



## On the Role of the Arctic Ocean in Polar Amplification

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Understanding oceanic effects on climate in the Arctic region requires knowledge of the mean circulation and its seasonal to decadal variability in the region. We synthesize results from a hierarchy of climate models together with available observations in the pan-Arctic region to better understand potential oceanic contributions to polar amplification. In particular, results from a version of the Regional Arctic System Model (RASM) forced with multi-decadal reanalysis data are analyzed with the main focus on the annual cycle and interannual to decadal variability of the upper ocean heat content in relation to the decline of the Arctic sea ice cover and warming climate. The motivation for this study is the increase of heat accumulation in the upper ocean, which has been observed and simulated by some model since the late 1990s. We investigate the circulation patterns and their seasonal to decadal variability controlling inflow of volume and properties into the Arctic Ocean. In addition, we examine critical processes governing the outflow of warm water, including coastal runoff, from the shelves into basin, for their impact on retreat and thinning of sea ice cover. Finally, the transport due to the boundary current along the slope and eddies in the basin are considered for their redistribution of heat within the upper ocean and contribution to the overall state of sea ice cover.

The main goal of this study is to advance a system-level understanding of critical processes and feedbacks in the Arctic and their links with the Earth System. The secondary, yet an equally important objective, is to identify important areas from which to obtain new or additional observations to better understand some of these processes and to help constrain models.