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## A sea ice-free Arctic during the Last Interglacial supports fast future loss

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The Last Interglacial (LIG) is a period of great importance as an analog for future climate change. Global sea level was 6-9 m higher than present. Stronger LIG summertime insolation at high northern latitudes drove Arctic land summer temperatures around 4-5 K higher than during the preindustrial era. Climate-model simulations have previously failed to capture these elevated temperatures. This may be because these models failed to correctly capture LIG sea ice changes.

Here, we show that the latest version of the UK Hadley Center coupled ocean-atmosphere climate model (HadGEM3) simulates a much improved Arctic LIG climate, including the observed high temperatures. Improved model physics in HadGEM3, including a sophisticated sea ice melt-pond scheme, results in the first-ever simulation of the complete loss of Arctic sea ice in summer during the LIG.

Our ice-free Arctic yields a compelling solution to the long-standing puzzle of what drove LIG Arctic warmth. The LIG simulation result is a new independent constraint on the strength of Arctic sea ice decline in climate-model projections, and provides support for a fast retreat of Arctic summer sea ice in the future.