Comparison of AMSR2 and SSMIS sea ice concentrations with ship-based observations along the Arctic Northeast Passage
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Abstract: The rapid decrease of Arctic summer sea ice make the regular commercial transport along the Northeast Passage possible nowadays. Near real-time satellite derived sea ice concentration AMSR2 and SSMIS are commonly used in the manned ship-route planning and numerical model forecasting, however the accuracy and applicability of those data haven’t been systemically evaluated. In this paper, ship-based sea ice observations from Xuelong and Polarstern along Northeast Passage in summer of 2012 are used to assess the concentration and extent from AMSR2 and SSMIS. The results show that AMSR2 agree well with ship-based SIC (R=0.84), but a little overestimation in high concentration (mean bias=0.03). SSMIS have a poor relationship 0.56 with ship-based SIC and obviously underestimate the high concentration larger than 30% (mean bias= -0.14). Further analysis imply what widespread exist of melting pools lead to the large bias of SSMIS in high concentration, which maybe a systemic algorithm error. AMSR2 perform better than SSMIS in detecting sea ice concentration and extent, so AMSR2 should be firstly considered when using them in the operational Arctic sea ice services.

Keywords: Arctic sea ice concentration, AMSR2, SSMIS, Ship-based observations.

Fig.1. Map showing the R/V Xuelong and Polarstern Arctic Cruise track for this study. The blue line showed the go-path route of Xuelong from Bering Strait to Norwegian Sea (Jul 20- Aug 7) and the red line showed the return-path route of Xuelong from Svalbard back to Bering Strait, crossing the high Latitude Arctic (Aug 24-Sep 7). The black line showed the Arctic route of
Polarstern during Aug 26 to Oct 2. The blue and green region indicated the sea ice cover from SSMIS, respectively for July 22 and Aug 24, 2012.

Fig. 2. Comparisons of ship-based SIC observations, AMSR2 and SSMIS SIC along transects
during the voyages of R/V Xuelong Jul. 20-30 (a, b), R/V Xuelong Aug. 24- Sep. 7 (c, d) and R/V Polarstern Aug. 8- Oct. 2 (e, f). Three-point moving average was used to all the data in Fig.1.
Fig. 3. SIC from AMSR2 (a, c, e, g) and SSMIS (b, d, f, h) at ship-based observations points compared with SIC observed from the ship in all three routes. The gray line represents the best linear fit of the data and the black line represent a 1:1 relationship.