Spatiotemporal Polynya Formation Trends in the Canadian Arctic Archipelago using Sea Ice Charts from 1968 Onwards

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ABSTRACT

Arctic temperatures increase up to 1.9 times faster than the rest of the globe. This greatly affects sea ice conditions. In the Canadian Arctic Archipelago (CAA), polynyas (open water areas forming over winter) greatly contribute to the ice breakup during the melt season. Monitoring of these areas are of particular importance because an increase in size and occurrence could lead to earlier ice breakup and contribute to Arctic amplification. The main goal of this project is to analyze the spatiotemporal trends in polynya formation for the CAA. To do so, ice concentration anomalies, polynya occurrences, and opening periods were studied using the Canadian Ice Service charts. A significant increase in open water/thin ice areas was observed for the months of April, May, June and July from the mid- 2000s onwards. This rise in monthly occurrences was compared with air temperatures and wind anomalies. This showed that temperature increase was more likely to be the cause for the higher count of polynyas than winds. Lastly, a detection algorithm developed by Nemer *et al*. (2016) using fuzzy logic and discrete wavelet transform was used to segment and classify RADARSAT 1-2 images to assess its potential for automatic open water area retrievals. After testing the algorithm, some issues were noted with the classification such as open water being classified as ice and vice versa, indicating that the use of this algorithm with these images is not suitable for the variable sea ice and weather conditions of the CAA.

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