



Arctic sea ice-free season projected to extend into fall

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The recent Arctic sea-ice reduction is associated with an increase in the ice-free season, with comparable contributions of earlier retreat and later freeze-up. Here we show that within the next decades, the trends towards later freeze-up should progressively exceed and ultimately double the tendency towards an earlier ice retreat date. Such asymmetry is due to the response of ice and ocean thermodynamics to warming: the extra solar heat reaching the ocean due to earlier ice retreat is absorbed at a higher rate than it is released until freeze-up. Based on climate change simulations, we envision an increase and a shift of the ice-free season towards fall, which will affect Arctic ecosystems and navigation.