Geophysical Research Abstracts
Vol. 14, EGU2012-6737, 2012
EGU General Assembly 2012

Arctic climate change in recent centuries: a review

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In locations where meteorological records are lacking, and for time periods where no monitoring occurred, proxy records are the only source of data on the background to the current climate change seen globally, but amplified in the Arctic. In recent decades Arctic climates have warmed at twice the rate of the planet as a whole (Miller et al. 2010), but with meteorological data short lived and sparse, it is not fully understood how unusual these changes are or when they started. Several recent projects have reported on both individual, site-specific studies and regional syntheses of palaeoclimate (eg. Overpeck, 1997; Kaufman et al. 2009, Fitzpatrick et al. 2010) prompted by the measured and modelled amplification of warming in the Arctic and observed rapid responses in the eco- and cryospheres. These studies provide baseline data for understanding recent changes, but they have limitations. The aim of this paper is to review the published evidence from terrestrial proxy sources with the following critical foci:

(i) Most studies are limited to reconstructions of summer conditions, despite evidence that during recent warming winter temperatures have been more variable than average or summer temperatures (Serreze and Francis, 2006).
(ii) Most studies have reconstructed only temperature estimates rather than precipitation, despite the ecological and climate-feedback importance of precipitation.
(iii) In many cases the calibration and testing period during which proxy data and meteorological data coincide is very short, limiting the accuracy of reconstructions
(iv) Combined, arctic-wide syntheses are perhaps premature given the current state of knowledge, and potentially hide an important regional variability in Arctic climate change.

Due to the importance of the last few centuries in understanding the long-term context of recent warming, correcting some of these deficiencies is important, and some possible solutions will be outlined.

References:
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