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Impact of 2015–2016 El Niño and 2017–2018 La Niña on $PM_{2.5}$ concentrations across China

Abstract

Rapid industrialization and urbanization in China will lead to increasing air pollution, but air pollution varies across time and space and is affected by emission sources, pollution control measures, and atmospheric conditions. Most of the previous studies on the relationship between ENSO and haze pollution in China have been limited to specific seasons and specific regions, but the effects of ENSO on haze pollution can be year-round and spread over most regions. In this study, nine zones were categorized according to topography, climate, and economic level to compare the $PM_{2.5}$ concentrations in each area of China during the 2015-2016 El Niño event and the 2017-2018 La Niña event in the same seasons.

The results show that $PM_{2.5}$ concentrations at most monitoring stations exhibit seasonal variations, with the highest levels in winter, the lowest in summer, and transitional patterns in spring and autumn. Comparing $PM_{2.5}$ concentrations during El Niño and La Niña, the overall concentrations across China are higher during El Niño, except in southern China, where winter $PM_{2.5}$ concentrations are higher during La Niña. Wavelet analysis reveals stronger oscillation signals in the semi-annual and seasonal scales in northern China compared to southern China, with slightly stronger seasonal and intra-seasonal oscillation signals during El Niño than La Niña. The regional differences in fall and winter $PM_{2.5}$ concentrations between El Nino and La Nina can be explained by differences in the anomalous atmospheric circulation patterns, with the northern part of the country being mainly affected by the low-level wind field, and the southern part of the country being affected by the low-level wind field and surface precipitation patterns.

Keyword

ENSO

Fine particulate matter

Reference

Wang, X., Zhong, S., Bian, X., and Yu, L.: Impact of 2015–2016 El niño and 2017–2018 la niña on $PM_{2.5}$ concentrations across China, *Atmos. Environ.*, **208**, 61–73, 2019.