

Met Office model to better predict extreme winters

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Severe UK winters, like the 'big freeze' of 2009/10, can now be better forecast months in advance using the Met Office's latest model, new research suggests.

A new study, published today in *Environmental Research Letters*, compares the latest seasonal [forecast system](#) to the one previously used and shows that it can better warn the UK of extreme winter weather conditions.

Dubbed the 'high-top' system, it is different from the previous system as it takes into account phenomenon known as sudden stratospheric warmings (SSWs), which have previously been shown to be responsible for cold surface conditions.

'SSWs occur when the usual westerly winds in the stratosphere – between 10 and 50km [altitude](#) – break down. This causes a reversal in the westerly winds in the stratosphere, generating a signal that can often burrow down to the Earth's surface over the course of a few weeks,' said lead author of the study David Fereday.

'This reduces the occurrence of surface [westerly winds](#) that bring mild air to [northern Europe](#) in winter from the North Atlantic. Instead, northern Europe experiences cold and blocked conditions that can cause extreme low temperatures, as happened in winter 2009/10.'

The Met Office's current long-range forecasting system, GloSea4, is able to simulate weather conditions in higher parts of the atmosphere. This was not a feature available in the forecast system used for the 2009/10 long-range outlook.

GloSea4 uses a [computer model](#) which simulates winds, humidity and temperatures on an approximately 150km-spaced grid of points at a range of vertical heights from the surface to beyond the [stratosphere](#) which is why it is able to

represent SSWs more realistically.

In the study, the researchers compared the forecasts made during the 2009/10 winter with the low-top model, to retrospective forecasts with the high-top model. The forecasts started on dates in October and November and predicted conditions from December to February.

The high-top model predicted conditions that were more closely matched to the observed severe conditions in 2009-10, especially in the late winter.

The high top version of the GloSea4 [forecasting system](#) has been in operation since late 2010 and provided useful guidance to weather forecasters in the following two winters (2010/11 and 2011/12).

Co-author of the study, Jeff Knight, said: 'By October 2010, the high top version of the GloSea4 system was indicating an increased chance of a cold start to winter. That year December was the second-coldest in 350-years of records. It also highlighted the possibility that conditions in late winter were likely to be less harsh, which was indeed the case.'

'In 2011, GloSea4 predicted that a mild, westerly [winter](#) was likely. This turned out to be the case—only the first two weeks of February 2012 were cold. The inclusion of the high top [model](#) is one of a series of planned improvements to long range forecasts.'

More information: More information about the winter of 2009/10 can be found here:

www.metoffice.gov.uk/about-us/...-studies/winter09-10

A Met Office blog on SSWs can be found here: metofficenews.wordpress.com/20...o-europe-and-the-uk/

'Seasonal forecasts of northern hemisphere winter 2009/10' D R Fereday et al 2012 *Environ. Res. Lett.*

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