Geophysical Research Abstracts
Vol. 15, EGU2013-1569-1, 2013
EGU General Assembly 2013

The impact of sea ice and sea surface temperatures on development of the major Eurasian block of January/February 2012

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From late January on into February 2012 large parts of Europe experienced severe winter weather as a result of substantial cold advection from the east. This cold incursion developed in response to and on the southern flank of a westward-migrating area of anomalously high pressure over Eurasia. In the lead up to this event forecast models exhibited considerable spread, at least for western Europe. From about mid-January the ECMWF monthly forecast system was signifying at least a risk of very cold weather. Re-runs with this system were used to try to assess the degree to which the outcome in this finely-balanced situation was influenced by the sea ice and sea surface temperature (SST) distributions. One hypothesis was that depleted Arctic sea ice, and higher-than-normal SSTs around the Arctic, particularly in the Barents Sea area (as prevailed in 2012) could have helped force the overlying atmosphere to move into a 'cold Europe' mode. The synoptic-dynamic reasoning behind this will be described. Four pairs of uncoupled model re-runs were performed, comprising a control with observed SST/sea ice patterns, and an experiment with SST/ice anomalies that were approximately opposite. Patterns of day 15-28 control minus experiment 1000-500mb thickness differences across the Northern hemisphere were noteworthy, and were fairly consistent for different start dates. In the 'cold Barents Sea' experiment, the extent of cold incursions reduced over Europe.

The above results have various important, if tentative, implications. One is that correct modelling of sea ice and SST anomalies may be pivotal in long range forecast integrations. A second is that warming and sea ice depletion in the Barents Sea area, as many climate models predict, may help increase the prevalence of high latitude winter blocks, which bring cold to populated areas such as Europe. However, this is just one case and there may be other instances where the apparent influence of the underlying surface differs markedly.