

Marginal ice zone sea ice observations in the refreezing Chukchi Sea

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Regions in the Arctic Ocean that were inaccessible in November are now open for navigation, even for non-icebreakers, and R/V Mirai, a Polar Class 6 vessel, carried out a late autumn voyage in 2018. It conducted a 12-day sea ice observation campaign during the 9th–20th of November along a fixed Marginal Ice Zone (MIZ) transect in the eastern Chukchi Sea and obtained first-hand observations at a time when research vessels are rarely in the sea. Satellite sea ice data were compared with the shipboard observations and compared relatively well. A sequence of events to describe the observations are grouped and described in four phases: 9th–13th, “Sea ice growth under relatively calm wind conditions” ; 14th–16th, “the on-ice wave event, sea ice break up, and subsequent sea ice advance” ; 17th–18th, “sea ice retreat or a mass shift under moderate easterly winds” ; and 19th–20th, “warming sea surface temperature (SST) under strengthening cold off-ice winds and air temperatures below -10 °C” . Shipboard and ERA5 reanalysis data were analysed to identify physical processes that affect the Chukchi Sea refreezing process. Sea ice conditions during the first two phases appear to be influenced primarily by surface winds whereas the analysis suggests a driver of sea ice conditions in the latter phases were due to ocean interior processes. The MIZ transect waters became heavily ice covered within five days after R/V Mirai began its return voyage, so the observation period covered most of the refreezing process along the transect water.

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