice fell to its lowest extent on record and the melting of some European glaciers was, literally, off the charts.The State of the Global Climate 2022 shows the planetary scale changes on land, in the ocean and in the atmosphere caused by record levels of heat-trapping greenhouse gases. For global temperature, the years 2015-2022 were the eight warmest on record despite the cooling impact of a La Niña event for the past three years. Melting of glaciers and sea level rise - which again reached record levels in 2022 - will continue to up to thousands of years.“While greenhouse gas emissions continue to rise and the climate continues to change, populations worldwide continue to be gravely impacted by extreme weather and climate events. For example, in 2022, continuous drought in East Africa, record breaking rainfall in Pakistan and record-breaking heatwaves in China and Europe affected tens of millions, drove food insecurity, boosted mass migration, and cost billions of dollars in loss and damage,” said WMO Secretary-General Prof. Petteri Taalas.“However, collaboration amongst UN agencies has proven to be very effective in addressing humanitarian impacts induced by extreme weather and climate events, especially in reducing associated mortality and economic losses.

来源：WMO

发布时间：2023-04-21

数据类型：资讯

https://public.wmo.int/en/media/press-release/wmo-annual-report-highlights-continuous-advance-of-climate-change

4. China commits to Early Warnings for All

摘要：China has committed its full support to the UN’s Early Warnings for All Initiative which seeks to ensure that everyone is covered by warnings of potentially dangerous weather by the end of 2027.At the Belt and Road Forum on Early Warnings for All, the World Meteorological Organization, the Ministry of Ecology and Environment of the People's Republic of China and the China Meteorological Administration signed a cooperation agreement on supporting this UN initiative.“Earlier Warning, smarter action, higher resilience for a safer world,” was the slogan of the Beijing Statement on Early Warnings for All under Belt and Road Initiative issued on 12 April as part of the Belt and Road Initiative. It stresses the importance of early warnings and of deep, rapid and sustained efforts across the board to cope with climate change.WMO Secretary-General Prof. Petteri Taalas met Chinese Vice Premier Liu Guozhong, who stressed that China

attaches great importance to international meteorological cooperation.Liu said the Chinese government actively supports the UN's Early Warnings for All Initiative and stands ready to work with WMO.“China is a very strong player in meteorology and we are very pleased that you are able to share your expertise with other countries. This kind of expertise is very much needed in less developed countries to promote climate adaptation capacity and resilience to high-impact weather events. Now we have the Early Warnings for All and that is a great opportunity to implement the Belt and Road initiative,” said Prof.

来源：WMO

发布时间：2023-04-18

数据类型：资讯

https://public.wmo.int/en/media/news/china-commits-early-warnings-all

5. It was the second joint warmest March on record

摘要：The world had the second warmest March on record and Antarctic sea ice was the second lowest on record, according to two internationally recognized datasets which feed into WMO’s State of the Global Climate reports.Antarctic sea ice extent continued to hover near record low levels, ranking as the second-smallest March extent on record, according to the reports from the EU Copernicus Climate Change Service (C3S) and the US National Atmospheric and Oceanic Administration (NOAA).There were three named storms which reached major tropical cyclone strength. The exceptionally long-lived Tropical Cyclone Freddy in the South Indian Ocean set a record for the largest amount of accumulated cyclone energy (ACE), an integrated metric of the strength, frequency and duration of tropical storms, for any storm on record. A WMO Expert Committee is examining whether Freddy, which caused serious loss of life and major flooding in Madagascar, Malawi and Mozamibique, set a record as the longest-lasting tropical cyclone.March 2023 - temperature highlights:The month was jointly the second warmest March globally, according to Copernicus which is operated by ECMWF. NOAA said it was the second warmest.Temperatures were above average over southern and central Europe, and below average over most of northern EuropeIt was much warmer than average over a vast swathe of land covering North Africa, south-western Russia and most of Asia, where many new high temperatures records for March were setMuch above-average temperatures also occurred over north-eastern North America, Argentina and neighbouring countries, a large part of Australia, and coastal Antarctica Conversely, it was much colder than average over western and central North America March 2023 – hydrological variables highlights:In

March 2023, it was wetter than average in a west-to-northeast band across northern Europe, and over Türkiye. Regions experiencing drier-than-average conditions during March 2023 included most of the Iberian Peninsula, where conditions were conducive to wildfires, the Alpine arc, parts of Central Europe, the eastern Balkans, and the north-western coast of the Caspian Sea. Beyond Europe, in March 2023 it was wetter than average over parts of the USA, several regions of Asia, the Horn of Africa, New Zealand, northern Australia, part of southern Africa, and Brazil.

来源：WMO

发布时间：2023-04-13

数据类型：资讯

https://public.wmo.int/en/media/news/it-was-second-joint-warmest-march-record

6. Predictive power of climate models may be masked by volcanoes

摘要：Simulated volcanic eruptions may be blowing up our ability to predict near-term climate, according to a new study published in Science Advances. The research, led by the National Center for Atmospheric Research (NCAR), finds that the way volcanic eruptions are represented in climate models may be masking the models' ability to accurately predict variations in sea surface temperatures in the tropical Pacific that unfold over multiple years to a decade. These decadal variations in sea surface temperatures in the tropical Pacific are linked to climate impacts across the globe, including variations in precipitation and severe weather. Accurate predictions, therefore, could provide community leaders, farmers, water managers, and others with critical climate information that allows them to plan years in advance. "Near-term climate prediction on annual to decadal timescales is a rapidly growing and important field in the climate community because it bridges the gap between existing seasonal forecasts and centennial climate projections," said Xian Wu, who led the study as a postdoctoral researcher at NCAR. "When we rely on models to make these predictions, it's important to carefully consider the model's fidelity. In this case, we found that model errors in simulating the response to volcanic eruptions degraded our prediction skill."This research was funded by the U.S. National Science Foundation, which is NCAR's sponsor, the U.

来源：NCAR

发布时间：2023-04-12

数据类型：资讯

https://news.ucar.edu/132890/predictive-power-climate-models-may-be-masked-volcanoes

7. Protection from climate change requires strong health systems

摘要：The health impacts of climate change will not be addressed without strong public health systems. To mark World Health Day on 7 April, the joint WMO-WHO Office on Climate and Health took a look at the role of universal health care systems in protecting people from the myriad of growing health risks tied to our changing environment.Our health, at the mercy of climate changeA community health center becomes flooded and loses power during a severe storm and is unable to provide essential obstetrics care and treat the injured people showing up for help. An agriculture worker experiences heat stroke, but is unable to receive life saving medical treatment without access to health insurance and ambulatory care. A national health system overwhelmed by a cholera outbreak following a flood finds little capacity to focus on other health crises.These scenarios are just a few examples of the wide range of impacts the health sector faces as it increasingly grapples with extreme weather, disease epidemics, displacements, economic downturns, and infrastructure failures driven by climate change. When these shocks occur, critical services can be hindered just as people need them most – compounding risk and resulting in more illness and lives lost.Strong and resilient health systems provide climate change protectionsThe importance of access to health services and information as a basic human right is universal, but we are still far from achieving universal health coverage. 30% of the global population is still unable to access essential health services, and almost two billion people face catastrophic or impoverishing health spending – with disproportionate impacts hitting those in the most vulnerable settings.While those without universal health coverage face greater barriers to accessing care overall, service delivery can be severely impacted by climate hazards even in areas where healthcare is advanced, accessible and affordable.

来源：WMO

发布时间：2023-04-11

数据类型：资讯

https://public.wmo.int/en/media/news/protection-from-climate-change-requires-strong-health-systems

8. Foreign emissions exacerbate PM2.5 pollution in China through nitrate chemistry

摘 要 ：Jun-Wei Xu1, Jintai Lin1*, Gan Luo2, Jamiu Adeniran1, Hao Kong11Laboratory for Climate and Ocean–Atmosphere Studies, Department of Atmospheric and Oceanic Sciences, School of Physics, Peking University, Beijing, China2Atmospheric Sciences Research Center, University at Albany, Albany, NY, USACorrespondence: Jintai Lin (linjt@pku.edu.cn).AbstractFine particulate matter (PM2.5) pollution is a severe problem in China. Research on the sources of Chinese PM2.5 pollution has focused on the contributions of China's domestic emissions. However, the impact of foreign anthropogenic emissions has typically been simplified or neglected, partly due to the perception that the short lifetime of PM2.5 (a few days) does not allow long-distance transport. Here we explore the role of foreign anthropogenic emissions in Chinese PM2.

来源：北京大学资讯

发布时间：2023-04-07

数据类型：资讯

https://www.atmos.pku.edu.cn/kxyj/kyjz/148513.htm

9. WMO supports Net Zero Energy Transition

摘要：The World Meteorological Organization is stepping up its activities to promote tailored weather and climate information and forecasts to support the transition to renewable energy and away from polluting fossil fuels.Reaching net zero by 2050 will mean a complete transformation of our global energy system, with a switch to lower emissions electricity production and increased energy efficiency.But the transition to clean energy calls for investment in improved weather, water and climate services that can be used to ensure that our energy infrastructure is resilient to climate-related shocks, to inform on measures to increase energy efficiency across multiple sectors, and to harness renewable sources of energy. A new WMO publication, Integrated Weather and Climate Services in Support of Net Zero Energy Transition provides guidelines and examples of best practices of these services. It harnesses the expertise of nearly 50 authors coordinated by the WMO services commission Study group for Integrated energy services."This publication provides well-timed support for this crucial decade of energy transition to net zero. By enabling WMO Members and their National Meteorological and Hydrological Services, as well as energy sector companies and practitioners, to deliver and use integrated weather and climate services, national strategies on clean and sustainable energy for all can be achieved in a timely and effective manner," says Prof. Petteri Taalas, WMO Secretary-

General.WMO organized a webinar to launch the publication on 29 March. The event included speakers from meteorological services providers and energy sector users who highlighted the importance of integrated energy services for building decarbonized and resilient energy systems.

来源：WMO

发布时间：2023-04-03

数据类型：资讯

https://public.wmo.int/en/media/news/wmo-supports-net-zero-energy-transition

✧文献信息

城市边界层

本监测周期内，文献信息共更新 17 条：

Recent Progress in Atmospheric Chemistry Research in China: Establishing a Theoretical Framework for the "Air Pollution Complex"

摘要：Atmospheric chemistry research has been growing rapidly in China in the last 25 years since the concept of the "air pollution complex" was first proposed by Professor Xiaoyan TANG in 1997. For papers published in 2021 on air pollution (only papers included in the Web of Science Core Collection database were considered), more than 24 000 papers were authored or co-authored by scientists working in China. In this paper, we review a limited number of representative and significant studies on atmospheric chemistry in China in the last few years, including studies on (1) sources and emission inventories, (2) atmospheric chemical processes, (3) interactions of air pollution with meteorology, weather and climate, (4) interactions between the biosphere and atmosphere, and (5) data assimilation. The intention was not to provide a complete review of all progress made in the last few years, but rather to serve as a starting point for learning more about atmospheric chemistry research in China. The advances reviewed in this paper have enabled a theoretical framework for the air pollution complex to be established, provided robust scientific support to highly successful air pollution control policies in China, and created great opportunities in education, training, and career development for many graduate students and young scientists. This paper further highlights that developing and low-income countries that are heavily affected by air pollution can benefit from these research advances,

来源：Springer

发布时间：2023-04-28

数据类型：期刊

https://link.springer.com/article/10.1007/s00376-023-2379-0

Air pollution and associated health impact and economic loss embodied in inter-provincial electricity transfer in China

摘要：Highlights•Air pollution and health loss embodied in electricity transfer in China are assessed.•Virtual air pollutant emissions exhibited an eastward and southward transfer pattern.•Electricity transfer increased PM2.5-related deaths by 3600 and 345 million USD economic loss in 2016.•Health loss increased in interior regions and reduced in coastal regions owing to electricity transfer.As the largest producer and consumer of coal in the world, China heavily relies on coal resources for thermal power generation. Owing to the unbalanced distribution of energy resources, electricity transfer among regions in China plays a key role in promoting economic growth and ensuring energy safety. However, little is known about air pollution and the related health impacts resulting from electricity transfer. This study assessed PM2.5 pollution and related health and economic losses attributable to the inter-provincial electricity transfer in mainland China in 2016. The results show that a large amount of virtual air pollutant emissions were transferred from energy-abundant northern, western and central China to well-developed and populated eastern coastal regions. Correspondingly, the inter-provincial electricity transfer dramatically reduced the atmospheric levels of PM2.5 and related health and economic losses in eastern and southern China, while increasing those in northern, western and central China. The health benefits attributable to inter-provincial electricity transfer were mainly

来源：sciencedirect

发布时间：2023-04-24

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0048969723022738

A comprehensive SERS, SEM and EDX study of individual atmospheric PM2.5 particles in Chengdu, China

摘 要：Highlights•A SERS approach regarding of atmospheric environmental pollutant, PM2.5•A rapid, sensitive and non-destructive analysis of chemical properties of PM2.5•The inverted Au hole array was used to directly load PM2.5 without pretreatment.•A holistic physical and chemical characterization of PM2.5•The analytical method of PM2.5 by combining SERS with SEM and EDXCharacterization of atmospheric fine particulate matter (PM2.5) in large cities has important implications for the study of their sources and formation mechanisms, as well as in developing effective measures to control air pollution. Herein, we report a holistic physical and chemical characterization of PM2.5 by combining surface-enhanced Raman scattering (SERS) with scanning electron

microscopy (SEM) and electron-induced X-ray spectroscopy (EDX). PM2.5 particles were collected in a suburban area of Chengdu, a large city in China with a population over 21 million. A special SERS chip composed of inverted hollow Au cone (IHAC) arrays was designed and fabricated to allow direct loading of PM2.5 particles. SERS and EDX were used to reveal the chemical composition, and particle morphologies were analyzed from SEM images. SERS data of atmospheric PM2.5 indicated qualitatively the presence of carbonaceous particulate matter, sulfate, nitrate, metal oxides and bioparticles. The EDX showed the presence of the elements C, N, O, Fe, Na, Mg, Al, Si, S, K, and Ca in the collected PM2.5. Morphology analysis showed that the part

来源：sciencedirect

发布时间：2023-04-24

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S004896972302288X

Peculiar weather patterns effects on air pollution and COVID-19 spread in Tokyo metropolis

摘要：Highlights•PM2.5 particles and high urban heat may triger COVID-19 pandemic disease in Tokyo.•Tokyo peculiar synoptic atmospheric low-pressure systems enhance COVD-19 incidence.•Summer heat waves 2022 had high impact on the seventh COVID-19 wave in Tokyo.•It is mandatory need the reduction of air pollution during persistent anticyclonic conditions.As a pandemic hotspot in Japan, between March 1, 2020–October 1, 2022, Tokyo metropolis experienced seven COVID-19 waves. Motivated by the high rate of COVID-19 incidence and mortality during the seventh wave, and environmental/health challenges we conducted a time-series analysis to investigate the long-term interaction of air quality and climate variability with viral pandemic in Tokyo. Through daily time series geospatial and observational air pollution/climate data, and COVID-19 incidence and death cases, this study compared the environmental conditions during COVID-19 multiwaves. In spite of five State of Emergency (SOEs) restrictions associated with COVID-19 pandemic, during (2020–2022) period air quality recorded low improvements relative to (2015–2019) average annual values, namely: Aerosol Optical Depth increased by 9.13% in 2020 year, and declined by 6.64% in 2021, and 12.03% in 2022; particulate matter PM2.5 and PM10 decreased during 2020, 2021, and 2022 years

by 10.22%, 62.26%, 0.39%, and respectively by 4.42%, 3.95%, 5.76%. For (2021–2022) period the average ratio of PM2.5/PM10 was (0.319 ± 0.1640), showing a higher con

来源：sciencedirect

发布时间：2023-04-18

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0013935123006990

A New Stable Boundary Layer Parameterization for Numerical Weather Prediction Models: A Heat Flux Budget Approach

摘要：The present study introduces a new boundary layer parameterization for weather and forecasting models. It is implemented here as a boundary layer module in Weather Research and Forecasting (WRF) model. The main novelty in the new scheme is that it includes prognostic equations for the heat flux and temperature variance, being the first WRF boundary layer scheme with that feature. This is specially aimed at improving the representation of nocturnal stable boundary layer and of its turbulence regimes, weakly and very stable. The effort is supported by previous studies that found that the two regimes and the transitions between them are better represented by simplified numerical schemes that represent the interactions between the surface and the air adjacent to it when the heat flux and temperature variance are solved prognostically. The results show that the two regimes are adequately simulated by the new scheme. Such an evaluation is presented in terms of the relationship between the turbulence velocity scale and mean wind speed, of the dependence of the potential temperature gradient near the surface and the mean wind speed, and by the relationship between flux and gradient Richardson numbers. In the new scheme, the relationship between thermal structure and the mean and turbulent flows arises naturally from the heat flux prognostic equation, not being arbitrarily imposed by an empirical stability function.

来源：Springer

发布时间：2023-04-17

数据类型：期刊

https://link.springer.com/article/10.1007/s10546-023-00810-4

Impacts of land use and land cover changes on local meteorology and PM2.5 concentrations in Changchun, Northeast China

摘要：Land use and land cover (LULC) changes have a considerable influence on the surface energy balance, altering regional meteorology and air quality. However, this impact is not quantified in Changchun, an important city in the old industrial base of Northeast China. In this study, based on the Weather Research and Forecasting-Community Multiscale Air Quality (WRF-CMAQ) model, the LULC2017 (LULC data in 2017) and LULC2001 (LULC data in 2001) scenarios were simulated for January and July 2017, respectively, to assess the impact of LULC changes on meteorology and fine particulate matter (PM2.5) concentrations in Changchun. The results show that the sensible heat flux in the urban expansion area (UEA) increased during the daytime, reaching a maximum value of 154 W/m2 and 162 W/m2, respectively, while the latent heat flux decreased during the daytime, reaching a maximum value of 22.84 W/m2 and 180.75 W/m2, respectively. Consequently, 2 m temperature (T2) increased by 4 °C and 3 °C, respectively; 10 m wind speed (WS10) increased by 1.05 m/s and 1.60 m/s, respectively; and planetary boundary layer height (PBLH) increased by 100 m and 117 m, respectively. These variations in meteorological factors can substantially impact the spatial distribution of air pollutants. In the UEA, PM2.5 concentrations decreased by 34 μg/m3 and 20 μg/m3 in January and July, respectively. The change in SO42− accounted for approximately 25% of the total concentration change of PM2.5, with a decrease of approx

来源：sciencedirect

发布时间：2023-04-15

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0169809523001564

Characteristics and sources of PM2.5-bound elements in Shanghai during autumn and winter of 2019: Insight into the development of pollution episodes

摘要：Highlights•Ship emissions, coal combustion, soil dust, vehicle and industrial emissions were the major sources of PM2.5 elements.•The development of pollution events was explained using high-time resolution data of elements and major components.•Local accumulation and regional transport dominated different stages of winter PM2.5 events.Elemental composition of PM2.5 dispersed in the atmosphere has received increasing attention due to its health effect and catalytic activities. In this study, the characteristics and source apportionment of PM2.5-bound elements were investigated

using hourly measurements. K is the most abundant metal element, followed by Fe > Ca > Zn > Mn > Ba > Pb > Cu > Cd. With an average of 8.8 ± 4.1 ng m−3, Cd was the only element whose pollution level exceeded the limits of Chinese standards and WHO guidelines. The concentrations of As, Se, and Pb doubled in December compared to November, indicating a large increase in coal consumption in winter. The enrichment factors of As, Se, Hg, Zn, Cu, Cd, and Ag were larger than 100, indicating that anthropogenic activities greatly affected them. Ship emissions, coal combustion, soil dust, vehicle emissions, and industrial emissions were identified as major sources of trace elements. In November, the pollution from coal burning and industrial activities was significantly reduced, demonstrating the remarkable achievement of coordinated control measures. For the first time, hourly measurements of PM2.5-bound elements

来源：sciencedirect

发布时间：2023-04-12

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S004896972302051X

Transport matrix of PM2.5 in Beijing-Tianjin-Hebei and Yangtze River Delta regions: Assessing the contributions from emission reduction and meteorological conditions

摘要：Both meteorological changes and emission control have significant impacts on PM2.5 concentration and regional transport contribution, where it is important to clarify the relationship among them for air pollution control. In this paper, the WRF-CAMx coupled with a set of simulation scenarios was employed for decomposing the contributions of meteorological conditions, emission, and regional transport considering transport matrix to PM2.5 concentration in the Beijing-Tianjin-Hebei (BTH) and Yangtze River Delta (YRD) regions during 2013–2017. The results show that the local contributions occupied the primary position in PM2.5 concentrations in the BTH and YRD regions, reaching 57.9% and 58.1% in 2017, respectively. In terms of regional transports, they were mainly from Shandong Peninsula (SP) and Fen Nutrient Plain (FNP) for BTH, while Central triangle Region (CTR) and SP for YRD. Analysis of typical representative months suggested that in January, the concentration of local contribution reached peak. In addition, the results also show that when the intensity of emission reduction increased, the proportion of local contribution increased significantly while the local absolute contribution

concentration decreased correspondingly. The meteorological conditions had little impact on transport matrix dominated by local contribution, whereas, the more favorable the meteorological diffusion conditions, the lower the contribution ratio of the out-of-region transport and the lower the co

来源：sciencedirect

发布时间：2023-04-11

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S1352231023002017

Nighttime–daytime PM10 source apportionment and toxicity in a remoteness inland city of the Iberian Peninsula

摘要：Highlights•PMF was applied to PM10 samples segregated by day and night periods.•Traffic was found to be the main source during the day representing 33% of the PM10.•Biomass burning was the main contributor to exceedances of PM10 limit values.•70% of the samples were classified as toxic.•Toxicity was mainly attributed to biomass burning.The distribution of daytime and nighttime sources of PM10 collected from January to March 2021 at an urban background site in the city of Bragança, Portugal, was performed using positive matrix factorisation (PMF). Additional data of PM2.5, NOx and meteorological variables were collected to support the interpretations. A solution with 5 factor profiles was found: traffic (33%), dust (24%), biomass burning (21%), secondary inorganic aerosol (SIA) (12%) and sea salt (10%). Mean daytime and nighttime PM10 concentrations were 43.1 μg m−3 and 46.1 μg m−3, respectively. Nighttime concentrations were dominated by residential biomass combustion. Vehicle traffic and dust factors showed significantly greater contributions during the day (+12% and +4%, respectively), suggesting that exhaust and non-exhaust emissions and long-range transport are important contributors to daytime PM10 levels. In contrast, there were no significant differences between day and night for SIA and sea salt. Exceedances of the daily limit to PM10 (50 μg m−3) and PM2.5 (15 μg m−3) were observed in 22 (33%) and 27 (40%) days of the campaign, respectively, mostly associated with bio

来源：sciencedirect

发布时间：2023-04-11

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S1352231023001978

The spatiotemporal variation of PM2.5-O3 association and its influencing factors across China: Dynamic Simil-Hu lines

摘要：Highlights•The spatio-temporal pattern of PM2.5-O3 associations in China was revealed.•Associations changed from negative in northwest to positive in southeast.•The dividing lines between positives and negatives changed with seasons.•The dividing lines are parallel to the famous Hu Line from Heihe to Tengchong.•Determinants for this pattern are quantities of rainfall, temperature and humidity.In recent years, PM2.5 and O3 composite airborne pollution has become one of the most severe environment issues in China. To get a better understanding and tackle these problems, we employed multi-year data to explore the spatiotemporal variation of the PM2.5–O3 relationship in China and investigated its major driving factors. Firstly, interesting patterns were found that named dynamic Simil-Hu lines, which presented a combined effect of natural and anthropogenic influences, were closely related to the spatial patterns of PM2.5-O3 association across seasons. Furthermore, regions with lower altitudes, higher humidity, higher atmospheric pressure, higher temperature, fewer sunshine hours, more accumulated precipitation, denser population and higher GDP often show positive PM2.5-O3 associations, regardless of seasonal variations. Amongst these factors, humidity, temperature and precipitation were dominant factors. This research suggests that the collaborative governance of composite atmospheric pollution should be implemented dynamically, in consideration of geographical locations, meteorol

来源：sciencedirect

发布时间：2023-04-07

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0048969723019654

Tracing the sources of PM2.5-related health burden in China

摘要：Fine particulate matter (PM2.5) poses a major environmental risk to human health. We estimated PM2.5-related premature deaths in 30 Chinese provinces in 2020 using an integrated exposure response model based on monitored concentrations and obtained regional and sectoral contributions based on the atmospheric transport of the atmospheric transport contribution matrix. From the perspective of regional- and sectoral-scale effects, the results revealed that 740,140 [95% confidence interval (CI):646,538–839,968] premature deaths were related to PM2.5 in 2020, mainly in East (30%), Central

(18%), and North (15%) China. Manufacturing activity was found to be the major cause of PM2.5-related premature deaths, accounting for over 50% of the deaths. From the perspective of the interregional atmospheric transport effect, although local emissions were the major source of PM2.5-related premature deaths in all regions, non-local emissions contributed approximately 30%. The overall trend in the net atmospheric transport direction was from north to south. In particular, the Guangdong, Guangxi, and Hainan provinces of South China received contributions of more than 40% from non-local provinces, mainly from the East and Central China. Combined with economic data, the regions and sectors with the highest PM2.5-related premature deaths per unit output or consumption include the manufacturing and household sectors in North and Northeast China and transportation, agriculture, and electricity in Ce

来源：sciencedirect

发布时间：2023-04-06

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0269749123005468

Long-term exposure to air pollution and COVID-19 severity: A cohort study in Greater Manchester, United Kingdom

摘要：Highlights•This is a retrospective cohort study covering an entire UK region (Greater Manchester).•Long-term exposure to particulates was associated with COVID-19 severity.•SO2 and benzene had stronger associations than NO2 to COVID-19 severity.•Old, obese and smokers are most susceptible to air pollution-associated COVID-19.Exposure to outdoor air pollution may affect incidence and severity of coronavirus disease 2019 (COVID-19). In this retrospective cohort based on patient records from the Greater Manchester Care Records, all first COVID-19 cases diagnosed between March 1, 2020 and May 31, 2022 were followed until COVID-19 related hospitalization or death within 28 days. Long-term exposure was estimated using mean annual concentrations of particulate matter with diameter ≤2.5 μm (PM2.5), ≤10 μm (PM10), nitrogen dioxide (NO2), ozone (O3), sulphur dioxide (SO2) and benzene (C6H6) in 2019 using a validated air pollution model developed by the Department for Environment, Food and Rural Affairs (DEFRA). The association of long-term exposure to air pollution with COVID-19 hospitalization and mortality were estimated using multivariate logistic regression models after adjusting for potential individual, temporal and spatial confounders. Significant positive associations

were observed between PM2.5, PM10, NO2, SO2, benzene and COVID-19 hospital admissions with odds ratios (95% Confidence Intervals [CI]) of 1.27 (1.25–1.30), 1.15 (1.13–1.17), 1.12 (1.10–1.14), 1.16 (1.14–1.18), and

来源：sciencedirect

发布时间：2023-04-06

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0269749123005961

Mapping nighttime PM2.5 concentrations in Nanjing, China based on NPP/VIIRS nighttime light data

摘要：Fine inhalable particulate matter (PM2.5) is one of the major air pollutants that affect human health and the environment. Detailed knowledge of the spatial distribution of PM2.5 is meaningful for the prevention and control of air pollution. Satellite remote sensing has become an effective way to observe PM2.5 concentrations. However, most studies have focused on mapping PM2.5 concentrations from satellite-derived daytime aerosol optical depth (AOD), which cannot effectively depict the nighttime atmospheric environment. This paper aims to develop a method to derive nighttime PM2.5 concentrations in Nanjing, China, using the National Polar-orbiting Partnership (NPP)/Visible Infrared Imaging Radiometer Suite (VIIRS) nighttime light remote sensing data during September–December 2020. The relationship between the satellite at-sensor radiance, PM2.5 concentrations and other environmental factors was first explored based on the nighttime radiative transfer equation. Taking into account the pixel direct radiation and the background scattered radiation, the spatial independent variables for estimating nighttime PM2.5 were determined. Five machine learning algorithms and multiple linear regression (MLR) were employed to develop models to estimate nighttime PM2.5 concentrations. The results showed that the MLR model had obviously lower accuracy than the machine learning models, and the RF model outperformed the other models, with a coefficient of determination (R2) of 0.81 and a mean a

来源：sciencedirect

发布时间：2023-04-05

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S1352231023001930

Dependency of vertical velocity variance on meteorological conditions in the convective boundary layer

摘要：Measurements of vertical velocity from vertically pointing Doppler lidars are used to derive the profiles of normalized vertical velocity variance. Observations were taken during the FESSTVaL (Field Experiment on Submesoscale Spatio-Temporal Variability in Lindenberg) campaign during the warm seasons of 2020 and 2021. Normalized by the square of the convective velocity scale, the average vertical velocity variance profile follows the universal profile of Lenschow et al. (1980). However, daily profiles still show a high day-to-day variability. We found that moisture transport and the content of moisture in the boundary layer could explain the remaining variability of the normalized vertical velocity variance. The magnitude of the normalized vertical velocity variance is highest on clear-sky days and decreases as the absolute humidity increases and surface latent heat flux decreases on cloud-topped days. This suggests that moisture content and moisture transport are limiting factors for the intensity of turbulence in the convective boundary layer. We also found that the intensity of turbulence decreases with an increase in the boundary layer cloud fraction during FESSTVaL, while the latent heating in the cloud layer was not a relevant source of turbulence in this case. We conclude that a new vertical velocity scale has to be defined that would take into account the moist processes in the convective boundary layer.

来源：ACP

发布时间：2023-04-05

数据类型：期刊

https://acp.copernicus.org/articles/23/4045/2023/

Fossil and non-fossil sources of the carbonaceous component of PM2.5 in forest and urban areas

摘要：Atmospheric particulate matter (PM2.5) can damage human health. Biogenic organic compounds emitted from trees may increase the concentration of PM2.5 via formation of secondary aerosols. Therefore, the role of biogenic emissions in PM2.5 formation and the sources of PM2.5 need to be investigated. Dual carbon isotope and levoglucosan analyses are powerful tools to track the sources of total carbon (TC) in PM2.5. We collected a total of 47 PM2.5 samples from 2019 to 2020 inside a pine forest and in urban areas in South Korea. The average 13C and 14C of TC in PM2.5 at the Taehwa

Research Forest (TRF) were 25.7 and 380.7, respectively, which were not significantly different from those collected at Seoul National University (SNU) in urban areas. Contribution of fossil fuel, C3-, and C4- plants to carbonaceous component of PM2.5 were 52, 27, and 21% at SNU, whereas those were 46, 35, and 19% at TRF, respectively. The biomass burning tracer, levoglucosan, was most abundant in winter and correlated with the contribution of C4 plants derived carbon. Results indicate that biogenic aerosols emitted from trees is less likely to be an important source of PM2.5 and that trees can act as a bio-filter to reduce PM2.5.

来源：Nature

发布时间：2023-04-04

数据类型：期刊

https://www.nature.com/articles/s41598-023-32721-2

Chemical and morphological characterization by SEM–EDS of PM2.5 collected during winter in Ulaanbaatar, Mongolia

摘要：In this study, the morphological and elemental properties of airborne fine particles (PM2.5) collected during winter (15 December 2020–14 January 2021) in Ulaanbaatar, Mongolia, were investigated using scanning electron microscopy (SEM) combined with energy-dispersive X-ray spectrometry (EDS). SEM analysis of the PM2.5 samples revealed that the particle shape distribution on haze days (daily mean PM2.5 concentration of over 100 μg m−3) was irregular (62%), spherical (24.6%), cluster (10.7%), and chain-like (2.7%), while the particle shape on clean days (daily mean PM2.5 concentration of less than 30 μg m−3) was distributed as follows: irregular (56%), cluster (22%), spherical (17.3%), and chain-like (4.7%). The apparent mean particle size on haze days (2.07 μm) was twofold greater than that on clean days (1.13 μm). Based on the EDS spectra, carbonaceous particles were the most abundant (38%), followed by mineral dust (36%), Fe-rich particles (4.7%), N-rich particles (4.7%), calcium sulfate (4%), fly ash (4%) and others (2%) on clean days. On haze days, carbonaceous particles accounted for 86% of the total, and Fe-rich, mineral, transition metal, and calcium sulfate particles accounted for 6.7, 4.7, 1.3 and 0.7%, respectively, indicating that carbonaceous particles were the main contributor on haze days. In particular, the sample filters collected on haze days were predominantly covered with tar/soot-like sticky matter, in contrast to those collected on clean days. Spearman&#x

来源：sciencedirect

发布时间：2023-04-04

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S1352231023001784

The relationship between residential exposure to atmospheric pollution and circulating miRNA in adults living in an urban area in northern France

摘要：Highlights•Air pollution is associated with the miRNA profile in a large, population sample.•The miRNAs significantly associated with air pollution are involved in inflammation.•miRNAs might mediate the effect of air pollution on health.•miRNAs are potential biomarkers of the environmental risk.IntroductionMicroRNAs are epigenetic regulatory factors capable of silencing the expression of target genes and might mediate the effects of air pollution on health. The objective of the present population-based study was to investigate the association between microRNA expression and long-term, residential exposure to atmospheric PM10 and NO2.MethodWe included 998 non-smoking adult participants from the cross-sectional ELISABET survey (2010–2014) in the Lille urban area of France. The mean residential annual pollution levels were estimated with an atmospheric dispersion modelling system. Ten microRNAs were selected on the basis of the literature data, together with two housekeeping microRNAs (miR-93-5p and miR-191-5p) and were quantified with RT-qPCRs. Multivariate linear regression models were used to study the association between microRNAs and air pollution. The threshold for statistical significance (after correction for the FDR) was set to $p < 0.1$.ResultsThe mean annual exposure between 2011 and the year of inclusion was 26.4 ± 2.0 µg/m3 for PM10 and 24.7 ± 5.1 µg/m3 for NO2. Each 2 µg/m3 increment in PM10 exposure was associated with an 8.6% increment (95%CI [3.1; 14.3]; pFDR = 0.

来源：sciencedirect

发布时间：2023-04-03

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0160412023001861

城市气象精细预报

本监测周期内，文献信息共更新 11 条：

Assessment and prediction of regional climate based on a multimodel ensemble machine learning method

摘要：Accurate modeling of climate change at local scales is critical for climate applications. This study proposes a regional downscaling model (stacking-MME) based on the fusion of multiple machine learning models (stacking). The performance of the model was evaluated for simulating precipitation, solar radiation, maximum temperature and minimum temperature and predicted three future possible changes in climate variables over time (near-term (2031–2040), medium-term (2051–2060), and long-term (2081–2090)). After determining the optimal GCM(Global climate model) based on rating metric calculations, the parametric and structural uncertainties in the GCM simulation of CMIP6 (Sixth International Coupling Model Comparison Project) were reduced. Furthermore, the performance of MME (multimodel ensembles) was enhanced by integrating three machine learning algorithms. The results show that among the nine machine learning models, the Light Gradient Boosting Machine, Gradient Boosting Regressor and Random Forest have the best performances. These three models are also considered for the development of stacking model fusion. The Stacking-MME model can reliably reduce the systematic error of GCMs and has the potential to better predict climate. In the SSP245 and SSP585 situations, precipitation will increase by 23.79% and 29.26% at the end of the twenty-first century, respectively. Maximum and minimum temperatures will increase by 1.48 and 2.89 °C and 1.22 and 2.36 °C, respectively.

来源：Springer

发布时间：2023-04-27

数据类型：期刊

https://link.springer.com/article/10.1007/s00382-023-06787-7

Skilful Forecasts of Summer Rainfall in the Yangtze River Basin from November

摘要：Variability in the East Asian summer monsoon (EASM) brings the risk of heavy flooding or drought to the Yangtze River basin, with potentially devastating impacts. Early forecasts of the likelihood of enhanced or reduced monsoon rainfall can enable better

management of water and hydropower resources by decision-makers, supporting livelihoods and major economic and population centres across eastern China. This paper demonstrates that the EASM is predictable in a dynamical forecast model from the preceding November, and that this allows skilful forecasts of summer mean rainfall in the Yangtze River basin at a lead time of six months. The skill for May–June–July rainfall is of a similar magnitude to seasonal forecasts initialised in spring, although the skill in June–July–August is much weaker and not consistently significant. However, there is some evidence for enhanced skill following El Niño events. The potential for decadal-scale variability in forecast skill is also examined, although we find no evidence for significant variation.

来源：Springer

发布时间：2023-04-20

数据类型：期刊

https://link.springer.com/article/10.1007/s00376-023-2251-2

Evaluating wind profiles in a numerical weather prediction model with Doppler lidar

摘要：We use Doppler lidar wind profiles from six locations around the globe to evaluate the wind profile forecasts in the boundary layer generated by the operational global Integrated Forecast System (IFS) from the European Centre for Medium-range Weather Forecasts (ECMWF). The six locations selected cover a variety of surfaces with different characteristics (rural, marine, mountainous urban, and coastal urban).We first validated the Doppler lidar observations at four locations by comparison with co-located radiosonde profiles to ensure that the Doppler lidar observations were of sufficient quality. The two observation types agree well, with the mean absolute error (MAE) in wind speed almost always less than 1 m s−1. Large deviations in the wind direction were usually only seen for low wind speeds and are due to the wind direction uncertainty increasing rapidly as the wind speed tends to zero.Time–height composites of the wind evaluation with 1 h resolution were generated, and evaluation of the model winds showed that the IFS model performs best over marine and coastal locations, where the mean absolute wind vector error was usually less than 3 m s−1 at all heights within the boundary layer. Larger errors were seen in locations where the surface was more complex, especially in the wind direction. For example, in Granada, which is near a high mountain range, the IFS model failed to capture a commonly occurring mountain breeze, which is highly dependent on the sub-

grid-size terrain features that are not resolved by the model. The uncertainty in the wind forecasts increased with forecast lead time, but no increase in the bias was seen.At one location, we conditionally performed the wind evaluation based on the presence or absence of a low-level jet diagnosed from the Doppler lidar observations. The model was able to reproduce the presence of the low-level jet, but the wind speed maximum was about 2 m s−1 lower than observed. This is attributed to the effective vertical resolution of the model being too coarse to create the strong gradients in wind speed observed.Our results show that Doppler lidar is a suitable instrument for evaluating the boundary layer wind profiles in atmospheric models.

来源：GMD

发布时间：2023-04-18

数据类型：期刊

https://gmd.copernicus.org/articles/16/2077/2023/

A New Stable Boundary Layer Parameterization for Numerical Weather Prediction Models: A Heat Flux Budget Approach

摘要：The present study introduces a new boundary layer parameterization for weather and forecasting models. It is implemented here as a boundary layer module in Weather Research and Forecasting (WRF) model. The main novelty in the new scheme is that it includes prognostic equations for the heat flux and temperature variance, being the first WRF boundary layer scheme with that feature. This is specially aimed at improving the representation of nocturnal stable boundary layer and of its turbulence regimes, weakly and very stable. The effort is supported by previous studies that found that the two regimes and the transitions between them are better represented by simplified numerical schemes that represent the interactions between the surface and the air adjacent to it when the heat flux and temperature variance are solved prognostically. The results show that the two regimes are adequately simulated by the new scheme. Such an evaluation is presented in terms of the relationship between the turbulence velocity scale and mean wind speed, of the dependence of the potential temperature gradient near the surface and the mean wind speed, and by the relationship between flux and gradient Richardson numbers. In the new scheme, the relationship between thermal structure and the mean and turbulent flows arises naturally from the heat flux prognostic equation, not being arbitrarily imposed by an empirical stability function.

来源：Springer
发布时间：2023-04-17
数据类型：期刊
https://link.springer.com/article/10.1007/s10546-023-00810-4

Influence of ENSO on the ECMWF subseasonal prediction of summer rainfall over the Yangtze River

摘要：In this study, based on the ECMWF 20-year (1997～2016) hindcasts, the subseasonal prediction of the weekly summer rainfall anomaly over the middle and lower reaches of the Yangtze River (YR) were studied. The skill at 2-week lead time exhibits prominent interannual variation, which is significantly correlated with the preceding winter ENSO. That is, rainfall anomaly can be better predicted in El Niño decaying summer than in La Niña decaying summer. Observation analyses show that in El Niño decaying summer the intraseasonal variation of YR summer rainfall is featured by strong low-frequency (> 30 days) intraseasonal oscillation (ISO) partly associated with the first boreal summer ISO mode (BSISO1) activity, in comparison with La Niña decaying summer. This is possibly because El Niño-induced mean state western North Pacific (WNP) anti-cyclone blocks the northward propagation of convection over the WNP, resulting in BSISO1 stagnation in phases 3–4. The phase stagnation could force stable atmospheric teleconnection, which is favorable to sufficient moisture transportation to the YR and persistent rainfall formation. Finally, prediction verification showed that more accurate prediction for the middle-low-level circulation contribute to the better prediction of rainfall anomaly in El Niño decaying summer than in La Niña decaying summer.

来源：Springer
发布时间：2023-04-17
数据类型：期刊
https://link.springer.com/article/10.1007/s00382-023-06784-w

Machine learning algorithms for high-resolution prediction of spatiotemporal distribution of air pollution from meteorological and soil parameters

摘 要 ：Highlights•High-resolution prediction of air fine particular matter concentration is conducted.•New developed machine learning algorithms are adopted for

this purpose.•Prediction for temporal/spatial variability of PM2.5 over Iraq region is studied.•Research provided good forecasting spatial variability of PM2.5 at high resolution.This study uses machine learning (ML) models for a high-resolution prediction (0.1°×0.1°) of air fine particular matter (PM2.5) concentration, the most harmful to human health, from meteorological and soil data. Iraq was considered the study area to implement the method. Different lags and the changing patterns of four European Reanalysis (ERA5) meteorological variables, rainfall, mean temperature, wind speed and relative humidity, and one soil parameter, the soil moisture, were used to select the suitable set of predictors using a non-greedy algorithm known as simulated annealing (SA). The selected predictors were used to simulate the temporal and spatial variability of air PM2.5 concentration over Iraq during the early summer (May-July), the most polluted months, using three advanced ML models, extremely randomized trees (ERT), stochastic gradient descent backpropagation (SGD-BP) and long short-term memory (LSTM) integrated with Bayesian optimizer. The spatial distribution of the annual average PM2.5 revealed the population of the whole of Iraq is exposed to a pollution level above the standard limit. The changes in temperature and soil moisture a

来源：sciencedirect

发布时间：2023-04-15

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0160412023002040

Raindrop size distribution and microphysical features of the extremely severe rainstorm on 20 July 2021 in Zhengzhou, China

摘要：By using the observation data of four DSG5-type disdrometers, four automatic weather stations and two dual-polarization Doppler weather radars, this paper analyzes the characteristics of raindrop size distributions (DSDs) and their integral parameters during the severe precipitation in Henan Province, China, specially focusing on the extremely severe rainstorm on the 20 July 2021 in Zhengzhou City. The results show that: (1) In line with most of the severe precipitation in northern China, the July 2021 extreme precipitation were dominated by small raindrops, but medium-sized raindrops with diameter D in 2–4 mm contributed 61.28% to the rain rate R during the time period of extremely severe rainfall at Zhengzhou (ZZ) station, and the raindrops with D > 4 mm contributed 53.74% to the radar reflectivity factor Z. (2) Quantitative evaluation of the gamma model of DSD for different values of R is carried out, and the fitting effect of the gamma model is better

for the raindrop spectrum with a single peak structure. However, this method cannot reflect the double-peak structure when R is large. (3) Some differences have been found in the Z-R relationship between Z and R among the four stations (GY, XM, XY, and ZZ). The maximum value of fitting coefficient a appears at the ZZ station, which is close to the a values in the Meiyu season in eastern China. For the other three stations, the a values are comparable to those of typhoons in the western Pacific, but the fitting coefficient b

来源：sciencedirect

发布时间：2023-04-12

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0169809523001369

Changes in the dynamical, thermodynamical and hydrometeor characteristics prior to extreme rainfall events along the southwest coast of India in recent decades

摘要：Extremes in rainfall have links with atmospheric dynamics, thermodynamics, and deep cloud properties. Employing station-based gridded rainfall data, analysis product of sea surface temperature (SST), reanalysis product of dynamic/thermodynamic parameters and remotely sensed cloud properties, we demonstrate the features and evolution of rainfall extremes over the southwest coast of India (8–14°N, 75–77.5°E) during monsoon season. Analysis of the frequency and total amount of extreme rainfall reveals that the northwest coast (14–20°N) typically serves as the central node for the precipitation extremes. However, linear trends in rainfall extremes are remarkably different across the northwest and southwest coasts of India. Specifically, we noted a marked decrease in extreme rain events between 14 and 16°N along the northwest coast, while at the same time, the southwest coast emerges as a hot spot for extreme rain events. Results suggest that the evolution of rainfall extremes on the southwest coast is linked to the warming of the south-central Arabian sea (AS), enhanced SST gradient between north and south AS, and low pressure over the Bay of Bengal (BoB) four days before the event day. Under the influence of these factors, moisture-laden winds shift from the northwest coast to the southwest coast of India. Three days before the extreme precipitation, the BoB low-pressure centre advances westward and eventually merges with the trough of low along the west coast on the event day a

来源：sciencedirect

发布时间：2023-04-11

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0169809523001497

Extreme and severe convective weather disasters: A dual-polarization radar nowcasting method based on physical constraints and a deep neural network model

摘要：It is difficult for traditional methods, such as the PySTEPS method, which is based on optical flows, and the UNet method, which is based on convolutional neural networks, to predict extreme weather events (e.g., hail, heavy rain, lightning and mesoscale cyclones) 0–60 min in advance because these events have short life cycles, occur at small scales, rapidly develop and are highly nonlinear. Based on the structural characteristics of severe weather, we propose a physically constrained generative adversarial deep neural network nowcasting model to improve the prediction accuracy and blurry data problem associated with nowcasting extreme convective weather within the 0–60 min interval. The improved TITAN algorithm is used to quickly identify and match strong storm cells in three dimensions, and the convection-diffusion constraint equation is established. Additionally, reflectivity (Zh), differential reflectivity (Zdr), the range derivative-specific differential phase (Kdp), correlation coefficient (cc), precipitation particle phase, and velocity divergence are considered when training the model with a large sample set, and constraint equations are used for optimization. The critical success index, false alarm ratio and miss probability scores of the nowcasting results obtained with this method are better than the PySTEPS and UNet results. Additionally, the root mean square error of a hailstorm nowcasted with a 30-min lead time is significantly better than that of the other meth

来源：sciencedirect

发布时间：2023-04-09

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0169809523001473

Improving detention ponds for effective stormwater management and water quality enhancement under future climate change: a simulation study using the PCSWMM model

摘要：Urban surfaces are often covered by impermeable materials such as concrete and asphalt which intensify urban runoff and pollutant concentration during storm events, and lead to the deterioration of the quality of surrounding water bodies. Detention ponds are used in urban stormwater management, providing two-fold benefits: flood risk reduction and pollution load minimization. This paper investigates the performance of nine proposed detention ponds (across the city of Renton, Washington, USA) under different climate change scenarios. First, a statistical model was developed to estimate the pollutant load for the current and future periods and to understand the effects of increased rainfall on stormwater runoff and pollutant loads. The Personal Computer Storm Water Management Model (PCSWMM) platform is employed to calibrate an urban drainage model for quantifying stormwater runoff and corresponding pollutant loads. The calibrated model was used to investigate the performance of the proposed nine (9) detention ponds under future climate scenarios of 100-year design storms, leading to identifying if they are likely to reduce stormwater discharge and pollutant loads. Results indicated significant increases in stormwater pollutants due to increases in rainfall from 2023 to 2050 compared to the historical period 20002014. We found that the performance of the proposed detention ponds in reducing stormwater pollutants varied depending on the size and location of the detention ponds. S

来源：Nature

发布时间：2023-04-05

数据类型：期刊

https://www.nature.com/articles/s41598-023-32556-x

Nudging allows direct evaluation of coupled climate models with in situ observations: a case study from the MOSAiC expedition

摘要：Comparing the output of general circulation models to observations is essential for assessing and improving the quality of models. While numerical weather prediction models are routinely assessed against a large array of observations, comparing climate models and observations usually requires long time series to build robust statistics. Here, we show that by nudging the large-scale atmospheric circulation in coupled climate models, model output can be compared to local observations for individual days. We illustrate this for three climate models during a period in April 2020 when a warm air intrusion reached the MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate) expedition in the central Arctic. Radiosondes, cloud remote sensing and

surface flux observations from the MOSAiC expedition serve as reference observations. The climate models AWI-CM1/ECHAM and AWI-CM3/IFS miss the diurnal cycle of surface temperature in spring, likely because both models assume the snowpack on ice to have a uniform temperature. CAM6, a model that uses three layers to represent snow temperature, represents the diurnal cycle more realistically. During a cold and dry period with pervasive thin mixed-phase clouds, AWI-CM1/ECHAM only produces partial cloud cover and overestimates downwelling shortwave radiation at the surface. AWI-CM3/IFS produces a closed cloud cover but misses cloud liquid water. Our results show that nudging the large-scale circulation to the observed state allows a meaningful comparison of climate model output even to short-term observational campaigns. We suggest that nudging can simplify and accelerate the pathway from observations to climate model improvements and substantially extends the range of observations suitable for model evaluation.

来源：GMD

发布时间：2023-04-04

数据类型：期刊

https://gmd.copernicus.org/articles/16/1857/2023/

城市气候与生态

本监测周期内，文献信息共更新 3 条：

Impacts of climate change on wind energy potential in Australasia and South-East Asia following the Shared Socioeconomic Pathways

摘要：Highlights•Multi-model ensemble to investigate evolution of wind resources up to 2100•Using novel climate-change scenarios, Shared Socioeconomic Pathways (SSPs)•More specifically, two scenarios, moderate (SSP2-4.5) and high emissions (SSP5-8.5)•Greater changes in general in high-emissions scenario, except for seasonal variability•Drastic changes (>150 %) projected for end of century in certain regions, e.g., Vietnam, Borneo.Wind energy is poised to play a major role in the energy transition. Fluctuations in global atmospheric circulation are expected as a result of climate change, and wind projections based on the most up-to-date scenarios of climate change, the Shared Socioeconomic Pathways (SSPs), anticipate significant changes in wind energy potential in many regions; so far, these changes have not been studied in Southeastern Asia and Australasia, a region with notable wind energy potential. This work investigates the evolution of wind power density and its temporal variability considering the latest

scenarios of climate change, the SSPs. More specifically, two scenarios are considered, SSP2-4.5 and SSP5-8.5, corresponding to moderate and high emissions, respectively. As many as 18 global climate models are considered and compared against past-present data, and those that perform best are retained to build a large multi-model ensemble. The results show that projected changes in mean wind power density at the end of the 21st century are of little significance (typically be

来源：sciencedirect

发布时间：2023-04-19

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0048969723019666

Role of Stratospheric Processes in Climate Change: Advances and Challenges

摘要：In this review, instead of summarizing all the advances and progress achieved in stratospheric research, the main advances and new developments in stratosphere-troposphere coupling and stratospheric chemistry-climate interactions are summarized, and some outstanding issues and grand challenges are discussed. A consensus has been reached that the stratospheric state is an important source of improving the predictability of the troposphere on sub-seasonal to seasonal (S2S) time scales and beyond. However, applying stratospheric signals in operational S2S forecast models remains a challenge because of model deficiencies and the complexities of the underlying mechanisms of stratosphere-troposphere coupling. Stratospheric chemistry, which controls the magnitude and distribution of many important climate-forcing agents, plays a critical role in global climate change. Convincing evidence has been found that stratospheric ozone depletion and recovery have caused significant tropospheric climate changes, and more recent studies have revealed that stratospheric ozone variations can even exert an impact on SSTs and sea ice. The climatic impacts of stratospheric aerosols and water vapor are also important. Although their quantitative contributions to radiative forcing have been reasonably well quantified, there still exist large uncertainties in their long-term impacts on climate. The advances and new levels of understanding presented in this review suggest that whole-atmosphere interact

来源：Springer

发布时间：2023-04-05

数据类型：期刊

https://link.springer.com/article/10.1007/s00376-023-2341-1

Intra-urban risk assessment of occupational injuries and illnesses associated with current and projected climate: Evidence from three largest Australian cities

摘要：Highlights•Western inland regions of Sydney and Brisbane are at greater risk of OI for workers.•Workers in regions with low NDVI and socio-economic status are vulnerable to heat.•Projected climate change (2016–3045, 2036–2065) will heighten heat-related OI risk.•Location-specific risk estimation of OI is crucial to mitigate the impacts of heat.BackgroundIncreased risk of occupational injuries and illnesses (OI) is associated with ambient temperature. However, most studies have reported the average impacts within cities, states, or provinces at broader scales.MethodsWe assessed the intra-urban risk of OI associated with ambient temperature in three Australian cities at statistical area level 3 (SA3). We collected daily workers' compensation claims data and gridded meteorological data from July 1, 2005, to June 30, 2018. Heat index was used as the primary temperature metric. We performed a two-stage time series analysis: we generated location-specific estimates using Distributed Lag Non-Linear Models (DLNM) and estimated the cumulative effects with multivariate meta-analysis. The risk was estimated at moderate heat (90th percentile) and extreme heat (99th percentile). Subgroup analyses were conducted to identify vulnerable groups of workers. Further, the OI risk in the future was estimated for two projected periods: 2016–2045 and 2036–2065.ResultsThe cumulative risk of OI was 3.4% in Greater Brisbane, 9.5% in Greater Melbourne, and 8.9% in Greater Sydney at extreme heat. The we

来源：sciencedirect

发布时间：2023-04-05

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0013935123006473

人工智能气象

本监测周期内，文献信息共更新 4 条：

Assessment and prediction of regional climate based on a multimodel ensemble machine learning method

摘要：Accurate modeling of climate change at local scales is critical for climate applications. This study proposes a regional downscaling model (stacking-MME) based on the fusion of multiple machine learning models (stacking). The performance of the model was evaluated for simulating precipitation, solar radiation, maximum temperature and minimum temperature and predicted three future possible changes in climate variables over time (near-term (2031–2040), medium-term (2051–2060), and long-term (2081–2090)). After determining the optimal GCM(Global climate model) based on rating metric calculations, the parametric and structural uncertainties in the GCM simulation of CMIP6 (Sixth International Coupling Model Comparison Project) were reduced. Furthermore, the performance of MME (multimodel ensembles) was enhanced by integrating three machine learning algorithms. The results show that among the nine machine learning models, the Light Gradient Boosting Machine, Gradient Boosting Regressor and Random Forest have the best performances. These three models are also considered for the development of stacking model fusion. The Stacking-MME model can reliably reduce the systematic error of GCMs and has the potential to better predict climate. In the SSP245 and SSP585 situations, precipitation will increase by 23.79% and 29.26% at the end of the twenty-first century, respectively. Maximum and minimum temperatures will increase by 1.48 and 2.89 °C and 1.22 and 2.36 °C, respectively.

来源：Springer

发布时间：2023-04-27

数据类型：期刊

https://link.springer.com/article/10.1007/s00382-023-06787-7

A multi-modal machine learning approach to detect extreme rainfall events in Sicily

摘要：In 2021 almost 300 mm of rain, nearly half of the average annual rainfall, fell near Catania (Sicily Island, Italy). Such events took place in just a few hours, with dramatic consequences on the environmental, social, economic, and health systems of the region.

These phenomena are now very common in various countries all around the world: this is the reason why, detecting local extreme rainfall events is a crucial prerequisite for planning actions, able to reverse possibly intensified dramatic future scenarios. In this paper, the Affinity Propagation algorithm, a clustering algorithm grounded on machine learning, was applied, to the best of our knowledge, for the first time, to detect extreme rainfall areas in Sicily. This was possible by using a high-frequency, large dataset we collected, ranging from 2009 to 2021 which we named RSE (the Rainfall Sicily Extreme dataset). Weather indicators were then been employed to validate the results, thus confirming the presence of recent anomalous rainfall events in eastern Sicily. We believe that easy-to-use and multi-modal data science techniques, such as the one proposed in this study, could give rise to significant improvements in policy-making for successfully contrasting climate change.

来源：Nature

发布时间：2023-04-16

数据类型：期刊

https://www.nature.com/articles/s41598-023-33160-9

Machine learning algorithms for high-resolution prediction of spatiotemporal distribution of air pollution from meteorological and soil parameters

摘 要 ：Highlights•High-resolution prediction of air fine particular matter concentration is conducted.•New developed machine learning algorithms are adopted for this purpose.•Prediction for temporal/spatial variability of PM2.5 over Iraq region is studied.•Research provided good forecasting spatial variability of PM2.5 at high resolution.This study uses machine learning (ML) models for a high-resolution prediction (0.1°×0.1°) of air fine particular matter (PM2.5) concentration, the most harmful to human health, from meteorological and soil data. Iraq was considered the study area to implement the method. Different lags and the changing patterns of four European Reanalysis (ERA5) meteorological variables, rainfall, mean temperature, wind speed and relative humidity, and one soil parameter, the soil moisture, were used to select the suitable set of predictors using a non-greedy algorithm known as simulated annealing (SA). The selected predictors were used to simulate the temporal and spatial variability of air PM2.5 concentration over Iraq during the early summer (May-July), the most polluted months, using three advanced ML models, extremely randomized trees (ERT), stochastic gradient descent backpropagation (SGD-BP) and long short-term memory (LSTM) integrated with

Bayesian optimizer. The spatial distribution of the annual average PM2.5 revealed the population of the whole of Iraq is exposed to a pollution level above the standard limit. The changes in temperature and soil moisture a

来源：sciencedirect

发布时间：2023-04-15

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0160412023002040

Extreme and severe convective weather disasters: A dual-polarization radar nowcasting method based on physical constraints and a deep neural network model

摘要：It is difficult for traditional methods, such as the PySTEPS method, which is based on optical flows, and the UNet method, which is based on convolutional neural networks, to predict extreme weather events (e.g., hail, heavy rain, lightning and mesoscale cyclones) 0–60 min in advance because these events have short life cycles, occur at small scales, rapidly develop and are highly nonlinear. Based on the structural characteristics of severe weather, we propose a physically constrained generative adversarial deep neural network nowcasting model to improve the prediction accuracy and blurry data problem associated with nowcasting extreme convective weather within the 0–60 min interval. The improved TITAN algorithm is used to quickly identify and match strong storm cells in three dimensions, and the convection-diffusion constraint equation is established. Additionally, reflectivity (Zh), differential reflectivity (Zdr), the range derivative-specific differential phase (Kdp), correlation coefficient (cc), precipitation particle phase, and velocity divergence are considered when training the model with a large sample set, and constraint equations are used for optimization. The critical success index, false alarm ratio and miss probability scores of the nowcasting results obtained with this method are better than the PySTEPS and UNet results. Additionally, the root mean square error of a hailstorm nowcasted with a 30-min lead time is significantly better than that of the other meth

来源：sciencedirect

发布时间：2023-04-09

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0169809523001473

✧会议信息

本监测周期内，会议信息共更新 5 条：

中国气象学会关于召开第九届全国城市气象学术论坛的通知

摘要：为更好地总结我国城市气象学发展成果，推进城市气象保障服务高质量发展，由中国气象学会主办，中国气象学会城市气象学委员会、北京气象学会、北京城市气象研究院（北京城市气象工程技术研究中心）、中国气象局城市气象重点开放实验室、中国气象局雄安大气边界层重点开放实验室（培育）承办，中国科学院大气物理研究所、中国气象科学研究院、国家气候中心、北京大学、北京市气象服务中心、南京大学、南京信息工程大学、中山大学、暨南大学协办的“第九届全国城市气象学术论坛”定于 2023 年 5 月在河北雄安新区召开，本届论坛主题为“城市可持续发展的气象保障研究”。现将有关事宜通知如下：中国气象学会关于召开第九届全国城市气象学术论坛的通知.pdf 附件 1 第九届全国城市气象学术论坛录用名单.pdf 附件 2 雄安绿博园建国酒店交通指南.doc 中国气象学会 2023 年 4 月 24 日

来源：中国气象学会

会议时间：2023-04-24

会议地点:

数据类型：会议

http://www.cms1924.org/WebPage/WebPageDetail_369_0_3890.aspx

中国气象学会关于召开 2023 年风云气象卫星用户大会的通知

摘要：为贯彻落实习近平总书记对气象工作重要指示精神，落实《气象高质量发展纲要（2022—2035 年）》，强化风云气象卫星支柱作用，全面提高风云气象卫星对生命安全、生产发展、生活富裕、生态良好的支撑能力，提升风云气象卫星服务“一带一路”能力，促进不同行业和领域间用户的交流与合作，经研究，兹定于 5 月举办 2023 年风云气象卫星用户大会。大会主题是：“构建精密气象监测系统，提升风云卫星应用能力”。现将大会有关事宜通知如下：中国气象学会关于召开 2023 年风云气象卫星用户大会的通知.pdf 附件 1：酒店建议路线.pdf 附件 2：入选论文主要作者.pdf 中国气象学会 2023 年 4 月 14 日

来源：中国气象学会

会议时间：2023-04-14

会议地点:

数据类型：会议

http://www.cms1924.org/WebPage/WebPageDetail_369_0_3885.aspx

中国气象学会关于举办第十七届防雷减灾论坛的筹备通知

摘要：第十七届防雷减灾论坛拟定于 2023 年 10 月中下旬举办。本次论坛由中国气象学会主办，中国气象学会雷电委员会、复旦大学大气与海洋科学系、中国气象科学研究院灾害天气国家重点实验承办，中国科学院大气物理研究所、成都信息工程大学、南京信息工程大学、中国气象局大气探测中心、重庆市气象局、中国气象科学研究院协办。具体内容请查看以下通知：中国气象学会关于举办第十七届防雷减灾论坛的筹备通知.pdf 中国气象学会 2023 年 4 月 13 日

来源：中国气象学会

会议时间：2023-04-14

会议地点:

数据类型：会议

http://www.cms1924.org/WebPage/WebPageDetail_369_0_3882.aspx

中国气象学会关于举办气象青年科技交流会暨 2023 年青年科学家论坛的筹备通知

摘要：为弘扬科学家精神，助力青年科技后备人才学术成长，加强和促进新时代大气科学及相关领域青年学者的研讨与交流，由中国气象学会主办的中国气象学会气象青年科技交流会暨 2023 年青年科学家论坛拟定于 2023 年 8 月举行。现将有关事宜通知如下：中国气象学会关于举办气象青年科技交流会暨 2023 年青年科学家论坛的筹备通知.pdf 附件 1：论文摘要要求及格式.doc 附件 2：摘要第一作者联系方式.doc 中国气象学会 2023 年 4 月 13 日

来源：中国气象学会

会议时间：2023-04-14

会议地点:

数据类型：会议

http://www.cms1924.org/WebPage/WebPageDetail_369_0_3884.aspx

中国气象学会关于举办 2023 年海峡两岸青年气象科学家论坛的筹备通知

摘要：为推动海峡两岸青年人才气象科技创新交流，促进气象科技成果服务两岸经济社会发展，由中国气象学会主办，福建省气象学会、厦门市气象天文学会、福建省灾害天气重点实验室、厦门市海峡气象开放重点实验室等承办的“2023 年海峡两岸青年气象科学家论坛”拟定于 2023 年 6 月举行。现将有关事宜通知如下：中国气象学会关于举办 2023 年海峡两岸青年气象科学家论坛的筹备通知.pdf 附件 1：论文摘要要求及格式.doc 附件 2：论文信息采集表.doc 中国气象学会 2023 年 4 月 13 日

来源：中国气象学会

会议时间：2023-04-14

会议地点:

数据类型：会议

http://www.cms1924.org/WebPage/WebPageDetail_369_0_3883.aspx