Review of *Sodankyä manual snow survey program* by Leppänen et al.

General comments

The paper aims at a formal description of the *Sodankylä manual snow survey program* i.e. the manual snow measurements conducted by FMI in Sodankylä on a regular basis.

There are several snow observation sites around the world, the Sodankylä site has a particular long history. It is definitely a very useful contribution to describe the measurement/observation program and publish the information in a dedicated paper. The Sodankylä data serves as a basis for many studies, which would benefit from a thorough description of the program. In general, this is well suited for publication in GI.

Honestly, this is the first time I have to review a instrumentation/data systems paper, so I had to think twice about the target audience and related requirement for such a paper. I see two different target groups:

1. Institutions with own snow programs, who want to compare their procedures with the "Finnish way" and probably set-up new procedures. This is closely related to our current discussions in Europe about harmonization of snow measurement methods. Here, the paper may (and should) well serve as a guide of how the manual part of a snow measurement program is to be described.

2. Users of the data. Here the paper should provide (as a teaser) what the user can expect from a specific data set.

Presently I am not convinced, that the manuscript is complete enough, for neither target group. From my perspective, a measurement (here: "Data set") should be defined in terms of particular entities like *Sites, Variables, Instruments, Protocols/Algorithms, Metadata, Data, Example data* which should all be touched. Presently the paper presents these things not in a very systematic and complete way. The authors chose "data sets" as the main organizational unit of the manuscript, which makes sense. But per "data set" the other aforementioned entities might be addressed more systematically. Some comments in this respect:

- *Sites.* I would expect the description of all involved sites (Sec. 3.4.2+the others) in the beginning and before describing the "data sets". Figure 1 should include all involved sites (Fig. 1 contains the sounding site, while the photo in Fig 2 contains the lake site, which is misisng in Fig 1) In addition, the naming or acronyms of the sites should be consistent throughout the paper (and tables). I would also include the location of the sites for the other " data sets" in Fig 1, not only the snow pits.

- *Data/Example data.* It is clear that the actual data is not included in the publication, which is ok. This is in contrast to Morin et al. (ESSD 4, 13 2012) which has a slightly different scope but should be cited. It is nice and helpful, though, if the manuscript contains example data (e.g. Sec. 3.4.3) but this is presently included only for the

snowpack variables. The paper could more systematically show an example for each "data set".

- *Measurement protocols/algorithms.* The paper could be more complete in this respect, wherever details of measurement protocols are not available in original articles. Ideally, the description of the measurements would be sufficiently self-contained, that the paper could be given as an instruction to someone who is supposed to fill in as a substitute for a manual measurement. This is particular useful for target group 1 mentioned above. I am not an expert in snow observations, so the authors know way better than me what should be taken care of in the sense of pitfalls. I just noticed that different amount of information is given for each measurement protocol (some details for the insertion of thermometers vs no details for the snowfork, no details for ice cube, "protocol pictures" only for some measurements in Fig 4, etc...)

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Specific comments

abstract: Soil types are explicitly mentioned here, but no further specific information on soils is given later

p408,l2: Map in Fig 1 should contain "Sodankylä town".

p408,l6: In reference to these statements here it would be reader-friendly if Fig 3 has date on the x-axis, e.g. 01-Oct etc.

p408,l10: Here additional data from automatic measurements are mentioned, this also happens later on p 413. It makes sense to list additional (snow and meteo) measurement in one place and be as complete as possible, and potentially indicate their locations in the map. The potential of snow measurements (attraction of new users of the snow survey data) commonly comes in conjunction with other measurements.

p409,l6: How do the measurements before/after 1940 compare with each other? Here the example data plot could automatically illustrate that.

Sec 3.3: The section on snow courses contains only sparse information. What does "regular" mean? Where are the locations? (maybe add them in Fig.1) How does SD from snow courses compare to daily snow depth? (This I would ask myself if I belong to target group 2 above. I know, the paper is not about a systematic comparison of these data sets, but this kind of teaser would be provided automatically by some adding "example data" for these data sets as well.)

p415,l21: "divergent" $\rightarrow$ distinct or diverse