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Quantifying and predicting the impact of the Madden-Julian Oscillation on the state of the Arctic

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The character of Arctic sea ice and Northern Hemisphere (NH) snow depth is the result of a complex interrelationship between meteorological and oceanographical factors. These parameters have been found to vary on a number of time and spatial scales, including the intraseasonal, and Arctic sea ice and NH snow depth have been found to be strongly related to both thermodynamic and dynamic forcing on that time scale. Furthermore, several recent studies have shown that the leading mode of tropical atmospheric variability on the intraseasonal scale, the Madden Julian Oscillation (MJO), modifies these mid- and high-latitude thermodynamic and dynamic forcing mechanisms. However, the MJO's impact on sea ice and snow depth remains largely unstudied.

This study seeks to fills important gaps in knowledge and prediction of the Arctic system, by mapping the dependence of Arctic sea ice and NH snow depth by phase of the MJO, attempting to explain the observed variability via known relationships to atmospheric state variables. Through the use of atmospheric compositing analysis and Self-Organizing Map clustering, evidence of MJO projection onto the Arctic and high-latitude NH atmosphere, and subsequent modulation of seasonal Arctic sea ice concentration and high latitude NH snow depth will be discussed.