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Interactive comment on "Delayed and rapid deglaciation of alpine valleys in the Sawatch Range, southern Rocky Mountains, USA" *by* Joseph P. Tulenko et al.

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Summary: The authors report a new set of cosmogenic 10Be exposure ages along the retreat path in well-studied glacial valleys in the Sawatch Range in southern Colorado. The data are especially interesting because they provide limits on the rate of ice retreat at the end of the last Pleistocene glaciation and show remarkable similarity. The authors have done an excellent job of interpreting the ages in the context of existing cosmogenic chronologies of glacial deposits elsewhere in the region and assess the regional vs. global climate forcings that likely affected the retreat of glacier termini during the last glacial-interglacial transition.

I believe the manuscript is suitable for publication in Geochronology and will be of broad interest to the readership. I suggest the following revisions, especially concerning the need for (1) additional explanation of the potential limitations and sources of error in exposure ages of glacially scoured bedrock, and (2) the comparison of exposure ages computed with the NENA calibration and the Promontory Point calibration.

Line-by-line comments:

Line 50: the Uinta Mountains are part of the Middle Rocky Mountains physiographic province and probably do not need to be singled out here (although they are awesome and have a fantastic glacial record).

Line 53: could probably state "Latest Pleistocene or Early Holocene" here, as Marcott et al. found that some cirque floor moraines were abandoned as early as 15 ka. Additionally, basal 14C ages from lake sediments inboard of cirque-floor moraines are Pleistocene in age in some mountains (see records published by J. Munroe for the Uinta Mountains (Munroe and Laabs, 2017) and by J. Munroe and others in the Ruby Mountains).

Lines 90-93: should cite some of the earlier, original reports on the glacial record in southern Colorado and northern New Mexico. Jim McCalpin did some work in the region (mostly the Sangres) in the 1980s and Keith Brugger has done more recent mapping in the Sawatch.

Lines 101-104: the Guido et al. cosmo ages are pre-CRONUS (and also pre-really good AMS measurements) and probably should be recalculated in order to accurately compare with more recently published cosmo ages from southern Colorado. If you've already done this, then it's worth specifying here. If not, the Guido et al. ages are available in ICE-D.

Line 174: prior to this paragraph, consider adding a paragraph about how exposure ages of glacially scoured bedrock are related to ice margin position and some po-

tential limitations of dating these to track ice retreat compared to moraines. As you know, glacially scoured bedrock surfaces that protrude above the valley floor (forming smooth and easy-to-sample surfaces) represent places of minimal scour depth, which can result in an inheritance problem. The Bayesian approach helps to sort this out by accounting for relative age differences, but even so, the potential for inheritance is greater than for most other applications of cosmogenic dating and should be acknowledged. Snow cover is another important consideration along valley floors and should be acknowledged if not assessed.

Lines 189-211: consider reorganizing the reporting of ages here. The bedrock exposure ages are reported first, then the exposure ages of recessional moraines/young modes of terminal moraines, and then the bedrock ages are described again. Perhaps starting with the moraine ages (or including them in a previous section) and focusing just on the bedrock exposure ages here would improve the flow of this section and a smoother transition to the retreat rates in the subsequent paragraph.

Lines 233-242: the statistical reasons for excluding four exposure ages are explained well here, but the most likely reason that some exposure ages fall out of stratigraphic order, inconsistent exposure between sample sites, is not. As noted in a previous comment, the potential limitations of bedrock exposure ages should be acknowledged.

Lines 243-255: I can't see the reason for using NENA-Lm as an example of another production/scaling model for high altitude sites in western NA. The NENA calibration site is far away and much lower in elevation, and I think the reason for using it in some earlier studies in the mountain west was to illustrate the effects of lower SLHL production rate (which started to appear in the literature circa 2010) on exposure ages. Perhaps a better option would be to compare the ages computed with the Promontory Point calibration/LSDn scaling with ages computed with a globally averaged production rate and LSDn scaling, or just show the effects of using different scaling models with the Promontory Point calibration? This would better illustrate the degree to which the choice of production rate affects exposure ages, which I assume is what the authors

are doing here.

Lines 267-269: should probably cite Young et al. (2011) at the end of this sentence.

Fig. 1: this is a beautiful map! As you reference some other glaciated mountains in the western U.S. in the introductory paragraphs, consider labeling some of the ones shown on the map along with pluvial lakes.

Fig. 2: seems like a good idea to show all the terminal moraine cosmo ages instead of just the young mode at Pine Creek, given that the terminals are the "starting point" for ice retreat? Just a suggestion; I understand that you're emphasizing the onset of ice recession in this paper, not the glacier maxima.

Fig. 5: may want to consider a more recent and focused assessment of the Bonneville hydrograph in Oviatt (2015) or some of the specific discussions about the duration of the Provo phase of the lake by D. Miller (2016).

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