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Sea Ice

On thin ice in the warm Arctic

Researchers have never recorded a smaller area of February sea-ice cover on the Arctic Ocean than in 2018

[08. March 2018] **The Arctic sea ice continues to dwindle: Since the 1970s, when satellites first began monitoring the white sheet covering the Arctic Ocean, its February extent was never as small as it was this year. The reason: warm air intrusions, which are not only hitting the Arctic more frequently, but are also intensifying and reaching farther north.**



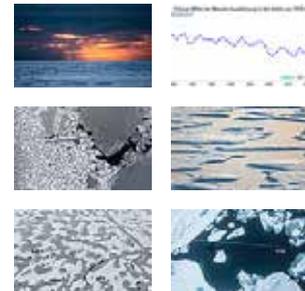
This February, while many regions in Europe were shivering from the frigid polar air, mild winds from the south warmed the Arctic, bringing northern Greenland temperatures of up to six degrees Celsius in the middle of the polar night. Such temperatures, which are practically summery for these latitudes, combined with Siberian cold in Central Europe are weather patterns linked to climate change. Warm air slows the freezing of water in the Arctic Ocean. When less ice is formed, the wintertime ice cover remains smaller than in past years and the ocean warms more quickly.

In February 2018, researchers at the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) recorded a sea-ice extent of roughly 14 million square kilometres - the lowest average value for the ice cover in the High North since the beginning of satellite measurement in 1978. "That being said, the ice cover in February is by no means shrinking steadily from year to year; there are substantial variations," explains sea-ice physicist Marcel Nicolaus from the Alfred Wegener Institute. Yet the long-term figures show a clear trend - the February ice cover on the Arctic Ocean is shrinking by an average of 2.75 percent per decade.

"Climate change is definitely behind this long-term decline," says Marcel Nicolaus. And the trend will have consequences for the weather in the Northern Hemisphere: if temperatures climb and the ice cover on the Arctic Ocean continues to shrink, the small differences in air pressure between different parts of the polar jet stream - the term that meteorologists use to describe a cluster of intense winds high in the atmosphere that blow from west to east across the globe at speeds of several hundred kilometres per hour - will change. But the polar jet stream isn't a perfect circle; it can form giant loops, especially when the difference in temperature between north and south lessens. If climate change amplifies the polar jet stream's fluctuations, in some areas warm air will travel much farther north than usual; in others, cold air will reach much farther south.

And it's precisely this development that climate researchers are already observing: the warm air intrusions in the Arctic are not only more frequent, but

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are also growing more intense and reaching farther north. In February 2018, over Greenland the Arctic vortex swung especially far to the north, whereas it extended much farther to the south than usual over Europe, effectively trapping a high-pressure area over Scandinavia and a low-pressure area over Greenland in the process. On the flanks of these areas, ice-cold polar air flooded directly into Europe, penetrating far into Southern Europe; meanwhile, over Greenland warm air flowed far to the north, slowing the formation of ice cover on the Arctic Ocean.

In order to better grasp these changes, it's not enough to measure the sea-ice extent in the Arctic; the ice thickness is also an essential factor, as thin ice is more likely to break and be blown away or compressed by the wind. Accordingly, since 2010 the researchers have also measured the thickness of the ice on the Arctic Ocean, chiefly relying on the European satellite CryoSat-2 and Earth observation satellites to help them do so. "Here, too, we can see a first trend toward thinner ice on average," explains AWI researcher Marcel Nicolaus. Climate change is not only causing the ice on the Arctic Ocean to shrink in terms of area, but also in terms of mass, creating a vicious circle: the ice cover is becoming more fragile and variable. This in turn will cause temperatures to rise further, because open water keeps far more heat from sunlight on the Earth than sea ice does.



The Alfred Wegener Institute pursues research in the polar

regions and the oceans of mid and high latitudes. As one of the 19 centres of the Helmholtz Association it coordinates polar research in Germany and provides ships like the research icebreaker Polarstern and stations for the international scientific community.

