Europe hammered by winter, is North America next?

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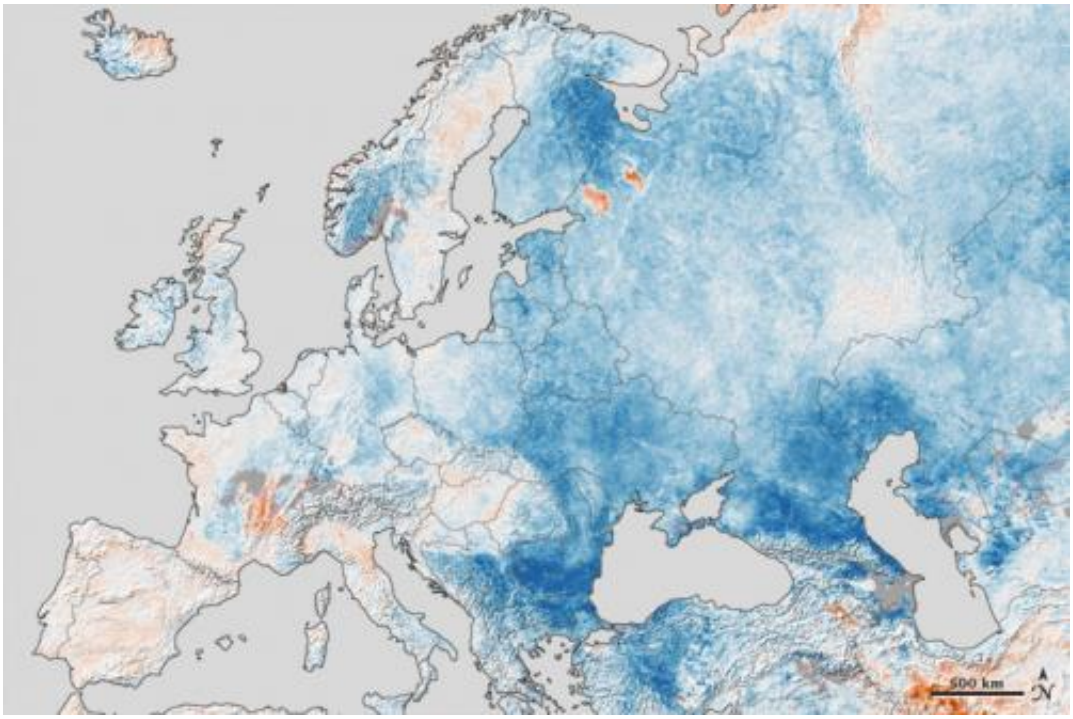

This map shows temperature anomalies for Europe and western Russia from January 25 to February 1, 2012, compared to temperatures for the same dates from 2001 to 2011. The anomalies are based on land surface temperatures observed by the MODIS instrument on NASA's Terra satellite.

For the first half of this year's winter, the big news was warm temperatures and lack of snow. Ski resorts were covered in bare dirt, while January temperatures in southern California topped July highs.

Then, out of the blue, Europe got clobbered: Over the past two weeks, temperatures in Eastern Europe have nose-dived to -30 degrees Celsius (-22 degrees Fahrenheit). Blizzards and the bone-chilling cold have resulted in the deaths of over 550 people so far, with rooftop-high snow drifts trapping tens of thousands of villagers in their homes and cutting off access to entire towns. It has even snowed as far south as North Africa.

NASA climatologist Bill Patzert of the Jet Propulsion Laboratory explains what happened: "A couple of weeks ago, Mother Nature did an about face. The tight polar vortex that had bottled up the cold arctic air in the beginning of winter suddenly weakened. Cold air swept out of Siberia and invaded Europe and the Far East."

The "tight polar vortex" is caused by the Arctic Oscillation (AO), a see-sawing pressure difference between the Arctic and lower latitudes. When the pressure difference is high, a whirlpool of air forms around the North Pole. That's what happened earlier this winter: the whirlpool was more forceful, corralling the cold air and keeping it nearer the pole.

Now the vortex is weakening. With "the AO Index going negative," as an expert or weather-nerd might put it, cold air escapes from that whirlpool and heads southward, resulting in the killing extremes now plaguing the other half of the planet.

However, even the breakdown of the vortex cannot completely account for the severity of the winter Europe is suddenly experiencing. As strange as it sounds, some climatologists, among them Judah Cohen of Atmospheric and Environmental Research in Massachusetts, attribute the unusual cold to global warming. Cohen contends that since sea ice is being melted by warmer temperatures in the Arctic, more moisture is available for the atmosphere to pick up – and drop as snow. As a result, Siberian snow cover has increased, and this snow cover has a cooling

effect which reaches East Asia and Europe.

"Cohen's research is cutting edge and could bring important improvements to forecasting climate and weather over North America and Europe," says Patzert. "Cohen and others are on the threshold of understanding of how climate change affects the behavior of the Arctic Oscillation1."

Patzert adds, however, that this winter is just one of many severe winters that have changed European history. "Looking back, Mother Nature has taken us on some very wild rides."

He cites the winter of 1683/84, when the Thames River in England stayed frozen with a thick layer of ice for nearly two months, as an example.

"And let's not forget the frigid winter of 1812, when Napoleon's Grande Armee was decimated by the extreme cold in Western Russia."

Patzert notes that European history would have been much different if Napoleon had had a good meteorologist on his staff and some NASA satellites to warn him about what he was marching into.

"And the turning point of World War II occurred in 1941, when Germany's forces were nearly frozen in place," he adds.

There are many other examples2, and climate change can't be blamed for all of them.

"There's always going to be some natural variability. Every episode of high temperatures or extreme cold isn't climate change. Sometimes it's just weather!"

The weakening Arctic Oscillation could soon bring a return of winter to North America as well, although Patzert doesn't expect it to be as severe as what's happening on the other side of the Atlantic.

Is there any relief in sight for Europe?

"The good news is that this crippling cold snap arrived mid-winter. With the vernal equinox less than six weeks away, this AO episode will become muted – hopefully."

Hang on till Spring."

Provided by Science@NASA