CLIMATE SCIENCE FOR SERVICE PARTNERSHIP CHINA

UNPRECEDENTED EVENTS
CSSP China has pioneered a new method that enables estimations of China’s current risk to climate-related extremes. This work can help government and society anticipate extreme events and build climate resilience in the near and long-term.

Extremes in weather and climate, which can lead to events such as heatwaves and flooding, can have serious impacts on society, including the loss of lives and livelihoods. However, there are relatively few observations of such extremes, as they are, by definition, rare, making it difficult to estimate the risk and plan ahead for such events.

How can information on current climate risk help support decision makers?

Identifying climate-related risks in the present day and near future can help government and society anticipate extreme events, helping to build climate resilience in the near and long-term. For example, an understanding of the likelihood and intensity of heatwaves in the near future can help management of public health. Similarly, identifying risks from extreme rainfall can help protect business and infrastructure from flooding.
What CSSP China is doing

CSSP China has developed a new technique for assessing the current climate risk to extreme events, called UNSEEN (UNprecedented Simulation of Extremes with ENsemble). It uses ensembles of seasonal climate predictions to generate a much larger set of recent weather and climate events than is available from historical observations. The method identifies the potential for unprecedented weather and climate events under current climate conditions and estimates the risk of such extremes occurring in the real world. Before using the new technique, there is rigorous assessment of its suitability for the region and extreme in question. One benefit of this new technique is that it can be applied to temperature (to assess possible heatwaves and extreme cold events) as well as rainfall (to identify extreme rainfall or dry events leading to potential flooding or droughts).

The method has been applied to assess the risk of extreme summer temperatures over the Yangtze river basin (figure 1).

Figure 1 shows that much warmer summers than have been observed in recent decades are possible in the Yangtze river basin.

Using this method, we calculate that, in any given year, there is currently a 6% risk of an unprecedented hot month in July or August, and a 1% risk of a month 0.8°C hotter than previously observed.

This information could help inform adaptation planning in cities to enhance resilience to current and future extreme weather and climate events. It could also be useful for farmers in these regions to help better manage risk and prevent losses to crops and livestock.

Water stress and food security

Building on this, by applying the method to examine the risk of severe water stress in China's maize-growing regions, helps understand the risk of maize yield shocks in the current climate. CSSP China found that the chance of severe water stress leading to maize yield loss is higher than previously thought in China and other major maize growing regions around the world. It reveals that the current climate in China is capable of producing adverse conditions for maize (a combination of low rainfall and high temperatures), more extreme than any adverse conditions in China over the last 30 years. Therefore, current adaptation plans and policies in China may underestimate the true risk of shocks to maize yields. Such losses to Chinese maize could affect access to food, food prices and trade, leading to a greater reliance on reserve stocks.
What’s next?

Applying this method to a wider range of weather and climate indicators such as extreme wind speeds will enable estimates of the probability of extreme high wind speeds. This will be useful for planning purposes in the Chinese wind energy and building infrastructure sectors. The applications to food security will also extend to estimate risks to other important crops such as soybean and rice.

UK-China Research Innovation Partnership Fund information

The Weather and Climate Science for Service Partnership Programme – of which CSSP China is a part - comprises projects to develop partnerships harnessing UK scientific expertise to build the basis for strengthening the resilience of vulnerable communities to weather and climate variability, supported by the UK government’s Newton Fund.

For more information visit: www.newtonfund.ac.uk and follow via Twitter: @NewtonFund

For more information about CSSP China please visit the Met Office (www.metoffice.gov.uk/research/collaboration/cssp-china), IAP (www.lasg.ac.cn/cssp) or CMA (www.cma.gov.cn/en2014) or contact cssp-china@metoffice.gov.uk

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气候科学支持服务伙伴关系中国项目

史无前例的事件
评估中国当前和近期面临的气候极端状况风险

CSSP中国项目率先采用一种新方法来评估中国当前所面临的气候极端状况风险。这项工作有助于政府和社会预测与气候有关的极端事件，建立近期和远期针对气候的复原力。

天气和气候极端状况可导致热浪和洪水等事件，可能给社会带来严重影响，包括人员伤亡和生计损失。然而，针对此类极端状况的观测资料相对较少，因为极端状况本身就非常罕见，因此非常难以估计风险并针对风险采取预防措施。

有关当前气候风险的信息如何能为决策者提供支持？

识别当前和近期的气候相关风险有助于政府和社会预测极端事件，从而帮助建立近期和远期针对气候的复原力。例如，通过了解近期热浪出现的可能性和强度，可为公共卫生管理提供帮助。同样，通过识别极端降水带来的风险，有助于保护企业和基础设施免受洪水侵袭。
CSSP中国项目正在采取哪些行动

CSSP中国项目开发了一项新的技术来评估当前的极端气候事件风险，该技术被称为UNSEEN（“借助集合对极端状况进行史无前例的模拟”）。该项技术可利用季节性气候预测的集合而生成近期天气和气候事件数据集，其容量比现有历史观测记录的还要大。该方法可识别在当前气候条件下发生史无前例天气和气候事件的潜在可能性，并可估计此类极端状况在真实世界中发生的风险。在使用这项新技术前，需要严格评估其对于相关区域和极端状况的适用性。这项新技术的一个优点是它可适用于温度（以评估可能出现的热浪和极端寒冷事件）以及降水（以识别有可能导致洪水或旱灾的极端降水或干旱事件）。

该方法已被用于评估长江流域出现夏季极端气温的风险（图1）。

图1显示，长江流域可能出现远远高于最近数十年所观测到的夏季高温天气。

借助此方法，我们可计算出在任何特定年份，7月或8月出现史无前例的高温天气的风险目前为6%，出现某个月份的气温比以往观测记录高0.8℃的风险为1%。

这一信息可能有助于为各城市制定适应性规划提供参考，从而提高对当前和未来天气和气候极端状况的复原力。该信息还可能对相关区域的农民有用，帮助其更好地管理风险以及预防农作物和牲畜损失。

缺水和粮食安全

以此为基础，运用该方法评估中国玉米种植区内发生严重缺水的风险，有助于理解在当前气候条件下玉米产量严重下降的风险。CSSP中国项目发现，在中国和全球其他主要玉米种植区，严重缺水导致玉米减产的可能性要高于原先预想的水平。该方法显示，中国当前的气候可能出现对玉米不利的条件（降水量低和气温高等综合因素），比过去30年中国出现的任何不利条件都更为极端。因此，中国目前的适应方案和政策可能低估了玉米减产的真实风险。中国玉米产量如此规模的下降可能影响到粮食供应、食品价格和贸易，进而导致对储备库存的依赖性加大。
下一步？

通过将此方法应用于更大范围的天气和气候指标（如极端风速），将可估计极端大风风速出现的概率。这对于中国风电和基础设施建设等行业规划非常有用。在粮食安全领域的应用也可得到拓展，进而可评估大豆和大米等其他重要农作物所面临的风险。

中英研究与创新合作基金信息

天气气候科学支持服务伙伴关系计划（CSSP中国项目是其中之一）包含多个伙伴关系项目，旨在依托英国政府牛顿基金（Newton Fund）的支持，利用英国的科学专长，为加强易受天气和气候变率影响社区的复原力提供基础。

如需更多信息，请访问：www.newtonfund.ac.uk，并通过Twitter关注：@NewtonFund

如需有关CSSP中国项目的更多信息，请访问英国气象局 (www.metoffice.gov.uk/research/collaboration/cssp-china)、IAP (www.lasg.ac.cn/cssp) 或CMA (www.cma.gov.cn/en2014) 网站，或联系cssp-china@metoffice.gov.uk

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