Underestimated future Arctic Ocean warming due to unresolved marine heatwaves at low resolution

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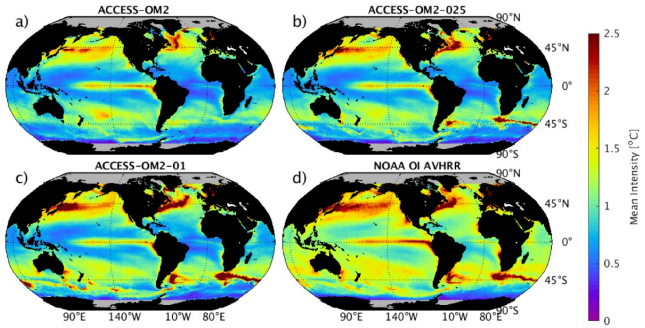
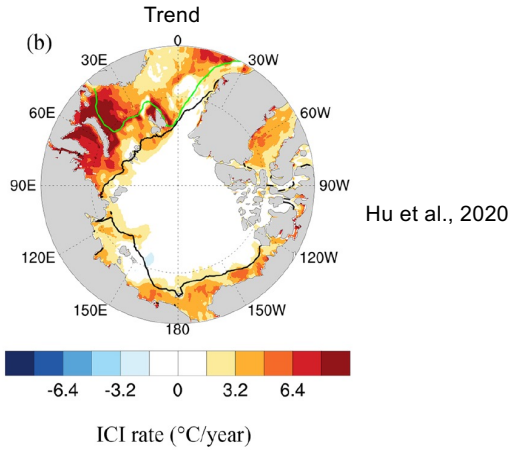
Introduction

Marine heatwaves (MHWs), known as extreme ocean warming episodes, **are better represented in high-resolution models**.



Pilo et al.,2019

The **Arctic MHWs are getting more intense with sea ice retreating**



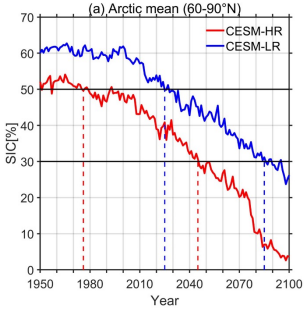
Hu et al., 2020

ICI rate (°C/year)

Model (Chang et al., 2020)

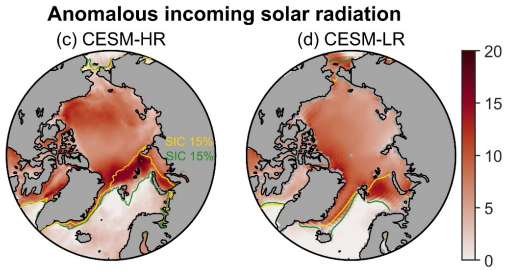
- CESM-HR – 0.1° ocean, 0.25° atmosphere
- CESM-LR – 1° ocean and atmosphere

Period selection: SIC decreases from 50% to 30%

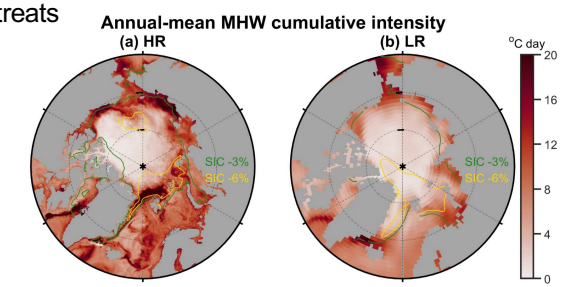


Arctic Ocean warming

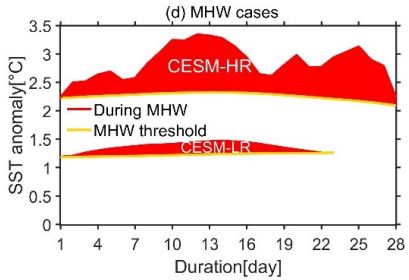
Despite same long-term decline in sea ice area, **extra solar heat input in HR**



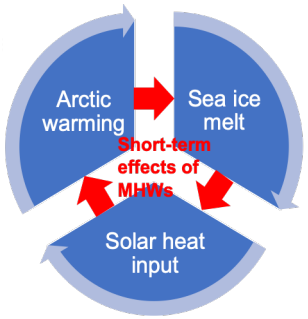
In **HR, much stronger MHWs** emerge at where sea ice retreats



Arctic MHWs



Both causal and composite analysis shows **stronger positive feedback between MHWs and Arctic Ocean warming in HR** via ice-albedo feedback.



Conclusions

In the short term, the resolved MHWs cause stronger sea ice melt and thus solar heat input, reinforcing a stronger long-term Arctic Ocean warming trend.

Extremes/(sub) mesoscales → **Climate transition**

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Subarctic–Arctic Interest League

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