The Cryosphere Discuss., 8, C1909–C1911, 2014
www.the-cryosphere-discuss.net/8/C1909/2014/

The Cryosphere
Discussions
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Interactive comment on "Post-LIA glacier changes along a latitudinal transect in the Central Italian Alps" *by* R. Scotti et al.

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Received and published: 26 September 2014

Post-LIA glacier changes along a latitudinal transect in the Central Italian Alps Review by Michael Kuhn

This paper describes the behavior of the glaciers in a fairly unknown but scientifically interesting region of transition from the dry interior to the wet outside of the Central Southern Alps. Even if my review addresses many points, it is not negative but meant to be constructive and should help to publicize information on this hidden part of Alpine glaciers. I favor publication of this manuscript following modification and condensation.

With respect to the "continental to maritime climatic settings" mentioned in the abstract I feel that abundant precipitation at either margin of the Alps is independent of the pres-

ence of oceans, thus not "maritime" . It is rather the forced convection when moist air first hits the mountains that cause the two precipitation maxima and the screening of the dry interior. In the introduction the authors state that "low-elevation glaciers under maritime conditions would display higher sensitivity to climatic fluctuations". Irrespective of their location or climatic conditions, low elevation glaciers tend to be dominated by accumulation rather than by melting, their climate sensitivity is not generally larger than that of large valley glaciers. The smallest group of Austrian glaciers, <0.1 km2, have displayed relative area changes from +10% to -100% in the period from 1969 to 1998 (Kuhn et al., Zeitschrift für Gletscherkunde und Glazialgeologie 43/44, 2012, 3-107). In the valuable list of references to Italian literature I am missing <Bonardi et al. 2012, I ghiacciai della Lombardia> where individual glaciers have been well documented. In chapter 2 obviously Cima de Piazzi is not part of the Livigno subregion. When mean annual air temperatures are given, e.g. for Cancano, the elevation of that station would help the reader. An alternative would be to compare temperatures at one given elevation like 2000 m. The introduction of the Avalanche Area Accumulation Basin Ratio provides an important parameter that has gained acceptance in recent years. However, "usually occupied by avalanche supply. . ." is a vague definition. Most readers will agree that "the lower and upper limit of the glacial domain and their fluctuations are usually related to surface and volume changes". I strongly object to the use of the term "theoretical equilibrium line altitude". Show me a theory that explains why the ELA of a glacier in equilibrium should have an accumulation area ratio of 0.67! I would rather use the median surface elevation as a parameter that describes the glacier topography without referring to any hypothetical mass balance conditions. In chapter 4, line 14, I believe that if MAP increases, ELA should decrease. In support of the sky view factor of clear sky radiation the authors may also apply the term "openness" used in recent geo-statistics. Is the "increasing scatter" of ELAo really an effect of increasing MAP, or is it due to a large elevation range in the Disgrazia and to more avalanche activity in the Orobie? The arguments in this chapter are somewhat defensive. It seems that now a generation of authors is at work that has been taught by their

old teachers to prove and to defend everything even before it is questioned, which uses a lot of space in print and of attention of the readers. Personally I prefer the even older tradition of open discussion, and I believe that Cryosphere Discuss is a perfect vehicle for that. I suggest to summarize much of chapter 4 in tables or simple maps instead of lengthy verbalizations in the text. E.g. page 4087 is difficult to read. Condense this information into one table or give short comments on Tab. 3 and Fig.7. Section 4.2 could be condensed considerably, details may be given in the supplements, likewise 4.4. P. 4087, lime 18: “Retreat” refers to length; use “area loss” for size. Mention that losses depend also on Emin; low glacier tongues suffer more ablation. P. 4091: It is difficult to compare these results to other publications. I am in favor of the parameters you use, please apply them to some of the Alpine glaciers frequently quoted for comparison. Section 5. Again, use median elevation instead of “theoretical ELA” . Do not use “rc” once for ridge crest and again for regional climate. What, if Erc = Emax? 5.2 Small glaciers. By no means can we generalize that the smallest glaciers are the most sensitive, see above. 4094, line 1: ? possible confusion caused by. . .? Line 18: area decrease instead of retreat. 4095, 7: % per year? 4096, 15: <10 ha, or 0.1 km2

In conclusion I repeat that I find this a valuable contribution to Alpine glaciology and climatology which can easily be modified in order to meet the standard of The Cryosphere. Michael Kuhn, 20.8.2014.

Interactive comment on The Cryosphere Discuss., 8, 4075, 2014.