

Arctic Sea Ice and Extreme Weather

Supervisors

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Project description

The decline in Arctic sea ice cover (see video below) has been widely documented and it is clear that this change is having profound impacts locally. An emerging and highly uncertain area of scientific research, however, is whether such Arctic change has a tangible effect on weather and climate at lower latitudes. The devastation wrought by the landfall of Superstorm Sandy in 2012, the frigid temperatures over North America in the winter of 2013/2014, the cold and snowy winters of 2009/2010 and 2010/2011 over Europe and bouts of extreme summer weather have all been linked to Arctic sea ice loss over the past decade, in both the scientific literature and the media. Furthermore, there are suggestions that as the Arctic continues to see unprecedented sea ice decline in the coming decades, extreme weather in mid-latitudes may become more commonplace (see video below). However, such connections remain highly uncertain and controversial, with other studies suggesting that there is in fact no robust evidence for such a link between Arctic sea ice and midlatitude weather and that, for example, the chances of cold weather extremes in the coming decades may actually decrease because of Arctic sea ice loss.

This project will enhance understanding of relationships between Arctic sea ice and European weather through detailed analysis of retrospective climate forecasts, produced at the UK Met Office. These forecasts use state-of-the-art climate models and include interactive sea ice. Each hindcast starts from the observed state of the ocean (including sea ice), land and atmosphere - the “initial conditions”. Unfortunately, the initial conditions are not known precisely, and individual hindcasts can be very sensitive to small uncertainties in the initial conditions. This sensitivity is taken into account by making an “ensemble” of forecasts - each with slightly different starting conditions, which reflect our uncertainty. These ensemble hindcasts constitute a new and rich data set which will be used to explore potential links between Arctic sea ice and European weather and climate.

Further reading

Cohen, J., J.A. Screen, J.C. Furtado, M. Barlow, D. Whittleston, D. Coumou, J. Francis, K. Dethloff, D. Entekhabi, J. Overland & J. Jones, 2014: Recent Arctic amplification and extreme mid-latitude weather, *Nature Geosci.*, 7, 627-637.

Scaife, A. A., et al., 2014: Skillful long-range prediction of European and North American winters, *Geophys. Res. Lett.*, 41, 2514–2519, doi:10.1002/2014GL059637.