

Climate change and extreme weather linked to high pressure over Greenland

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Credit: NASA

Greenland is one of the fastest-warming regions of the world, according to climate change experts at the University of Sheffield.

New research, led by Professor Edward Hanna from the University's Department of Geography, has identified changes in weather systems

over Greenland that have dragged unusually warm air up over the western flank of Greenland's Ice Sheet.

These weather systems are also linked to extreme weather patterns over northwest Europe, such as the unusually wet conditions in the UK in the summers of 2007 and 2012.

The study analysed changes in weather systems over Greenland since 1851, using a measure called the Greenland Blocking Index (GBI). The index measures the occurrence and strength of atmospheric [high pressure](#) systems, which tend to remain stationary when they occur, causing long runs of relatively stable and calm weather conditions. The high pressure also blocks storm systems from moving in on the region. The previous available version of the GBI only extended back to 1948.

Professor Hanna and his team have found an increase in the occurrence of atmospheric high pressure 'blocking' systems over Greenland since the 1980s throughout all seasons, which relates to a significantly strong warming of the Greenland and wider Arctic region compared with the rest of the world.

The Sheffield-led team also found an especially strong recent increase in the occurrence of Greenland 'blocking' weather systems in summer, which is linked to a more northward-meandering branch of the atmospheric jet stream. This has resulted in warmer air more often moving north into the region in recent years.

Professor Hanna said: "Our research has found an increase in the incidence of high pressure weather systems remaining stationary over Greenland since the 1980s, which is having a significant impact on extreme weather and [climate change](#) in the region.

"These weather systems are occurring in the area more often because of

strong Arctic warming and changes in the atmospheric jet stream in recent years.

"This is resulting in an increase in the occurrence of warm air in the region and it is also affecting weather systems downstream of Greenland, such as over the UK. The unusually wet weather seen in the UK in the summers of 2007 and 2012, for instance, is linked to these stationary high pressure systems over Greenland."

The research team, which also includes a climate scientist John Cappelen from the Danish Meteorological Institute in Copenhagen, Denmark, found that Greenland 'blocking' pressure systems have become much more variable from year to year in December in recent decades. This reflects an increasing destabilisation of atmospheric weather systems in late autumn and early winter, which the team believe may be related, at least in part, to dramatic declines in sea-ice coverage in the Arctic region.

"Sea-ice coverage throughout the Arctic has significantly reduced in recent years, which we already know is having an amplifying effect on warming in the region. What this study now tells us is that changes in stationary high pressure over Greenland are adding to the change in polar climate," Professor Hanna added.

This research has more than doubled the timespan of data analysed on Greenland 'blocking' [weather systems](#) and is a useful measure of changes in North Atlantic atmospheric circulation. The results can enable an improved understanding of the links between mid-latitude and high-latitude climate change when combined with other climatological studies.

Findings from the research are published in the *International Journal of Climatology* on 27 April 2016

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Provided by University of Sheffield

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