Referee Comment on
Forest fire danger rating in complex topography – results from a case study in the Bavarian Alps in autumn 2011
by Schunk et al.

General Comments

This paper provides details on fire danger conditions during a period of drought in Bavaria. It contrasts the fire danger predictions at low and high elevations and at daily and hourly time scales, and concludes that within complex terrain there are significant variations in fire danger (in both space and time) that are driven by mountain meteorological process. This study provides an important example of the spatiotemporal variations in fire danger that can occur, and which can inform current scientific and operational discussions on fire danger indices. For example, in Australia there is currently a debate about the most appropriate time-scale that fire danger should be assessed over (e.g. daily, hourly, sub-hourly). The example in this paper, though not in Australia, clearly demonstrates that in complex topography it is necessary to monitor fire danger conditions on an hourly interval (or even perhaps sub-hourly) and to be aware of the spatial variation that may occur due to the presence of temperature inversions. As such it makes a good contribution to the literature and should be of interest to a good portion of the journal's readership.

Overall the paper is well written, but I do think that it could be improved in a number of places. I therefore recommend publication of the manuscript subject to minor revisions, which are detailed below.

Specific Comments

1. The fire danger indices used all reflect different combinations of factors contributing to fire danger. This needs to be explained a bit more. For example, the FFMC is really a measure of fuel moisture and therefore gives an indication of ease of ignition and flammability. It is a subsidiary index to the Canadian Fire Weather Index (FWI), which provides a rating of intensity and is therefore more suitable as a general index of fire danger. For example, in his comparison of the Australian and Canadian Fire Danger Rating Systems Matthews (2009) it is the FWI that is compared with the McArthur FFDI.

   Likewise, the Angstrom Index, though called a fire danger index, should really be considered as a measure of fuel moisture or flammability – see also Sharples et al. (2009).

   In my opinion, the only "fire danger index" used in the study is the McArthur FFDI. The authors should consider using the FWI instead of the FFMC. The Fosberg Fire Weather Index (Goodrick, 2002) is another possibility.

2. Given the apparent mid-slope placement of the "Felsenkanzel" station, and the clear night time conditions described in the case study it seems likely that the station could have been subject to 'thermal belt' formation (McRae and Sharples, 2011). This means that temperature may have been lower at elevations higher than this station (complimentary relationship for relative humidity). This means that the placement of the station may have been such that the differences in fire danger were maximised. This should be noted in the manuscript with a suitable reference to thermal belt formation.

3. Is it possible to indicate the times when the fires occurred in the higher elevations in figure 5 and/or figure 7?

Minor Corrections

<u>Abstract</u>:

Line 7: Change to "... *humid conditions in the lower layer and warmer, dryer conditions*..."

Line 8: Note that "high" fire danger can refer to a specific range of fire danger index values. I suggest changing the text to "... *leading to higher fire danger levels and multiple fire occurrences*..."

Line 10: Delete the word "rating".

Line 15: Given that the fire danger indices calculated on an hourly basis do resolve the differences to some degree, I would suggest changing the text to something like "... s*tandard meteorological stations and fire danger indices that are calculated on a once-a-day basis.*"

<u>Introduction</u>:

Page 1385, line 24: Change text to "(Sharples, 2009; and the references therein)"

Page 1387, line 2: Replace "a massive" with "elevated" or "significant".

<u>Results</u>:

Page 1392, line 20: Change the text to "... *clearly in the raw index values of this graph.*" That is, swap the order of "raw" and "index". Alternatively, you could just delete "raw".

References

Goodrick, S.L. (2002) Modification of the Fosberg fire weather index to include drought. *International Journal of Wildland Fire*, 11: 205–211.

Matthews, S. (2009) A comparison of fire danger rating systems for use in forests. *Australian Meteorological and Oceanographic Journal*, 58: 41–48.

Sharples, J.J., McRae, R.H.D., Weber, R.O., Gill, A.M. (2009) A simple index for assessing fuel moisture content. *Environmental Modelling and Software*, 24(5): 637-646.

McRae, R.H.D. and Sharples, J.J. (2011) Modelling the thermal belt in an Australian bushfire context. In Chan, F., Marinova, D. and Anderssen, R.S. (eds) *MODSIM2011, 19th International Congress on Modelling and Simulation*. Modelling and Simulation Society of Australia and New Zealand, December 2011, pp. 1652-1658. ISBN: 978-0-9872143-1-7. www.mssanz.org.au/modsim2011/A2/mcrae.pdf