Short-term weather patterns modulate air quality in Eastern China during 2015-2016 winter

Objective

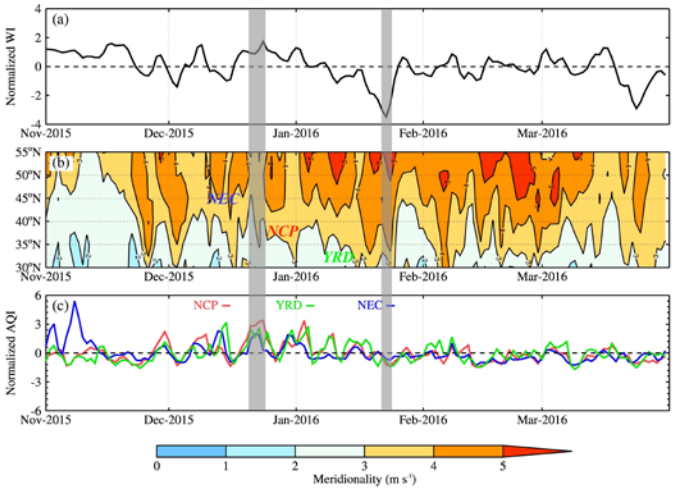
- To investigate how westerly winds at the mid-tropospheric (500 hPa, ~5500 m) modulate wintertime air quality in Eastern China

Methods

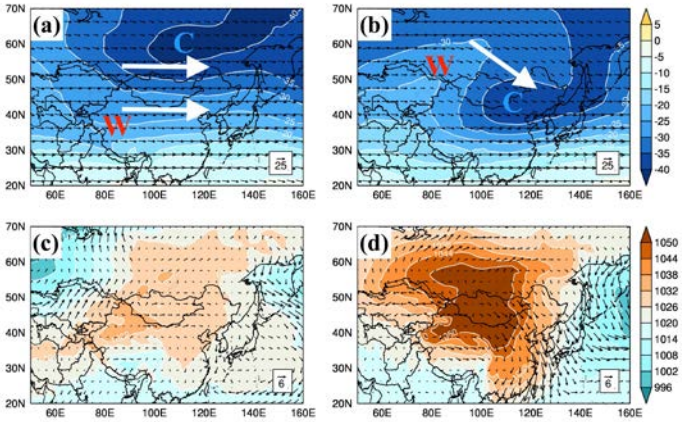
- To Perform two simulations by the WRF-Chem model to exclude the emission impact during 2015-2016 winter.
- To establish the relationship of ambient air quality and westerly winds.

Summary

- A more positive normalized Westerly Index (WI) corresponds to a lower meridionality and a more positive normalized AQI, vice versa.
- A more positive normalized WI implies for **a zonal straight westerly wind** at the mid-troposphere, **confining cold air within high latitudes and isolating warm air at the mid-latitudes**. Near the surface, **the Siberian High is weak and low northerly winds are prone to high $PM_{2.5}$ concentrations** in Eastern China.
- A more negative normalized WI implies **for a wavier meridional airflow** at the mid-troposphere, **allowing more cold air advection from north to south**. Near the surface, **the Siberian High is strong and high northerly winds are in favor of low $PM_{2.5}$ concentrations** in Eastern China.



Day-to-day variability of (a) normalized WI, (b) meridionality from 30°N to 55°N, and (c) normalized AQI in the NCP, NEC and YRD during 2015-2016 winter.



Typically different weather patterns on the polluted days (Dec 21-24, 2015) and clean days (Jan 21-23, 2016) shown in Fig.7 (the gray shading bars) at the surface (c-d) and 500 hPa (a-b). The white arrows imply for the movement direction of airflows, and "W" implies for the warm core and "C" implies for the cold core.