

# ***Interactive comment on “Counteractive effects of regional transport and emissions control on the formation of fine particles: a case study during the Hangzhou G20 Summit” by Ying Ji et al.***

## **Anonymous Referee #1**

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The manuscript titled "Counteractive effects of regional transport and emissions control on the formation of fine particles: a case study during the Hangzhou G20 Summit" by Ji et al. gave a detailed analysis of the major chemical components in particulate matters during the 2016 Hangzhou G20 mega-event. This mega-event has attracted substantial attentions as emission controls had been implemented at both large-scale areas and with significant intensities firstly over the Yangtze River Delta region. However, the effectiveness has been rarely reported. The study by Ji et al. comprehensively investigated the chemical characteristics of fine particles during the five defined stages. It is found that particle pollution during some control periods are even higher than the pre-control period. Regional and long-range transport are found playing an important

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role. It is highlighted that the formation of secondary aerosols is quite different from previous studies in northern China, e.g. the dependence of sulfate formation on relative humidity, SNA/PM<sub>2.5</sub> ratios as a function of humidity, etc. It is also found that the SNA/EC ratios are strongly impacted by the extent of long-range transport.

Overall, this is an interesting and important work for understanding the relative importance of emission control and long-range transport. The interpretation of the results is generally well described. I recommend it for publication with minor revisions as listed below.

Major Comments: Line 251 - 267, Why S2 didn't show absence of SOC peaks during daytime as S3 and S4? S2 - S4 are all among the emission control periods. Line 329 - 331, I didn't see sulfate from Hunan in the figure. What's the reason of the different potential source regions of SO<sub>2</sub> and sulfate? Line 394 - 397, high sulfate hotspots are seen in Figure 8 and it is concluded that shipping activities could be the cause. How is this conclusion supported? Line 444 - 467, The results of the SNA/PM<sub>2.5</sub> ratios and PM<sub>2.5</sub> concentrations as a function of relative humidity are overall interesting and showed differently from previous results. This suggested that the formation mechanisms of secondary aerosol are different from the north to south in China. However, the conclusion "Hence, the relationship between PM<sub>2.5</sub> concentrations and RH was ambiguous, which was attributed to the net effects of regional/long-range transport and emission control" was not well supported. The authors may more statistically explain it.

Minor Comments: Line 187, change "first" to "firstly" Line 188, add "value" after (OC/EC)<sub>pri</sub> Line 202, it is unclear what's the "most stringent emission control stage", please add more details. Line 206, how is the boundary height measured? Line 241, change "about" to "from" Line 246, change "7 September and 9 September" to "September 7th and 9th" Line 272 - 273, Does this sentence refer to Fig. 4a? If so, the trace ions (Na<sup>+</sup>, K<sup>+</sup>, Ca<sup>2+</sup>, Mg<sup>2+</sup>, and Cl<sup>-</sup>) are not included. Line 276, add "compared to S1" after "from S2 to S4". Line 284, compared to the average of S2-S4?

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Please write clearly. Line 296, change "The NO<sub>3</sub>-/EC variation" to "The variation of NO<sub>3</sub>-/EC" Line 304, it should be "well developed boundary layer" but not "well developed boundary layer height" Line 305, "be subjected to" should be "be subject to". Line 358, SO<sub>2</sub> in the equation is a typo. Line 374, add "respectively" after "compared to S<sub>2</sub> - S<sub>4</sub>" Line 441, change "relative" to "relatively" Line 525, change "sector" to "sectors" Line 531, it should be written clearly "from the northeast to southwest" is clockwise or anti-clockwise. Line 549 - 550, I guess the error bars refer to the SNA/EC ratio but not PM<sub>2.5</sub>.

Technical Comments: Figure 1. the right panel of the figure is suggested to use a terrain shapefile. Figure 2. Add units for wind direction and change its scale to 0~360; Add unit for temperature; The missing data in the figure should be explained; The definitions of S<sub>1</sub>- S<sub>5</sub> are better added into the caption. Figure 3. Add unit for temperature; Add title for the X-axis; Figure 4. The dotted lines are not easy to see; Enlarge the titles of the Y axis; Mark S<sub>1</sub> - S<sub>5</sub> on the pie charts. Figure 5. The size of the Y-axis for the three panels seems different, make it consistent; Indicate five stages at the top of the figure. Figure 6. The geographic areas in the back trajectory map are different from the PSCF maps. Make it consistent as well as for Figure 8. Figure 7. Add unit for wind direction and change its scale to 0~360; In Fig. 7c, the unit of the trajectory height is also missing. Figure 9. Add the unit of temperature; Add the description of the error bar in the caption Figure 11. Add the unit of wind direction; Add the description of the error bar in the caption

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