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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effects of vernal equinox solar eclipse on temperatures and wind directions in Switzerland" *by* Werner Eugster et al.

Anonymous Referee #2

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This paper reports the effect of the solar eclipse in March 2015 on a network of measurement sites in Switzerland. The effects of topology are relevant for this region, and this is probably the most comprehensive study of eclipse meteorology over a multi-altitude network to date. The authors seem particularly interested in comparing two versions of the "cold cored cyclone" as presented by Clayton and modified by Aplin and Harrison, since the trajectory of the 2015 eclipse makes Switzerland ideal for such a test. Altogether this is a thorough and competent study, at a higher standard than many eclipse meteorology papers, and I am happy to recommend publication with some minor revisions.

The main concern I have is to do with the structure of the paper. The authors present their data analysis methods before describing the data analysis itself and this makes

for a disjointed read. For a journal that does't use a "methods" section like ACP I would recommend moving the specific analysis techniques to the section on, for example, analysing temperature effects (or whatever it is). Occasionally the data analysis decisions do not appear to have any theoretical basis, for example, the choice of a gamma distribution for the temperature changes, and perhaps also the diurnal variation in the diffuse fraction. The gamma distribution is justified by the authors because it permits others to see their measured temperature changes in context, however this could be achieved with a cumulative probability distribution to all the data, without assuming a shape for the curves, so I am not sure what the gamma distribution really brings here. In general, the use of a purely empirical approach may not be a problem in itself, but the authors should state that this is the approach taken and explain why.

The figures are generally of good quality but occasionally the captions should be edited so that the figures can be understood without reference to the main text. The caption to figure 2 was particularly obtuse from this point of view. In Figure 8 I didn't understand why and how the probability was used - shouldn't this be explained in the main text, if it is really needed at all. And on Figure 10, I (personally) think wind vectors would be a clearer way to indicate the change, which would then fit better with your figure 1. The use of colour to indicate flow directions is not intuitive.

Minor comments listed below.

P1 L3-4 This sentence is confused between eclipse meteorology and the broader scientific benefits of studying eclipses.

P1 L34 Should this be 1600km?

P2 L3-4 This sentence is ambiguous about whether a total or partial eclipse was seen at the two quoted locations. I believe the 1999 eclipse was total over south west England which would imply it was 97% at Reading and perhaps total at the other location, but please check and clarify.

P4 L26 I am not sure what you mean by "model" - are you simply referring to the loess fitted values?

P4 L28 is "instationarities" a proper word?

P5 I recommend moving most of the material on this page to the sections where you actually discuss each effect, as explained above.

P5 L18 Can you explain what this does so that people who don't use this particular software are able to reproduce your work?

P6 L4 Why gamma? (as discussed above)

P6 L7 Both SE and SD are used for errors in this paper, can you be more consistent?

P7 eq 4. Is this another example of an entirely empirical fit, or is there some reason why the diffuse fraction varies with time during the day that is not explained?

P7 L7 Explain image analysis here rather than in the methods

P7 L17-20 Are you effectively working out the long wave albedo here? And if so, would it help to say that?

P7 L31 explain bootstrapping here rather than in methods section

P8 L4 would it help to compare the temperature changes in the literature for partial versus total eclipses, even if it is just to show there is no real difference?

P8 L6-8 See comments above

P8 L15 Can you take a couple of sentences to explain the normal diurnal variation in the mountain valley winds? This seems a unique local meteorology that not everyone will be familiar with.

P11 L18 Annular eclipses don't cause full occultation, and in terms of the meteorological effects are analogous to partial rather than total eclipses.

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