

4<sup>th</sup> World Conference on

# CLIMATE CHANGE

October 19-21, 2017 | Rome, Italy

## Inter-annual variation of aerosol pollution in East Asia and its relation with strong/weak East Asian winter monsoon

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Aerosol has become one of the major air pollutants in East Asia, and its spatial distribution can be affected by the East Asian monsoon circulation. By means of the observational analysis and the numerical simulation, the inter-annual variation of wintertime aerosol pollution in East Asia and its association with strong/weak East Asian winter monsoon (EAWM) are investigated in this study. Firstly, the MODIS/AOD records during 2000-2013 are analyzed to reveal the inter-annual variation characteristics of aerosols. It is found that there is an increasing trend of AOD in East Asia over the last decade. The areas with obvious increasing AOD cover the Sichuan Basin (SCB), the North China Plain, and most of the Middle-Lower Yangtze River Plain in China. Secondly, the EAWM index (EAWMI) based on the characteristic of circulation are calculated to investigate the inter-annual variations of EAWM. The NCEP reanalysis data are used in EAWMI calculation and meteorological analysis. Nine strong and thirteen weak EAWM years are identified from 1979 to 2014. Finally, the effects of strong/weak EAWM on the distribution of aerosols in East Asia are discussed. It is found that the northerly wind strengthens (weakens) and transports more (less) aerosols southward in strong (weak) EAWM years, resulting in higher (lower) AOD in the north and lower (higher) AOD in the south. The long-term weakening trend of EAWM may potentially increase the aerosol loading. The weakening of EAWM should be another cause that results in the increase of AOD over the Yangtze River Delta (YRD) region, the Beijing-Tianjin-Hebei (BTH) region and SCB but the decrease of AOD over the Pearl River Delta (PRD) region. Using the Regional Climate-Chemistry coupled Model System (RegCCMS), we further prove that the intensity of EAWM has great impacts on the spatial distribution of aerosols. More obvious changes occur in lower atmosphere, and the change pattern of aerosol column content in different EAWM years is mainly decided by the change of aerosols in lower troposphere.

### Biography

Min Xie received the B. S. degree in 2001 and the Ph. D. degree of Meteorology in 2007 from Nanjing University. He worked as a research assistant in the Hong Kong Polytechnic University in 2007 and 2009, and a postdoctoral research fellow in the University of Hong Kong during 2010 to 2012. Now he is an associate professor in Nanjing University. His research interests include interaction between air quality and climate change in regional scale, natural emission of trace gases in China, meso- and micro-scale modeling on atmospheric environment, and regional environmental impact assessment and planning, etc. He published several papers in these fields.

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