Hydrology and Earth System Sciences Discussions

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Comment on hess-2021-78

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Community comment on "Technical note: Introduction of a superconducting gravimeter as novel hydrological sensor for the Alpine research catchment Zugspitze" by Christian Voigt et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-78-CC1, 2021

I read the paper with great interest as an example of SG measurements at extreme high topographic variations. Contrary to Reviewer#1, I believe this paper is ready to be published as a preliminary analysis of some difficult measurements. It is unrealistic to demand all papers must be textbook ready when ongoing developments are of some interests to the community. So I thought that rejection was too harsh.

There were however some useful comments in this review. I agree the writing is repetitious in some concepts as similar topics are commented on several times in different sections. It would pay dividends if the authors kept comments tightly under each of their subsections, instead of back-and-forth referencing. Also the bibliography needs attention. Generally the figures are appropriate.

A few observations:

Figure 1: the topography; maybe add a profile EW or NS to give some sense of how fast it is falling off for the first km or 2 around the station? This pertains very much to the integration of the mass effect of the snow and water.

Table 2: The tidal results are presented with almost no comments. What are the X-vectors for the various OTL waves?

Figure 3: it would be better to label each panel by letters (a), (b) … and then refer to these in the caption.

Figure 4: like Reviewer#2 I was surprised at the high correlation between the SG and SWE from such a simple Bouguer model. With all the mass variations below the station the departure from a Bouguer plate is extreme, and nearby snow mass variations should be quite significant close to the station, offset by significant lack of mass further from the SG. This needs more attention/discussion.

I didn't see any elevation correction for the local pressure admittance (Boy et al, 2002). This would be interesting because the nominal admittance is modified at high elevations due to the reduced density of the air column (compared to the values given on the IGETS/EOST loading website). An arrays of barometers is probably not rewarding, especially in this difficult terrain.

Overall, this paper is well worth revising, especially with the new AG calibration for the drift (the previous AG gradient doesn’t mean much over 2004-2019) and SG scale factor.