

Dear Kravitz,

We wish to thank you for the comprehensive suggestions. We are sorry for missing your comments. Please find our responses in the revised manuscript. We hope that the revised version of our manuscript is suitable for publication in ESD.

Thank you for your consideration!

Yours sincerely,

Na Ying

(On behalf of all authors)

Reply to the Editor

In the following we response on a point-by-point basis. Please note that the comments are highlighted in the red text color represents the revised text.

Comments:

1. *The abstract overstates things a bit. For example, you didn't really study the improvement of air quality. Also, "beyond doubt" is a bit much.*

Response:

We thank the referee for this kind and valuable comment. We have corrected them in the revised version.

Before

“By analyzing the transport routes, we show that a mass of links extends southward from the BTHHS to the Yangtze River Delta (YRD) regions with one- or two-day time lags. Hence, we conclude that earlier emission reduction in BTHHS and early-warning measures in YRD will help to improve air quality in both regions. Moreover, significant links are concentrated in wintertime, suggesting the impact of the winter monsoon. In addition, all cities have been divided into nine clusters according to their spatial correlations. We suggest that the cities in the same clusters should be regarded as a whole to control the level of air pollution. This approach, beyond doubt, is certainly also applicable to the studies of other air pollutants such as ozone, NO_x, and so on.”

After:

“By analyzing the transport routes, we show that a mass of links extends southward from the BTHHS to the Yangtze River Delta (YRD) regions with one- or two-day time lags. Hence, we conclude that earlier emission reduction in BTHHS and early-warning measures in YRD will provide better air pollution mitigation in both regions. Moreover, significant links are concentrated in wintertime, suggesting the impact of the winter monsoon. In addition, all cities have been divided into nine clusters according to their spatial correlations. We suggest that the cities in the same clusters should be regarded as a whole to control the level of air pollution. This approach is able to characterize the transport and cluster for other air pollutants such as ozone, NO_x, and so on.”

2. *Similarly, lines 217-220 contain a policy recommendation. This is an overstatement for your study. Unless you want to discuss the policy implications of doing this, including advantages and disadvantages, this sentence should be removed.*

Response:

We thank the referee for this kind and valuable comment. We have deleted it in the revised version.

3. *In lines 226-227, you did not show that these transport routes are related to the monsoon. It's suggestive, but not conclusive.*

Response:

We thank the referee for raising this. We have modified it in the revised version.

Before

“It means the routes features in winter are dominant over the whole year. Hence, the southwestern links are related to the East Asia winter monsoon.”

After

“It means the routes features in winter are dominant over the whole year. Here the southwestern links may be related to the East Asia winter monsoon.”

4. *Your response to reviewer #1 point 4 worries me. The circumference of Earth is about 40,000 km, so you are now defining short distances as anything that travels less than halfway around the planet. I think this is problematic.*

Response:

We thank the referee for raising this. We have deleted it in the revised version.

5. *I would also encourage the authors to do another round of proofreading. I noticed some typographical errors in your reviewer responses.*

Response:

We thank the referee for this kind and valuable comment. We have modified it in the revised version.

Before

“These studies suggest that curbing air pollution has not been a local issue, and the regional coordinate could be an effective approach to improve the air quality of the regional atmospheric environment.”

“In 2012, The 12th Five-Year Plan on Air Pollution Prevention and Control in Key Regions approved proposed to divide China into three key regions to jointly prevent air pollution, which is named as the Beijing-Tianjin-Hebei (BTH), Yangtze River Delta (YRD) and the Pearl River Delta (PRD), and major urban agglomerations such as Lanzhou-Xining, Wuhan and surrounding areas, Shaanxi and Guanzhong city (MEP, 2012).”

“Hence, the PM_{2.5} transports in the whole of China over a long-time period have not been fully understood; furthermore, the traditional approaches adopted in the above studies do not fully consider the nonlinear transport processes between cities.”

“The PDF of positive links weights has a long tail in the original data, which is not presented in the link weights of the shuffled networks.”

“It is found that the degrees, weighted degrees, and edge lengths conform to power-law distributions which is associated with some climate and weather phenomena such as the tropical circulations and cyclones (Pierrehumbert, 1986).”

“Different colors represent the ability to transmission.”

“The other interconnected areas are Heilongjiang and Jilin provinces, Jilin and Liaoning province

(northeast China), Hunan and Hubei province (central China), and Jiangxi-Fujian, Guizhou-Chongqing-Sichuan, and Shanxi-Shaanxi-Ningxia-Gansu.”

“Hence, it is reasonable to analyse the transmission and cooperation regions of PM_{2.5} from the perspective of whole national evolution over a long period of time. To quantify the relations of PM_{2.5} among cities, the patterns of weighted degree are investigated.”

“Based on the PM_{2.5} networks, the transport links and collaborative regions are analysed.”

“In winter, although we get a similar transmission pattern, it possesses a strong intensity. We demonstrate that the possible reason is resulted from the influence of cold fronts, which, exactly, disperses the PM_{2.5} accumulated in the North China Plain to the Yangtze River Delta region and thus, leads to the propagation of PM_{2.5} from the BTH region to the YRD region. Hence, links BTH to the YRD region obtained from the whole year are related to the cold front occurring in wintertime.”

“The result is consistency with previous studies obtained from the WRF-Chem model. Hence, complex network methodologies are useful for the studies of the transport and cluster of air pollutants in faster and more economic ways. Furthermore, they are also potential in the studies of other air pollutants such as ozone, NO_x, and so on.

In addition, the study have some limitations. The relations between PM_{2.5} cities have been measured based on the lagged correlations, which have yielded useful results. However, the peak of cross-correlation in a correlogram may be spurious due to serial autocorrelation within each time series, which is another common feature in geophysical time series. Furthermore, the results cannot reveal causal relationships, which may suffer from problems related to interpretability.”

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