

## ***Interactive comment on “Thermal characteristics of permafrost in the steep alpine rock walls of the Aiguille du Midi (Mont Blanc Massif, 3842 m a.s.l.)” by F. Magnin et al.***

**Anonymous Referee #1**

Received and published: 10 July 2014

The study is based on a unique data set from a long-term permafrost-monitoring program in steep alpine rock walls started in 2005 at the Aiguille du Midi (Mont Blanc Massif, France). This is the highest instrumented bedrock permafrost site in the European Alps.

The paper describes and presents a four to eight-year dataset from nine surface-temperature loggers and three 10 m-deep boreholes and gives a detailed description of both the surface and ground thermal regime on annual and seasonal basis. The results are analysed in the light of microtopographical settings and differences in snow cover and provide insights into active layer patterns, permafrost characteristics, and a fracture induced temperature anomaly within the steep alpine rock walls of Aiguille du

C1226

Midi.

The study and results from their field data confirm the results of previous permafrost studies in steep bedrock slopes and provides new insights into the effects of variations in snow cover and bedrock structure.

The subject matter is appropriate for the Cryosphere and should be of great interest to other permafrost scientists and the alpine geohazards scientific community in general. The presented data and interpretation of results is sound and are clearly presented. The paper is very well written and figures are of high quality and fully understandable. However, I have some general comments, questions and suggestions for improvements (see below) the authors should consider in a revised version of the paper. In my opinion, the paper is acceptable for publication with minor revisions.

General comments: The paper is dominated by presentations of new data and interpretation of results from steep alpine rock walls. I miss some more discussion on how your results may contribute to better understand permafrost-related hazards in general, and the thermo-hydrmechanical processes involved. Are e.g. some of your results related to the effects of variations in snow cover and bedrock structure important? You conclude that "the thermal features of BH\_N show that the fracture has a greater impact than snow insulation on the permafrost thermal regime, whereas it seems that snow insulation has probably more influence on the active layer pattern". This is in my opinion very interesting results and could be further discussed in the light of present knowledge.

In the introduction the authors state: "The last few decades have seen an increase in rockfall activity from steep, high-altitude rock walls in the Mont Blanc Massif (Western European Alps)...". Do you have any ideas or strategies on how your monitoring program could be used or expanded to better understand the increased rockfall activity in this area?

Specific comments: P2836, L11-13: Did you do any calculations or have any idea how

C1227

much the bedrock temperature for the borehole sites is influenced by the galleries (e.g. air circulation) and other installations at AdM, e.g. heating from the restaurant(?) above BH\_S?

P2838, L11-13: Did you use this data in the present paper? It was not clear if you used the Météo France data or your local weather data, or did you combine it? Did you compare the Météo France data with your own air temperature data? Did you correct for altitude difference between e.g. the Météo France station and your local sites for calculating the ASO and SSO? At what height above rock surface was the air temperature measured and did you consider possible errors in your air temperature measurements itself, e.g. the influence of the surface properties on radiative errors (see e.g. Huwald, H., C. W. Higgins, M.-O. Boldi, E. Bou-Zeid, M. Lehning, and M. B. Parlange (2009), Albedo effect on radiative errors in air temperature measurements, *Water Resour. Res.*, 45, W08431, doi:10.1029/2008WR007600.)? All these points may be relevant and important to get the correct air temperature, influencing the ASO and SSO values for your sites. Some more information and critical assessments on these points would be useful.

---

Interactive comment on *The Cryosphere Discuss.*, 8, 2831, 2014.