

# A heavy haze episode in Beijing in February of 2014: Characteristics, origins and implications

RENCHANG YAN<sup>1</sup>, SHAOCAI YU<sup>2</sup>, PENGFEI LI<sup>3</sup>, SI WANG<sup>4</sup>  
AND WEIPING LIU<sup>5</sup>

Research Center for Air Pollution and Health, College of  
Environmental and Natural Resources, Zhejiang  
University, Hangzhou, Zhejiang 310058, P.R. China.

<sup>1</sup>yc\_zju@163.com

<sup>2</sup>shaocaiyu@zju.edu.cn

<sup>3</sup>21314045@zju.edu.cn

<sup>4</sup>loveandshare@126.com

<sup>5</sup>wliu@zju.edu.cn

More than half Chinese cities are suffering from severe air pollution due to the rapid development of industry and urbanization. Beijing, as a political and cultural centre of China, has frequently suffered from severe haze. However, the precise sources of air pollution in Beijing still remain uncertainty. In this study, the observational data ( $PM_{2.5}$ ,  $PM_{10}$ ,  $O_3$ ,  $NO_2$ ,  $CO$  and  $SO_2$ ) at ten monitoring stations from February 8 to 28, 2014, in Beijing were used to analyse air pollution. The satellite observations for aerosol optical thickness are also used. Backward trajectory model and receptor models were used to identify the sources of air pollution in Beijing. On the basis of  $PM_{2.5}$  concentrations, we separated the whole data into three categories: relatively clean air ( $PM_{2.5}$  concentrations less than  $75 \mu g m^{-3}$ ), haze ( $PM_{2.5}$  concentrations greater than  $75 \mu g m^{-3}$  but less than  $200 \mu g m^{-3}$ ) and heavy haze ( $PM_{2.5}$  concentrations greater than  $200 \mu g m^{-3}$ ). The results show that the average concentrations of  $PM_{2.5}$  are  $29.5 \mu g m^{-3}$ ,  $136.6 \mu g m^{-3}$  and  $311.2 \mu g m^{-3}$  for relatively clean air, haze and heavy haze cases, respectively. The back trajectory cluster analysis reveals that the predominant clusters are East and South for the heavy haze case. The results of the receptor models show that for the haze case, pollutants mainly originated from south of Beijing such as Dezhou, Liaocheng and Heze in Shandong province, while for the heavy haze case, pollutants were mainly from southwest of Beijing such as Baoding, Hengshui and Handan in Hebei province. These results indicate that the emissions in the surrounding provinces made a significant contribution to Beijing's air pollution. Thus, it is necessary to implement air pollution control for all surrounding areas, especially for the industrial zones in the south/southwest regions of Beijing.