

# ***Interactive comment on “Meteorological formation mechanism of regional transport in winter heavy air pollution events in the middle Yangtze River area, China” by Yongqing Bai et al.***

## **Anonymous Referee #1**

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### Review of the paper

Meteorological mechanism of regional transport in winter heavy air pollution events in the middle Yangtze Basin areas over China

by Yongqing Bai and co-authors

The paper describes the meteorological processes that can lead to largely increased air pollution in the Hunan and Hubei provinces in central China in winter. The authors analyse PM<sub>2.5</sub> observations together with ERA interim meteorological re-analysis data by means of multivariate EOF decomposition.

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The paper suffers from several significant shortcomings. I do not recommend its publication in ACP.

First of all the analysis deals with a very regional or local effect. The authors do not make clear why it should be of interest for an international scientific audience to get insights into the meteorological effects leading to increased pollutants concentrations in the Hunan and Hubei provinces. In particular, the authors do not put their findings in the context of similar studies or similar conditions elsewhere in the world. Also, the literature cited in the paper consists almost exclusively of Chinese authors reporting about air quality in China. Of course, this is necessary in order to put the study into the context of other similar studies. However, the authors should have taken other international studies into account.

Second, the paper repeats its findings several times, partly even by using exactly the same expressions. The explanations given in section 4.2 are more or less repeated in 4.3 (lines 488-501), 5.1 (lines 547-560) and 5.2 (617-622). This makes the reading of the paper very tedious.

Third, the English used in the paper needs significant improvements and corrections. Sometimes, it is very difficult to understand what the authors really want to say. For example, the expression “the effect mechanism of (...) meteorological conditions” or the “effect mechanism of pollutant transport” is central to the paper and appears five times. However, it isn't clear what the authors mean with the “effect mechanism”.

Other major comments:

In the abstract and at several other places in the document, the authors mention the pollution transport pathways through “Nanxiang Basin-Yunmeng Plain pathway and the Dabie Mountain's Hilly Area-Yunmeng Plain pathway”. If you are not from China, it is quite hard to understand these descriptions unless you provide a map.

Lines 126 – 129: The authors argue that their findings are of practical value by broad-

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ening the scientific understanding of heavy pollution formation mechanisms. However, the findings may be of scientific interest but I cannot see the practical value. The differences to other regions of China (and perhaps to other regions with similar topography) are not much discussed in the paper. In addition, because the authors themselves demonstrate in section 5.2 that chemistry transport models like WRF-CHEM are able to reproduce the pollution transport towards the Hunan and Hubei provinces, the question arises which additional insights this study gives.

Section 2.2: The methods are not well described, the explanations are too brief and too general. The authors should have made an attempt to better explain their approach to the reader. They could also give references for those who are not deeply involved in MV-EOF and EEOF or give more details in an appendix.

Line 183: It is not clear what “synthetic analysis” exactly means in this context.

Line 221: What is meant with the “most obvious spatial characteristics”?

Figure 2: What re the units of the color scale? If this is PM<sub>2.5</sub> is this in  $\mu\text{g}/\text{m}^3$  or perhaps  $\text{mg}/\text{m}^3$ ? What is the unit of the arrow? The number 0.15 below the arrow doesn't have units, either.

Table 1: You list 8 typical regional pollutant transport events. No 2 & 3 as well as 6 & 7 have just one day difference. How can you consider them as another event? In the rightmost column it is stated that they belong to the same transport event.

Figure 3: The arrows in (c) and (d) have different standard length (6 in (c) and 3 in (d)) which is misleading

Line 308 – 310: It is not clear what you want to say with the temperature differences. A change by  $3^\circ$  or only  $1^\circ$  in 24h does not seem to be much.

Line 330: What is Figure 2d?

Figure 5: If boundary layer height is given in color scale, what are the units and what

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does this figure say?

Figure 6: You should not use different standard lengths for arrows when graphs are combined in one figure.

Line 374: What would you call a “pollution-free day”? This might be very subjective.

Line 407: How was the synthesis of the 8 pollutant transport events done?

Figure 9 and Figure 10: How were the soundings “synthesized”? Is this an average of the vertical soundings? If yes, this could be misleading.

Line 493: What is meant with “cold air degenerates”?

Lines 579 – 585: It is quite hard to understand what is meant in this sentence.

Lines 586 – 597: Even if the WRF setup that was used is described somewhere else, it needs a better and more detailed explanation here, e.g. what was the spatial resolution and the number of vertical layers?

Line 726 - 731: I could imagine that there are AQ forecast systems running in China and such a “predictive warning sign” is not much needed.

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