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## **Verification of ECMWF deterministic forecast against surface and radiosonde observations around the marginal ice zone in the Chukchi Sea during an Arctic cruise of the R/V Mirai**

The R/V Mirai conducted an Arctic cruise of the Chukchi and Beaufort Seas from 25 October to 7 December 2018. During this cruise, intensive meteorological observations around the marginal ice zone (MIZ) were made in the period of 6 to 22 November 2018. This study verified the ECMWF deterministic and ensemble forecasts against surface and radiosonde observations around the MIZ during this period.

Predicted 2m temperature showed an apparent positive bias at the nearest grid point to the location of the R/V Mirai on 9–13 November, even in a 24-hour forecast. The warm biases were also seen at 1000 to 925 hPa levels in this period. In particular, the biases reached up to 700 hPa and were largest ( $\geq 2$  K) at 925 hPa and on 12 November.

Regarding synoptic fields on 12 November, analyzed northerly wind was dominant around the location of the R/V Mirai. Predicted northerly wind in 24- to 72-hour forecasts was, however, weaker than the analyzed wind. The warm biases were attributed to the weaker northerly wind. The weaker northerly wind was related to the negative sea level pressure (SLP) error along over the MIZ at lead times up to 72 hours. Around the MIZ, predicted sea-ice concentration (SIC) was much lower than the observed SIC by AMSR2. The negative SLP error was generated by excessive surface heat flux due to the lower SIC in the model.

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