

## 2008 September sea ice outlook – R. Kwok

1. Sea ice extent of the Arctic at summer minimum:  $5 \times 10^6 \text{ km}^2$

2. Basis of assessment:

*Condition of the seasonal ice cover:* even though the seasonal ice cover was formed later in the fall of 2007, the mean thickness of the FY ice cover at the end of March seems comparable to that of the previous two seasons because of lower snow accumulation and thus faster growth i.e., higher ice production. The higher latitude seasonal ice cover is also thicker and regions with typically shorter melt seasons can be expected to have a better chance of surviving the summer. This is based on ICESat estimates.

*Condition of the old ice cover:* the MY ice coverage is at a record low ( $\sim 2 \times 10^6 \text{ km}^2$ ) near the end of May, but because of the location of the ice cover (north of Greenland and Ellesmere) it is expected that additional losses of MY will be due primarily to export rather than melt. The average thickness of the MY ice cover is only slightly lower than the thickness of the previous winter. Again, this is based on a preliminary analysis of ICESat sea ice freeboard and QuikSCAT MY coverage.

*Freezing degree-days (FDD):* The Oct-May FDD (from NCEP/NCAR fields) for the entire Arctic Ocean is actually comparable to the winter of 2007.

*Assumptions about the summer:* If the anomalous circulation pattern of the 2007 summer were not repeated (those patterns caused a combination of: a) advection of warm air from the south; b) advection of sea ice from the Pacific to the Atlantic sectors and increased outflow at the Fram Strait and other passages; and, c) perhaps a decrease in cloudiness and thus increased insolation at the surface) then we expect a net replenishment of the ice cover this summer.

3. Supporting data

Our outlook is based on the mean summer behavior of the ice extent of the past five years 2002-2007 (see figures) weighted by the conditions of 2007.

*Fig. 1* Outlook of the summer ice coverage within the Arctic Ocean (boundaries at the Fram Str, Svalbard -Franz Jozef Land, Franz Jozef Land-Severnaya Zemlya)- it does not include the sea ice coverage outside of the Arctic Basin. Dashed line shows the Jun-Sep ice extent; error bars show the variability of the ice extent between 2002-2007. The large red dot is our projection of the 2008 minimum ice extent after adding in the ice coverage outside the Arctic Ocean.

*Fig. 2* Behavior of 2007 summer ice extent within the Arctic bounds described in Fig. 1.

4. Additional data

There is considerable deformation of the surviving ice cover at the end of the summer and early fall when the ice is thin and when ice compactness is low. There needs to be a better quantification of ice dynamics on the ice thickness distribution during this time as it affects the consistency of multiyear ice coverage estimates at summer minimum and during winter.

## References

Kwok, R. (2008), Summer sea ice motion from the 18 GHz channel of AMSR-E and the exchange of sea ice between the Pacific and Atlantic sectors, *Geophys. Res. Lett.*, 35, L03504, doi:10.1029/2007GL032692.

Kwok, R. (2007), Near zero replenishment of the Arctic multiyear sea ice cover at the end of 2005 summer, *Geophys. Res. Lett.*, 34, L05501, doi:10.1029/2006GL028737.

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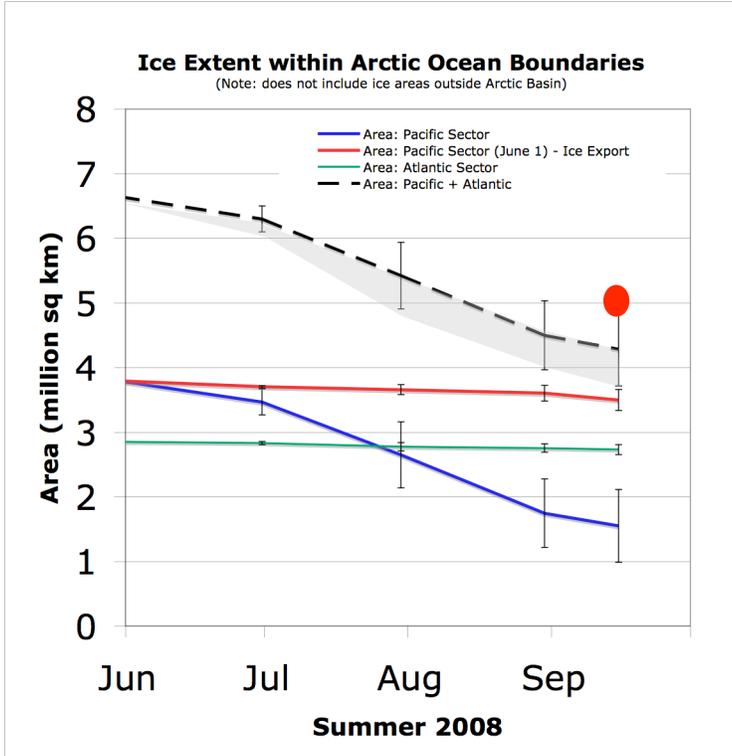


Fig. 1

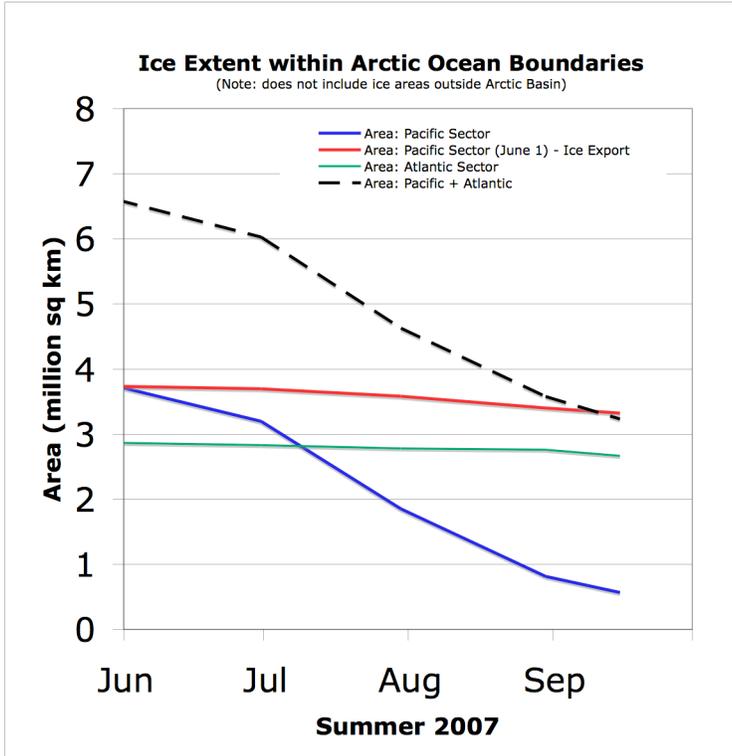


Fig. 2