



How sea ice could be the cold beating heart of European weather

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The possibility that the ongoing rapid demise of Arctic sea ice may instigate abrupt changes is, however, not tackled by current research in general. Ice cores from the Greenland Ice Sheet (GIS) show clear evidence of past abrupt warm events with up to 15 degrees warming in less than a decade, most likely triggered by rapid disappearance of Nordic Seas sea ice. At present, both Arctic Sea ice and the GIS are in strong transformation: Arctic sea-ice cover has been retreating during most of the satellite era and in recent years, Arctic sea ice experienced a dramatic reduction and the summer extent was in 2012 and 2016 only half of the 1979-2000 average. With such dramatic change in the current sea ice coverage as a point of departure, several studies have linked reduction in wintertime sea ice in the Barents-Kara seas to cold weather anomalies over Europe and through large scale tele-connections to regional warming elsewhere. Here we aim to investigate if, and how, Arctic sea ice impacts European weather, i.e. if the Arctic sea ice works as the 'cold heart' of European weather. To understand the effects of the sea ice reduction on the full climate system, a fully-coupled global climate model, EC-Earth, is used. A new energy-conserving method for assimilating sea ice using the sensible heat flux is implemented in the coupled climate model and compared to the traditional, non-conserving, method of assimilating sea ice. Using this new method, experiments are performed with reduced sea ice cover in the Barents-Kara seas under both warm and cold conditions in Europe. These experiments are used to evaluate how the Arctic sea ice modulates European winter weather under present climate conditions with a view towards favouring both relatively cold and warm conditions.