ESARC
Martin Miles
Method: Semi-empirical / semi-theoretical (i.e.,"seat-of-the-pants")

Minimum sea-ice extent for the Arctic as a whole, 3.8 million square kilometers

In summary, While the winter/spring 2008 sea-ice extent has rebounded from the 2007 negative mega-anomaly, the age-class distribution at present is negatively skewed compared to satellite climatology and even the values for 2007, as is ice concentration within the ice –ocean margin that defines extent. Therefore, preconditioning would favor a less-extensive summer minimum ice cover than in 2007, unless offset by a return to atmospheric conditions that are opposite the anomalous ones in 2007 – conditions that lead to both dynamic (increased sea-ice export through Fram Strait) and thermodynamic (melt) losses. The 2007 mode cannot be expected to recur; however there is likewise no reason to expect opposite conditions. The net expectation here is 3.8 million square kilometers, exceeding the 2007 minimum by about a half million square kilometers.

The most compelling indication of a new record low is the observed strong (90–95%) relationship between seasonal ice and tendency to melt in summer, leaving predominantly only the multi-year ice that manages to survive the melt season. The potential importance of a long-term tendency toward more seasonal ice and less perennial, multi-year (MY) ice was expressed in, for example, Johannessen, Shalina and Miles in *Science* (1999). Since then, this trend towards less MY ice has continued and the trend in overall sea-ice extent has not only been increasingly negative, but increasingly non-linear. Therefore, whereas some may expect a rebound from the 2007 anomaly toward the (linear) trend, a curvilinear trend-line may be a more accurate reference. Furthermore, our logic of essentially disregarding the higher-than-2007 winter/spring ice extent is that a predominantly seasonal ice cover such as is evident in the Arctic at present will behave more and more like, e.g., the Baltic Sea, which is ice-free in summer regardless of the extent and severity of the previous winter ice cover.

The single most important additional information that would improve the prediction is the expected predominant mode(s) of atmospheric-circulation variability in the Arctic in June–September 2008.