Summer Sea ice in the Arctic Pacific Sector from the CHINARE-2010 cruise: Preliminary Results

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The Fourth Chinese National Arctic Research Expedition (CHINARE) from July 1 to Sep. 20, 2010 conducted comprehensive scientific studies on ocean-ice-atmosphere interaction and the marine ecosystem's response to climatic change in Arctic. The sea ice team of 10 persons collected sea ice physical properties (ice concentration, floe size, melt pond coverage, sea ice and snow thickness) of the Arctic Pacific sector, in particular between 150 W to 180 W to 88.5 N (Fig 1), based on (1) underway visual observations and automatic camera recording; (2) a downward-looking video mounted on the left port side recording overturning of ice floes; (3) on-site measurements of snow and ice thickness using drilling and electromagnetic instrument EM31 on ice stations; (4) six flights of aerial photogrammetry from helicopter, and (5) Satellite data and NIC ice charts. Figures 2,3,4 show the results of ship-based observations of ice thickness, floe size, melt pond coverage, and ice concentration (IC), as well as the AMSR-E IC for the westward, northward and southward legs. Figures 5,6 respectively show the IC for the ice observations period and for each selective days along the northward and southward legs. IC, floe size, and ice thickness are clearly different at the marginal ice zone (MIZ) as compared with those inside the pack ice zone. It seems in this region that ice edge reached the minimum on Sept 10 (table 1), about 9 day earlier than the mean minimum for the entire Arctic ocean reached on Sept 19. Along the northward leg the width of the MIZ decreased from 350km on July 25 to 0km on Sept 19 (table 1). For the southward leg, the width of the MIZ was more complicated. The maximum width was 500km on Aug 28, while it was still about 100-200km scattered ice south of the 200km or more no ice zone before reach the edge of pack ice.

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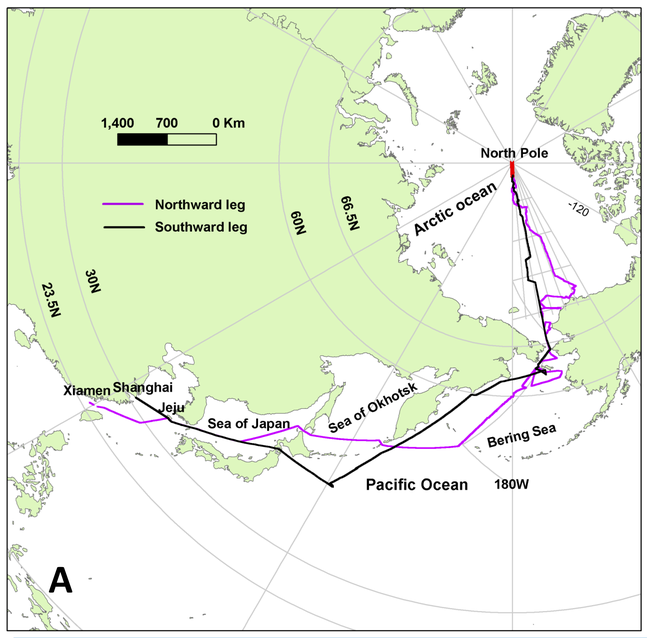

Figure 1. (A) showing the ship tracks from Xiamen, China (July 1) to Shanghai, China (Sept 20), 2010; (B) showing the ship-based half-hourly visual observations of sea ice (red: westward; blue: northward; magenta: southward) and ice station locations (green dots), ID and date (MMDD); LIS denotes the long-term ice station Aug 8-19.

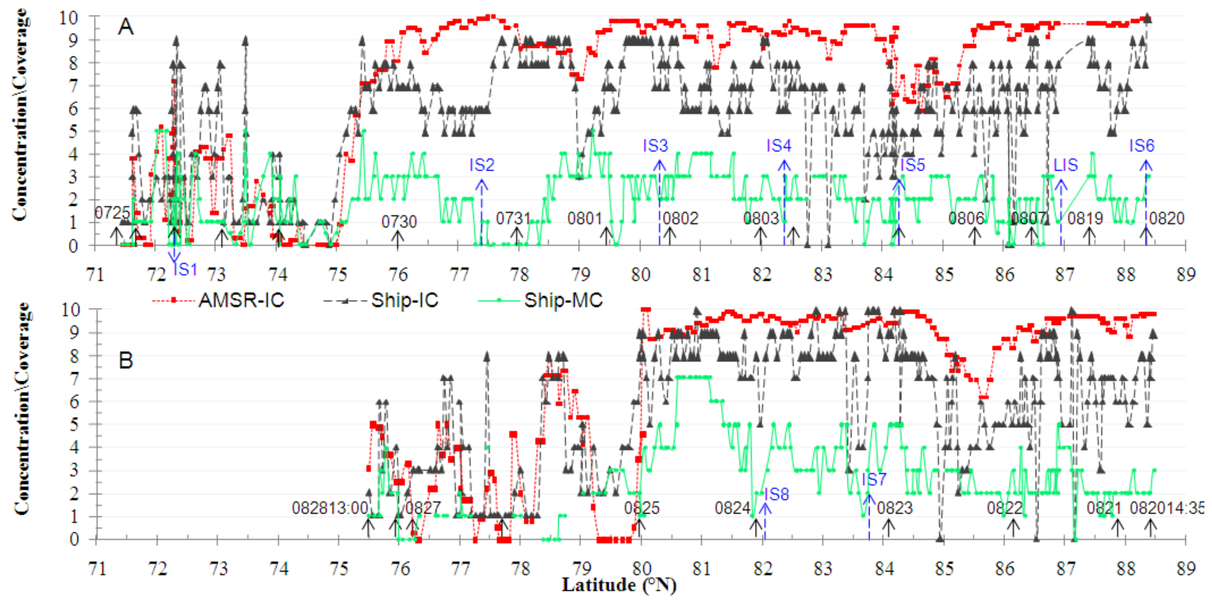

Figure 3. Showing the ship-based observations of ice concentration (IC), melt ponds coverage (MC), and AMSR-E IC for the northward leg (A) and southward leg (B). Times and ice stations are also indicated in the figure.

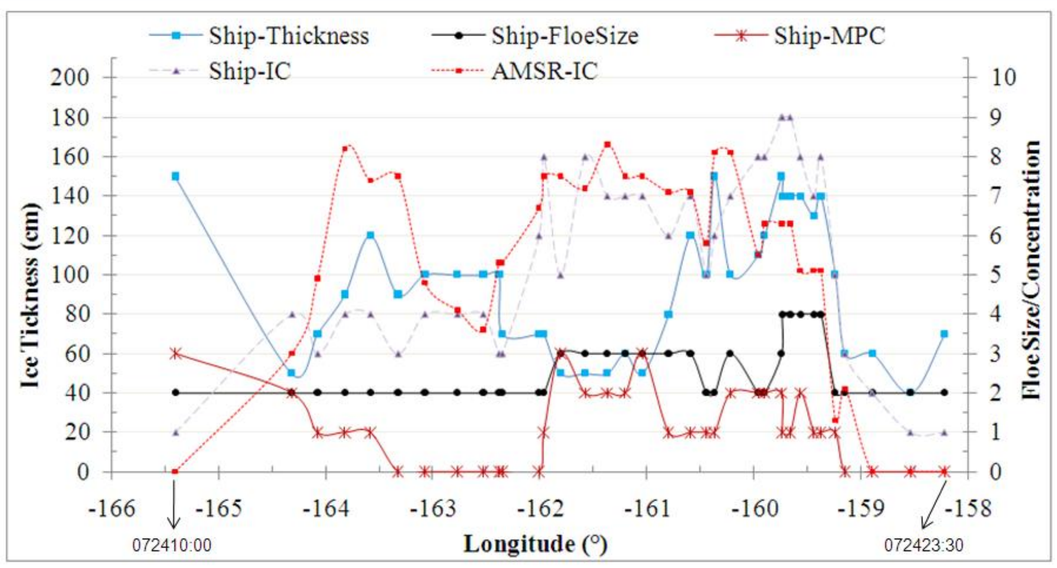

Figure 2. Showing the ship-based observations of ice thickness, floe size, melt pond converge (MPC), and ice concentration (IC), as well as AMSR-E IC for the westward leg, July 24. Floe size code: 1 (<2m), 2 (2-20m), 3 (20-100m), 4 (100-500m), 5 (500-2000m), 6 (2-10km), and 7 (>10km).

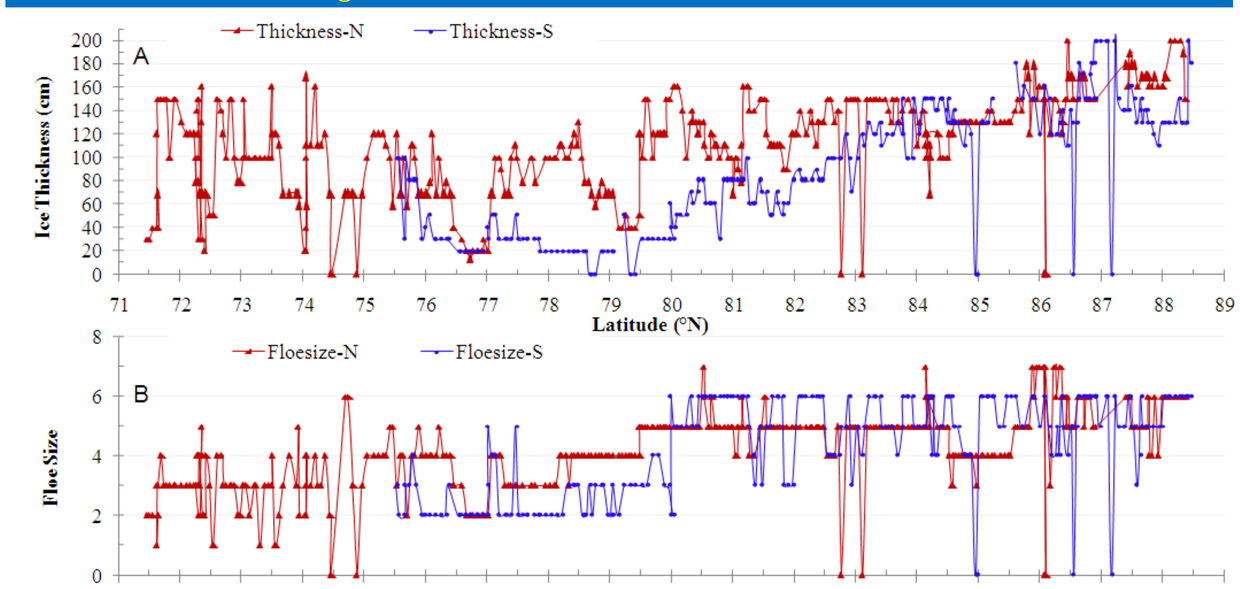

Figure 4. Showing the ship-based observations of ice thickness (A) and floe size (B) respectively for the northward leg (red) and southward leg (blue). Floe size code: 1 (<2m), 2 (2-20m), 3 (20-100m), 4 (100-500m), 5 (500-2000m), 6 (2-10km), and 7 (>10km).

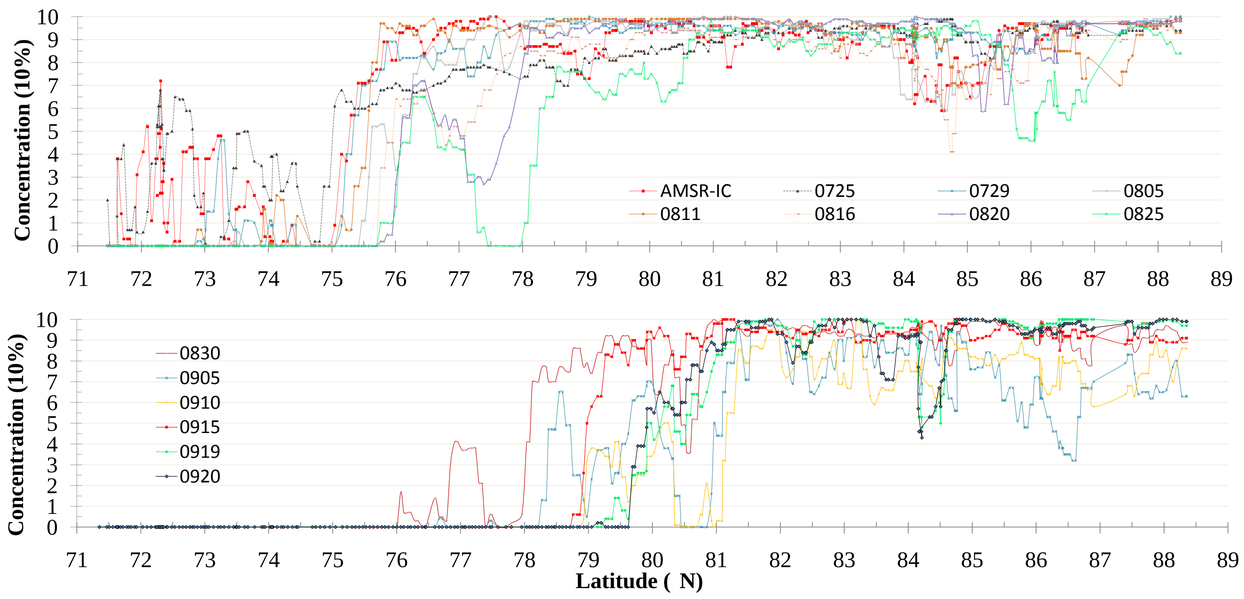

Figure 5. AMSR-E IC for the ship-based observations period (0725-0820) and for each of the selected days along the northward leg.

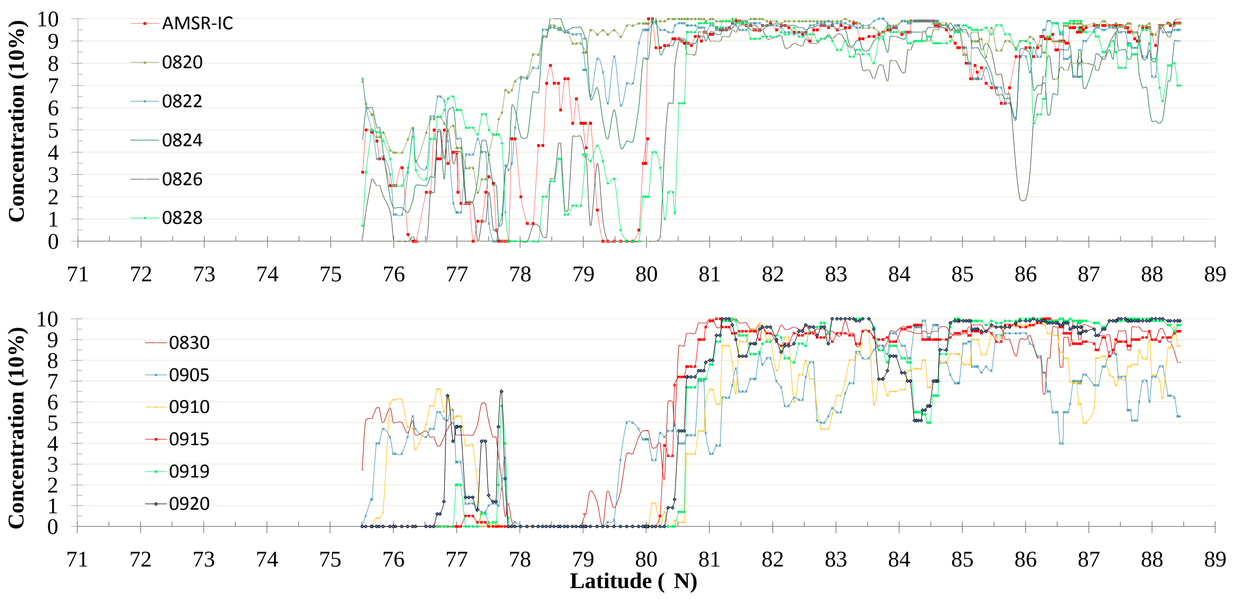

Figure 6. AMSR-E IC for the ship-based observations period (0820-0828) and for each of the selected days along the southward leg.

Table 1. the northmost latitude and width (km) of the marginal ice zone (MIZ) along the northward and southward legs on selective days (MMDD)

	0725	0729	0820	0825	0828	0830	0905	0910	0915	0919
North leg	74.8° (350)	75.1° (350)	76° (250)	78° (220)		78° (200)	80.9° (280)	81.1° (200)	78.9° (10)	79.6° (0)
South leg			77.5° (^)	80° (^)	80.5° (500)	79.5° (400)	79.5° (400)	80.6° (*)	80.2° (*)	80.6° (*)

^denotes MIZ beyond the last ship-based observation on Aug 28; * denotes there is a 200km or more region of no ice zone between the northmost latitude and scattered ice zone.