Review report on the paper of Söder et al. for the Journal Atmospheric Measurements Techniques: **Evaluation of wake influence on high-resolution balloon-sonde measurements**.

General comments

The article "**Evaluation of wake influence on high-resolution balloon-sonde measurements**" addresses the possible impact of the wake-created fluctuations on turbulence measurements from rising balloons. Such a wake can be generated in the trail of the balloon and/or by objects in the vicinity of the sensors (gondola, rope). The authors show few examples of likely wake encounter based on very high-resolution (8 kHz) measurements of the wind velocity from their LITOS instrument. These examples are convincing as they show large velocity fluctuations hardly distinguishable from atmospheric turbulence when the payload is likely in the balloon wake.

The approach of this work is mostly probabilistic, the main aim is to estimate the probability for wake encounter by the payload hanged below a rising balloon. Based on a probabilistic model, the authors estimate the relative impact of various factors, some of them not being considered in previous works such as the vertical wind or the rotation of the wind vector. As expected, the probability for the payload to be in the wake depends mainly on the balloon-gondola distance and on the vertical shear of the horizontal wind. From a statistical study based on 30 radiosondes, they estimated the probability for the payload to be in the wake of the balloon. They concluded that the probability for such an encounter for standard radiosondes is 28% in the average.

The article addresses a relevant question: to what extent does the disturbances induced by the system carrying a high resolution sensor impact turbulence measurement? The authors convincingly show (1) some effects of such disturbances (2) that the probability for the payload to be in the wake is quite large even for large balloon-payload distances, and (3) that this issue must be carefully addressed when estimating atmospheric turbulence from instruments carried by rising balloons. The possible wake effects are obvious for high-resolution sensors, but may also impact turbulence detections from standard resolution (~1 Hz) radiosondes.

Undoubtedly, this article deserves to be published. It is well organized, well written (as far as I can judge). The figures are appropriate and well made. The quotes seem relevant to me. I generally appreciated this work.

Specific comments

1) I wonder about the possible impact of wake on the turbulence detection from standard radiosondes. This issue could be addressed by considering the statistics of the time during which the payload stays in the wake, i.e. of the spatial extent of the payload-wake encounters. The two presented example have spatial extent of 15 and 6 m, hardly detectable from radiosonde measurements (some authors - Ferron et al., Wilson et al. - recommend to undersample the vertical profile in order to detect inversions in the potential temperature profile. For radiosondes, this lead to vertical resolution of about 15 m). Do the authors think that such a statistics could be obtained from the presented probabilistic model? Perhaps beyond the subject of the paper, I think such a result could increase the scope of this work.

2) p17, l5-6: Can you be more specific about this affirmation?

3) p21, l15-16: the assertion that the wake of the balloon contributes to noise (meaning instrumental noise) is questionable. The signatures of the balloon's wake on the temperature profile, either temperature peaks or turbulent eddies, are not a contribution to instrumental noise (assumed uncorrelated), but are likely responsible of false inversions in the potential temperature profile.

Minor comments

p8, l13: Euklidian -> Euclidian

p 8, l10: why a factor 2 in the definition of L?

p8, l10: the notation *L = (...).* min*(w_rel)* is not very satisfactory (the dot can be read as an operator...)

Appendix and figure A1: Can one conclude that *w* is estimated to be zero in the troposphere for all flights?