



Early 20th century and recent Arctic warming: A three-dimensional view

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The Arctic is currently experiencing a rapid warming that is generally assumed to be related to anthropogenic global warming. A pronounced warming of the Arctic also occurred in the first half of the 20th century, the causes of which are much less clear. Understanding the early 20th century warming is therefore important for assessing the present and future climate trends in the Arctic. In this paper we show that the two periods distinguish themselves with respect to the three-dimensional structure of the warming and of the atmospheric circulation in the Arctic. Using recently recovered historical upper-air data as well as reconstructions of upper-level circulation, we show that the early 20th century warming was most pronounced in winter in the Scandinavian Arctic and appears throughout the tropospheric column. Reconstructed atmospheric circulation shows strong anomalous advection from Europe, transporting warm (and polluted) air to the European Arctic. The recent warming has a pronounced structure in the Bering Strait region in spring (though the European Arctic also warms rapidly in winter), where it is more confined to the lower troposphere. The differences in the spatial structure of the warming allow defining fingerprints, which will help in evaluating model simulations with respect to the mechanisms involved.