Response to Referee#1

Dear Referee,

Thanks for your constructive comments and suggestions on our manuscript (egusphere-2023-1299). We have studied them carefully and made revisions on the manuscript. These comments and the corresponding replies are listed below.

The reviewer's comments are highlighted by gray. Followed by the comments are our responses. The texts led by "**In Section xx**" are the current texts in manuscript. The added texts or ~~deleted texts~~ are colored by red.

With regards,

Shuqi Yan

Comments:

1. Abstract, lines 20/21:" The fog propagation speed would decrease notably by 6.4m/s (66%) if the BLLJ-related moisture and warm advections are turned off." You may add "in the model" to make the concept clearer.

Thanks for this suggestion. We have added "in the model".

In Abstract

The fog propagation speed would decrease notably by 6.4m/s (66%) in the model if the BLLJ-related moisture and warm advections are turned off

2. Suggestion not to use and bold letters/words in the main text body, including abstract.

Thanks for this suggestion. All the bold words are corrected.

3. lines 148 – 151: The directions indicated and angles seem somewhat confusing: 160° means wind from 160° (SE winds) and corresponding fog propagation into the NW direction, correct? Please be more clear.

Thanks for this suggestion. The 160° problem depends on the coordinate system we choose. In the original manuscript, it is in Cartesian coordinate system, not in wind direction coordinate system. It means the direction is from (0,0) to (cos160°, sin160°). The fog propagation is indeed from SE to NW as you mentioned, no matter what coordinate system is chosen. We have added "in Cartesian coordinate system" for clarification.

In Section 3.2

… and the maximum propagation speed is 9.6m/s occurring at 160° direction (in Cartesian coordinate system).

4. Lines 227/228 and other places in the manuscript, including Fig. 13: It seems not quite alright to say that "fog forms at upper level ahead of forming at ground". "Fog" at an upper level with no fog present at the ground, isn't fog! Fog is a cloud with ground contact. If there is no ground contact of the cloud, it is a low stratus cloud. Authors, please revise the manuscript accordingly in order to be more precise with the respective wording. The process that you describe is stratus lowering, as you correctly state in the following..

Thanks for this suggestion. In the first apperance of "upper level fog", we add "The upper-level fog with no ground contact is referred to as low stratus" after it. The related words in the whole manuscript are modified accordingly: "upper level fog"→"low stratus", "subsidence of upper-level fog"→"stratus lowering".

The modifications spread over the manuscript. We only list some representative modifications.

In Section 3.4

Additionally seen from Figure 9, the west boundary of vertical fog region below about 100m has a negative slope, i.e., fog forms at upper level ahead of forming at ground. The upper-level fog with no ground contact is referred to as low stratus. The height at which fog/low stratus firstly forms is shown in Figure 10. An initial fog area forms at ground level before 00:00 on 21 January. Since then, low stratus ~~the majority of fog area firstly~~ forms at upper level (about 10~66m) over the downstream area, while the ground fog in downstream area forms about 0~20min later than low stratus ~~upper level fog~~. The formation of low stratus ~~upper level fog~~ may also be caused by the BLLJ-induced moisture advection. In addition, the ~~fog~~ cloud water advection (Section 2.2.3) to downstream area by BLLJ could also be a potential reason. We hypothesize that the formation of ground fog is partly favoured by the stratus lowering ~~subsidence of upper-level fog. Stratus-lowering or upper-fog subsidence to ground~~, which has been reported by previous studies (e.g., Haeffelin et al., 2010; Liu et al., 2012); the base height of stratus can be smaller than 100m before fog formation (Dupont et al., 2012; Fathalli et al., 2022), which is basically close to our results (10~66m in Figure 10). While in this event, the stratus lowering phenomenon ~~upper-fog subsidence~~ remains to be verified by additional high-spatiotemporal resolution vertical observations.

According to above results, three potential factors for fog propagation are raised: BLLJ-related temperature advection, moisture advection and ~~fog~~ cloud water advection. These advections possibly promote low stratus ~~fog~~ formation ~~in the upper level~~ within 100m above surface, and subsequently the low stratus ~~upper level fog~~ could subside to be ground fog by the turbulent mixing or sedimentation of ~~fog~~ cloud droplets. Currently, their contributions to fog propagation have not been quantitatively revealed. Therefore, it will be addressed in the next section.

In Abstract

The moisture advection probably promotes ~~upper level fog~~ low stratus formation, and later it subsides to be ground fog by turbulent mixing of fog droplets.

Other revisions in Results, Conclusions, figure texts and figure captions are the same with the above.