

## ***Interactive comment on “Wuhan MST radar: Technical features and Validation of wind observations” by Lei Qiao et al.***

### **Anonymous Referee #2**

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Review on Wuhan MST radar: Technical features and validation of wind observations, by Qiao

General comments: The main objectives of the manuscript are, i) describing the Wuhan MST radar system and ii) validating its measurements. The major problem of the manuscript is it neither describes the system completely nor does a comprehensive scientific evaluation of its products. It falls somewhere in between. Also, the radars built under Chinese Meridian project were discussed in earlier papers (see Chen et al. 2016). Then it is not clear to me what the authors want to describe/study here? The authors may focus on either complete description of the system (highlighting the updates from 2016 after Chen's publication, if any) or on a detailed scientific evaluation of products.

C1

Specific comments: 1. The MST radars from China were discussed at length in few system related papers (Chen et al. 2016). What is new in this paper? Is there any upgrade made after those papers? If the authors intention is to highlight the stable performance of the system, then it is better to do a detailed scientific evaluation. 2. Lines 30-37: Several of these radars have been upgraded, like MU radar, Indian MST radar, NERC MST radar, etc. It is better to include recent references also to have updated knowledge on these radars. 3. The description of the system is not complete. Enough details were not provided on the antenna parameters, TR module specifications and RF performance. Also, it is better to include important specifications of the system in a table. 4. A separate sub-section exists on clutter suppression without describing how it is done! Is it simple removal of data at zero frequency and fill it with interpolated data from neighboring points? Or do you employ any filtering techniques (like wavelets)? 5. In spite of having two years of observations, the authors restricted the analysis to one profile comparison. Even that comparison shows a difference of 5-7 m s<sup>-1</sup> in the mid- and upper-troposphere, too large to accept. The authors should do the validation using a large data set to have a statistically robust conclusion on the performance of the radar. 6. Line 289: Several reasons were quoted for the wind discrepancy, including aspect sensitivity, without dwelling on any of those issues. Mere quoting of some references (elsewhere) may not resolve the problems in your radar or analysis. If aspect sensitivity is the real reason, why is it occurring only at those heights and in meridional plane alone? 7. Line 308: Even the average wind difference between the radar and ERA is too large (10 ms<sup>-1</sup>). What could be the reason for this difference? Also, do some statistical analysis by providing RMSE and correlations with statistical significance tests. 8. Line 354: Same problem as above, the SSW events were cited as the potential reason for the wind discrepancy without verification. Instead of citing old references, why don't you check whether or not any such events occurred during that period? 9. So many grammatical errors to list here (few of them are given below in minor comments). They should be corrected before the submission of the revised version.

C2

Minor Comments: Lines 13-14: Rewrite these sentences. Line 26: Change to “The mesosphere-stratosphere-troposphere (MST) radars have been used for studying the.....” Line 29: Replace ‘applied’ with ‘employed’ or some other suitable word. Same line, should be ‘turbulence’ Line 31: The sentence is abruptly ending. MST community plays a significant role in what? Lines 38-39: Rewrite these sentences. Line 44: Should be ‘...to write a new article in response to the readers and users demand (or request)...’ Line 49: Remove ‘of radar echoes’ Line 74: The signal is scattered by ‘refractive index irregularities’. Line 99: With 4 m antenna spacing, one can tilt the beam up to 24° from zenith without grating lobe!! Line 114: ‘respects’ is not the correct word there. Line 115: ...data pots of .... Correct it. Line 154: How about azimuth angles? Line 174: The recovery time of T/R switch is somewhat on higher side, which restricts the minimum height coverage (if shorter pulses are available) Line 218: Replace ‘in sunny day’ with ‘during fair weather’ Line 210: Since the LNA bandwidth of small TR module is 1 MHz, FIR filter bandwidth of 1.5 MHz will not improve the performance. First of all, what is the logic in choosing 1 MHz bandwidth at LNA? Line 225: Should be ‘Doppler spectra’. The sentences in this paragraph suffer with several grammatical errors. Correct them. Line 230: What do you mean by high-frequency interference? Line 231: Bring more clarity in presentation. At present, description of different modes of operation exists under ‘Validation of wind observations’. Add one more subsection 3.1. Modes of operation and then change numbers of other subsections accordingly. Line 245: If the temporal resolution of the data is 30 min, then the number of data points in a day should be 48. Then how come different numbers for different modes? Line 280: The radiosonde generally take an hour to reach 18 km assuming an ascent rate of 5 m s<sup>-1</sup>. Is it a special sonde (or filled with more gas?) that reaches 25 km in 1 hour? Line 300: Which one is latest? ERA-Interim or ERA5? Line 334-336: Rewrite the sentences. Also the data acquisition rate is high at 75 km not at 80 km. Line 351-354: Rewrite the sentences.

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