

Development of an Arctic System Model

Larry Hinzman and John Walsh¹

¹*International Arctic Research Center, University of Alaska Fairbanks*

In the last 50 years a wide range of changes in the Arctic have been documented. Many of these changes were evident since the mid-1970s; however, it is quite likely that these changes began or were initiated early in the 20th century, prior to extensive observational records in arctic regions. Regardless of the driving forces, the combined observations and documentation suggest that the arctic system may be entering a state not seen in the last 1000 years. The complex interplay of physical, chemical, biological and social processes interact to such a degree that it is not possible to understand future trajectories without developing more fully holistic perspectives of the complete system. The components of the Arctic are inter-related through a complex network of linkages, feedbacks and multi-dependent interactions. Theoretically a change in one variable in a part of the system can initiate a cascade of effects throughout the system, and these connections need to be understood and quantified in order to achieve a level of predictability. A central justification for developing an Arctic System Model, or system of models, is to strengthen our understanding of the inter-connections among system components and the related feedback processes, which will lead to further improvement of models. This quantitative capability is a necessary precursor to reliable predictions of environmental and societal responses to future climate. This objective encompasses our understanding of change, attribution of change, and effects of change. We feel that this is the only reasonable approach to predictability and will help society prepare for and adapt to ongoing environmental changes in the Arctic. This is a huge task, and we will need to work collectively and in collaboration with our international colleagues to succeed.