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The Arctic cryosphere in the mid-Pliocene and the future

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P07.28**The Arctic cryosphere in the mid-Pliocene and the future***Daniel Lunt(1), A Haywood(2)**(1) University of Bristol, School of Geographical Sciences, Bristol, UK**(2) University of Leeds, UK*

The mid-Pliocene (around 3 million years ago) was a relatively warm period, with increased atmospheric CO₂ relative to pre-industrial. It has therefore been highlighted as a possible palaeo-analogue for the future. However, changed vegetation patterns, orography, and smaller ice sheets also influenced the mid-Pliocene climate. Here, using a General Circulation Model and ice sheet model, we determine the relative contribution of vegetation and soils, orography and ice, and CO₂ to the mid-Pliocene arctic climate and cryosphere. We find that compared to pre-industrial, increased mid-Pliocene CO₂ contributes 35% of arctic temperature change, lower orography and ice sheet feedbacks 42%, and vegetation changes 23%. The simulated mid-Pliocene Greenland ice sheet is substantially smaller than that of modern, due mostly to the higher CO₂. However, our simulations of future climate change indicate that the same increase in CO₂ is not sufficient to melt the modern ice sheet substantially. We conclude that although the mid-Pliocene resembles the future in some respects, care must be taken when interpreting it as an exact analogue due to vegetation and ice sheet feedbacks. These act to intensify mid-Pliocene Arctic climate change, and act on a longer timescale than the century scale usually addressed in future climate prediction.