

Visual in situ Sea-Ice Observations taken during the Chinare 2008 expedition on board the Chinese icebreaker Xuelong (PRIC)

These observations occurred during the period extending from mid-August until early on September 2008 north of the Beaufort Sea (80 to 86°N and 135°W to 160°W approximately).

Most of the sea ice observations were taken during the Ice camp starting on August 22 and ending on August 29 located at about 85°N and 145°W in an area of strong drift (30 miles northwards in one week). During this whole period we received daily sea ice AMSR-E image processed by the University of Bremen and the Polar View consortium and were able to compare with the situation in the area surveyed by Xuelong during this period. Many observations were taken using EM31 hanging on portside of Xuelong during the whole cruise and also radiometers posted at an angle on portside like EM31 (cf Kazu report).

Thanks to AMSR-E images Xuelong was making good progress sailing northwards in a significantly less sea ice concentration area than the surroundings at the same latitude.

We also collected good information from IMBs (CRREL) deployed during the spring together with Met buoys and Acoustic Ice Tethered Platforms for Damocles. The main results being a/ that the region located north of the Beaufort Sea exhibited a strong drift towards the north (similar to the Xuelong drift already mentioned) and b/ a strong inhomogeneity in surface and bottom melt of sea ice both in time and space. However during that time bottom melt never exceeded 1m and never reached 2m like recorded in 2007 (Don Perovich).

One of the most fascinating observations from Xuelong concerned the melt ponds. In general melt ponds concentration was of the order of 5/10 but there were 2 kinds of melt ponds 1) mainly those characterized by blue turquoise water indicating sea ice bottom still trapping melted water above the ice and 2) those characterized by no bottom and filled up with sea water looking very dark compare with the other ponds. An interesting feature concerns the geometry of these dark holes (not ponds anymore in fact). A typical geometry appeared like an elongated shape of about 50 to 100m long and a more restricted width of about 10 to 2m. This resulted from the surface topography of sea ice before entering into the summer melt season. Of course passive microwave radiometers did not reach any resolution of that size but it would be interesting to see how the melt ponds evolution with black holes replacing the turquoise blue waters, might affect the backscattering signals captured by radiometers. In almost all cases the bottom of the melt ponds was reaching an ultimate stage of deterioration before disappearing by exhibiting this typical ice coral reef aspect quite noticeable when reaching the surface after being released and detached from the sides of the ponds naturally (buoyancy) or under the effect of the icebreaker when progressing into the sea ice. An important point to mention concerns the sea ice thickness that was very small (few tens of centimeters and less) over large areas indicated like solid ice by AMSR. No smart polar bears dared venturing into this region.

Although the past winter was significantly colder than the previous winter and more ice was formed and summer was not as long as the previous summer, it looks like the 2008 summer minimum sea ice extent would get pretty close to the previous minimum reached last year (septemner 2007) with some differences notably in the western Arctic (Chukchi and Beaufort Seas). There was much less ice in the Beaufort Sea and north of the Mackenzie

sector of the Arctic compare with last year. For most of the summer there was a persistent tongue of ice in the Chukchi Sea (north of Wrangel island) that finally disappeared at a later stage. Both north-west and north-east passages opened at about the same time early on August.

Even if the 2008 summer sea ice minimum extent appeared to be slightly above the 2007 all time record minimum according to passive radiometers, it does not seem like the ice mass budget would be significantly different in 2008 compare with 2007. The lower sea ice concentration observed north of the Beaufort Sea in the area and explored during Chinare 2008 with Xuelong seems to have been preconditioned by a strong and persistent northwards sea ice drift that lasted for several months from spring (April 2008) when ice stations were deployed north of the Canadian polar station Eureka, to well into the summer. Very early in the season this whole area already exhibited a significantly lower sea ice concentration that accentuated throughout the summer season. There was a remarkable persistent and strong shear zone north of Eureka well documented by ice platforms deployed overthere during spring time for Damocles. It seems like sea ice drift speed is an important parameter related to sea ice summer minimum extent and that seems quite logical. Why is sea ice drifting so more rapidly to day than before?