

Interactive comment on “Monitoring of active layer dynamics at a permafrost site on Svalbard using multi-channel ground-penetrating radar” by S. Westermann et al.

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Review of Monitoring of active layer dynamics at a permafrost site on Svalbard using multi-channel ground-penetrating radar S. Westermann, U. Wollschlager, and J. Boike

This paper presents a fairly thorough account of the calibration and use of multi-channel radar to monitor the active layer depth and water content of permafrost. The paper is well written and accessible for the readers of The Cryosphere.

My comments refer only to the radar part of the paper, especially section 3.

I would like to have some more information on the critical parts of doing a multi-channel

C281

radar survey – I think this is a relatively niche subject in glaciology and while some specific details are given here, it would helpful to have some more introduction.

In particular the paragraph on p.292 line 26-p293 l5 detail modifications to a scheme that are, without further introduction simply obscure technicalities to the reader (at least to me).

It seems to me that knowledge of the separation of the antennas is fairly critical to the success of the inversion scheme outlines in equations 1 and 2. Table 1 lists those separations to mm resolution. This seems rather unlikely to be achieved in reality given that we are told the antennas were separated by a rope. This implies that at the very least there would be changes in “long” separations simply according to the terrain, and of course bigger ones in negotiating turns around obstacles and valleys.

I would like to see some discussion of errors introduced by the antenna geometry, and if these are really negligible then some general comments about how to select the suitable antenna separations since it is stated that “For the chosen antenna separations (Table 1), the absolute travel times of the radar signal do not differ strongly between the four channels (on the order of 5 ns, Figs. 2, 3), which leads to relatively noisy evaluations of reflector topography and soil water content.”

Does this imply that antenna geometry should be chosen beforehand to ensure that this does not happen. This would be useful information for people wanting to perform similar surveys – which the authors presumably advocate. Additionally advice could be given on suitable antenna frequencies and any other practical details which their experience suggests may helpful to more novice practitioners of multi-channel radar surveys.

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C282