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Time of emergence of Arctic climate change

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The Arctic region is characterised by comparatively strong warming over recent decades, as well as by relatively large seasonal, interannual and decadal variability. As a result, separating the forced climate change signal from natural variability is not straightforward. The question is whether the climate change signal will emerge earlier in the Arctic than elsewhere.

Here we address that question using re-analysis data and CMIP5 climate model output. We investigate various variables such as temperature, total precipitation, rainfall, snowfall, and sea ice, different seasons, and specific Arctic locations such as the Barentsz Sea. In-depth analysis of long CMIP5 climate model integrations in combination with re-analysis data allows for an improved estimate of the actual Arctic natural variability. This leads to a more accurate evaluation of the time of emergence of the climate change signal.

We find that the year of emergence is highly dependent on the variable of interest, season and location. Generally, temperature change exhibits earlier emergence than precipitation trends, because precipitation is far more variable than temperature. The results enable one to assess recent extreme seasons, for example the exceptional wet winter of 2016-17 in Svalbard, in the context of climate change and natural variability.