

## 4.132 The seesaw modulation of haze pollution in North China from the combined effect of El Nino and Arctic Oscillation.

Early Career Scientist

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Abstract:

By utilizing the recent observational  $PM_{2.5}$  data in China, this study found that the  $PM_{2.5}$  concentrations show distinct seesaw features with abnormally high and low in the adjacent two months of December 2015 and January 2016, respectively. This dipole  $PM_{2.5}$  variations are modulated by the combined effect of El Nino and Arctic Oscillation (AO). In December 2015, the mature phase of super El Nino, accompanied by positive AO, induced weakened East Asian winter monsoon (EAWM), featured by positive anomaly of geopotential height at mid-troposphere (i.e., 500 hPa) and southerly wind anomaly at low level (i.e., 850 hPa) over the North China Plain (NCP), resulting in reduced Planetary Boundary Layer (PBL) height, abnormally warm temperature and substantial haze accumulation during this period. In the following month (January 2016) when El Nino starts to decay, the sharp reversal of AO from positive phase (in December 2015) to negative phase triggered enhanced EAWM, inducing more cold advection and low-level northerly wind invasion of the NCP, fostering the atmospheric dispersion and substantially reduction in haze formation. This abrupt turn of AO from positive to negative phase was robustly found during the same decay period (February 1983 and January 1998) after mature phase (January 1983 and December 1997) of the other two super El Nino, likely a modulation of the southward shift of upper troposphere jet at 200 hPa and weakened stratospheric vortex during the decay phase compared to the mature phase, which is also qualitatively identified through a model experiment by Geng et al. (2017).

**Key words:** El Nino, Arctic Oscillation, East Asian winter monsoon, haze