

1 **List of Supplemental Material**

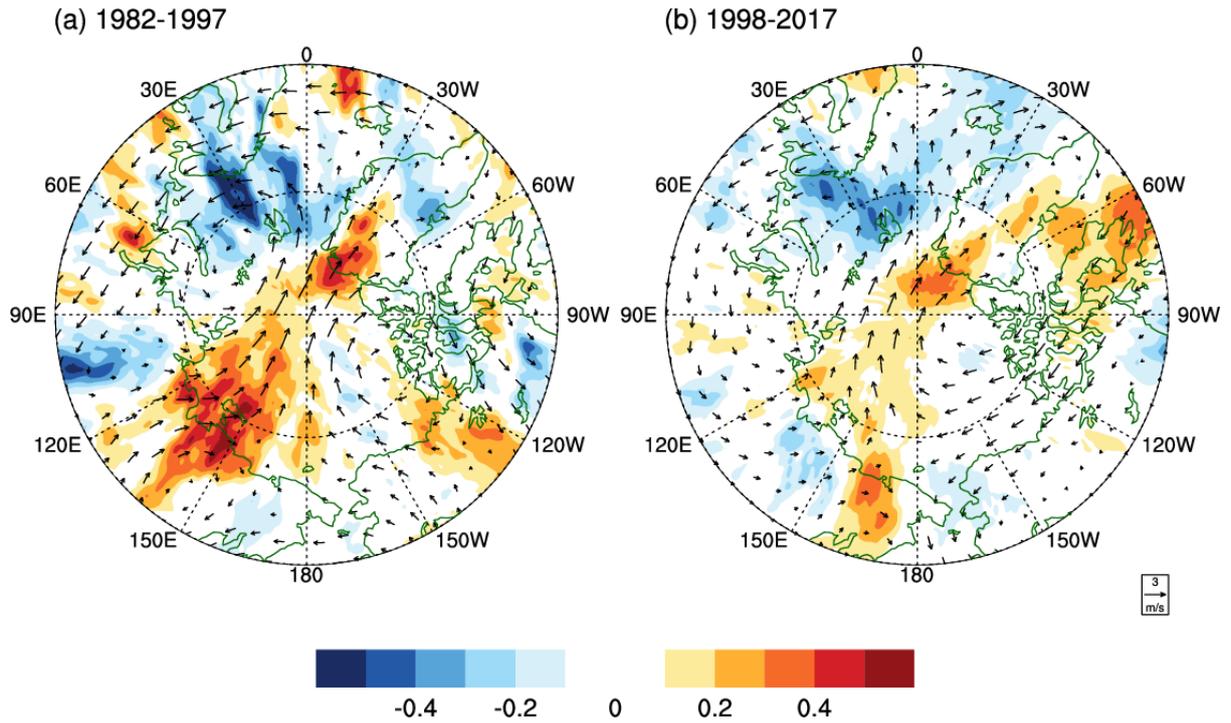
2 Figure S1. Temperature advection associated with AD (shaded, K day⁻¹) shown with the wind
3 at 500 hPa (vector, m/s) for (a) the early (1982-1997) and (b) the recent (1998-2013) period.

4 Temperature advection is calculated by $\mathbf{V}' \cdot \nabla T' + \bar{\mathbf{V}} \cdot \nabla T' + \mathbf{V}' \cdot \nabla \bar{T}$, where $\bar{\mathbf{V}}$ and \bar{T} are time-
5 mean 500 hPa wind and air temperature in each period, respectively, and \mathbf{V}' and T' are
6 regressed wind and air temperature onto the AD index, respectively.

7 Figure S2. Regression patterns of outgoing long-radiation (OLR, W m⁻²) onto the AD index for
8 (a) the early (1982-1997) and (b) the recent (1998-2013) period. OLR data is obtain from
9 NOAA [Liebmann and Smith, 1996]. The AD index was reversed in sign for the melting phase
10 of sea ice. Dotted area indicates the statistically significant region at 95% confidence level.

11 Figure S3. Leading EOF modes for the negative PDO phase before 1998. (a) is EOF1 and (b)
12 is EOF2.

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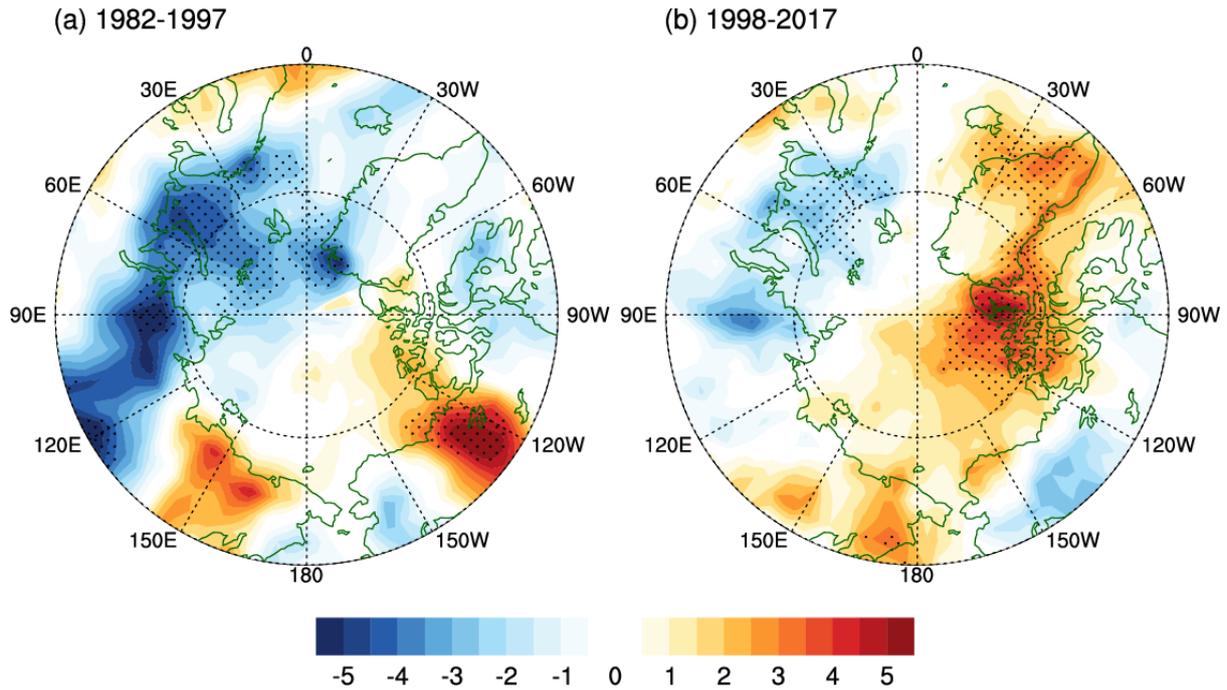


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15 Figure S1. Temperature advection associated with AD (shaded, K day⁻¹) shown with the wind
 16 at 500 hPa (vector, m/s) for (a) the early (1982-1997) and (b) the recent (1998-2013) period.

17 Temperature advection is calculated by $\mathbf{V}' \cdot \nabla T^- + \mathbf{V}^- \cdot \nabla T' + \mathbf{V}' \cdot \nabla T'$, where \mathbf{V}^- and T^- are time-
 18 mean 500 hPa wind and air temperature in each period, respectively, and \mathbf{V}' and T' are
 19 regressed wind and air temperature onto the AD index, respectively.

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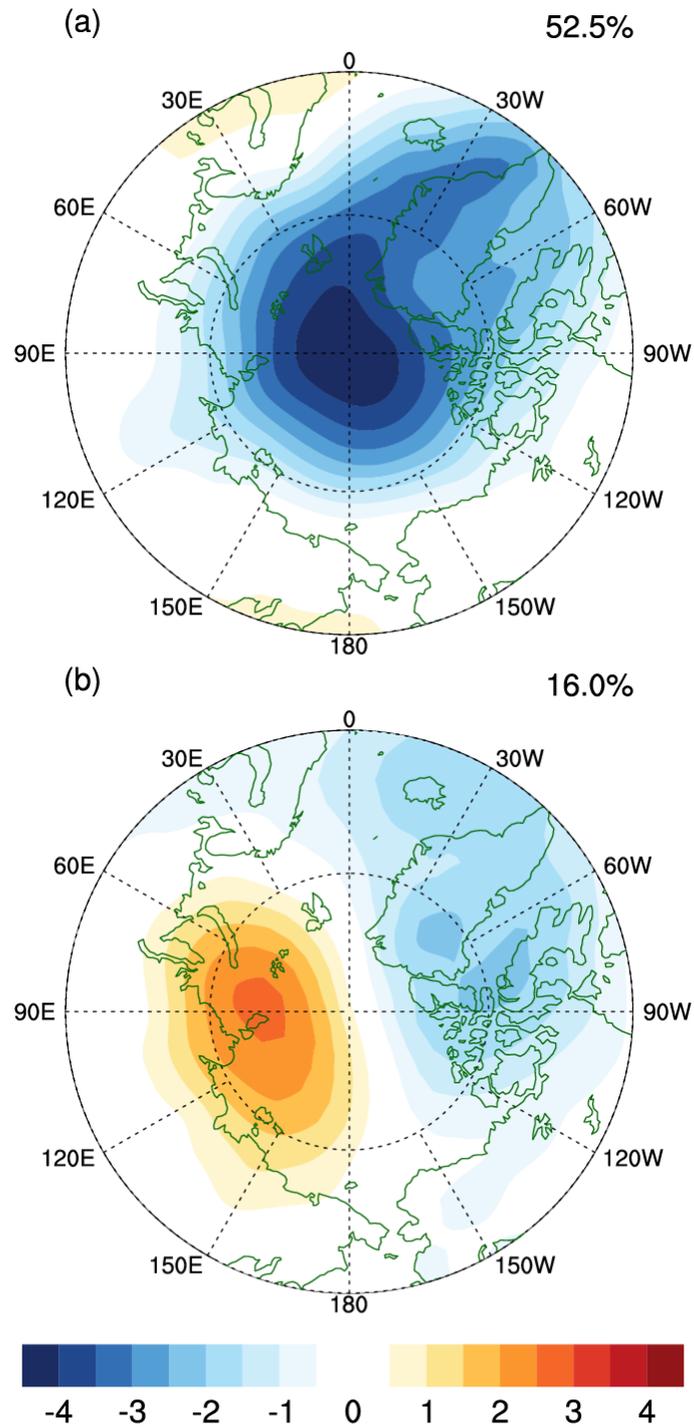
22 Figure S2. Regression patterns of outgoing long-radiation (OLR, W m^{-2}) onto the AD index for
 23 (a) the early (1982-1997) and (b) the recent (1998-2017) period. OLR data is obtain from
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