2014 September Arctic Sea Ice Outlook: Regional report

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1 Methods

Our outlook uses a state-of-the-art General Circulation Model (GCM) initialized with May 2014 sea ice thickness anomalies obtained from the Pan-arctic Ice-Ocean Modeling and Assimilation System (PIOMAS). The GCM used is the National Center for Atmospheric Research (NCAR)'s Community Earth System Model version 4 (CESM1) at 1° resolution in all components. Further details of our methodology are described in our main outlook report.

2 Regional outlook

Figure 1 shows the difference in September sea ice concentration between the experiment and control ensembles in the GCM. Overall, there is a loss in sea ice in the experiment relative to the control, but the Atlantic-facing sea ice region (Svalbard, Franz Josef, Severnaya Zemlya) tends to have positive anomalies relative to the control ensemble (not climatology). This suggests that the greatest sea ice loss will be in East Siberia and Alaska, somewhat reminiscent of the pattern in 2007.

Since the GCM and observations have a slightly different mean state (the September GCM sea ice limit extends further south), it is not appropriate to apply GCM anomalies one-to-one to an observational climatology. Instead we derive a relationship between ice concentration in the control and experiment GCM ensembles for each longitude, and apply this relationship at each longitude to an observational climatology (which itself is a mean SIC of the last 10 years- this approximates to the expected linear trend value). The results are shown in figure 2.

Figure 3 shows the Julian Ice-free day for the period 2003-2012 and our outlook values for 2014. We use daily sea ice concentration data from NSIDC to compute the mean. To calculate the outlook value, we apply the changes in sea ice concentration between the GCM experiment and control to the 2003-2012 observational mean obtained from NSIDC. To account for the difference in mean state between GCM and observations, we use the methodology described above. We define IFD as the first day when the SIC is below 25% in a grid cell.

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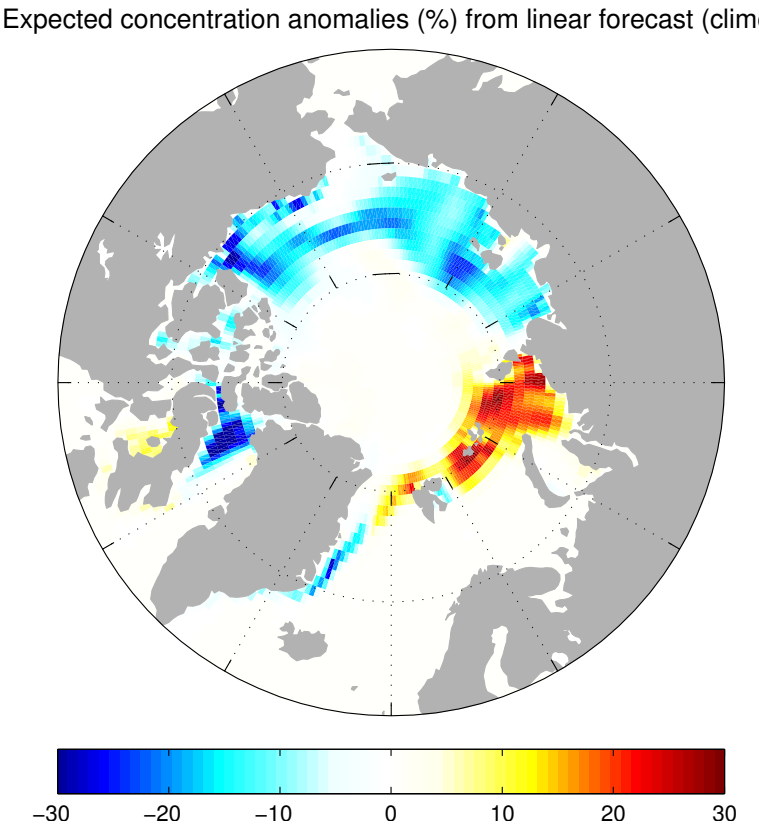

Figure 1: Difference in September sea ice concentration between the experiment and control ensembles in the GCM.

The changes between the outlook and the mean reflect the changes in extent described above; later IFDs in the Kara/Barents sectors, and earlier IFDs in East Sibera/Alaska.

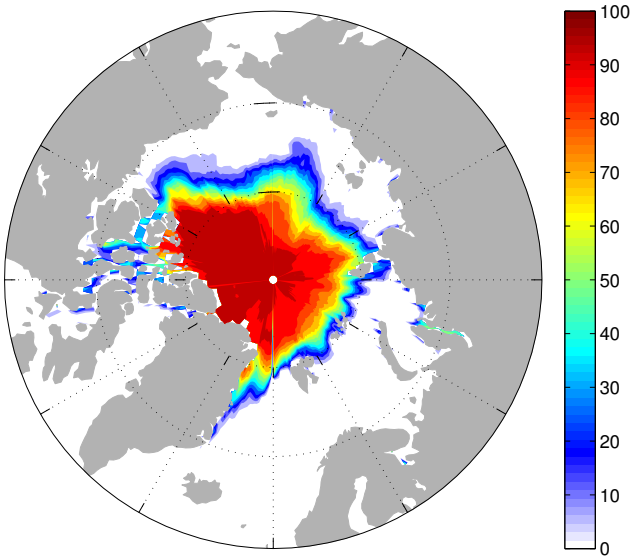

Figure 2: Sea ice concentration probability for September 2014

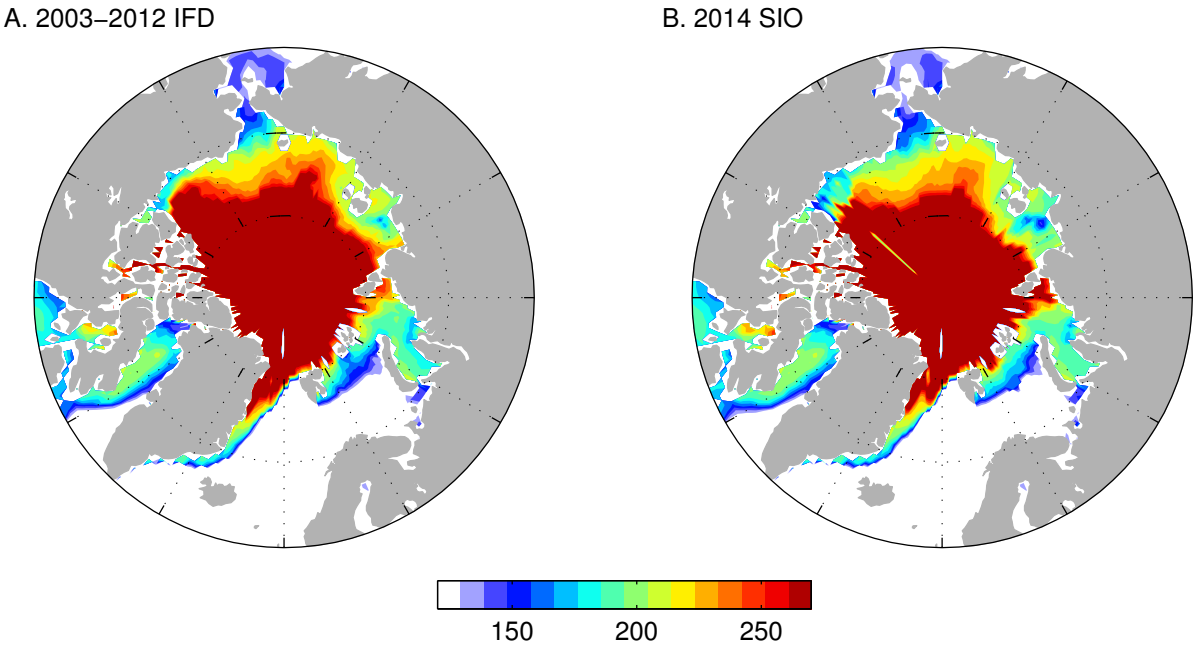

Figure 3: a) mean Ice-free day (IFD) for the period 2003-2012 and b) outlook of IFD for 2014.