

## ***Interactive comment on “A foehn-induced haze front in Beijing: observations and implications” by Ju Li et al.***

**Anonymous Referee #2**

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This observational study describes the evolution of meteorological conditions and PM concentrations associated with a foehn event. As the warm, dry, and relatively clean foehn wind meets the cold, wet and polluted air mass in the Beijing area, a haze front formed. The large observational network captured the characteristics and evolution of this haze front as it moved through the network. The level of details captured by both the ground and the upper air observations (including wind profilers, Doppler Lidars and radiosounds) makes this study a useful contribution to the literature regarding foehn characteristics and its influence on air pollution.

The manuscript contains a large number of figures that are generally in good quality. The writing, however, could use substantial improvements, as described below.

Define the key terms. The central focus of the manuscript is on haze front, but there is

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no clear definition on what a haze front is and how to identify it from the observations. It is stated in the paper that “The HF line was identified by temperature and humidity contrasts between the warm and cold air masses and the convergence line of the surface wind field”. How does this differ from foehn front? Is HF the same as foehn front? I would expect that a HZ should be identified by sharp contrast in PM values, instead of temperature and humidity. If HZ and foehn front are the same, then say it. In sum, it should be clearly stated near the beginning what you mean by haze front, foehn front, and what criteria are used to identify these fronts from your observational data.

The manuscript could benefit from reorganization. It is good to begin with describing background conditions for this episode. The sequence of the current description is: PM time series, sounding profiles, profiler winds, and finally synoptic patterns. I would reverse the order, starting from synoptic patterns and ending with surface observations including PM time series. More details are needed in the description of synoptic conditions. Right now, the synoptic patterns are shown, but there is very little discussion. In addition to describing the synoptic patterns for this case, there should be some discussion on how typical the pattern is and how often it occurs in order to put this particularly episode into historical context. Further, I do not see the need to separate “The evolution of HF” and “Characteristics of the HF and foehn winds” into two sections.

Some of the discussion could be improved. Some of the discussion is rather confusion. For example, “This HF occurred on 24 December 2015 concurrent with a severe air pollution episode.” But according to the PM time series in Fig. 2a, PM is high on the 23rd, but dropped down to nearly 100 on the morning of the 24th, and gradually increased to nearly 500 in the afternoon of 25. So if HF occurred on the 24th, then it was not concurrent with severe air pollution episode. In fact, in the next paragraph, it is mentioned that “the Beijing area was clear with low pollution.” It is unclear what the background pollution level was and what was associated by HF. Is the increase on the 24th due to the passage of HF? I would expect a sharp increase instead of a gradual increase. In the discussion of satellite images, it is unclear how you distinguish

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haze from fog or clouds in the satellite images? Some of the descriptions used present tense while others used past tense. Be consistent. The discussion about the HF and foehn characteristics is exhausting to read. Better rewriting is necessary to improve readability.

Figures Figures are generally in good quality, but figure captions could use more details. For example, the caption for Figure 1 should include a description of the different symbols, although they are described in the text. Also include AWS and PM stations in Figure 1.

The font size for the axis labels in the time series plots and some of the text in the figures should be enlarged. They are currently too small to read unless the figures are enlarged by 200% (e.g., Fig. 10 c vertical axis, Fig. 10 b, the label for the color bar; Figure 2b).

Clearly mark the time of HF passage on the time series plots.

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