

Response to Reviewer 1's comments

[General Comments] In the present work, the persistent heavy rainfall event during the period from 29 July to 2 August 2023 ("23-7" event) was examined, focusing on synoptic forcings. Special attention was paid to an inclined vertical distribution on the western boundary was figured out, except for the remnant vortex originating from typhoon Doksuri(2305) and tropical storm Khanun(2306). Although previous studies considered the influence of the western Pacific subtropical high (WPSH) on heavy rainfall over north China, little has been documented on a tilted western boundary of WPSH. Interestingly, warm-dry cap overhead associated with the WPSH explains well the absence of convection and rainfall along the western boundary of WPSH. Overall, this study broadens the horizon of extreme precipitation in North China.

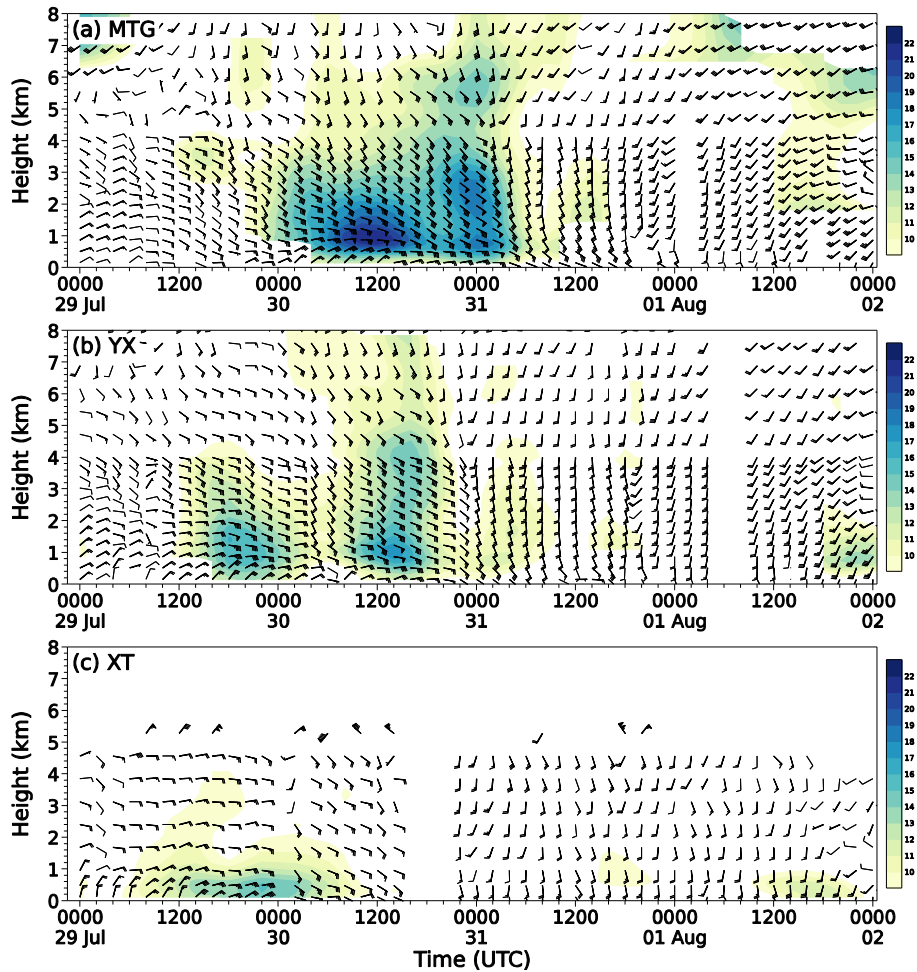
The study is well-designed and clearly organized, making it both interesting and relevant. Prediction of extreme rainfalls is an important field with significant implications for public safety. I would like to recommend publishing this paper in NHESS after addressing the relatively minor comments and clarifications below.

Response: Thank you very much for your kind words and positive comments on our manuscript. In the following sections, you will find our responses to each of your points and suggestions. We are grateful for the time and energy.

Specific comments:

(1) Although wind bars are given in Fig. 2, it is still hard to get low-level jet(s). It is recommended to draw the contour lines of wind speed or color the wind bars with wind speed for low-level jets.

Response: This is an excellent suggestion. We have redraw Fig. 2, and updated the text accordingly. For your convenience, the updated figure is shown as follows.



28

29 **Fig. R1.** Temporal evolution of wind profile (a full barb is 4 m s^{-1} , and shadings
 30 denote wind speed over 10 m s^{-1}) from observations near (a) MTG, (b) YX, and (c)
 31 XT during the period of 0000 UTC 29 July to 0000 UTC 2 August 2023. Note only
 32 the wind profile below 5 km above the ground can be observed due to the limitation
 33 of the instrumentation near Xingtai (XT).

34

35 (2) Lines 240-243: “The shift moments (roughly marked by thick black lines) are
 36 near at 0800 UTC 31, 2000 UTC 30, and 1600 UTC 30 July for the MTG, YX, and
 37 XT regions, respectively”. Why wind shift occurred at different moments? It is
 38 necessary to indicate the difference in the weather system during these two periods.

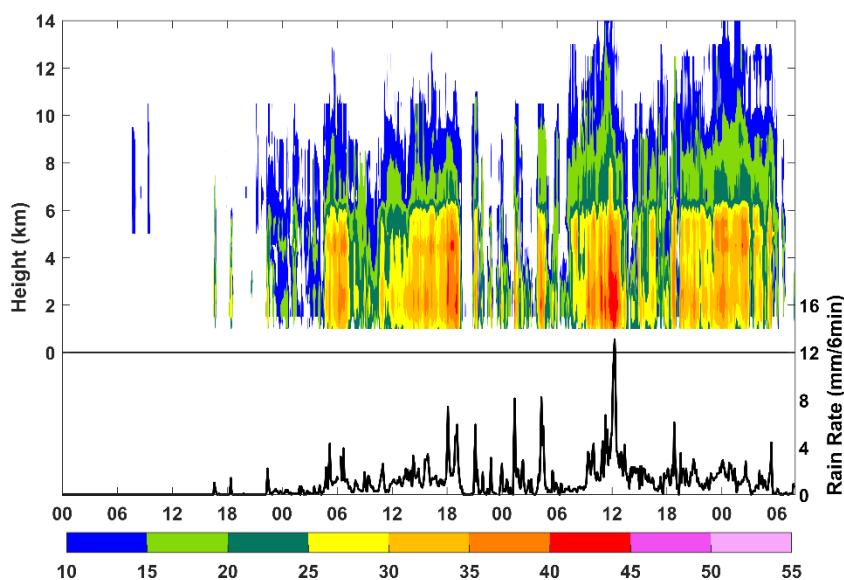
39 **Response:** In the present event, the wind field was significantly influenced by
 40 Typhoon Khanun (2306). As the typhoon gradually moved northwestward and the
 41 vortex weakened, the first to be affected was Xingtai (XT) in the south, then Yixian

42 (YX) in the centre and finally Mentougou (MTG) in the north. Therefore, the wind
43 shift occurred at different moments.

44

45 (3) Line 434: “this precipitation was mainly dominated by warm cloud processes
46 (Fig. 14).” The result is derived from the simulation. Can similar structural features
47 be observed from radar observations?

48 **Response:** Yes. The temporal evolution of the observed radar reflectivities over
49 Mentougou (MTG) is shown in Fig. R2. It can be seen that strong reflectivities are
50 mainly in the lower and middle troposphere, indicating active warm cloud processes.



51

52 **Fig. R2.** Time series of radar observations (top) and rain gauge rainfall rates
53 (bottom, mm/6min) near Mentougou (MTG).

54

55 (4) Since terrain plays an important role in the precipitation, it is recommended to
56 take terrain over 1000 m into account in the three-dimensional diagram (i.e., Fig.
57 15).

58 **Response:** Thank you for this great suggestion. It is hard to insert a
59 three-dimensional terrain in the diagram. Therefore, the topography over 1000 m is
60 superimposed on the map, as shown by the black contours in Fig. 15.

61

62 (5) *Technical comments: Please consider adjusting your reference list with the*
63 *manuscript preparation guidelines of NHESS.*

64 **Response:** Thanks for the kind suggestions. The references have been updated
65 according to the NHESS.

66

67 We appreciate you very much for your positive and constructive comments and
68 suggestions on our manuscript, which are valuable in improving the quality of our
69 manuscript.