# Simulation of an Arctic Summer Cyclone Using MPAS

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During the late 20th century and early 21st century, the Arctic region has experienced greater-than-global surface warming and dramatic sea ice loss. Global Climate Models (GCMs) can qualitatively reproduce the observed large-scale Arctic patterns, however many aspects of predictability remain less understood. While GCMs are inhibited by their inability to fully resolve important smaller-scale features, high resolution Limited Area Model (LAM) forecasts are sensitive to the larger-scale choice of initial and boundary conditions downscaled from a relatively coarse global model. Furthermore, while GCMs account for important atmosphere–ocean–sea ice couplings that are important for long-term predictability, state- of-the-art LAMs often do not.

The Model for Prediction Across Scales (MPAS) is a new, coupled global model on an unstructured Voronoi mesh. Local horizontal refinement allows for desired resolution in regions of interest, and a smooth transition to a relatively coarse global mesh reduces the boundary complications that typically arise from nesting approaches. Additionally, since MPAS does not employ a latitude-longitude grid, polar filtering is not required and there is uniform performance over the globe. Here, we use MPAS to examine the evolution, dynamics, and predictability of an Arctic cyclone in the summer of 2006. This high amplitude, tropopause-based cyclone had a lifetime on the order of months and was located over relatively thin sea ice. These factors make modeling the atmosphere, ocean, and sea ice crucial for long-term prediction. Runs of weeks to months are used to simulate the life cycle of the quasi-stationary cyclone. We present verification statistics to quantify the performance of the model, and results show the cyclone to be an important feature, especially regarding the mean atmospheric circulation and the anomalously high sea ice extent in September 2006. Dependencies on mesh resolution and physics parameterizations will also be discussed, including implications for future cases.