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## Separation of natural variability and anthropogenic trend in the Arctic

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The sea ice cover in the Arctic Ocean has been reducing with growing interannual variability in last 40 years and low ice in the Pacific sector and the Siberian Shelf as the more recent characters. The first EOF of sea level pressure is the Northern Annular Mode (NAM). The second EOF is the Arctic Dipole Mode (ADM) energetic in winter with two poles over Siberia and Greenland at opposite signs. In spring and summer, another dipole mode (ADMSS) stands out at a dominant quasi-biennial cycle, having two poles over Europe and Canada. The decadal ice variability was mainly explained by the NAM until 1990. During 1980s, the most influential atmospheric mode shifted to the ADM and correlated with the ice anomalies: i.e., the Pacific (Atlantic) sector had low (high) ice cover at a 1-year lag from the positive ADM with a low pressure over Siberia. The quasi-biennial ice variability is distinct in the East Siberian-Laptev Sea correlated with the ADMSS in the same year due to seaward winds. Thus, the space-time distributions are much more complicated than a straightforward ice melting caused by global warming. They have to be examined against observed data and model results in the atmosphere-ice-ocean system, and separated from the signal of global warming.

Keywords: Arctic Ocean, sea ice, climate change, global warming