Review of “Elucidating the boundary layer turbulence dissipation rate using high-resolution measurements from a radar wind profiler network over the Tibetan Plateau” by Meng et al, submitted for publication in ACP

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The authors use one year of data from the Chinese radar wind profiler (RWP) network at six sites at the Tibetan Plateau (TP) to evaluate the evolution of turbulence intensity (turbulence dissipation rate ε) and planetary boundary layer (PBL) height (zi) throughout the day. First they show the daily variation of these parameters, averaged over the whole year for each daytime hour, at each of these six sites and point out the large differences between the two site in the North of the TP (with high turbulence intensity) and those in the south and east of the TP (low turbulence intensity). The differences are ascribed to different land cover, but no detail is presented. Next the data from all six stations are averaged per hour and effects of surface-air temperature (deltaT), vertical wind shear (VWS) and cloud cover are discussed. The authors conclude that deltaT has the largest influence in the PBL and VWS has the largest influence above the PBL.

The paper provides information on the spatial and temporal variation of turbulence and PBL and effects of some factors across the TP and is suitable for publication in ACP, subject to revisions addressing the general and detailed comments below, including suggestions for technical corrections.

General comments. In view of the differences between the six sites, in particular as regards turbulence dissipation rate (Fig. 2), what is the justification to average the data over all six sites? Would it not be more reasonable to analyze the data for each site and compare the results? This could provide information on other factors influencing the turbulence characteristics. Along the same lines, cloud cover and especially surface and air temperature vary strongly with season. Why, instead of discussing seasonal variation, are the data averaged over the whole year? Likely, the seasonal variations also vary between the six sites and the data for each site might provide constraints depending on local conditions which now are hidden in the large amount of data but for different conditions. Furthermore, the effect of cloudy vs clear sky likely affects the deltaT (and the surface and air temperature) and thus would provide more information than looking at all data together. This likely also explains the relatively small difference between cloudy and clear sky zi of only 117 m (line 310).

Another comment is the conclusion the “incapability of analyzing the effect of wind shear on ε below 0.5 km AGL in the following section” (line 376). With a maximum zi of about 2 km (figs. 2 & 4) this implies that z/zi needs to be at least 0.5/2=0.25, and preferably should be a function of zi. However z/zi is sometimes >0, sometimes >0.2 (For instance Fig. 6 and caption and text use different measures, but it is throughout the whole MS) and lsq fit seem to be made over different ranges (Fig 6 and Table 2).

The authors define AGL as “above sea level” (line 140) but use AGL also when they mean above ground level. I suggest to define above sea level as ASL and above ground level as AGL and check the paper when each is meant to be used.

The authors use “trend” but do not derive any trend. The difference between two data points (line 251) cannot be called a trend, in particular when these data are taken about 1500 km apart and nothing is known about the variation in between , may be just say that in the east the one-year averaged turbulence is smaller than at the western site? Note that “trend” is also used wrongly at other instances to indicate an increase or decrease.

Detailed comments:

33 spatial discrepancy > do you mean these a large difference between the six sites?

36 difference in land

40 do clouds suppress turbulence? Or does solar irradiation heat the surface which creates a larger deltaT and thus turbulence (as is discussed in the paper, see also line 47).

62 change to: impact on the forecast skill of weather and climate models

70/71 hard for radiosondes and ultrasonic anemometers …. of atmospheric ..

72 elevation larger than 4000 m

75 change could to can

76 change bubbling to thermals of warm air

79 change to : understanding the …

83 change influential to influencing

94 change to: flux promotes the …

103 change to: clouds tend to suppress

104 change to: China using fine …

106 change to: compared to clear …

108 change to: PBL contributors to ..

112 change to: in turn influences ..

115 change “elusive” to “unclear”

117/118 change to: Coincidently, the RWP network in China provides us a valuable …

136 of the RWP

137 and detailed information

140 ASL (see general comments)

144 Dunhuang?

154 signal to noise

182 is this a hypothesis or are these assumptions?

191 excluding the above

192 from the turbulent

200 between the Earth’s surface and the atmosphere above

201 affecting cloud

209 profile is greater

213 presents

240 TP ranges from

254 meridional or latitudinal?

257 reaches values up to

258 replace “least magnitude “ with “lowest value”

Par. Starting at line 272: is there an explanation why zi at Dingri is so much higher than at any of the other 5 sites?

275 replace “both” with “the”

277 vegetated terrain at the Ganzi

278 the sentence suggests that Fig.1 shows vegetation, but the locations seems to be overlaid on an elevation map

280 in the PBL

282 the sentence starting with “Thus, “ : some word seems to be missing (spatial variation?) but the sentence does not make sense: is the dissipation relevant to the surface type or does the surface type influence the turbulence?

295 PBL properties?

299-304 it is not mentioned to which sky conditions this applies

306 ε ranges from

350-351 does Table 2 show scatter plots or …. please correct and explain what table 2 shows, and also why the lower limit of z/zi is 0.2 whereas in the plots you use 0. Obviously the range influences the lsq fits, as the comparison between the eqs in Table 2 and Fig. 6 shows. However, Fig 8 shows that the lowest data point is for z/zi =0.2. Please discuss this in the text, and if no data exist below z/zi=0.2, all figures and text mentioning z/zi>0 needs to be corrected.

361 -364 The data and discussion clearly show the effect of clouds on the turbulence in the PBL. However, the question arises whether clouds reduce the solar irradiation at the surface and thus surface heating and thus deltaT. The extent to which deltaT changes depends on COT and cloud cover. Therefore I would suggest that deltaT is the governing parameter rather than cloud cover.

383 As mentioned in the text (see also general comments), VWS influences turbulence within the PBL, but it can be determined only in the upper part (>500 m). Hence the summary sentence on lines 383-384 should more carefully formulated to do justice to the detail presented in the above.

Also in the rest of the text, the conclusions on the effect of VWS within the PBL need to be more carefully formulated (see also general comment).

406 decreases with height (remove trend)

407 linear variation of the slope from the lower PBL to the top of the PBL. Within the PBL< the slope is positive, above the PBL ...

411-413 Fig 8 clearly shows the influence of cloud cover on the deltaT and the effect of the surface heating on the turbulence in the lower half of the PBL (z/zi<0.5, while higher in the PBL the surface effect has dampened and there is no difference between clear and cloudy sky.

421 the slope decreases with height

447 buoyant and mechanic forcing

468 at the Minfeng

472-473 similar to comment on line 282

487 PBL in clear-sky

504 remains known or unknown?