SNAPSHOT

Arctic melt leads to weather extremes

Over two days in February 2010, a record-breaking 82.3 cm of snow fell on Washington DC, paralyzing the US capital, grounding flights and adding further doubts to those sceptical of global warming. However, what President Obama called 'snowmaggedon' could easily be another symptom of climate change.

Evidence is mounting that melting Arctic sea ice is ultimately to blame for the more extreme winter weather in the north.

The minimum area covered by Arctic sea ice has declined by about 29% since 1979. Less ice at the end of summer means that the open water heats up more than usual, and so can return more heat and moisture to the air in late autumn and early winter. More moisture generally means increased precipitation.

At the same time, the Arctic warming affects atmospheric circulation. When the air temperature difference between the pole and mid-latitudes is reduced, the prevailing westerly jet-stream winds that blow from Canada to Europe to north of Japan are weakened. A weak jet stream tends to 'wobble' more from north to south, and sometimes these meanders can 'pinch' off to form an isolated eddy. When such eddies or 'blocking patterns' form, they tend to make the weather over that region more persistent, explains Jennifer Francis of Rutgers University, New Jersey.

A study published at the end of February, found a strong link between Arctic ice loss, blocking patterns and snow cover (*Proc. Natl Acad. Sci. USA* http://doi.org/hq2; 2012). Jiping Liu, of the Georgia Institute of Technology, Atlanta, and colleagues show that a decrease in autumn Arctic sea ice of 1 million km^2 — one-fifth of current autumn sea-ice coverage, about twice the size of Spain — corresponds to about 3–12% more snow cover in large parts of the northern United States, northwestern and central Europe, and northern and central China. The researchers say that this weather pattern should actually favour warmer winter conditions in northeastern Canada and Greenland, where weak westerly winds allow the intrusion of warm air from the North Atlantic.

Francis, on the other hand, argues that a meandering jet stream and the creation of eddies will simply create more persistent weather of all kinds. "You might get a cold snowy period in Europe one year, and be warm the next. It all depends where the swings of the jet stream are set up," she says. That in turn depends on a number of factors, including the Arctic Oscillation and El Niño. "I think they're sticking their necks out a bit predicting very specific weather for specific places," she says. Francis's work is now in press (*Geophys. Res. Lett.* http://doi.org/hq3; 2012).

The theories seem to match some recent weird weather. In 2009–2010, the United States, Norway, the UK and Ireland saw their coldest winters since 1984–1986, and it was the second-coldest December in central England for more than 350 years. In the same spring that Washington DC was hit with snow, Europe reportedly had its biggest snowstorms in 25 years: a state of emergency was declared in the Spanish region of Catalonia. Hudson Bay and Baffin Island in the Canadian north, on the other hand, were up to 5 °C warmer than usual.

But the weather, as always, will never be entirely predictable. Vancouver saw an unfortunate early spring during the February 2010 winter Olympics, and the winter of 2010–2011 saw average to low snowfall in the eastern United States, despite an extremely high Arctic ice melt. "Every year is going to be different," says Francis.

NICOLA JONES

© BILL CLARK/GETTY IMAGES