Department of Physics

UNIVERSITY OF OXFORD

PRESS RELEASE: EMBARGO TO 0600 BST THURSDAY 30 MAY

FIRST USE OF WEATHER FORECASTS TO SHOW HUMAN IMPACT ON EXTREME WEATHER IS "TRANSFORMATIONAL", SCIENTISTS SAY

National forecasting centres like the Met Office could use the same tools used for weather forecasting to quantify how human behaviour is aggravating major events like floods, heatwaves and storms, climate scientists at Oxford University Physics show in a study to be published today (30/5) in *Nature Communications*.

Oxford climate physicists, led by Professor Myles Allen, have, for the first time, demonstrated how state-of-the-art weather forecasts can be used to show how greenhouse gas emissions affect extreme weather. In new studies of recent events in both the UK and U.S., they assessed the impact of global warming at a local scale and found that human activity both worsened specific weather events and made them more likely to occur.

Today's study, entitled 'Heatwave attribution based on reliable operational weather forecasts' will be published in *Nature Communications* at 10:00 AM BST / 05:00 AM ET Thursday 30 May at https://doi.org/10.1038/s41467-024-48280-7.

The findings coincide with the United Nations "AI for Good Summit" in Geneva, where scientists from the Oxford Physics team will lead sessions on how artificial intelligence and machine learning can improve regional forecasting of extreme weather and future climate predictions.

"We have shown for the first time that the same top-quality models used for weather forecasting, which are tested relentlessly every day, can be used to show the impacts of global warming," said Professor Myles Allen, who leads the Oxford University Physics research team. "Multi-billion-pound decisions depend on adapting to climate change, so we need the most reliable means possible to inform them – and this is it."

"Weather forecasters could – and should – both warn people of extreme weather and explain how it is being affected by climate change," Professor Allen continued. "It isn't a simple case of climate change making all weather worse: some events, like prolonged winter cold, have become less likely."

The new Oxford studies used the world's most reliable medium range weather forecasting model, from the European Centre for Medium-Range Weather Forecasting, to assess the impact of climate change on extreme weather. A previous study, published in Environmental Research: Climate, focused on Storm Eunice in the UK, which reached wind speeds of 122 miles per hour and caused 17 deaths in February 2022.

"We found that climate change expanded how much of the UK was impacted by storm Eunice and intensified the storm's severity by as much as 26%," said Shirin Ermis, who led the UK study by Oxford University Physics. The study published today applied the same approach to the U.S. Pacific Northwest heatwave, thought to have killed over 800 people in June 2021.

"Climate change and human influence is having a very clear impact on certain extreme weather like storms and heatwaves," said Dr Nicholas Leach, who led the U.S. study. "Human influence made this 2021 heatwave at least 8 times more likely, and we also found the risk of similar heatwaves occurring is doubling every 20 years at the current rate of global warming."

Understanding how climate change and human activity impacts extreme weather events remains a significant and urgent challenge because every year such events cost many lives and billions of dollars in aid and disaster relief around the world.

In the UK, the cost of dealing with natural disasters caused by extreme weather and climate change could bankrupt the country by the end of the century, according to a recent report from the environmental intelligence agency Kisters. And in the U.S., the cost of dealing with 28 separate weather and climate disasters in 2023 alone topped a record US$90 billion.

To investigate the impact of climate change on extreme weather, and assess the influence of human activity, scientists rely on computer modelling. However, climate models are often inaccurate at a regional or local level and only represent specific atmospheric processes at a coarse scale, making their predictions unreliable, especially for extreme weather like storms.

The Oxford teams overcame this by using high-resolution weather forecasting models to simulate extreme weather as if it had occurred in a world without human influence on climate, and in a warmer world of the future. Their models could simulate and predict even unprecedented weather events and can also be used to understand and quantify how human behaviour is changing them.

“Why only use a road atlas when you have a satnav available?” said Dr Leach. “Our climate models are like the old A-to-Z: tried and tested, but they have their limitations, especially when it comes to extreme weather. Using state of the art weather forecast models allows us to quantify how human influence impacts extreme weather, to zoom in on local impacts, and to investigate the processes driving this, giving us greater confidence in our predictions.”

At the AI for Good summit in Geneva today, Professor Philip Stier of Oxford University Physics, will convene a workshop with leading international experts to discuss future climate prediction systems. These are expected to make extensive use of artificial intelligence, to deliver more accurate predictions of the impact of climate change at local level.

Further information, images and media interviews/ enquiries:

PR & Media Contact: Tessa Curtis, Department of Physics
E: tessa.curtis@physics.ox.ac.uk
M: +44 7767 654122

NOTES TO EDITORS

+ Source, The National Center for Environmental Information (NCEI)

About Oxford University Physics

Oxford University Physics is one of the largest physics departments in the world, top-ranked in the UK and among the lead research universities globally in all key areas of physics (currently number 3 in the QS World Rankings 2024). Its mission is to apply the transformative power of physics to the foremost scientific problems and educate the next generation of physicists as well as to promote innovation and public engagement with physics.

Oxford University Physics leads ground-breaking scientific research across a wide spectrum of challenges: from quantum computing, quantum materials and quantum matter to space missions and observation; from climate science to the development of next-generation technologies for renewable energy; and from designing experiments to understand the nature of existence to revolutionising medicine and healthcare through biophysics.

Oxford University Physics has spun out 18 companies since launching the University’s first commercial venture in 1959 and works with enterprise across most areas of its leading scientific research.

About Oxford University

Oxford University has been placed number 1 in the Times Higher Education World University Rankings for the eighth year running, and number 3 in the QS World Rankings 2024. At the heart of this success are the twin-pillars of our ground-breaking research and innovation and our distinctive educational offer.

Oxford is world-famous for research and teaching excellence and home to some of the most talented people from across the globe. Our work helps the lives of millions, solving real-world problems through a huge network of partnerships and collaborations. The breadth and interdisciplinary nature of our research alongside our personalised approach to teaching sparks imaginative and inventive insights and solutions.

Through its research commercialisation arm, Oxford University Innovation, Oxford is the highest university patent filer in the UK and is ranked first in the UK for university spinouts, having created more than 300 new companies since 1988. Over a third of these companies have been created in the past five years. The university is a catalyst for prosperity in Oxfordshire and the United Kingdom, contributing £15.7 billion to the UK economy in 2018/19, and supports more than 28,000 full time jobs.