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Climate of the Past Discussions

Interactive comment on "Early last glacial maximum in the Southern Central Andes reveals northward shift of the westerlies at ~39 ka" *by* R. Zech et al.

Anonymous Referee #2

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This paper presents new data dealing with the dating of maximum glacial advances in the Southern Central Andes (40 degrees South) during the last glacial period. The authors find a maximum glaciation at about 39 ka and discuss this result regarding changes in the position of westerlies. The scientifc question is very interesting, the paper is well written and concise thus it should be published. I have however a major comment and a few remarks that should be addressed in the revised version:

- Main comment: I am concerned about the interpretation of glacial advance/retreat only in terms of precipitation at this latitude and on the east side of the Andean divide. I find difficult to disentangle the influence of temperature and precipitation on glacier

mass balance in this region. I realize that the other referee has the same comment and I read the authors' answer (I do not understand the last paragraph and the reference of Wager et al., 2010 related to a glacier at 35 degrees South is submitted- I cannot access the paper). They recognize that it is difficult to determine which climate factor is the main control. Therefore, I strongly suggest to mention this important caveat in the paper and in the conclusions.

- The valley is located on the East side of the Andes and I am wondering whether the main moisture source is the Pacific (there is no reference about the climate situation in section 2).

- I am not convincing when the authors seek for a mechanism to reconcile their results with the generals notions for westerlies position during the LGM (low temperature and maximum sea ice invloved in the northward motion of westerlies during LGM). Even if sea ice and temperature were not maximum and minimum respectively at 39 ka, they were very close to their LGM values. Thus, previous findings are not fully inconsistent with the results obtained here. The authors should reformulate the start of section 5.

- The discussion about the influence of cosmic ray is interesting but remains highly speculative (end of page 1996: the authors should explain the mechanism of Son et al., 2008). Please tone down or mention this speculative aspect.

- It is surprising to read (page 1997, lines 16-17) that the CO2 drop between 70 and 39 ka is not significant whereas one can read on page 1996 (lines 9-10) that the temperature and sea ice changes between 39 ka and 20 ka are significant. Normalized variations (in per cent) for each parameter would certainly show that changes between 40 and 20 ka are lower than between 70 and 40 ka.

- The end of the conclusion is somewhat far from the results and remains speculative. . .

Interactive comment on Clim. Past Discuss., 6, 1991, 2010.