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Atmospheric Measurement Techniques Discussions

Interactive comment on "Schneefernerhaus as a mountain research station for clouds and turbulence – Part 1: Flow conditions and large-scale turbulence" *by* S. Risius et al.

Anonymous Referee #1

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The paper is part 1 of a description of basic characteristics of the Schneefernerhaus research Station (UFS); part 2 Siebert et al., AMTD 5, 569-597, 2015. Such studies are important for further research work on this site. Unfortunately, this study does not fulfil my expectations for such a type of paper:

Climatological information for the site is very important. If no data for a 30-year climatological period is available (only for 2000 – 2012 is given here), it would be possible to generate such a period using the data of the peak of the Zugspitze. It is trivial that the temperature at Schneefernerhaus is higher than at the peak of the Zugspitze, but of special interest would be the vertical temperature gradient between Schneefernerhaus and Zugspitze and perhaps the occasional existence of an inversion layer. The authors are surprised that the pdf-functions of the wind speed and wind direction do not differ between cloudy and non-cloudy conditions. Why should they differ? I cannot understand why topography is the reason for different wind distributions for wind from east or west. Easterly winds are often related to anticyclonal conditions and westerly winds to cyclonal conditions. The authors have to first normalize the wind velocity with the geostrophical wind (available from the re-analysis; perhaps the wind velocity at the peak of the Zugspitze does not differ very much). If after the normalization you see differences, a discussion of topographic effects may be possible.

A paper about flow conditions at a mountain site, especially when the site is on a slope and in a valley, should discuss typical situations of mountain meteorology like luv blocking, lee waves, lee rotators, lee cavity, and turbulence wake. All these are a function of the Froude number (Stull, 1988;Whiteman, 2000). Because the wind direction is channelized into easterly and westerly winds it would be interesting to know what happens in the case of foehn and Alpine pumping (Winkler et al., 2006).

Also the part concerning clouds is very weak: Do banner clouds affect the Schneefernerhaus? Why should you measure cloud physics at Schneefernerhaus and not at the peak of the Zugspitze? It may be easier to study cloud physics at a mountain station. Is the cloud physics comparable to that of airborne measurements?

Absolutely unusual is the definition of large scale turbulence and small scale turbulence (part 2 of the paper). Turbulence in meteorology is classified into macroscale turbulence (synoptical scale) and microscale turbulence (Etling, 2008). In between is mesoscale turbulence (spectral gap), e.g. local circulation systems in the mountains. The large scale and small scale turbulence are both in the range of microscale turbulence. Probably the authors want to separate the microscale turbulence into frequencies smaller than the frequencies of the inertial subrange (large scale) and into frequencies of the inertial subrange and dissipation range (small scale). On page 546, line 27 the authors call both ranges local turbulence (?).

From the spectral analysis I cannot see results which differ from the typical conditions. The anisotropy is typical in the investigated spectral range (Lumley and Panofsky, 1964). If there are some effects which differ from typical conditions near the ground, the authors should present these results. Furthermore, it may be interesting if the conditions found near the ground differ from the turbulence conditions for airborne cloud physics investigations.

The investigation of the structure function and the energy dissipation is a typical issue of the investigations of the inertial sub range. This is probably a task of part 2 of the paper.

How can you measure the wind field and the turbulence when the distance to the mountains (rock?) is only 20 m (p. 546, line 13)? The slope in the small picture of Fig. 8 should be -2/3!

Also the conclusion is very weak and not very quantitative. I have mentioned several points above which should also be concluded.

The paper does not fulfill any criterion for describing the flow characteristics and the turbulence structure for frequencies lower than the inertial subrange for a mountain research station. The paper should be rejected. In the event that the second part of the paper can be accepted, the discussion about the dissipation range could be combined with it.

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