

Trends in Surface Temperature, Sea Ice, and Pigment Concentration in the Arctic

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Global surface temperatures increased by about 0.8 °C during the last century while Arctic temperatures increased at a higher rate of about 0.6 °C per decade since 1981. This is consistent with the expected amplification of global signals in the Arctic on account mainly of ice-albedo feedback. Satellite data from 1978 indicate that the total sea ice cover has been declining at a modest rate of around 2 to 3 % per decade but the perennial ice (or ice that survives the summer) has been rapidly declining at almost 10% per decade. The perennial ice cover consists mainly of thick multiyear ice floes and a continued retreat could lead to a blue Arctic Ocean in summer and profound changes in the region. Warming due to increases in greenhouse gases in the atmosphere is supposed to be most apparent in winter when long wave radiation is most dominant but during the same period, the sea ice cover declined by about 1.5% per decade only and the trends in winter temperature were lower than those in other seasons. However, this phenomenon may change soon since drastic reductions in the maximum extent of the winter ice cover and associated warming are observed in 2005 and 2006. The retreat of the perennial ice also exposes more open water and has revealed an asymmetric distribution of chlorophyll *a* pigment concentration in the Arctic basin. Phytoplankton blooms are most dominant at high latitudes, partly on account of sea ice, but in the Arctic basin, it appears that pigment concentrations in the Eastern (Laptev Sea) Region are on the average three times higher than those in the Western (Beaufort Sea) Region. Such asymmetry appears to be associated with a number of reasons including wider shelf in the East than in the West, associated sea ice processes, and river run-off that affects nutrient availability and the fractional mixture of case 1 and case 2 waters. Existing data also point to increases in the plankton concentrations in recent periods of abnormally low extents in the perennial ice cover suggesting an increasingly productive Arctic.