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Title: *The Changing North: Predictions and Scenarios*

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Consistent with the observed changes of the past 50 years, the Arctic is expected to warm faster than the rest of the globe through the end of this century. Predicted changes by 2100 also include increased precipitation, loss of summer sea ice, and accelerated melt of terrestrial ice. However, these predictions are subjected to three types of uncertainty: uncertainty in the greenhouse gas/aerosol forcing scenario, uncertainties arising from differences in models, and the effects of internal variability. The latter includes interannual to multidecadal variations that can dominate underlying trends over the shorter timescales that are of greatest concern to many planners and stakeholders. Examples of large-scale internal modes of variability that affect the Arctic include the Arctic Oscillation, the Atlantic Multidecadal Oscillation and the Pacific Decadal Oscillation. Because of the prominence of these internal modes, greenhouse warming has a smaller signal-to-noise ratio in the subarctic and Arctic than in the tropics. The areas from which sea ice is lost are exceptions. By contrast, the greenhouse signatures of precipitation and sea level pressure have stronger signals in the Arctic than in low and middle latitudes.

We illustrate the uncertainties arising from forcing scenario selection, across-model differences and internal variability by showing the large ranges of projections for the middle and end of the 21st Century. It is only by the later decades of the century that the uncertainties in the scenario selection become comparable to those arising from the other two sources of uncertainty. Nevertheless, the low-frequency character of the Atlantic and Pacific modes of variability offer some potential predictability over timescales of several years to a decade or two. A major issue in the realization of this potential predictability is the ability of climate models to capture the timescales and spatial manifestations of the low-frequency internal modes. We will show that the spatial patterns tend to be captured more realistically than the timescale of the internal modes. We will also illustrate the consequences of the various uncertainties by showing the multimodel means and spreads of projected changes in Arctic sea ice cover. Finally, we will present several potential “wild cards” that could alter the trajectory of the Arctic climate system in ways that may not be captured by climate models tuned to the recent climate.