Climate Change and the World's Three Poles: The Arctic, Antarctic and Himalaya

National Meeting organised jointly by the Grantham Institute and Royal Meteorological Society

Thursday 28 April 2022, 13:00 – 14:00

Abstract

Climate change is having rapid and dramatic impacts on glacier ice and snow at three of the World's poles: the North Pole, the South Pole, and the world's highest point, the glaciers of the Himalaya. In the Arctic, the Greenland Ice Sheet is experiencing increased summer melt, and we are witnessing a great increase in ice discharged into the ocean. The Arctic sea ice extent is decreasing, exposing more dark ocean water which absorbs heat and amplifies warming. In the Antarctic, we are seeing rapid changes in the floating ice shelves that surround the continent, which are thinning and have increased surface melt. The great outlet glaciers that drain the Antarctic Ice Sheet are also shrinking, driving global sea level rise. In the Himalaya, hundreds of millions of people depend on glaciers for water, for irrigation, industry and domestic consumption. As the glaciers here shrink, they will provide less water for downstream populations, providing more tension in an already water-stressed region. Himalayan glaciers are frequently covered in rock debris, making their response to climatic changes highly non-linear and difficult to predict. Working at high-elevation is challenging but if models projecting future glacier change in the region are to be considered robust, the collection of field data is essential. This event will bring together experts in ice at the Earth's three poles for three exciting talks and an engaging panel discussion in order to explore climate change at the world's highest, most northern and most southerly points and opportunities to reduce the impact or adapt to climate change in these regions.

13:00	Welcome	Prof Liz Bentley, FRMetS
13:02	Introduction	Dr Bethan Davies
13:05	Melting Ice and the Future of Antarctica	Dr Ella Gilbert
13:15	What is Happening to the Greenland Ice Sheet?	Dr James Lea
13:25	EverDrill: An insight into the thermal conditions of a Himalayan debris-covered glacier	Dr Duncan Quincey
13:40	Audience Q&A	All speakers
13:55	Wrap up by Chair	
14:00	Meeting Close	

Abstracts and Biographies

Dr Ella Gilbert

Melting ice and the future of Antarctica

The Antarctic ice sheet contains enough ice to raise global sea levels by 58 m. This means that what happens at the poles affects us all, and understanding Antarctic change is of the utmost importance for adapting to a future that could look very different.

The continent has changed notably in recent decades, with rising temperatures in the atmosphere and oceans driving ice melt from above and below. But Antarctica is vast and regionally distinct, with a complex array of factors behind varied processes of change in each part of the continent. Changing atmospheric and ocean circulation have different effects in different sectors of the Antarctic, and climate is changing more in some regions than others. Ultimately, these processes of change have far-reaching global implications for people across the world, and scientific research in these areas is vital to inform our projections of the future.

Ella Gilbert (she/her) has her heart in the ice and her head in the clouds. She is a climate scientist at the British Antarctic Survey, where her research focuses on how the Arctic and Antarctic ice sheets will respond to climate change. She is also a passionate communicator who attempts to translate complex science into language we can all understand.

Dr James Lea
What is happening to the Greenland Ice Sheet?
The Greenland Ice Sheet is shrinking. Through a combination of surface melting and iceberg calving it is currently the largest contributor to global sea level change, though ice loss from the ice sheet is also known to impact the oceans and atmosphere. Together, this means that changes occurring in Greenland will have much broader impacts; affecting weather, climate, life in the oceans, and even future trade through the Northwest Passage. This talk will cover a brief introduction to how climate change is impacting the Greenland Ice Sheet, and how the Greenland Ice Sheet is impacting climate change, showing that what happens in the Arctic will not stay in the Arctic, and has implications for us all.

James Lea (he/him) is a glaciologist at the University of Liverpool, who uses evidence from satellite imagery, past glacier change, and numerical models to help understand past, present and future glacier change. He has conducted multiple field seasons at the margin of the Greenland Ice Sheet working to reconstruct past glacier advance and retreat, with a particular focus on understanding iceberg calving processes and how these are incorporated into numerical models. In recent years, he has been working to leverage advances in cloud computing technologies to undertake rapid, continental-scale analysis of satellite imagery to understand how recent climate change has been impacting glaciers and ice sheets and what this will mean for their future. James is currently leading a UKRI Future Leaders Project on 'Glacier and Ice Sheet Change in a Warming World', and is an advocate for improving LGBTQ+ inclusivity in the environmental sciences.

Dr Duncan Quincey
EverDrill: An insight into the thermal conditions of a Himalayan debris-covered glacier
Himalayan debris-covered glaciers provide an important source of water to the communities that inhabit the foothills. Their recession is well-documented, and while the broad scale climatic controls are largely understood, the individual characteristics that determine a glacier's response to that climatic forcing are not. The EverDrill project aimed to provide empirical data on glacier subsurface conditions as a first step towards closing this knowledge gap. In particular, we focussed on measuring ice temperatures, and discovered that around 56% of the ablation area of the highest glacier in the world, the Khumbu Glacier in Nepal, comprises ice that is at the melting point. From boreholes drilled in the glacier's ablation area, we measured a minimum ice temperature of –3.3 °C, and the coldest ice we measured was 2 °C warmer than the mean annual air temperature. Our results indicate that high-elevation Himalayan glaciers are vulnerable to even minor further atmospheric warming.

Duncan Quincey (he/him) is a remote sensing glaciologist at the University of Leeds. His research focuses on quantifying environmental changes in mountain regions using a combination of remote and in-situ methods, and data-modelling the processes driving these changes. In particular, he is interested in high-elevation processes relating to glaciers, snow, hillslopes and rivers, and how they impact on human populations. He has studied mountain hazards for more than 15 years, including glacial lake formation, outburst floods, ice avalanches and rockfalls, and seeks where possible to adopt an interdisciplinary approach to link physical changes in the mountain regions with social, economic and health impacts. He has led field campaigns in remote catchments of the Himalaya and the Andes, as well as in the Southern Alps of New Zealand, the European Alps, and the high-Arctic. Duncan was the PI of the EverDrill project, which attempted to collect the first distributed data on ice temperatures at more than 5000 m a.s.l. using an adapted pressure washer. Here he will present some of their key findings.

Chair:
Bethan Davies (she/her) is a glaciologist at Royal Holloway University of London. She investigates the relationships between glaciers and climate. She uses the geological record of past glacier fluctuations and pictures from satellites in order to better understand how glaciers behaved in the past, and uses these datasets to improve how we predict their future behaviour. She is also passionate about science communication and has long maintained the award-winning website, www.AntarcticGlaciers.org.

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