Can Arctic Sea Ice Melting Lead to More Summer Heat Extremes?

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September Arctic sea ice cover has halved since the 1970s, and this trend projects to continue. Climate models predict that a high-emission scenario could lead to a fully ice-free summertime Arctic ocean before 2100. Arctic sea ice plays a central role in our climate system; in this study, we aim to identify the effects that this projected melting will have on global summertime temperatures, and to understand the mechanisms by which these effects take place. We analyze data on 2-meter temperature, 850-hPa temperature, and 500-hPa zonal wind speed from experiments ran on two different climate model configurations: an atmosphere-only configuration using CESM1-WACCM, and an atmosphere-ocean coupled configuration using the same atmospheric component coupled to CESM1's ocean component. We find that the majority of the globe sees significant increases to average temperature in the coupled configuration, with particular amplification in the Arctic; while most average temperature changes in the uncoupled configuration are insignificant. We also find that wind speeds change significantly in both configurations, but with more amplification in the coupled. In particular, in the coupled experiments, the equatorward shift of the northern hemisphere's polar jet is associated with an unusually strong rise in temperature where the jet is shifting away from, and a fall in temperature in the place the jet is shifting towards. Finally, we find that the frequency of extreme temperatures increases almost all around the globe in the coupled experiments, with many locations seeing at least twice as many heat extremes, and some seeing over 90% extremes. Our broad takeaways are that melting Arctic sea ice projects to increase both average summertime temperature and frequency of extremes globally, and that ocean-atmosphere coupling and shifting jet streams both play a role.