Prediction of summer Arctic sea-ice distribution with a statistical method in 2023

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Arctic Sea Ice Information Center has predicted the arctic sea ice distribution from July 1 to September 20 and published it on the website in May, June, and July each year since 2021. The prediction method is based on the relation between the sea ice divergence/convergence (SID) from winter to spring and the detrended sea ice concentration (DSIC) in summer, shown by Kimura et al (2013). This relation shows that when SID is high, sea ice thickness gets thick and sea ice becomes hard to melt away. Additionally, a sea ice age (SIA) and mean divergence (MDIV) are also used for the prediction to account for the concentration of old sea ice. In addition, this year's prediction takes into account the movement of sea ice from spring to summer. Based on the average sea ice drifting velocity over the last four years, we calculated the sea ice movement from spring to summer and used it to derive the empirical equations.

The sea ice distribution in 2022 was re-predicted using the new prediction method and compared with observations. Compared to previous forecasting methods, the new method predicted higher sea ice concentration in the Beaufort Sea (Figure 1). This is because the new method takes into account the movement of thick multi-year ice during spring and summer. The results showed that the prediction accuracy was improved. We will also discuss the results of this year's sea ice prediction using new methods.
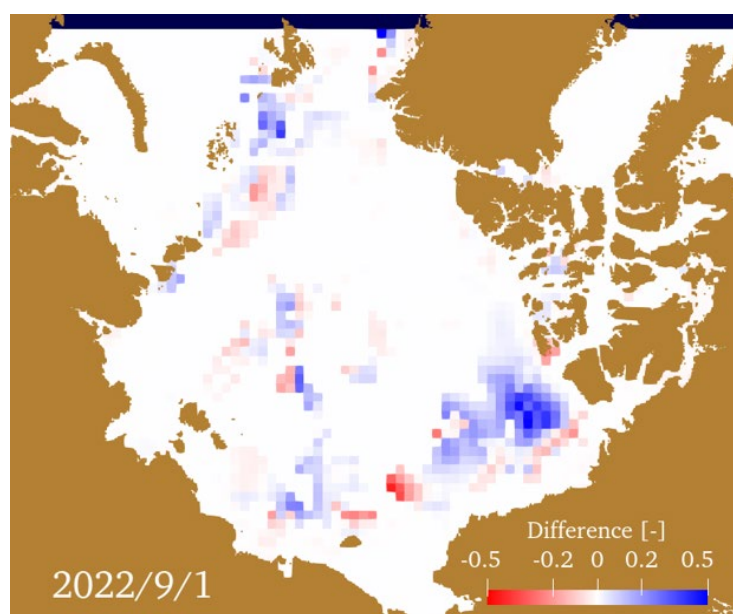

Fig 1: Difference in sea ice concentration obtained by conventional and new methods (conventional method - new method)

References

N. Kimura, A. Nishimura, Y. Tanaka and H. Yamaguchi, Influence of winter sea ice motion on summer ice cover in the Arctic, Polar Research, 32, 20193, 2013.