Reply to Reviewer 1

We thank Reviewer 1 for their detailed review and suggestions for improving the manuscript. Each comment is addressed below with the reviewer's comment in normal black text and our response in italicized blue text.

In this paper, the authors report on the results of measurements of capillary rise in snow, which is important not only for understanding the hydrological characteristics of snow but also for considering the interaction between snow and soil, using neutron radiography with high spatial and temporal resolution. In addition, based on the measurement results, they calculated the water retention curve and saturated hydraulic conductivity, which are important for understanding the characteristics of water movement in snow, and compared them with previous research.

The structure of the paper is very well organized and easy to understand. In particular, the experimental methods and analysis methods are described in detail, and this will be very useful when conducting additional experiments in the future. The results and discussion are highly reliable, as the study not only compares with previous research, but also takes into account the limitations of the measurement methods used in this study. The results of this research will undoubtedly contribute to the development of wet snow research, and are of sufficient scientific value to be published in academic journals.

The paper is of a high standard and there are no major points that need to be revised, but I will list some points that I noticed.

Major comments:

1. When determining the water retention curve and saturated hydraulic conductivity, the measured data is fitted using the least squares method. I understand that you have chosen the best method for determining the parameters, but in some cases, the fitting seems to be unreasonable depending on the experimental conditions. This is particularly true for the fitting used to determine the saturated hydraulic conductivity. I recommend that you show the regression error so that readers can judge the reliability of each fitting

   The errors for each of the fitted parameters are included in Table 1 and we will add some metrics for the quality of the fit such as R^2 to the revised manuscript.

2. The dry density of the snow sample is required to calculate the liquid water content, and they were calculated from their optical density of the first image. As Table 1 shows, the dry density calculated from the optical density differs even for the same snow quality (ex. $FG_{s,g}$, FG_s) and they also differ from the density obtained from X-ray CT. As the authors point out, it is not necessary for the density obtained from X-ray CT to match the density of the sample in the case. However, when calculating the liquid water content using the density obtained from X-ray CT, how much difference is there compared to when calculating the liquid water content using the density obtained from the optical density? Such information (The impact of density estimation on results) should be important for readers to understand the reliability of the results of this study and the points for improvement of this method. Therefore, I propose adding this kind of discussion to the paper.

   We will discuss this in more detail in the revised manuscript.

Specific comments:
L81: How was the melt form created in an environment with -1 °C?

Thank you for pointing this out – we will adjust the text to clarify this.

L263: In the text, it is claimed that “the fine-grained snow led to higher final wetting front positions (7 cm to 8 cm) compared to the coarse-grained snow (4 cm to 5 cm).” Which diagram did you use to make this judgement?

This can be seen in Figures 8 and 11 and we will explain this more explicitly in the revised manuscript.