城市气象科技信息监测简报

2023 年 3 月 （总第 21 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 4 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。

编辑团队:

苏　晨 北京城市气象研究院办公室副主任

楚艳丽　北京气象学会副秘书长、北京城市气象研究院副研究员

苗世光　北京气象学会秘书长、北京城市气象研究院院长

郭佩芸 北京城市气象研究院专职副书记

胡永云 北京气象学会理事长、北京大学教授

刘　燕 北京气象学会副秘书长

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❖报告概述

✧监测周期：

2023 年 03 月 01 日 - 2023 年 03 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 14 条

1. NC: 热穹顶环流对北美热浪的影响因背景增温和土壤湿度反馈而增强

摘要：极端天气气候事件如热浪、强降水、干旱等会给社会、经济和人民生命财产安全造成威胁。2021 年 6 月底至 7 月初，一场强劲的热浪席卷北美西海岸，造成部分地区温度相比于常年同期高出了 16-20℃。“热穹顶”是此次高温中的关键大气环流，热穹顶是指高层大气热高压在一定时间内停滞不动，高压像罩子一样把热空气盖在热浪发生区域，令热穹顶里面的温度升高，最终引发热浪。热穹型环流对区域热浪的未来影响问题，是一个众所关注的话题。3 月 27 日，中国科学院大气物理研究所 LASG 国家重点实验室周天军研究员课题组在《自然-通讯》发表题为“全球变暖背景下热穹型环流对北美热浪的影响增强”的研究论文，指出热穹顶环流在 2021 年北美极端高温中的贡献超过 50%。在全球变暖和土壤湿度-大气反馈的共同作用下，热穹顶环流控制下的极端高温强度会继续增加。“环流相似法”常用于定量估算环流对极端高温的贡献，即在过去历史年份中寻找与某一极端事件相似的环流，将相似环流下的温度作合成，从而定量估算环流对极端事件的贡献。作者将此方法应用到了北美地区，发现“热穹顶”可以解释 2021 年极端高温的 54.6%。极端高温和对应环流的时间序列显示，自上个世纪 90 年代之后，在全球增暖的背景下，最高温度加速上升，然而对应的热穹型环流却变化平缓。极端高温和环流这两个要素的不同变化趋势在气候模式模拟结果中得到进一步验证。

来源：大气物理所

发布时间：2023-03-30

数据类型：资讯

http://www.iap.cas.cn/gb/xwdt/kyjz/202303/t20230330_6720250.html

2. Increasing water hazards demand better early warnings

摘要：Governments should “put your money where your mouth is” to ensure that the flagship UN Early Warnings for All initiative reaches its goal to protect everyone from dangerous weather by 2027, according to a top UN envoy.“We can and must spare no effort to ensure that people and communities and countries are afforded with tools to save lives and livelihoods. We have a once in a generation opportunity to offer hope to those on the front line of the climate crisis. Let us not squander this opportunity,” Selwin Hart, Special Adviser to the Secretary-General on Climate Action and Just Transition, told a high-level side event at the UN 2023 Water Conference.“It will be difficult but, with a miniscule investment this is achievable,” he said.The Early Warnings for All initiative calls for initial new targeted investments between 2023 and 2027 of US$ 3.1 billion – a sum which would be dwarfed by the benefits. This is a small fraction (about 6 per cent) of the requested US$ 50 billion in adaptation financing.UN Secretary-General chaired the first meeting of the initiative’s Advisory Panel on 21 March to begin implementation this year in at least 30 countries.Water-related hazards like floods and drought as one of its main focuses of Early Warnings For All because they account for the majority of casualties and economic losses.

来源：WMO

发布时间：2023-03-24

数据类型：资讯

https://public.wmo.int/en/media/news/increasing-water-hazards-demand-better-early-warnings

3. Early Warnings For All Initiative scaled up into action on the ground

摘要：People least responsible for climate change suffer most from extreme weatherEarly warnings are efficient and cost-effective form of climate adaptationNew York, 21 March 2023 _ A global initiative to ensure that everyone on Earth is protected by early warnings by 2027 is being fast-tracked into action on the ground. A recent record-breaking tropical cyclone in Southeast Africa once again shows the paramount importance of these services to save lives and livelihoods from increasingly extreme weather and climate events.To aid this work, UN Secretary-General António Guterres has convened an Advisory Panel of leaders of UN agencies, multilateral development banks, humanitarian organizations, civil society, insurance and IT companies on 21 March. The aim is to inject

more political, technological and financial clout to ensure that Early Warnings for All becomes a reality for everyone, everywhere.The months ahead will see stepped up coordinated action, initially in 30 particularly at-risk countries, including Small Island Developing States and Least Developed Countries. Additional countries are expected to be added as this vital work with partners gathers pace, scale and resourcing. At the same time, the UN's existing actions and initiatives to save lives and livelihoods, and build resilience across a wide range of other countries will continue and be reinforced, ensuring the Early Warnings for All campaign turns its pledges into life-saving reality on the ground for millions of the most vulnerable people. The aim is not to re-invent the wheel, but rather promote collaboration and synergies and to harness the power of mobile phones and mass communications."Now it is time for us to deliver results. Millions of lives are hanging in the balance, It is unacceptable that the countries and peoples that have contributed the least to creating the crisis are paying the heaviest prices," said UN Secretary-General António Guterres.

来源：WMO

发布时间：2023-03-21

数据类型：资讯

https://public.wmo.int/en/media/press-release/early-warnings-all-initiative-scaled-action-ground

4. Urgent climate action can secure a liveable future for all

摘要：INTERLAKEN, Switzerland, March 20, 2023 – There are multiple, feasible and effective options to reduce greenhouse gas emissions and adapt to human -caused climate change, and they are available now, according to the Synthesis report by the Intergovernmental Panel on Climate Change (IPCC) report released today.But time is running out.«The climate time-bomb is ticking. But today's IPCC report is a how-to guide to defuse the climate time-bomb. It is a survival guide for humanity. As it shows, the 1.5-degree limit is achievable. But it will take a quantum leap in climate action, said UN Secretary-General António Guterres."This Synthesis Report underscores the urgency of taking more ambitious action and shows that, if we act now, we can still secure a liveable sustainable future for all," said IPCC Chair Hoesung-Lee.The Synthesis Report is the closing chapter of the Panel's Sixth Assessment.

来源：WMO

发布时间：2023-03-20

数据类型：资讯

https://public.wmo.int/en/media/press-release/urgent-climate-action-can-secure-liveable-future-all

5. Ambient air pollution and COVID-19 in California

摘要：Principal Investigator: Michael Kleeman, University of California, Davis This study will investigate the chronic and acute effects of air pollution exposure on COVID-19 incidence, mortality, and long-term complications, including onset of disease formation. Long- (2017−2018) and short- (2020) term exposures will be linked to a large medical records database in Southern California, with assessments at both the neighborhood and individual level.Funded under RFA 20-1B Air Pollution, COVID-19, and Human HealthStatus:OngoingAbstractPoster abstract for HEI Annual Conference 2023Air Pollution and COVID-19 severity among hospitalized COVID-19 Patients: A Multistate Survival AnalysisMichael Jerrett1, Michael Kleeman2, Jason Su3, Claudia Nau4, Deborah Young4, Rebecca Butler4, Christina Batteate1, Ariadna Padilla4, Sara Y. Tartof4, Richard Burnett1University of California at Los Angeles, Los Angeles, CA, USA; 2University of California at Davis, Davis, CA, USA; 3University of California at Berkeley, Berkeley, USA; 4Kaiser Permanente Southern California, Los Angeles, CA, USABackground: Efforts to limit the severity of COVID-19 outcomes have faced challenges due in part to vaccine hesitancy and low uptake of boosters. Growing interest centers on modifiable environmental risk factors such as air pollution that may limit the severity of COVID-19 in infected patients. Some evidence implicates air pollution as a risk factor for more severe outcomes in COVID-19 patients. To date, however, no studies have examined comprehensively how air pollution affects the severity of COVID-19 outcomes as measured by admission to the intensive care units, death and time to hospital discharge.Methods: A multistate survival model was developed in a cohort of 15,978 hospitalized patients with COVID-19 who were members of Kaiser Permanente Southern California (KPSC), a large, integrated health care system with membership that is highly diverse. KPSC documents all care in its electronic health records. The multistate model captured all possible states of transition between standard hospital care, intensive care and discharged from the hospital to quantify the association of air pollution exposure on the transition between states in patients with COVID-19: hospitalization, admission to ICU, recovery and discharge, or death (in or out of hospital Chronic air pollution exposure fields

were developed across Southern California using chemical transport models (CTMs) and Land Use Regression Models (LURMs) with a spatial resolution of 1 km.

来源：HEI

发布时间：2023-03-18

数据类型：资讯

https://www.healtheffects.org/research/ongoing-research/ambient-air-pollution-and-covid-19-california

6. Australian fires and perinatal health risks

摘要：Principal Investigator: Michelle L Bell, Yale University This study is investigating risk of birth outcomes and perinatal mortality from fire-related PM2.5. The interdisciplinary team is developing fire modeling methods to estimate PM2.5 specifically from fires for Australia with improved fire emissions inventories and Lagrangian modeling.Funded under RFA 20-1A Health Effects of Air PollutionStatus:OngoingAbstractInvestigation of smoke exposure during Au stralia fire seasons: Phase 1. Importance of quantifying plume injection heightsMichelle L. Bell,1 Josh Warren,1 Xu Feng,2 Loretta J. Mickley,2 Gavin Pereira,3 Yuming Guo,4 Jenny A. Fisher51Yale University, New Haven, USA; 2Harvard University, Cambridge, USA; 3Curtin University, Perth, Australia; 4Monash University, Melbourne, Australia; 5University of Wollongong, Wollongong, AustraliaBackg round and objectives: In recent years Australia has experienced unprecedented wildfires (often referred to as “bushfires”), resulting in severe air pollution across much of the continent. To date, studies on fire smoke and health are limited, but the growing literature indicates increased risk such as for hospital admissions and mortality.

来源：HEI

发布时间：2023-03-16

数据类型：资讯

https://www.healtheffects.org/research/ongoing-research/australian-fires-and-perinatal-health-risks

7. IPCC meets to approve the final component of the Sixth Assessment Report

摘要：The Intergovernmental Panel on Climate Change (IPCC) began its meeting today to approve the Synthesis Report to the Sixth Assessment Report. The session, taking place in Interlaken, Switzerland, is scheduled to run until 17 March.The Synthesis Report is the final instalment of the IPCC's Sixth Assessment Report. It integrates and summarises the findings of the six reports released by IPCC during the current cycle which began in 2015. This includes three Special Reports and the three IPCC Working Group contributions to the Sixth Assessment Report.During this meeting, the IPCC will approve the Summary for Policymakers of the Synthesis Report line by line. The panel will also adopt the longer report section by section.'Once approved, the Synthesis Report, will become a fundamental policy document for shaping climate action in the remainder of this pivotal decade. For policymakers of today and tomorrow, a much-needed textbook for addressing climate change. Make no mistake, inaction and delays are not listed as options," said the IPCC Chair Hoesung Lee opening the conference.

来源：WMO

发布时间：2023-03-13

数据类型：资讯

https://public.wmo.int/en/media/news/ipcc-meets-approve-final-component-of-sixth-assessment-report

8. Smoke particles from wildfires can erode ozone layer

摘要：Wildfire smoke that rises to the stratosphere can trigger chemical reactions that erode the protective ozone layer shielding Earth from the Sun's damaging ultraviolet radiation, new research finds.The study, led by scientists at the Massachusetts Institute of Technology with a co-author at the National Center for Atmospheric Research (NCAR), focused on catastrophic Australian fires that raged from December 2019 into January 2020. The fires — the country's most devastating on record — scorched tens of millions of acres and pumped more than 1 million tons of smoke into the atmosphere.The research team identified a new chemical reaction by which smoke particles from the Australian wildfires made ozone depletion worse. By triggering this reaction, the fires likely contributed to a 3-5 percent depletion of total ozone at mid-latitudes in the Southern Hemisphere, in regions overlying Australia, New Zealand, and parts of Africa and South America.The researchers' model also indicated the fires had an effect in the polar regions, eating away at the edges of the ozone hole over Antarctica. By late 2020, smoke particles from the Australian wildfires widened the Antarctic ozone hole by 2.5 million square kilometers — 10 percent

of its area compared to the previous year.It's unclear what long-term effect wildfires will have on ozone recovery. The United Nations recently reported that the ozone hole, and ozone depletion around the world, is on a recovery track, thanks to a sustained international effort to phase out ozone-depleting chemicals.

来源：NCAR

发布时间：2023-03-09

数据类型：资讯

https://news.ucar.edu/132886/smoke-particles-wildfires-can-erode-ozone-layer

9. AAS 组发 2021 年 7 月河南郑州暴雨专题文章

摘要：2021 年 7 月 17 日至 22 日，中国河南省发生了一次极端强降水过程，6 天累计降雨量超过 1000mm，远远超过该地区的年平均降水量，这在拥有 1000 万常住人口的河南省省会城市郑州是非常罕见的。2021 年 7 月 20 日降雨最强，郑州国家气象站测得高达 201.9mm 的小时极端降水，打破了中国大陆的小时降雨量历史记录。这次暴雨引发了郑州市严重的城市内涝，导致地铁和隧道被淹。为深入理解造成此次极端降水事件的动力、热力、微物理、陆面及边界层过程和条件，了解大尺度环流对局地过程的影响和控制机制，AAS 组织出版了郑州暴雨专题"Special collection on July 2021 Zhengzhou Henan Extremem Rainfall Case"，从过程机理、季节预测和短时预报等不同角度，深入分析研究了该极端天气事件发生的物理机制和可预测性。本期专题共征集了 6 篇文章，相关研究成果将为极端强降雨事件的预报预测这一具有挑战性的工作提供有价值的指导。《Advances in Atmospheric Sciences》2023 年"Special collection on July 2021 Zhengzhou Henan Extremem Rainfall Case"专题封面现将专刊中几篇论文的主要研究内容及结论简介如下：Zhang et al.（2023）基于台站观测和再分析资料，分析了此次暴雨过程的大尺度和中尺度特征及演变过程。其研究表明，行星尺度扰动、位涡(PV)带和双台风为此次暴雨过程提供了关键的水汽条件和不稳定能量，对强降水过程具有重要作用，而中 β 尺度对流涡旋有利于极端降水强度的维持。Wei et al.（2023）研究了局地过程对 7 月 20 日 4-5 点郑州破纪录极端小时降水的影响机制。对流可分辨的 WRF 数值模拟结果表明，郑州极端降水发生的条件与暖区暴雨类似，异常北抬的西太平洋副热带高压（WPSH）和台风"烟花"将大量暖湿空气由海上输送至郑州区域，郑州以东、南、北侧的低层辐合气流有利于准静止风暴的维持和发展，并使之停滞在郑州区域。该研究强调了北侧太行山的阻挡作用，促使偏东气流向南偏转，在郑州上空与来自南方的气流辐合；而

含丰富水汽的强低空偏东气流进一步阻挡了由降雨引发的冷池及强对流系统的东移，由此导致郑州极端小时降水突破历史记录。

来源：大气物理所

发布时间：2023-03-07

数据类型：资讯

http://www.iap.cas.cn/gb/xwdt/kyjz/202303/t20230307_6689500.html

10. WMO Executive Council endorses global greenhouse gas monitoring plan

摘要：Geneva, 6 March 2023 (WMO) - The World Meteorological Organization (WMO) Executive Council has endorsed plans for a new Global Greenhouse Gas Monitoring Infrastructure to fill critical information gaps and support action to reduce heat-trapping gases which are fuelling temperature increase. The Executive Council resolution recognizes the “growing societal importance of greenhouse gas monitoring in support of improving our scientific understanding of the Earth System, and the urgent need to strengthen the scientific underpinning of mitigation actions taken by the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement.”It seeks to build on WMO’s experience in coordination international collaboration in weather prediction and climate analysis and on long-standing activities in greenhouse gas monitoring, research and provision of related services under the auspices of the Global Atmosphere Watch established in 1989 and its Integrated Global Greenhouse Gas Information System (IG3IS).WMO would coordinate efforts within a collaborative international framework, to leverage all existing greenhouse gas monitoring capabilities – space-based and surface-based observing systems, all relevant modelling and data assimilation capabilities – in an integrated, operational framework, according to the resolution.Many of the existing international and national activities dealing with greenhouse gases are supported mainly by the research community. At present, there is no comprehensive, timely international exchange of surface and space-based greenhouse gas observations or modelling products. The resolution was approved during the Executive Council session 27 February to 3 March. It seeks further approval of this initiative by World Meteorological Congress which takes place in May 2023.Quotes“We know from our measurements that greenhouse gas concentrations in the atmosphere are at record high. The increase in CO2 levels from 2020 to 2021 was higher than the average growth rate over the

past decade and methane saw the biggest year-on-year jump since measurements started," said WMO Secretary-General Prof Petteri Taalas.

来源：WMO

发布时间：2023-03-06

数据类型：资讯

https://public.wmo.int/en/media/press-release/wmo-executive-council-endorses-global-greenhouse-gas-monitoring-plan

11. GCB: 城市化通过促进土壤非二氧化碳温室气体（CH4 和 N2O）排放而加速气候变化

摘要：全球目前一半以上的人口居住在城市区域，并且，随着城市化进程的进一步加快，更多的自然和农业生态系统被转化为城市生态系统。城市绿地，作为城市生态系统中用于改善生态环境质量的重要组成部分，其对大气二氧化碳（CO2）的吸收和固定作用已经得到许多研究的证实。然而，关于城市化引起的土地利用变化（即自然和农业生态系统转变为城市绿地）对土壤非 CO2 温室气体（甲烷（CH4）和氧化亚氮（N2O））排放的定量影响仍然知之甚少。中国科学院大气物理研究所 LAPC 国家重点实验室姚志生团队定量评估了城市化所引起的土地利用转换过程对土壤 CH4 和 N2O 排放的影响，并估算了全球城市绿地的 N2O 平均排放系数（EFd）。结果表明，自然和农业生态系统转变为城市绿地后平均增加了约 153%的 N2O 排放，使其排放量达到 3.0 kg N ha-1 yr-1；同时，这种土地利用变化还降低了约 50%的 CH4 吸收，而使土壤 CH4 吸收量降低为 2.0 kg C ha-1 yr-1。全球城市施肥林地和草地的 EFd 平均值分别为 3.7%和 1.3%，均显著高于全球施肥农田的 IPCC 推荐值 1.0%。由此可见，城市绿地可能是区域土壤 N2O 排放的"热点"源。基于上述城市土地利用变化引起的影响效应，初步估算城市化过程可导致全球每年增加土壤 N2O 排放约为 0.46 Tg N2O-N yr-1，其占全球人为 N2O 排放量的 6.3%；并且，同时减少土壤 CH4 吸收量约为 0.58 Tg CH4-C yr-1，约占全球土壤 CH4 总吸收量的 2.6%。城市化对土壤 CH4 和 N2O 排放的影响效应主要由城市环境条件、土壤理化性质和土地利用类型等因子的变化决定，如城市热岛效应和较高的氮沉降输入均会显著增加土壤非 CO2 温室气体排放强度。针对城市化所导致的土壤非二氧化碳温室气体排放的增加，可以通过减少绿地土壤压实，降低城市氮输入和改进城市造林等措施来提高城市的韧性和可持续性，从而减缓其对全球气候变化的影响。

来源：大气物理所

发布时间：2023-03-06

数据类型：资讯

http://www.iap.cas.cn/gb/xwdt/kyjz/202303/t20230306_6688789.html

12. WMO steps up action on climate and health

摘要：The World Meteorological Organization is stepping up its activities to protect people from climate and health-related hazards, including extreme heat, as part of an ambitious drive towards improved early warnings and action.WMO's Executive Council endorsed a new implementation plan for advancing integrated climate and health science and services over the next ten years. This promotes a coordinated approach to manage the impact of climate, weather, air pollution, UV radiation, extreme events and other environmental factors on health.WMO and the World Health Organization have a joint Climate and Health Office and a growing number of joint technical activities, including the establishment of a new ClimaHealth portal which is a one stop shop for information on climate and health. This joint leadership is crucial to protect people's health given the increase in extreme weather and climate change impacts.The Executive Council paid special attention to extreme heat and the need to strengthen "understanding, early warning, and risk management of the climate-related cascading risks of extreme heat, wildfire, and air quality related health risks.""Extreme heat is regarded as a silent emergency. It is one of the deadliest extreme weather events worldwide and poses a threat to millions of people. Heatwaves are more frequent and intense and starting earlier and ending later than in the past, said Ian Lisk, President of the WMO Services Commission which is spearheading WMO action."Extreme heat amplifies risks of drought, fire, air quality, water quality, and damage to infrastructure, agriculture, and human and animal health.

来源：WMO

发布时间：2023-03-03

数据类型：资讯

https://public.wmo.int/en/media/news/wmo-steps-action-climate-and-health

13. EF: 全球变暖将导致类似 2021 年夏季北美西部的超强热浪发生得更频繁

摘要：2021 年 6 月底至 7 月初，一次前所未有的超强热浪席卷了北美西部，多个城市的气温异常超过 6 月气候均值约 20℃，创下了有史以来高温事件的新纪录，其中美国俄勒冈州波特兰的日最高温度达到 46.7℃，加拿大不列颠哥伦比亚莱顿市的最高温度高达 49.6℃。这样罕见的极端事件导致超过 1000 人死亡，严重影响人

类健康、生态环境及社会生产。随着全球平均气温的持续升高，未来极端气候事件的发生频率和强度将会增加。在此背景下，类似 2021 年夏季北美西部的超强热浪将如何变化是一项值得探索的科学问题。尽管当前已有一些研究开展了对此次极端热浪事件的未来预估，但他们的结论主要基于单一气候模式或特定增暖情景下的分析。而考虑到单一气候模式可能存在的偏差以及未来增暖路径的不确定性，上述研究也许无法完全量化 2021 年夏季北美西部热浪的未来变化。针对这一问题，中国科学院大气物理研究所季风中心王林研究员团队及合作者采用了 CMIP6 提供的 15 个气候模式的模拟结果，并考虑更多的排放情景和增暖水平，这可以部分克服使用单一模式或特定情景的缺点，为决策者提供更多信息。本研究利用 ERA5 再分析资料和偏差订正后的 CMIP6 多模式模拟的数据预估了不同排放情景下（SSP1-2.6，SSP2-4.5，SSP5-8.5）类似 2021 年夏季北美西部超强热浪的未来变化。结果表明，随着全球变暖，北美西部经历类似极端事件的可能性将显著增加，罕见热浪也会更频繁地发生，且伴随着更高的极端温度和更短的重现期，特别是在高排放情景下。此外，随着排放水平的提高，未来在北美西部会有越来越多的地区打破 2021 年夏季创下的高温记录（图 1）。

来源：大气物理所

发布时间：2023-03-02

数据类型：资讯

http://www.iap.cas.cn/gb/xwdt/kyjz/202303/t20230302_6687469.html

14. AR&JES: 华中武汉城市圈夏季臭氧污染成因、来源及管控的新见解

摘要：大气近地面臭氧(O3)对人类健康、植被生态系统等构成较大威胁。自 2013 年我国全面加强大气污染治理以来，以 PM2.5 为主的空气污染问题得到了显著的改善，然而，高浓度的近地面 O3 引起了广泛的社会关注，呈现出污染持续时间长、范围广的趋势，作为二次污染物，其与一次排放前体物之间的非线性响应关系为污染治理带来了巨大的挑战。华中武汉城市圈位于长江中游，是华中地区经济快速发展、工业交通网络高度密集的特大城市群，该地区 O3 污染呈现逐年增长趋势，并显示出夏季连续多天高浓度、污染范围逐渐扩大的时空演化特征。因此，亟需对该地区 O3 污染形成机制、来源开展研究，以提升该区域整体的空气质量。大气所王莉莉副研究员团队联合湖北省生态环境监测中心站、中国气象科学研究院、南京信息工程大学、中山大学等单位，利用 2019 年 8 月武汉城市圈多城市同步观测的 O3 及其前体物和气象要素资料，综合利用光化学箱模型（NCAR-MM）、正交

因子矩阵分解模型（PMF)、相对增量反应活性（RIR）和经验动力学模拟（EKMA）方法，对该区域 O3 生成机制、O3-NOx-VOCs 敏感性、挥发性有机物（VOCs）的来源及对臭氧生成贡献进行解析。研究表明，鄂州局地臭氧生成速率 P(O3)最高，黄石、武汉和黄冈略低，其中（NO+HO2）过程主导着 O3 的光化学生成，（NO2 + OH）过程主导 O3 光化学损耗，夜间（O3+烯烃）对于 O3 的汇作用也不可忽视。O3 生成均主要受以芳香烃、氧化型有机物（OVOCs）以及烯烃（二甲苯、异戊二烯、2-丁烯、2-甲基丙烯醛和正己醛等）为主的人为源 VOCs 控制；VOCs 主要来源为机动车、工业、溶剂使用、燃料挥发、液化石油气使用和生物源排放。EKMA 表明武汉、鄂州、黄石和黄冈 AVOC/NO2 最佳削减比例为 5:1、4:1、6:1、5:1 时，若针对上述城市关键排放源进行前体物的协同减排，可缓解 O3 污染；此外，不同城市需根据自身产业结构施行因地制宜的管控调整，重点应针对机动车、溶剂使用和工业源进行管控（图 1)。另外利用上述研究方法，结合“去气象”的机器学习模型，评估了 2019 年 10 月第七届世界军人运动会（MWG）举办期间减排措施对武汉市 O3 污染的效用。在 MWG 期间，O3、NOx 和挥发性有机化合物（VOCs）的浓度、OFP（O3 生成潜势）分别比 MWG 前后显著降低，并且剔除气象因素的影响后，MWG 期间 O3 及其前体物也有不同程度的下降，显示减排措施对 O3 的下降起到了重要作用。

来源：大气物理所

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数据类型：资讯

http://www.iap.cas.cn/gb/xwdt/kyjz/202303/t20230301_6687029.html

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城市边界层

Wildfire-related PM2.5 and health economic loss of mortality in Brazil

摘要：BackgroundWildfire imposes a high mortality burden on Brazil. However, there is a limited assessment of the health economic losses attributable to wildfire-related fine particulate matter (PM2.5).MethodsWe collected daily time-series data on all-cause, cardiovascular, and respiratory mortality from 510 immediate regions in Brazil during 2000–2016. The chemical transport model GEOS-Chem driven with Global Fire Emissions Database (GFED), in combination with ground monitored data and machine learning was used to estimate wildfire-related PM2.5 data at a resolution of 0.25° × 0.25°. A time-series design was applied in each immediate region to assess the association between economic losses due to mortality and wildfire-related PM2.5 and the estimates were pooled at the national level using a random-effect meta-analysis. We used a meta-regression model to explore the modification effect of GDP and its sectors (agriculture, industry, and service) on economic losses.ResultsDuring 2000–2016, a total of US$81.08 billion economic losses (US$5.07 billion per year) due to mortality were attributable to wildfire-related PM2.5 in Brazil, accounting for 0.68% of economic losses and equivalent to approximately 0.14% of Brazil’s GDP. The attributable fraction (AF) of economic losses due to wildfire-related PM2.5 was positively associated with the proportion of GDP from agriculture, while negatively associated with the proportion of GDP from service.ConclusionSubstantial economic losses due to

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https://www.sciencedirect.com/science/article/pii/S0160412023001794

Mutagenicity of PM2.5 and Ethnic Susceptibility in Chengdu-Chongqing Economic Circle, China

摘要：Highlights•This study is based on the transcriptome and DNA mutation databases.•The analysis of DNA mutation is based on single nucleoside polymorphisms

(SNPs).•PM2.5 in the CD-CQ Economic Circle significantly induces DNA point mutation.•PM2.5 in different regions and seasons have different sensitive ethnic groups.PM2.5 seriously endangers human health, and its mutagenicity is considered an important pathogenic mechanism. However, the mutagenicity of PM2.5 is mainly determined by traditional bioassays, which are limited in the large-scale identification of mutation sites. Single nucleoside polymorphisms (SNPs) can be used for the large-scale analysis of DNA mutation sites but have not yet been used on the mutagenicity of PM2.5. The Chengdu-Chongqing Economic Circle is one of Chinas four major economic circles and five major urban agglomerations, and the relationship between the mutagenicity of PM2.5 and ethnic susceptibility in this circle remains unclear. In this study, the representative samples are PM2.5 from Chengdu in summer (CDSUM), Chengdu in winter (CDWIN), Chongqing in summer (CQSUM) and Chongqing in winter (CQWIN) respectively. PM2.5 from CDWIN, CDSUM and CQSUM induce the highest levels of mutation in the regions of exon/5′Utr, upstream/splice site and downstream/3′Utr respectively. PM2.5 from CQWIN, CDWIN and CDSUM induce the highest ratio of missense, nonsense and synonymous mutation respectively. PM2.5 from CQWIN and CDWIN induce the highest transition and

来源：sciencedirect

发布时间：2023-03-24

数据类型：期刊

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Comparison of traditional Cox regression and causal modeling to investigate the association between long-term air pollution exposure and natural-cause mortality within European cohorts

摘要：Highlights•We assessed associations between long-term PM2.5 and NO2 and natural-cause mortality.•We compared traditional Cox and causal inference models across large European cohorts.•We observed mostly consistent associations with both approaches.•Estimates partly differed in individual cohorts with no systematic pattern.•Application of multiple modelling methods is favorable to improve causal inference.Most studies investigating the health effects of long-term exposure to air pollution used traditional regression models, although causal inference approaches have been proposed as alternative. However, few studies have applied causal models and

comparisons with traditional methods are sparse. We therefore compared the associations between natural-cause mortality and exposure to fine particulate matter (PM2.5) and nitrogen dioxide (NO2) using traditional Cox and causal models in a large multicenter cohort setting. We analysed data from eight well-characterized cohorts (pooled cohort) and seven administrative cohorts from eleven European countries. Annual mean PM2.5 and NO2 from Europe-wide models were assigned to baseline residential addresses and dichotomized at selected cut-off values (PM2.5: 10, 12, 15 μg/m³; NO2: 20, 40 μg/m³). For each pollutant, we estimated the propensity score as the conditional likelihood of exposure given available covariates, and derived corresponding inverse-probability weights (IPW). We applied Cox proportional hazards models i) adjusting for all

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数据类型：期刊

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Elucidating ozone and PM2.5 pollution in the Fenwei Plain reveals the co-benefits of controlling precursor gas emissions in winter haze

摘要：The Fenwei Plain, home to 50 million people in central China, is one of the most polluted regions in China. In 2018, the Fenwei Plain was designated as one of the three key regions for the “Blue Sky Protection Campaign”, along with the Beijing–Tianjin–Hebei (BTH) and Yangtze River Delta (YRD) regions. However, compared to BTH and YRD, our understanding of the current status of air pollution in the Fenwei Plain is limited partly due to a lack of detailed analysis of the transformation from precursor gases to secondary products including secondary organic aerosol (SOA) and ozone. Through the analysis of 7 years (2015–2021) of surface monitoring of the air pollutants in Xi'an, the largest city in the Fenwei Plain, we show that roughly two-thirds of the days exceeded either the PM2.5 or the O3 level-1 air quality standard, highlighting the severity of air pollution. Moreover, an increase in O3 pollution in the winter haze was also revealed, due to the constantly elevated reactive oxygenated volatile organic compounds (OVOCs), in particular formaldehyde, with an ozone formation potential of over 50 μg m−3, in combination with the reduced NO2. The abrupt decrease of NO2, as observed during the lockdown in 2020, provided real-world evidence of the control measures, targeting only NOx (70 % decrease on average), and were insufficient to reduce ozone pollution because reactive OVOCs remained constantly high in a volatile organic compound (VOC)-limited

regime. Model simulation results showed that with NO2 reduction from 20 %–70 %, the self-reaction rate between peroxy radicals, a pathway for SOA formation, was intensified by up to 75 %, while the self-reaction rate was only reduced with a further reduction of VOCs of 50 %. Therefore, a synergic reduction in PM2.5 and O3 pollution can only be achieved through a more aggressive reduction of their precursor gases. This study elucidates the status of ozone and PM2.5 pollution in one of the most polluted regions in China, revealing a general trend of increasing secondary pollution, i.e., ozone and SOA in winter haze. Controlling precursor gas emissions is anticipated to curb both ozone and SOA formation, which will benefit not just the Fenwei Plain but also other regions in China.

来源：ACP

发布时间：2023-03-23

数据类型：期刊

https://acp.copernicus.org/articles/23/3595/2023/

Influence of spatial resolution of PM2.5 concentrations and population on health impact assessment from 2010 to 2020 in China

摘要：Ambient PM2.5 pollution is a leading environmental health risk factor worldwide. The spatial resolution of PM2.5 concentrations and population strongly impacts PM2.5-related health impact estimates. However, long-term variations and regional differences in this impact have rarely been explored, particularly in China. Here, by aggregating satellite-derived PM2.5 concentration and population datasets at 1-km resolution in China to coarser resolutions (10, 50, and 100 km), we evaluated decadal changes in the impact of resolution on health assessments at national and local scales. For the sensitivity of population-weighted mean (PWM) PM2.5 concentrations to resolution, we found that the national PWM PM2.5 concentration decreased with coarser resolutions; this pattern was widely observed and was more obvious in southern and central China and the Sichuan Basin. The results showed that the sensitivity of national PWM PM2.5 concentrations to resolution continuously weakened from 2010 to 2020, likely due to a reduction in the spatial heterogeneity of PM2.5 concentrations in regions with high sensitivity. This weakness caused a large underestimation of the long-term trend of national PWM PM2.5 using a 100-km resolution, which was 7% lower than the trend at 1 km. Regarding the sensitivity of PM2.5-attributable mortality to resolution, most of China

exhibited a pattern in which attributable mortality decreased with coarser resolution. The sensitivity of the estimated PM2.5-attributable m

来源：sciencedirect

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数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0269749123005079

The combined effects of heterogeneous chemistry and aerosol-radiation interaction on severe haze simulation by atmospheric chemistry model in Middle-Eastern China

摘 要：Heterogeneous chemistry and aerosol-radiation interaction (ARI) are considered two of the key mechanisms affecting haze formation and their reasonable parameterizations in atmospherically chemical models play an important role in accurate haze or air quality prediction. However, until the present, their relative contributions to severe haze have rarely been evaluated. Using the double-way atmospherically chemical model GRAPES_Meso5.1/CUACE CW, the relative contributions of heterogeneous chemistry and ARI to PM2.5 are investigated under different pollution levels in Middle-Eastern China (MEC) during December 2016. Study results show that the combined effects of heterogeneous chemistry and ARI generate 29.7% of total PM2.5 mass in MEC of December 2016, of which ARI contributes 19.7%, much higher than heterogeneous chemistry (6.1%). However, heterogeneous chemistry is important for reasonable reproduction of the proportion of secondary inorganic aerosols (SIA) of PM2.5, especially during heavy haze. Both the contributions of heterogeneous chemistry and ARI to PM2.5 increase with the haze pollution aggravation but to different degrees. The contribution of heterogeneous chemistry to modeled PM2.5 concentration rises from 4.0% on clean days to 6.6% under moderate pollution and 7.8% under heavy haze. And that of ARI increases rapidly from 9.1% on clean days to 21.0% under moderate pollution and 29.1% during heavy pollution. It is worth noticing that there is an additional contributi

来源：sciencedirect

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数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S1352231023001553

Long-term trends and sensitivities of PM2.5 pH and aerosol liquid water to chemical composition changes and meteorological parameters in Hong Kong, South China: Insights from 10-year records from three urban sites

摘要：Aerosol pH and aerosol liquid water (ALW) play key roles in regulating many atmospheric processes. In many countries, large reductions in SO2 and NOx emissions as a result of air pollution regulatory policies have led to improved air quality and significant changes in aerosol mass and chemical composition. Understanding the long-term trends and sensitivities of aerosol pH and ALW to changes in meteorological conditions and chemical composition is useful for predicting how atmospheric processes that depend on aerosol acidity and/or ALW will evolve as air pollutant emissions change over time. At present, long-term monitoring records of aerosol pH and ALW are limited in most parts of China and elsewhere in Asia due to the scarcity of long-term aerosol chemical speciation measurements acquired through regular sampling schedules and consistent analysis protocols in this region. We used a 10-year dataset (2011–2020) from three long-term monitoring sites to investigate the long-term trends of PM2.5 pH and ALW concentrations, identify key factors that drive the variations of PM2.5 pH and ALW concentrations, and investigate the sensitivities of PM2.5 pH and ALW concentrations to chemical composition changes during different seasons in Hong Kong, a highly populated urbanized city located in South China that has experienced improved air quality as a result of various effective air pollution regulatory policies. Despite the substantial decreases in PM2.5 concentrations and changes in che

来源：sciencedirect

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https://www.sciencedirect.com/science/article/pii/S1352231023001516

Premature deaths related to urban air pollution in Poland

摘要：In the present study, we conducted a risk assessment of urban population exposure to ambient particles (PM2.5, PM10), nitrogen dioxides (NO2), and tropospheric ozone (O3) in six Polish urban areas over the period 2015–2020. The main goals were to: i) evaluate the number of premature deaths attributed to ambient air pollutants, and to ii)

assess the effectiveness of emissions control policies in reducing urban population exposure to air pollution, and thus related health effects. For that, we used air quality data from 15 urban monitoring stations and city-specific health data (relative risk values and baseline incidence). For all cities, the annual PM2.5, PM10, and NO2 mean concentrations exceeded the 2021 World Health Organization Air Quality Guidelines in 2015–2020. In all cities, the annual PM2.5 (- 0.5% to - 6.1% year−1), PM10 (- 1.6 to - 8.1% year−1), and NO2 (- 1.3% to - 4.5% year−1) mean concentrations declined over time, while O3 levels rose (+1.0% to + 4.2% year−1). Exposure to ambient PM2.5, PM10, NO2, and O3 has substantially contributed to mortality in the six studied cities: a total of 6700 deaths for non-accidental causes, 2310 deaths for cardiovascular diseases, and 500 deaths for respiratory diseases were reported. Between 2015 and 2020, the number of annual PM2.5-, PM10-, and NO2-related premature deaths decreased (respectively, by - 8.4, - 6.7, and - 2.1 deaths per 106 inhabitants) in line with cleaner air. The rising O3 levels led to an increase in annual O

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数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S1352231023001498

Intra- and inter-city variability of PM2.5 concentrations in Greece as determined with a low-cost sensor network

摘要：Measurements of PM2.5 concentrations in five major Greek cities over a two-year period using calibrated low-cost sensor-based particulate matter (PM) monitors (Purple Air PA-II) were combined with local meteorological parameters, synoptic patterns and air mass residence time models to investigate the factors controlling PM2.5 spatiotemporal variability over continental Greece. Fourteen sensors nodes in Athens, Patras, Ioannina, Xanthi, and Thermi (in the Metropolitan Area of Thessaloniki) were selected out of more than 100 of a countrywide network for detailed analysis. The cities have populations ranging from 65k to 3M inhabitants and cover different latitudes along the South-North axis. High correlations between the daily average PM2.5 levels were observed among all sites, indicating strong intra- and inter-city covariance of concentrations, both in cold and warm periods. Higher PM2.5 concentrations in all cities during the cold period were primarily associated with low temperatures and stagnant

anticyclonic conditions, favoring the entrapment of residential heating emissions from biomass burning. Anticyclonic conditions were also connected to an increased frequency of PM2.5 episodes, exceeding the updated daily guideline value (15 μg m−3) of the World Health Organization (WHO). During the warm period, nearly uniform PM2.5 levels were encountered across continental Greece, independently of their population size. This uniformity strongly suggests the importance of long-range

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数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S1352231023001395

Insights into the compositional differences of PM1 and PM2.5 from aerosol mass spectrometer measurements in Beijing, China

摘 要 ：Aerosol mass spectrometers (AMS) have been widely used for characterization of submicron aerosol (PM1) species in the world. However, the chemical differences between PM1 and fine particles (PM2.5) in megacities are poorly understood. Here a PM1 high-resolution AMS with standard vaporizer (SV) and a PM2.5 time-of-flight aerosol chemical speciation monitor (ToF-ACSM) with capture vaporizer (CV) were deployed simultaneously in summer and winter in Beijing, China, and the chemical differences of non-refractory aerosol species between PM1 and PM2.5 were characterized. Our results showed that aerosol species in PM2.5 were overall highly correlated with those in PM1 (r2 > 0.8), yet the PM1/PM2.5 ratios varied largely for different aerosol species. Nitrate existed dominantly in PM1 (80–90%), while a considerable fraction of sulfate (30–45%) was observed in the range of 1–2.5 μm (PM1–2.5). Comparatively, PM1 organics showed higher fractions in PM2.5 in summer than winter (~70%). The changes in PM1/PM2.5 ratios of secondary inorganic aerosol (SIA) depended strongly on relative humidity (RH) in summer with considerable decreases as the increase of RH, while such a RH dependence of PM1/PM2.5 ratios was not significant in winter due to the absence of high RH data. We further compared the source apportionment results of organic aerosol (OA) between PM1 and PM2.5. Similar to previous studies, the SV AMS reported ubiquitously higher primary OA than the CV ToF-ACSM, nearly by a factor of 2 f

来源：sciencedirect

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数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S1352231023001358

The feedback effects of aerosols from different sources on the urban boundary layer in Beijing China

摘要：The interaction of aerosols and the planetary boundary layer (PBL) plays an important role in deteriorating urban air quality. Aerosols from different sources may have different effects on regulating PBL structures owing to their distinctive dominant compositions and vertical distributions. To characterize the complex feedback of aerosols on PBL over the Beijing megacity, multiple approaches, including in situ observations in the autumn and winter of 2016–2019, backward trajectory clusters, and large-eddy simulations, were adopted. The results revealed notable distinctions in aerosol properties, vertical distributions and thermal stratifications among three types of air masses from the West Siberian Plain (Type-1), Central Siberian Plateau (Type-2) and Mongolian Plateau (Type-3). Low loadings of 0.28 ± 0.26 and 0.15 ± 0.08 of aerosol optical depth (AOD) appeared in the Type-1 and Type-2, accompanied by cool and less stable stratification, with a large part (80%) of aerosols concentrated below 1500 m. For Type-3, the AOD and single scattering albedo (SSA) were as high as 0.75 ± 0.54 and 0.91 ± 0.05, demonstrating severe pollution levels of abundant scattering aerosols. Eighty percent of the aerosols were constrained within a lower height of 1150 m owing to the warmer and more stable environment. Large-eddy simulations revealed that aerosols consistently suppressed the daytime convective boundary layer regardless of their origins, with the PBL height (PBLH) decreasing from 1120

来源：sciencedirect

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数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0269749123004426

Fog scavenging of particulate matters in air pollution events: Observation and simulation in the Yangtze River Delta, China

摘要：Highlights•The ground and vertical PM2.5 concentration in fog processes that occurred in south Jiangsu of china was discussed.•The fog scavenging coefficients on PM2.5 concentration are mostly 54 %–65 %.•Higher fog scavenging coefficient occurred in the fog formation and enhancement processes.•PM2.5 concentration on the ground is

lower than the vertical area the fog.Stable atmospheric boundary layer is conducive to the accumulation of atmospheric pollution and the occurrence of fog, and fog has a removal effect on air pollution. In this study, we use the observation and WRF-Chem (Weather Research and Forecasting Model with Chemistry) simulation to analyze the factors affecting the removal efficiency in a continuous fog and haze episode from November 26 to 28, 2018 in Jiangsu Province, such as fog thickness and duration. The results show that the WRF-Chem simulation well reproduces the boundary layer characteristics in the stages of fog formation, development and dissipation. The atmospheric boundary layer provides favorable conditions for the maintenance of fog and air pollution. The inversion layer, with the maximum intensity of 3 °C per 100 m, creates favorable thermal conditions, and the water vapor advection is also conducive to the fog maintenance. The ground observation verifies the wet scavenging of PM2.5 during dense fog events. The scavenging effect is related to the fog duration, and the correlation is positive when the fog is just formed and negative when the fog i

来源：sciencedirect

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数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S004896972301344X

Probing air pollution in the Taichung metropolitan area, Taiwan.Part 1: Comprehensive model evaluation and the spatial-temporal evolution of a PM2.5 pollution event

摘要：Taichung City has become the second largest city in Taiwan, where PM2.5 and O3 pollution events occur frequently. The causes of these events urgently need a comprehensive and in-depth study. Therefore, a series of well-planned observation experiments were conducted in the city and its surrounding areas. The first experiment supported the current simulation study of the major causes of air quality deterioration in Central-Western Taiwan. First, we utilized the Weather Research and Forecasting (WRF)/Community Multiscale Air Quality (CMAQ) modeling system to simulate the intensive observation period (IOP) from 31 October 2021 to 22 November 2021. The performance of WRF-CMAQ is well justified by comparison with the observations. Next, we selected the PM2.5 (particles with aerodynamic diameters equal to or <2.5 μm) pollution event occurring on 3–6 November 2021 for detailed analysis. The results reveal that the meteorological conditions of this event were the prevailing easterly/southeasterly

winds blocked by the Central Mountain Range (CMR). Central Taiwan is located on the leeward side of the CMR and embedded in a calm wind area, which is especially favorable for the accumulation of PM2.5 during the nighttime. At noon, the PM2.5 concentration increased from the surface to the planetary boundary layer height (PBLH), even though the PBLH was overestimated. In the afternoon, the clean sea breeze would dilute the PM2.5 in the Taichung Basin and the urban PM2.5 plume would be transpo

来源：sciencedirect

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数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0169809523001102

Aggravated air pollution and health burden due to traffic congestion in urban China

摘要：Vehicle emissions are regarded as a primary contributor to air pollution and related adverse health impacts. Heavy traffic congestion increases traffic flow and thus produces more O3 precursor emissions, leading to more adverse air quality issues. Although the development of a vehicle emission inventory has received great concern and continuous efforts, limitations still exist. For example, real-time diurnal variations and increases in emission rates due to traffic congestion are not well understood. In this study, we developed a new temporal allocation approach in transportation emissions to investigate the impact on air quality and health burden due to traffic congestion in China in 2020. Both real-time congestion-level data and emission correction factors were considered in the approach. Results show that traffic congestion aggravates air pollution and health burden across China, especially in the urban clusters such as the North China Plain and Sichuan Basin. In these regions, the average annual increases in fine particulate matter (PM2.5) and ozone (O3) could be up to 3.5 μg m−3 and 1.1 ppb, respectively. The excess PM2.5 and O3 attributed to the traffic congestion also induce an additional 20 000 and 5000 premature deaths in China, respectively. In major cities, the increased rate of premature mortality caused by traffic congestion may reach 17.5 %. Therefore, more effective and comprehensive vehicle emission control policies or better planning of the road network should be established to reduce traffic congestion and improve air quality in China.

来源：ACP

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数据类型：期刊

https://acp.copernicus.org/articles/23/2983/2023/

Evaluation of Surface Layer Stability Functions and Their Extension to First Order Turbulent Closures for Weakly and Strongly Stratified Stable Boundary Layer

摘要：In this study, we utilize a generalization of Monin–Obukhov similarity theory to construct first order turbulent closures for single-column models of the atmospheric boundary layer (ABL). A set of widely used universal functions for dimensionless gradients is evaluated. Two test cases based on Large-Eddy Simulations (LES) experimental setups are considered – weakly stable ABL (GABLS1; Beare et al. in Bound Layer Meteorol 118(2):247–272, 2006), and very strongly stratified ABL (van der Linden et al. in Bound Layer Meteorol 173(2):165–192, 2019). The comparison shows that approximations obtained using a linear dimensionless velocity gradient tend to match the LES data more closely. In particular, the EFB (Energy- and Flux- Budget) closure proposed by Zilitinkevich et al. (Bound Layer Meteorol 146(3):341–373, 2013) has the best performance for the tests considered here. We also test surface layer “bulk formulas” based on these universal functions. The same LES data are utilized for comparison. The setup showcases the behavior of surface scheme, when one assumes that the velocity and temperature profiles in ABL are represented correctly. The advantages and disadvantages of different surface schemes are revealed.

来源：Springer

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数据类型：期刊

https://link.springer.com/article/10.1007/s10546-023-00784-3

Urban particulate water-soluble organic matter in winter: Size-resolved molecular characterization, role of the S-containing compounds on haze formation

摘要：Highlights Abundance of WSOM in size-resolved aerosol particles was determined by FT-ICR MS. The CHO compounds were concentrated in Aiken-mode and

coarse-mode particles. Haze caused acute increase of S-containing compounds in accumulation-mode particle. Monoterpenes were proven important precursors for SOA growth during haze episodes. The organosulfates could promote particle agglomeration and haze formation. Water-soluble organic matter (WSOM), as a group of ubiquitous components in atmospheric PM, plays a crucial role in global climate change and carbon cycle. In this study, the size-resolved molecular characterization of WSOM in the range of 0.010–18 μm PM was studied to gain insights into their formation processes. The CHO, CHNO, CHOS, CHNOS compounds were identified by the ultrahigh-resolution Fourier transform ion cyclotron resonance mass spectrometry in ESI source mode. A bimodal pattern of the PM mass concentrations was found in the accumulation and coarse mode. The increasing mass concentration of PM was mainly attributed to the growth of large-size PM with the occurrence of haze. Both Aiken-mode (70.5–75.6 %) and coarse-mode (81.7–87.9 %) particles were proven the main carriers of the CHO compounds, the majority of which were indicated to be the saturated fatty acids and their oxidized derivatives. The S-containing (CHOS and CHNOS) compounds in accumulation-mode (71.5–80.9 %) increased significantly in hazy days, where organosulfates (C11H20O6S, C12H22O7S) and nitroo

来源：sciencedirect

发布时间：2023-03-04

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0048969723012731

Contributions of various driving factors to air pollution events: Interpretability analysis from Machine learning perspective

摘要：Highlights•Quantifying the contributions of various driving factors to air pollution events (APs).•From global understanding to local explanations with interpretable analysis.•The order of sensitivity of secondary inorganic aerosols (SIA) to PM2.5 was NH4+＞NO3-＞SO42-.•Lower temperature and higher humidity promoted the formation of NO3-.The air quality in China has been improved substantially, however fine particulate matter (PM2.5) still remain at a high level in many areas. PM2.5 pollution is a complex process that is attributed to gaseous precursors, chemical, and meteorological factors. Quantifying the contribution of each variable to air pollution can facilitate the formulation of effective policies to precisely eliminate air pollution. In this study, we first used decision plot to map out the decision process of the Random Forest (RF) model for a single hourly

data set and constructed a framework for analyzing the causes of air pollution using multiple interpretable methods. Permutation importance was used to qualitatively analyze the effect of each variable on PM2.5 concentrations. The sensitivity of secondary inorganic aerosols (SIA): SO42-, NO3- and NH4+ to PM2.5 was verified by Partial dependence plot (PDP). Shapley Additive Explanation (Shapley) was used to quantify the contribution of drivers behind the ten air pollution events. The RF model can accurately predict PM2.5 concentrations, with determination coefficient (R2) of 0.94, root mean square error (RMSE) and m

来源：sciencedirect

发布时间：2023-03-04

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0160412023001344

Trends of source apportioned PM2.5 in Tianjin over 2013–2019: Impacts of Clean Air Actions

摘要：A long-term (2013–2019) PM2.5 speciation dataset measured in Tianjin, the largest industrial city in northern China, was analyzed with dispersion normalized positive matrix factorization (DN-PMF). The trends of source apportioned PM2.5 were used to assess the effectiveness of source-specific control policies and measures in support of the two Chinas Clean Air Actions implemented nationwide in 2013–2017 and 2018–2020, respectively. Eight sources were resolved from the DN-PMF analysis: coal combustion (CC), biomass burning (BB), vehicular emissions, dust, steelmaking and galvanizing emissions, a mixed sulfate-rich factor and secondary nitrate. After adjustment for meteorological fluctuations, a substantial improvement in PM2.5 air quality was observed in Tianjin with decreases in PM2.5 at an annual rate of 6.6%/y. PM2.5 from CC decreased by 4.1%/y. The reductions in SO2 concentration, PM2.5 contributed by CC, and sulfate demonstrated the improved control of CC-related emissions and fuel quality. Policies aimed at eliminating winter-heating pollution have had substantial success as shown by reduced heating-related SO2, CC, and sulfate from 2013 to 2019. The two industrial source types showed sharp drops after the 2013 mandated controls went into effect to phaseout outdated iron/steel production and enforce tighter emission standards for these industries. BB reduced significantly by 2016 and remained low due to the no open field burning policy. Vehicular emissions and road/

来源：sciencedirect

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数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0269749123003469

Two leading patterns of winter PM2.5 variations in eastern China before the outbreak of cold surge and their causes

摘要：It has been revealed that cold surge (CS) is a favorable weather condition to dissipate haze over Eastern China (EC). However, the variation of PM2.5 concentrations in EC (PCEC) during different CSs is less discussed. This study investigates the spatial and temporal variations of winter PCEC during CSs based on PM2.5 concentrations and NCEP/NCAR reanalysis datasets from 1980 to 2019. Two leading modes of PCEC variations during CSs were obtained through Empirical orthogonal function (EOF) analysis. The results show that PCEC increased before the CSs related to the EOF1 (Type1 CSs) occurred and decreased afterwards. While the PCEC has been showing a decreasing trend from 5 days before to 5 days after the CSs related to EOF2 (Type2 CSs), composite analysis shows that circulation anomalies with stable blocking highs over the Ural Mountains and the Sea of Okhotsk can increase the PCEC by strengthening the anticyclonic anomaly over EC before the Type1 CSs outbreak. While circulation anomalies with two wave-trains in mid and high latitudes can improve air quality from 5 days before to 5 days after the Type2 CSs outbreak by strengthening the cyclonic anomaly with northerly wind component over EC. The differences in circulation anomalies associated with two types of CSs mainly exist on the time scale of 10–30 days since the circulation anomalies of Type2 CSs are accompanied by the wave-train structure of “+ - + - +” propagating along the subtropical westerly jet stream. The wave-train

来源：sciencedirect

发布时间：2023-03-01

数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0169809523000935

城市气象精细预报

Selecting regional climate models based on their skill could give more credible precipitation projections over the complex Southeast Asia region

摘要：This study focuses on future seasonal changes in daily precipitation using Regional Climate Models (RCMs) from the Coordinated Regional Climate Downscaling Experiments-Southeast Asia ensemble (CORDEX-SEA). Projections using this RCM ensemble generally show a larger inter-model spread in winter than in summer, with higher significance and model agreement in summer over most land areas. We evaluate how well the RCMs simulate climatological precipitation using two skill metrics. To extract reliable projections, two sub-ensembles of 'better' and 'worse' performing models are selected and their respective projections compared. We find projected intensification of summer precipitation over northern SEA, which is robust across RCMs. On the contrary, in the southern part of SEA, the 'worse' ensemble projects a significant and widespread decrease in summer rainfall intensity whereas a slight intensification is projected by the 'better' ensemble. Further exploration of inter-model differences in future changes reveals that these are mainly explained by changes in moisture supply from large-scale sources (i.e., moisture convergence) with enhanced effects from local sources (i.e., evapotranspiration). The 'worse' models project greater changes in atmospheric circulation compared with the 'better' models, which can explain part of the uncertainty in projections for daily precipitation over the CORDEX-SEA domain. Hence, our findings might help assess more reliable projections over the SEA

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https://link.springer.com/article/10.1007/s00382-023-06751-5

CMA-BJ V2.0 系统华北地区降水预报性能评估

摘要：利用 CMA-BJ V2.0 系统在 2021 年汛期（6—9 月）华北地区预报的平均日降水量和 24 h 内逐时降水量，评估不同水平分辨率（3 km 和 9 km）在降水量、有效降水时次占比、降水强度、降水日变化等方面的预报性能。结果表明：9 km 和 3 km 分辨率预报均可较好地反映降水量和落区，捕捉平均日降水量大于 8 mm 的降水区域分布特征，但降水量级的预报较观测偏大；对小时降水量和有效降水时次

占比日变化的预报与观测基本一致，但对傍晚的峰值预报偏强，且多个时段空报，同时高估了小时降水量。与 9 km 分辨率预报相比，3 km 分辨率预报对有效降水时次占比随累积降水量的变化趋势与观测更接近，对小时有效降水时次占比日变化、峰谷值出现时间的预报也与观测更接近。9 km 分辨率预报对弱降水过程的预报能力更优，而 3 km 分辨率预报对强降水过程的预报能力更优。关键词:CMA-BJ V2.0 预报系统;偏差特征;定量降水预报评估

来源：应用气象学报

发布时间：2023-03-16

数据类型：期刊

http://qikan.camscma.cn/cn/article/doi/10.11898/1001-7313.20230201

对流尺度集合预报成员数对降水预报的影响

摘要：选取 2022 年川渝地区发生的 16 个强降水个例开展对流尺度集合预报批量试验，并通过对 31 组初值采用不同集合成员数时的降水集合预报技巧进行检验评估和综合分析。结果表明：集合成员的降水预报技巧总体上大致相当，因而采用不同成员数时预报技巧差异也不明显；表征降水总体分布特征的 Talagrand 分布和预报失误概率以及表征降水概率预报技巧的相对作用特征面积随着成员数的增加而逐渐改进，但当成员数达到一定数值后继续增大成员数对预报改进不明显。总体而言，对流尺度集合预报成员数设置为 16~18 最适宜。关键词:集合预报;对流尺度;概率预报;集合成员

来源：应用气象学报

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数据类型：期刊

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2020 年“6·26”冕宁致灾暴雨成因观测分析

摘要：利用多源观测数据，结合 ERA5 再分析资料，从环流背景、水汽条件、局地探空特征、对流系统演变以及地形影响等方面，分析了“6.26”冕宁暴雨的可能成因。结果表明：（1）暴雨期间，500 hPa 环流形势相对稳定，伴随中纬度槽东移和副热带高压西进，二者间西南气流显著增强，影响四川地区；盆地低涡北部非地转风风向随时间顺时针变化，使夜间向低涡中心辐合的气流增强，促进低涡发生、发展；盆地低涡西部的偏北气流和攀西高原的西南气流同时增强，使局地环流发生变化，改变降水区低层动力和水汽条件，决定降水起止。（2）冕宁暴雨过程分为两

个阶段：前期，受地形和冷池出流抬升影响，以及叠加其上的中层辐合的接力抬升作用，西南暖湿气流冲破对流抑制，在灵山寺西南侧山前形成强对流单体，强对流单体随引导气流向东北移动到灵山寺站，带来强降水；后期，受山前地形阻挡和山后源自盆地的冷空气的共同作用下，西南暖湿气流辐合上升运动的强度和伸展高度同时增加，灵山寺站附近不断有质心（回波强度超过 50 dBZ）高度较低的强回波单体生消，降水强度显著增强。关键词:冕宁暴雨/盆地低涡/局地环流演变/地形作用

来源：大气科学

发布时间：2023-03-15

数据类型：期刊

http://www.iapjournals.ac.cn/dqkx/cn/article/doi/10.3878/j.issn.1006-9895.2206.21149

2021 年 7 月河南极端暴雨事件的位涡诊断和精细化预报

摘要：2021 年 7 月 17～22 日，河南省发生一次大范围极端暴雨事件。本文利用 ERA5 再分析资料，基于湿位涡和倾斜涡度发展理论对此次暴雨过程进行诊断分析，并考察高分辨率全球模式天机系统及欧洲中期天气预报中心业务预报系统对此次降水过程的预报能力。结果表明此次事件是中高—低纬系统相互作用、协同影响的结果。18～19 日，来自中高纬度的高湿位涡沿倾斜的湿等熵面自对流层中高层向下入侵，降温和相对湿度增加，导致河南省西北部高涡度带的形成及对流层低层倾斜湿等熵面在河南省北部建立。20 日受低纬台风的影响南风增强，沿倾斜湿等熵面的上滑运动增强，导致相对涡度迅猛发展，强降水发生。天机系统对此次强降水过程的预报能力较欧洲中期天气预报中心的业务预报系统好，能为业务部门提前发布预警信号提供科学支撑。湿位涡和倾斜涡度发展理论是暴雨的诊断及预报的有力理论基础，在再分析资料及模式预报数据中与降水强度、降水落区及雨带的移动均有很好的对应。关键词:暴雨/中高—低纬相互作用/高分辨率模式/湿位涡/倾斜涡度发展来源：大气科学

发布时间：2023-03-15

数据类型：期刊

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中国东部降水中大尺度环流和局地陆—气相互作用的贡献：河南“21·7”强降水事件特征影响因子探究

摘要：2021 年 7 月河南省遭遇突破历史极值的极端强降雨，造成极大人员伤亡和经济损失，同时此次事件暴露出对中国东部汛期降水预测存在一定不足，提示我们需要加强汛期降水和传统影响因子不匹配的机理研究。本文首先利用再分析 ERA5 月资料识别了与 2021 年 7 月有相似环流背景的中国东部夏季降水事件；进一步利用基于相似环流型的动力调整方法，对 1979～2021 年 7 月中国东部降水距平开展了大尺度环流动力影响和局地陆面作用分离；最后，量化研究了上述两个作用对此次极端降水事件的贡献。得到如下主要结论：2011 年是 2021 年 7 月的 500 hPa 环流相似年，然而相应降水场在华北到长江中下游地区呈现显著差异。利用动力调整方法从降水距平中分离出大气环流的影响，相关分析表明余项反映局地陆—气反馈作用。降水余项是引起 2021 年 7 月江淮到长江下游地区的异常强降水的主要原因。归因分析表明，余项主要是由局地热力因子变化引起的，其中，蒸发加强，感热通量显著降低，增加了大气强对流不稳定能量，并通过影响大气相对湿度和边界层高度，使得降水增加。推广到 1979～2021 年 7 月降水的演变过程发现，中国东部降水余项的年际变率很强，极端降水异常主要体现在余项中，而环流分量相对稳定，结果强调了局地热力作用对夏季极端降水的重要影响。本研究表明，中国东部夏季降水的预测需要同时考虑大尺度大气环流特征和局地热力作用的贡献，后者对于极端降水预测的贡献尤为重要。关键词:强降水/河南/动力调整方法/大尺度环流/局地热力作用

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山东夏季两次极端雨强暴雨的滴谱特征研究

摘要：利用 Thies 激光雨滴谱仪观测的两次极端雨强暴雨的雨滴谱资料，结合 CINRADA/SA 多普勒雷达观测资料，分析了极端雨强对流降水雨滴谱和积分参数特征、以及地面雨滴谱的形成机制，主要结论为：（1）两次过程都是受副热带高压外围西南气流与西风槽共同影响，具有高温高湿的特点，有利于强降水的产生。（2）强对流降水（雨强 R＞20 mm h−1）雨滴谱参数 lgNw、D0 与雨强 R 关系显示，2015

年 8 月 3 日参数 D0 随着 R 增大很快增大，线性拟合线的斜率较大，lgNw 随着 R 增大逐渐减小，线性拟合线的斜率为负值；2017 年 7 月 26 日 D0 和 lgNw 与 R 都是正相关，但 D0 和 lgNw 随着 R 增大较缓慢地增大，线性拟合线的斜率较小。强对流降水雨滴浓度 NT 与雨强 R 之间的关系可以用幂函数拟合，8 月 3 日有较大系数和较小指数，7 月 26 日有较小系数和较大指数。（3）不同雨强的对流降水平均雨滴谱分布显示，8 月 3 日随着雨强增大（R＞50 mm h−1），直径 1～3 mm 中小粒子数密度相差不大，直径 3～6 mm 大雨滴的粒子数密度明显增大，对流降水 Z–R 关系有较大指数（1.61）；7 月 26 日随着雨强增大各直径档的粒子数密度基本同时增大，对流降水 Z–R 关系有较小指数（1.25）。综合各种参数与雨强关系和平均雨滴谱分布特征判断，8 月 3 日强对流降水雨滴谱属于典型的尺寸控制雨滴谱特征，而 7 月 26 日对流降水属于浓度—直径混合控制的雨滴谱特征。（4）雨滴谱归一化 Gamma 函数参数 Nw–D0 分布显示，两次对流降水都具有典型大陆性对流降水雨滴谱特征，对流降水主要属于冰相对流降水雨滴谱，但 8 月 3 日过程有较多雨滴谱属于冰相—暖雨混合对流降水雨滴谱特征。关键词:雨滴谱/极端雨强/尺寸控制/浓度—直径混合控制

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2021 年河南省一次罕见暴雨过程的降水特征及成因

摘要：基于河南省 119 个国家自动站逐小时降水观测资料、欧洲中期天气预报中心逐小时大气再分析资料（ERA-5）、美国国家环境预报中心（NCEP）再分析资料及美国国家海洋和大气管理局（NOAA）的海温资料对 2021 年 7 月 17～22 日河南省发生的一次历史罕见的极端强降水事件（简称“21·7”暴雨）的降水特征、大气环流和物理量场进行了较为详细的分析，并对比了河南历史上三次暴雨过程。结果表明：（1）“21·7”暴雨过程在 1 h 最大降水量、3 h 最大降水量、6 h 最大降水量、1 d 最大降水量、3 d 最大降水量和过程累计降水量方面均表现出显著极端性。（2）高层南亚高压与东海附近低涡稳定共存，中层副高稳定偏北偏强，与大陆高压形成对峙，使得天气形势稳定，为河南地区极端强降水的发生提供了背景条件。低层西太平洋副热带高压南侧东风气流与台风“烟花”北侧的东风气流相叠加，使得西太平洋到河南地区形成深厚的水汽通道，继而为河南地区极端强降水提供了充沛的水汽。

（3）在“21·7”暴雨期间，河南地区水汽通量散度值为负且大部分地区的整层可降水量可达 100 mm，整层水汽十分充沛。涡度和垂直速度场的大值区主要出现在太行山东麓临近地区，与降水大值区相对应。（4）与河南历史上两次暴雨过程“75·8”（1975 年 8 月上旬发生在河南的一次极端强降水事件）和“12·8”（2012 年 8 月发生在河南的一次极端强降水事件）相比，其相似之处在于台风在北移过程中受到副热带高压的阻挡而停滞少动，从而将源源不断的水汽输送至河南，造成极端降水事件的发生。（5）“21·7”暴雨期间西北太平洋副热带高压能够稳定维持在台风北侧是多种因素综合影响的结果，包括中高纬度环流配置、西太暖池异常偏暖造成 Hadley 下沉支加强，以及增强的越赤道气流。这是造成“21·7”暴雨过程累计降水量量级大于“12·8”暴雨且最终降水量超过 500 mm 的可能原因之一。关键词:极端强降水/河南/环流形势/物理量场/副热带高压

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中国北方未来沙尘起沙通量变化的数值模拟研究

摘要：本研究利用 WRF-Chem（Weather Research and Forecasting model with online coupled Chemistry）模式对未来中国北方沙尘起沙过程变化进行了模拟预测。为了提高预测结果的准确度，研究综合考虑了气溶胶、温室气体和植被覆盖率等因素对天气、气候和起沙过程的影响。预测结果显示，2016～2029 年西北部沙尘源地起沙量高于北部沙尘源地，地形和气候的差异是导致两地起沙过程及其季节变化差异的主要原因。两个沙尘源地四季起沙通量呈总体减少而部分季节增加的趋势，西北部沙尘源地起沙通量在春季总体呈上升趋势，在夏、秋和冬季呈下降趋势；北部沙尘源地起沙通量在春、夏和冬季呈下降趋势，在秋季呈微弱上升趋势。两个沙尘源地各季起沙通量的变化趋势由近地面风速主导，植被覆盖率、降水和地面温度等因素对起沙通量的年际波动有着重要影响。关键词:动力降尺度/WRF-Chem 模式/起沙通量变化预测/起沙通量变化驱动因素分析

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川渝地区夏季极端降水日变化特征分析

摘要：利用川渝地区 1991～2012 年夏季逐小时降水资料，分析该地区总降水、极端降水时空分布特征，特别是极端降水的日变化特征。结果表明，川渝地区受西高东低的地形影响，降水量总量（precipitation amounts，简称 PA）也呈西少东多分布，具体是川西北高原少、川西南山地及东部盆地多，盆周山区多、盆中丘陵区少；降水频率（precipitation frequency，简称 PF）则呈西高东低的相反分布，高原地区 PF 较高；降水强度（precipitation intensity，简称 PI）的分布与 PA 较为一致，自西向东逐渐增强。极端降水的 PA、PF、PI 空间分布特征与总降水的空间分布特征相似。东部的四川盆地乐山、雅安地区和达州、广元地区，以及西南山地区的西昌、攀枝花地区的 PA 大主要是由于 PI 大。西昌地区北方小部分西南山地区的 PA 大主要是由于 PF 大。川西高原区 PA 小是因为 PI 小。PA 日峰值自西向东递增，PF 日峰值呈相反变化趋势，自西向东递减。两者几乎全部都出现在夜间，“夜雨”特征显著。海拔较高的地区日峰值大多出现在前半夜，而海拔较低的地区大多出现在后半夜，自西向东日峰值出现时间逐渐推迟，因此川渝地区的降水系统可能存在自西向东传播的特征。聚类得到四类区域站点的典型形态降水日变化曲线分析表明，一区主要为川西高原地区，二区主要为高原向盆地过渡的南部山区，三区为盆地区域，四区为盆地向东部过渡的丘陵地区，PA、PF 和 PI 的日变化曲线均有“一峰一谷”的特征，区域一到四的 PA 峰值在午夜到凌晨，谷值在午后到傍晚，且自西向东逐渐推迟，PF 峰谷值时间均与 PA 峰谷值接近，PI 日变化波动较 PA 和 PF 的曲线大。位于高海拔地区的第一区 PA 小，主要是其 PI 小，高原向盆地过渡的南部山区的 PA 较大主要是 PF 较大，盆地区域及其向东部过渡的丘陵地区的 PA 的主要贡献是 PI 大。极端降水日峰值及其出现时间的分布特征都与总降水相似。川渝地区夏季小时极端降水的阈值西低东高，自西向东逐渐增大，极端降水量占总降水量的比重自西向东呈增大趋势，极端降水量对川渝地区东部总降水量贡献大，对西部贡献较少。关键词: 川渝/夏季/极端降水/日变化

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Sensitivity of cloud microphysics on the simulation of heavy rainfall in WRF- a case study for the 7–10 August 2019 event over Kerala, India

摘要：This work investigates the mechanism of the extremely heavy rainfall event during 7–10 August 2019 in Kerala. As the skill of WRF model for simulating the heavy rainfall strongly depends on the choice of cloud microphysics (CMP), sensitivity analysis is performed using cloud resolving WRF simulations with different CMP schemes to assess their performance. Total five sensitivity experiments are conducted by varying CMP schemes namely Thompson, Goddard, WSM6, Kessler and Purdue-Lin. Model results along with the fifth generation European Reanalysis (ERA5) data indicate that the heavy rainfall occurred in association with the monsoon depression, intensification of off-shore trough, and low-level jet (LLJ) phenomena and associated moisture transport and convergence. Our results clearly suggest that the heavy rainfall occurred during 7–10 August 2019 was less intensive compared to the August 2018 event. One of the prime reasons for meagre intensity is the presence of the upper tropospheric cyclonic flow over southeast Arabian Sea off Kerala, which reduced the intensity of low-level westerly flow, moisture transport and convection in 2019 event relative to the 2018 event. Comparison of simulated rainfall against station and gridded rainfall data indicate that the spatial and temporal variations of rainfall could be reproduced except that the model slightly over-estimated rainfall at a few stations in the central parts of Kerala. Out of the five CMP schemes, Thompson scheme simulates

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Multivariate bias correction of regional climate model boundary conditions

摘要：Improving modeling capacities requires a better understanding of both the physical relationship between the variables and climate models with a higher degree of skill than is currently achieved by Global Climate Models (GCMs). Although Regional Climate Models (RCMs) are commonly used to resolve finer scales, their application is restricted by the inherent systematic biases within the GCM datasets that can be propagated into the RCM simulation through the model input boundaries. Hence, it is advisable to

remove the systematic biases in the GCM simulations prior to downscaling, forming improved input boundary conditions for the RCMs. Various mathematical approaches have been formulated to correct such biases. Most of the techniques, however, correct each variable independently leading to physical inconsistencies across the variables in dynamically linked fields. Here, we investigate bias corrections ranging from simple to more complex techniques to correct biases of RCM input boundary conditions. The results show that substantial improvements in model performance are achieved after applying bias correction to the boundaries of RCM. This work identifies that the effectiveness of increasingly sophisticated techniques is able to improve the simulated rainfall characteristics. An RCM with multivariate bias correction, which corrects temporal persistence and inter-variable relationships, better represents extreme events relative to univariate bias correction techniques, which do not

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Deep learning models for generation of precipitation maps based on numerical weather prediction

摘要：Numerical weather prediction (NWP) models are atmospheric simulations that imitate the dynamics of the atmosphere and provide high-quality forecasts. One of the most significant limitations of NWP is the elevated amount of computational resources required for its functioning, which limits the spatial and temporal resolution of the outputs. Traditional meteorological techniques to increase the resolution are uniquely based on information from a limited group of interest variables. In this study, we offer an alternative approach to the task where we generate precipitation maps based on the complete set of variables of the NWP to generate high-resolution and short-time precipitation predictions. To achieve this, five different deep learning models were trained and evaluated: a baseline, U-Net, two deconvolution networks and one conditional generative model (Conditional Generative Adversarial Network; CGAN). A total of 20 independent random initializations were performed for each of the models. The predictions were evaluated using skill scores based on mean absolute error (MAE) and linear error in probability space (LEPS), equitable threat score (ETS), critical success index (CSI) and frequency bias after applying

several thresholds. The models showed a significant improvement in predicting precipitation, showing the benefits of including the complete information from the NWP. The algorithms doubled the resolution of the predictions and corrected an over-forecast bias from the input information. However, some new models presented new types of bias: U-Net tended to mid-range precipitation events, and the deconvolution models favored low rain events and generated some spatial smoothing. The CGAN offered the highest-quality precipitation forecast, generating realistic outputs and indicating possible future research paths.

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https://gmd.copernicus.org/articles/16/1467/2023/

Clear-air turbulence trends over the North Atlantic in high-resolution climate models

摘要：Clear-air turbulence (CAT) has a large impact on the aviation sector. Our current understanding of how CAT may increase with climate change in future is largely based on simulations from CMIP3 and CMIP5 global climate models (GCMs). However, these models have now been superseded by high-resolution CMIP6 GCMs, which for the first time have grid lengths at which individual turbulence patches may start to be resolved. Here we use a multi-model approach to quantify projected moderate CAT changes over the North Atlantic using CMIP6 models. The influence of the model resolution on CAT projections is analysed. Twenty-one CAT diagnostics are used, in order to represent uncertainties in CAT production mechanisms. Each diagnostic responds differently in time, but the majority display an increase in moderate CAT between 1950 and 2050. Although winter is historically the most turbulent season, there is strong multi-model agreement that autumn and summer will have the greatest overall relative increase in CAT frequency. By 2050, summers are projected to become as turbulent as 1950 winters and autumns. The global-mean seasonal near-surface temperature is used as a comparative metric. For every 1 °C of global near-surface warming, autumn, winter, spring, and summer are projected to have an average of 14%, 9%, 9%, and 14% more moderate CAT, respectively. Our results confirm that the aviation sector should prepare for a more turbulent future.

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Uncertainty of multi-source vegetation products on regional climate simulation in China

摘要：Vegetation is one of the most important parts of the Earth's land surface system. To investigate the impact and uncertainty of multi-source vegetation data on climate simulations in East Asia, we have compared two Fractional Vegetation Cover (FVC) and five Leaf Area Index (LAI) products and then performed seven experiments from 1999 to 2018 with the WRF model. The results suggest that the sensitivity of vegetation climatology is large especially in south East Asia, with a maximum difference of 4 m2/m2 in LAI and 16% in FVC. For the mean temperature, the responses in East Asia are between ± 0.4 K, and the uncertainty over the Chinese Mainland gradually enhances with the rapid vegetation growth. The feedback of precipitation is highly heterogeneous with sensitivities ranging between ± 1 mm. For interannual variability, vegetation has a greater impact in summer and autumn. The uncertainty of temperature and precipitation in summer over the Chinese Mainland is 118 and 1754 times that in winter. In addition, the linear trend results also indicate that the maximum trend difference in temperature is around 0.04 K/a in eastern China, while the precipitation has a larger range of 0.04–0.10 mm/a in southern East Asia. Besides, the biophysical mechanism analysis suggests that vegetation impact on surface energy budget is mainly a competition between albedo feedback and moisture feedback, and the large differences in multi-source FVC and LAI are sufficient to simulate different or even o

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Temperature and precipitation biases in CORDEX RCM simulations over South America: possible origin and impacts on the regional climate change signal

摘要：Precipitation and temperature biases from a set of Regional Climate Models from the CORDEX initiative have been analysed to assess the extent to which the biases

may impact the climate change signal. The analysis has been performed for the South American CORDEX domain. A large warm bias was found over central Argentina (CARG) for most models, mainly in the summer season. Results indicate that the possible origin of this bias is an overestimation of the incoming shortwave radiation, in agreement with an underestimation of the relative humidity at 850 hPa, a variable that could be used to diagnose cloudiness. Regarding precipitation, the largest biases were found during summertime over northeast of Brazil (NEB), where most models overestimate the precipitation, leading to wet biases over that region. This bias agrees with models' underestimation of both the moisture flux convergence and the relative humidity at lower levels of the atmosphere. This outcome suggests that the generation of more clouds in the models may drive the wet bias over NEB. These systematic errors could affect the climate change signal, considering that these biases may not be stationary. For both CARG and NEB regions, models with higher warm biases project higher warming levels, mainly in the summer season. In addition, it was found that these relationships are statistically significant with a confidence level of 95%, pointing out that biases are linearly linked with the climate change signal. For precipit

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城市气候与生态

Future climate change for major agricultural zones in China as projected by CORDEX-EA-II, CMIP5 and CMIP6 ensembles

摘要：Understanding future climate change is crucial for securing and managing water supplies necessary for agricultural activities in China, particularly in rainfed agriculture regions. This paper evaluates the projected climate change for nine major agricultural zones in China, using ensembles of regional climate models (RCMs) simulated under the Coordinated Regional Downscaling Experiment-East Asia second phase (CORDEX-EA-II) framework. The simulations were conducted for two climate scenarios (RCP2.6 and RCP8.5) at a 25 km grid spacing, with three RCMs (RegCM4, REMO, and WRF) driven by multiple CMIP5 global climate models (GCMs). The study compares the

RCM simulations to the driving CMIP5 and the recent CMIP6 ensembles, focusing on surface temperature, precipitation, and surface relative humidity for the present day (1981–2010), mid-future (2036–2065), and far future (2070–2099) periods. The model evaluations indicate that the GCM and RCM simulations are consistent with observations, with RCMs showing better performance than the driving GCMs. The results show that both GCMs and RCMs project increased temperature and precipitation in most agricultural zones of China in the future, with the CMIP6 ensembles projecting the largest temperature increase and the CORDEX-EA-II ensemble showing the finest spatial details. Relative humidity is projected to decrease over major rice-producing areas of South China in the CORDEX-EA-II, CMIP5, and CMIP6 ensembles. This study provides valuable i

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https://www.sciencedirect.com/science/article/pii/S016980952300128X

Impact of regional climate change on the mosquito vector Aedes albopictus in a tropical island environment: La Réunion

摘要：Highlights Climate change has a non-linear impact on precipitation in Reunion Island. The main type of breeding site modulates Ae. Albopictus sensitivity to climate change Both rainfall and temperature influence the distribution of Aedes albopictus. Climate change impact depends on scenario, season, region and altitude considered.The recent expansion of Aedes albopictus across continents in both tropical and temperate regions and the exponential growth of dengue cases over the past 50 years represent a significant risk to human health. Although climate change is not the only factor responsible for the increase and spread of dengue cases worldwide, it might increase the risk of disease transmission at global and regional scale. Here we show that regional and local variations in climate can induce differential impacts on the abundance of Ae. albopictus. We use the instructive example of Réunion Island with its varied climatic and environmental conditions and benefiting from the availability of meteorological, climatic, entomological and epidemiological data. Temperature and precipitation data based on regional climate model simulations (3 km × 3 km) are used as inputs to a mosquito population model for three different climate emission scenarios. Our objective is to study the impact of climate change on the life cycle dynamics of Ae. albopictus in the 2070–2100 time horizon. Our

results show the joint influence of temperature and precipitation on Ae. albopictus abundance as a fu

来源：sciencedirect

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数据类型：期刊

https://www.sciencedirect.com/science/article/pii/S0048969723011002

Modulation of daily PM2.5 concentrations over China in winter by large-scale circulation and climate change

摘要：We use the United Kingdom Earth System Model, UKESM1, to investigate the influence of the winter large-scale circulation on daily concentrations of PM2.5 (particulate matter with an aerodynamic diameter of 2.5 μm or less) and their sensitivity to emissions over major populated regions of China over the period 1999–2019. We focus on the Yangtze River delta (YRD), where weak flow of cold, dry air from the north and weak inflow of maritime air are particularly conducive to air pollution. These provide favourable conditions for the accumulation of local pollution but limit the transport of air pollutants into the region from the north. Based on the dominant large-scale circulation, we construct a new index using the north–south pressure gradient and apply it to characterise PM2.5 concentrations over the region. We show that this index can effectively distinguish different levels of pollution over YRD and explain changes in PM2.5 sensitivity to emissions from local and surrounding regions. We then project future changes in PM2.5 concentrations using this index and find an increase in PM2.5 concentrations over the region due to climate change that is likely to partially offset the effect of emission control measures in the near-term future. To benefit from future emission reductions, more stringent emission controls are required to offset the effects of climate change.

来源：ACP

发布时间：2023-03-02

数据类型：期刊

https://acp.copernicus.org/articles/23/2829/2023/

Temperature and precipitation biases in CORDEX RCM simulations over South America: possible origin and impacts on the regional climate change signal

摘要：Precipitation and temperature biases from a set of Regional Climate Models from the CORDEX initiative have been analysed to assess the extent to which the biases may impact the climate change signal. The analysis has been performed for the South American CORDEX domain. A large warm bias was found over central Argentina (CARG) for most models, mainly in the summer season. Results indicate that the possible origin of this bias is an overestimation of the incoming shortwave radiation, in agreement with an underestimation of the relative humidity at 850 hPa, a variable that could be used to diagnose cloudiness. Regarding precipitation, the largest biases were found during summertime over northeast of Brazil (NEB), where most models overestimate the precipitation, leading to wet biases over that region. This bias agrees with models' underestimation of both the moisture flux convergence and the relative humidity at lower levels of the atmosphere. This outcome suggests that the generation of more clouds in the models may drive the wet bias over NEB. These systematic errors could affect the climate change signal, considering that these biases may not be stationary. For both CARG and NEB regions, models with higher warm biases project higher warming levels, mainly in the summer season. In addition, it was found that these relationships are statistically significant with a confidence level of 95%, pointing out that biases are linearly linked with the climate change signal. For precipit

来源：Springer
发布时间：2023-03-01
数据类型：期刊
https://link.springer.com/article/10.1007/s00382-023-06727-5

人工智能气象

Deep learning models for generation of precipitation maps based on numerical weather prediction

摘要：Numerical weather prediction (NWP) models are atmospheric simulations that imitate the dynamics of the atmosphere and provide high-quality forecasts. One of the most significant limitations of NWP is the elevated amount of computational resources required for its functioning, which limits the spatial and temporal resolution of the outputs. Traditional meteorological techniques to increase the resolution are uniquely based on information from a limited group of interest variables. In this study, we offer an alternative

approach to the task where we generate precipitation maps based on the complete set of variables of the NWP to generate high-resolution and short-time precipitation predictions. To achieve this, five different deep learning models were trained and evaluated: a baseline, U-Net, two deconvolution networks and one conditional generative model (Conditional Generative Adversarial Network; CGAN). A total of 20 independent random initializations were performed for each of the models. The predictions were evaluated using skill scores based on mean absolute error (MAE) and linear error in probability space (LEPS), equitable threat score (ETS), critical success index (CSI) and frequency bias after applying several thresholds. The models showed a significant improvement in predicting precipitation, showing the benefits of including the complete information from the NWP. The algorithms doubled the resolution of the predictions and corrected an over-forecast bias from the input information. However, some new models presented new types of bias: U-Net tended to mid-range precipitation events, and the deconvolution models favored low rain events and generated some spatial smoothing. The CGAN offered the highest-quality precipitation forecast, generating realistic outputs and indicating possible future research paths.

来源：GMD

发布时间：2023-03-08

数据类型：期刊

https://gmd.copernicus.org/articles/16/1467/2023/

✧会议信息

本监测周期内，会议信息共更新 10 条：

“京师减灾”大讲堂 2023 年第一期——综合灾害风险管理与灾害风险金融：理论探讨与实践应用

来源：北京师范大学

会议时间：2023-03-29

会议地点:

数据类型：会议

https://geo.bnu.edu.cn/xzdt/84aed26d4347486eab20c79d7992ef6b.html

智慧城市及其应用

摘要：当前位置：首页科学研究 科研动态 【20230330 讲座】智慧城市及其应用 发布时间：Tue Mar 28 15:19:00 CST 2023 —END— 审核：吴其重 相关附件：

来源：北京师范大学

会议时间：2023-03-28

会议地点:

数据类型：会议

http://gcess.bnu.edu.cn/kxyj/kydt/59987d325c364fd4be63f2a51c6add42.html

胡中民 教授：陆地生态系统碳吸收的时空变异特征与驱动机制

来源：北京师范大学

会议时间：2023-03-24

会议地点:

数据类型：会议

https://geo.bnu.edu.cn/xzdt/53a58a0a34504e30a86c5241175f7872.html

Resolving the difference in secondary organic aerosol formation between environmental chambers and oxidation flow reactors with process-level modeling

来源：中科院大气所

会议时间：2023-03-21

会议地点:

数据类型：会议

http://www.iap.cas.cn/gb/xwdt/xshd/202303/t20230321_6703410.html

Secondary Organic Aerosol from Volatile Chemical Product Emissions

来源：中科院大气所

会议时间：2023-03-21

会议地点:

数据类型：会议

http://www.iap.cas.cn/gb/xwdt/xshd/202303/t20230321_6703409.html

我们身边的大气污染

摘要：当前位置：首页科学研究 科研动态 【20230323 讲座】我们身边的大气污染 发布时间：Tue Mar 21 14:56:00 CST 2023 —END— 审核：吴其重 相关附件：

来源：北京师范大学

会议时间：2023-03-21

会议地点:

数据类型：会议

http://gcess.bnu.edu.cn/kxyj/kydt/0e419fff92834bd09bfe395582d1c3ea.html

High Resolution Simulation of a Tornadic Convective Storm in South Korea

来源：中科院大气所

会议时间：2023-03-21

会议地点:

数据类型：会议

http://www.iap.cas.cn/gb/xwdt/xshd/202303/t20230321_6705675.html

The mysterious abundance of super coarse desert dust

摘要：The mysterious abundance of super coarse desert dust 发布时间：2023-03-11

来源：北京大学会议

会议时间：2023-03-11

会议地点:物理大楼北 539 教室（在线报告，腾讯会议：116-431-377）

数据类型：会议

https://www.atmos.pku.edu.cn/kxzb/xzbg/dqyhykxlt/147444.htm

HONO 来源及其对空气质量影响模拟研究

摘要：当前位置：首页科学研究 科研动态 【20230309 讲座】HONO 来源及其对空气质量影响模拟研究 发布时间：Tue Mar 07 14:18:00 CST 2023 —END— 审核：吴其重 相关附件：

来源：北京师范大学

会议时间：2023-03-07

会议地点:

数据类型：会议

http://gcess.bnu.edu.cn/kxyj/kydt/96bfb4c80c0d4146a5233f2740fc3fb6.html

Simulation of Past Extreme Climates and the Implications for Climate Sensitivity

摘要：Simulation of Past Extreme Climates and the Implications for Climate Sensitivity 发布时间：2023-03-06

来源：北京大学会议

会议时间：2023-03-06

会议地点:物理大楼北 539 教室（腾讯会议：455-244-030）

数据类型：会议

https://www.atmos.pku.edu.cn/kxzb/