This paper presents an approach to map the spatial distribution of ground temperatures and thaw depths using a 1D transient ground thermal model (CryoGrid 2). The model uses remote sensing derived surface temperature (MODIS 1 km complemented by 2-m air temperature from atmospheric reanalysis ERA-Interim 0.75 deg. grid spacing) and snow depth obtained from the GlobSnow snow water equivalent (SWE; 25 km grid spacing) product as forcing data. The study builds on the earlier work of Langer et al. (2013), moving the application of the CryoGrid 2 model from the local scale (station on Samoylov Island) to the regional scale by including the entire Lena River Delta (LRD). From Figure 1, one notices that the LRD is covered by many small lakes and branches of the Lena River (i.e. a large freshwater fraction). This is a complex area to study using coarse resolution passive microwave satellite data (or derived products) due to the large sub-grid scale variability within pixels, notably due to the presence of water bodies, which introduces significant uncertainty in SWE estimates (GlobSnow or other satellite-based SWE products). This issue has been recognized by the group who originally developed the GlobSnow product (reported in Takala et al., 2011) and at least one of its members in a latter publication (Derksen et al., 2012). Takala et al. (2011; Table 3) report mean bias errors of -36 mm and RMSE of 47 mm for a tundra area with small water bodies. Derksen et al. (2012) also show that SWE retrieval errors can be large (see Table 9 and Figure 12 of this publication) from passive microwave data, even more revealing (over 100% error; Figure 12) when examining errors on a monthly basis. As indicated by Takala et al. (2011): "Additionally, the consideration or compensation for the effect of (frozen) lakes requires further study and algorithm development work."

The authors of the present manuscript state, in Langer et al. (2013), that: "**The thermal state of permafrost is reproduced with an uncertainty of about ±2.5 °C with a SWE accuracy of about ±10 mm.** This is still below the performance that can be reached with a realistic LST accuracy of about ±2 °C. **However, a much lower SWE accuracy level (±40 mm) must be considered in regions with sparse weather stations (Luojus et al., 2010) and when field measurements are not available for calibration. Our results show that realistic permafrost simulations with a transient heat transfer model would be almost impossible with such low accuracies in the SWE forcing.** In contrast to the permafrost temperatures, the thaw depths are found to be more or less independent from the SWE accuracy. However, this might be different in regions where the permafrost temperature is already close to the freezing point as observed by Åkerman & Johansson (2008). In any case, the impact of snow on the active layer dynamics can be very complex and dependent on regional factors (Zhang, 2005). The performed sensitivity study demonstrates that a highly accurate snow cover forcing is crucial for reliable permafrost modeling."

Given: 1) the above statement by the authors in a previous paper; 2) the known retrieval errors in similar regions reported by the developers of GlobSnow SWE; and 3) the lack of validation of snow depth (derived from GlobSnow SWE with density values of 200-250 kg m^{-3}) over a larger area (transects) than just the small island of Samoylov (located to the south of the LRD), I am afraid to say that the manuscript submitted is not acceptable for publication in *The Cryosphere*. In fact, I am quite concerned by the fact that the authors missed the publication of Takala et al. (2011) which is the key paper reporting uncertainties of the GlobSnow SWE product. It is important to read and cite others who work in similar areas or at least with similar data sets, and who have reported uncertainties in the forcing variables used by CryoGrid 2.

Other remarks:

1. The authors do not seem to be aware that the SSM/I footprints for the 19 GHz and 37 GHz frequency brightness temperature channels are in the order of 70x45 km and 38x30 km, respectively. These brightness temperature measurements are then interpolated into a 25x25 km grid which is then used for SWE retrieval in GlobSnow. Therefore, although the authors masked some areas along the coast, the ocean “overspill” problem within the footprints is a larger problem than reported herein.
2. The large fraction of the landscape covered by lakes/river channels represents the largest uncertainty in GlobSnow SWE values. The authors need to read further on this topic in order to better understand the limitations of GlobSnow SWE and, perhaps, search for other products (satellite or reanalysis, including assemble) that could be considered in a new manuscript submission to *The Cryosphere* or another journal.
3. Boike et al. (2013) is given as the reference for the snow depth and density values of Samoylov Island. However, I personally browsed this paper to find that there are mismatches between values reported in Table 5 and Figure 6 of that paper and the values reported in Figure 3 (and the text) of the present manuscript. I am not sure how, as a reviewer, I can reconcile the two sources. The range (and maximum) of measured snow depths in Boike et al. (2013) do not always match those of this paper. For example, in winter 2004 (a high snow year), the maximum snow depth found in Table 5 and Figure 6 of Boike et al. (2013) is 56 cm while that plotted in the graph of Figure 3 of this paper is at a value of about 47 cm. This is only one of several examples.
4. How much confidence should we have in the snow depth map of Figure 5 and the ground temperature (1-m depth) map of Figure 11, given that snow density comes from Samoylov Island only and that there is a large degree of uncertainty in GlobSnow SWE retrievals over complex (lake-rich) areas such as the LRD? As shown in Figures 6-8, winter temperatures are significantly underestimated in wintertime by the model (up to 8 ^{o}C, most frequently by 3-4^{o}C). Of course, taking the average of all years combined reduces the error reported (1-1.5^{o}C given in the Abstract), but the errors are larger when inspecting each individual year.
5. The scaling issue between point (single station measurement(s)) and large satellite pixels should not be ignored throughout the manuscript.

Additional references not included in manuscript:

Derksen, C., Toose, P., Lemmetyinen, J., Pulliainen, J., Langlois, A., Rutter, N., & Fuller, M.C. (2012). Evaluation of passive microwave brightness temperature simulations and snow water equivalent retrievals through a winter season. *Remote Sensing of Environment*, 117, 236–248.

Takala, M., Luojus, K., Pulliainen, J., Derksen, C., Lemmetyinen, J., Kärnä, J. -P., Koskinen, J., & Bojkov, B. (2011). Estimating northern hemisphere snow water equivalent for climate research through assimilation of space-borne radiometer data and ground-based measurements.
Remote Sensing of Environment, doi:10.1016/j.rse.2011.08.014.