J6.3 BUILDING AND USING AN ARCTIC CLIMATE INFORMATION SYSTEM

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ABSTRACT

Investigation of multivariate biophysical data sets covering the last four decades show two types of Arctic variability: one is long-term trends as represented by loss of sea-ice and tundra area, and biological response; the second follows decadal variability in atmospheric forcing as represented by the Arctic Oscillation(AO) and its direct impacts, which are interannually modulated by the strength and location of the polar vortex. In the previous five years many ecosystems, such as the Bering Sea and east Greenland, are showing year-to-year persistence, despite considerable variability in the AO and other climate indices. We hypothesize that the changes occurring in the Arctic are beginning to be significant enough to make the Arctic less sensitive to cold swings in intrinsic atmospheric variability, although direct mechanisms are unclear. Many of these changes can be followed at a new Arctic change detection website, http://www.arctic.noaa.gov/detect/. The objective of the Arctic Change website is to presents recent indicators that describe the present state of the Arctic climate and ecosystem in an accessible, understandable, and credible historical context (Fig. 1).

Our conceptual model for external forcing of Arctic change (Fig. 2) is driven primarily by changes in atmospheric circulation, and thus subject to north/south gradients in hemispheric radiative forcing from volcanic aerosols, insolation cycles and CO2 increase. The positive phase of the AO in many years of the 1990s helped to establish the current state of the Arctic. This model suggests that major changes in the Arctic are likely to be irreversible over the next decades, but there still should be considerable spatial and decadal variability in the response. Many model forecasts for 2050 show warmer temperatures in fall and winter from albedo feedback due to reduced sea ice, although recent observed temperature changes are large in spring; these results may not be inconsistent. The next 20 years can be considered transitional and large variation between model forecasts are expected, as they are dominated by forced changes in circulation which have a large stochastic component. As there is still much uncertainty, it is important to monitor changes in the Arctic and to increase the credibility of understanding through a multivariate approach. Indicators should be watched over the next decade to accept or reject these hypotheses.

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Figure 1

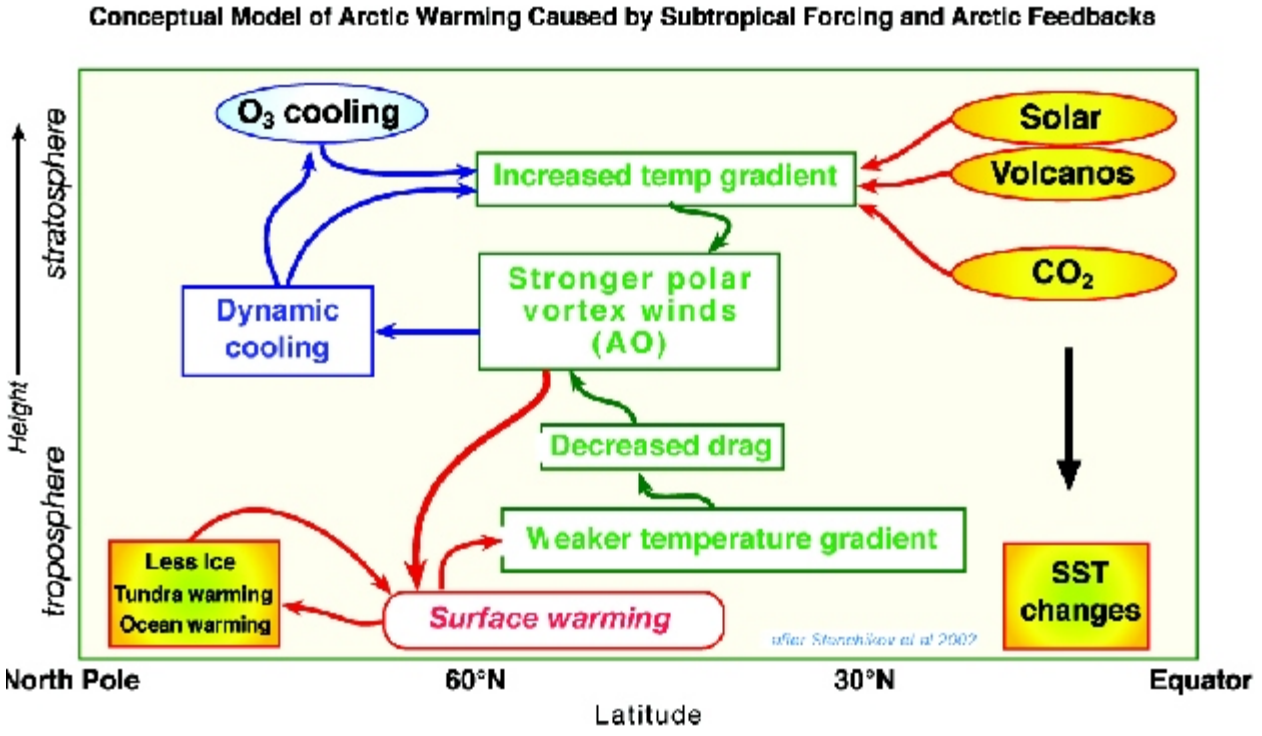

Figure 2