

Relationship between the Arctic Amplification and the Arctic Oscillation

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Recent observed Arctic warming may be caused mostly by the increasing anthropogenic greenhouse gases, but the part of the warming may be caused by Arctic Oscillation (AO) which is considered as natural variability of the atmospheric general circulation. During 1990 to 2010 the AO Index has shifted to negative values, which may explain the recent rapid warming over the Arctic Ocean and Greenland. The AMAP project under the Arctic Council (AC) recently announced that the sea level would rise up to 1.6 m by the end of this Century if the Greenland ice sheet continues to melt by this speed. This prediction of the sea level rise is far larger than the value of 0.5 m projected by the Fourth Assessment Report (AR4) of the IPCC. However, we must predict the future sea level raise carefully by taking account of the natural variability due to the Arctic Oscillation.

In this study, the recent warming over the Arctic Ocean and Greenland is decomposed in contributions from the natural variability due to the AO and the anthropogenic global warming due to the increased greenhouse gases. The 3D structures of various meteorological variables regressed with the AO Index are analyzed quantitatively, and the results are compared with the observed trends during 1990 to 2010. According to the results of this study, the recent rapid warming over the Arctic Ocean and Greenland can be explained mostly by the features of the AO. Considering the oscillating characteristics of the natural variability by the AO, it is suggested that the prediction of the sea level raise of 1.6 m by the end of this Century is likely to overestimate the reality of the future sea level raise.

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