

The Rapidly Changing Arctic: what we know, what we need to know and how we can identify and overcome challenges in Arctic Science

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We are entering a time of unprecedented climatic and environmental changes in the Arctic that are likely to have significant local and global societal consequences. However, there is great spatial variability in both climatic changes and impacts while long term trends can be moderated or even over-turned by unpredictable short-term events often represented by extremes and new records for the instrumental period. A general tendency for up-scaling and generalisation in science provides information for the global community on issues such as feedbacks to climate and sea level change. However, such Earth-system approaches fail to give local inhabitants the understanding and forecasting of change, and particularly extreme events, needed for adaptation. Although there are important research agendas that set out major, agreed priority research questions, there are persisting constraints on our attempts to understand changing Arctic environments and ecology despite many major technological and methodological advances. This simple paper focuses on personal experience from over half a century, and on experience working within the INTERACT Consortium of Arctic research stations on specific challenges to our understanding of change. The aims of the paper are not to review major science advances and challenges that are presented in several authoritative documents such as ACIA 2005, SWIPA 2011, and the three ICARP meetings of 1995, 2005 and 2015. Instead, we explore fundamental challenges presented by time scales, spatial scales, and approaches and we explore how networking can facilitate arriving at potential solutions.