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Future recovery of summer Arctic sea ice loss

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During the 21st century, the Arctic Ocean will very likely experience a transition from perennial to seasonal sea ice cover owing to anthropogenic climate change. Will this transition be gradual, or is there a critical threshold for the summer sea ice extent, below which the ice-albedo feedback inhibits the recovery of summer sea ice?

We examine this question using the global atmosphere-sea-ice-ocean model ECHAM5/MPI-OM. For the IPCC emission scenario A1B, the model predicts that the Arctic Ocean is essentially ice-free in September from the 2070s on. For the transition time period before that, we perform a series of experiments for which we artificially remove the Arctic sea ice in one summer, analyzing the changed ice cover in the following years.

First results indicate that, for the climate of the first half of the 21st century, Arctic sea ice recovers from summer ice-free conditions within a year. We investigate the mechanisms that mitigate the ice-albedo feedback and restore the state of the summer sea ice. We do not find a 'tipping point' for climate states with small Arctic sea ice caps. Hence, a smooth transition from perennial to seasonal Arctic sea ice cover can be expected.