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2008 Sea Ice Minimum Summary Report

In our last estimate of minimum ice extent, we provided two estimates; one based on our probabilistic model and a second based on empirical analysis that combined a variety of information, past history and experience. The model yielded an estimate of 4.86 million sq. km. The empirical estimate was 4.4 million sq. km. The observed minimum turned out to be 4.52 sq. km. Our two methods of estimation thus bracketed the actual minimum quite closely.

How important was preconditioning versus anomalous meteorological forcing in giving the 2008 September minimum?

Our opinion is that preconditioning was the key factor driving the ice reduction this summer. As others have noted, atmospheric conditions through much of spring and summer favored the survival of ice. When conditions shifted to wind patterns more conducive to reductions in ice extent due to ice transport, we believe that preconditioning in the form of relatively thin first-year ice vs. multiyear ice that resulted in reduced ice concentration and weaker ice within the interior pack, facilitated reduction of ice extent.

How was 2008 different than 2007?

With the exception of conditions during late summer, atmospheric circulation and air temperatures (Figures 1 and 2) in 2007 was, as least subjectively, more favorable to ice loss than appears to have been the case in 2008. Spring and summer in both years showed a general dipole pressure pattern that has been linked to reduced ice extent in the Pacific sector of the Arctic. However, this pattern was stronger and more persistent in 2007, with the pattern persisting through late summer. Southerly winds in the Beaufort, Chukchi and East Siberian seas were more common in 2007, resulting in higher temperatures in the region and northward ice transport. In contrast, winds were weak and variable north of Alaska in late summer 2008, which helped ice to persist in that area longer than usual. The persistence of the well-defined high pressure area in the Beaufort Sea and Canada Basin in 2007 also resulted in unusually cloud-free conditions and thus more solar warming compared to 2008. The center of the high pressure area in 2008 produced strong east to west ice transport in the Beaufort Sea in 2008 rather than the more northward transport in 2008. Low pressure in the Siberian Arctic was shifted southward in 2008. Closed low pressure areas in the Laptev/East Siberian Sea areas produced southward drift of ice into the region compared to the cross-Arctic drift in 2007. Overall, the 2007 patterns also favored increased ice export through Fram Strait compared to 2008.

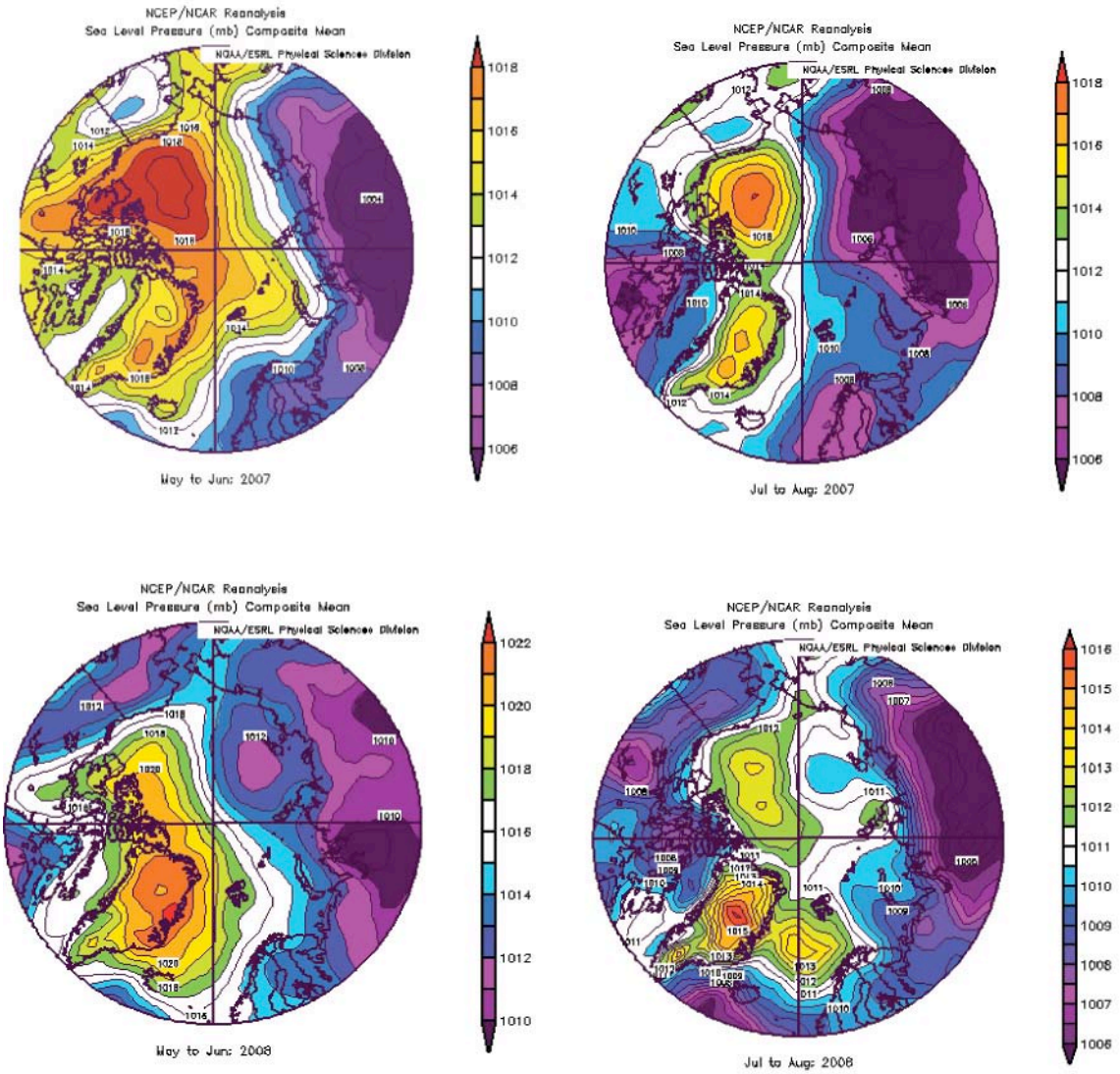

Figure 1. Mean sea level pressure for May-June and July-August 2007 (top) and 2008 (bottom).

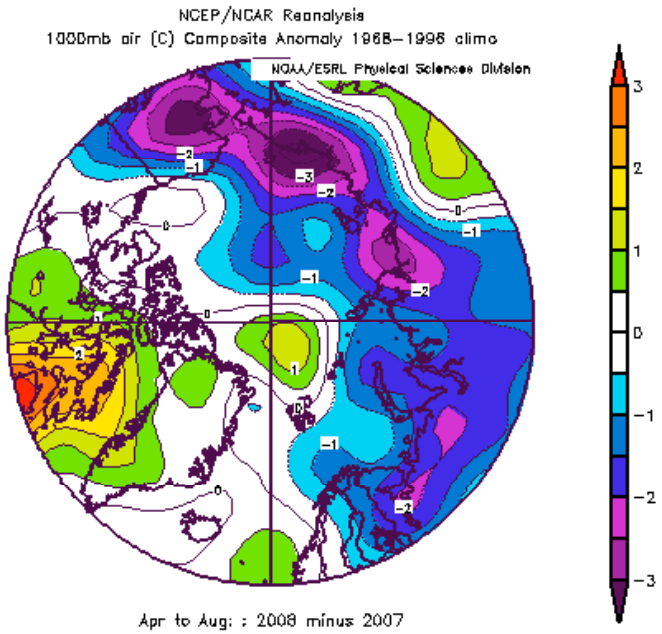

Figure 2. Mean surface air temperature for April – August 2008 minus April – August 2007.

If end of spring sea ice conditions were a major factor, does this give some skill in summer projections, even if the meteorological conditions cannot be predicted?
Yes. Our relatively accurate forecasts, which make use of ice age and ice type, demonstrate this.

What would be needed to provide a better OUTLOOK, e.g., improved passive microwave data interpretation, data assimilation in sea ice models, or ??
We think that the key parameters to improve the forecasts are ice thickness and snow depth, generated from observations and/or models.