Authors Response to Reviewer #2

We greatly appreciate the positive and helpful feedback you have given us. Below, we respond to your comments point-by-point in blue for clarity.

Major Comments
This paper aims to analyze the impacts of afforestation/reforestation on snow and the snow-albedo effect and identify the major pathways to improve the model in representing grass-snow and forest-snow interactions. Based on a comparison between nine regional climate models with different combinations of regional atmosphere model and land surface scheme, the results show that there is large uncertainty in the magnitude for the changes in the snow-albedo sensitivity index, even though the sign of the change direction is robustly modeled by all the models. The greatest differences between models emerge in the snowmelt season, which is also seen in one regional model using different land surface models. In general, the manuscript touches upon very interesting scientific questions and has many potential merits on improving regional climate model or Earth system model to represent biophysical effects from land-use change or potential natural vegetation change. It falls well within the scope of the journal "the Cryosphere". However, this paper lacks detailed demonstration and interpretation of how different forests and grass regulates land surface albedo and energy balance. For vegetation-snow interaction, there are both positive and negative responses for forest displacement of grasslands to near-surface warming. A positive response means the decreased albedo enhances the net incoming shortwave radiation, while a negative response means the shading effects of taller woody species may delay the snowmelt in certain circumstances.

(1) the effects of afforestation (forest run – minus run) on SASI (spatially and seasonally)
We will add plots to our manuscript showing this.

(2) how the effects of afforestation on near-surface temperature, latent and sensible heat fluxes, and downward shortwave radiation
This analysis has been undertaken in a previous study by Davin et al. (2020), we will add text to the manuscript describing the results from Davin et al. (2020) and discuss our results and the results of Davin et al. (2020) together.

(3) why is the impact of afforestation (FOREST-GRASS) on the number of snow days in the season so different among the models, if they prescribe the same forest and grassland land cover
The difference between the models can be attributed to the model's representation of snow processes. Snow days depends on the variable snow depth which is closely related to snow water equivalent (SWE). In fact, some of the models derive snow depth from SWE. As highlighted in Thackeray et al. (2019) and Mudryk et al. (2020), there are known deficiencies in climate models ability to simulate snow mass variables such as snow water equivalent.

(4) is dynamic vegetation and static vegetation (prescribe phenology or no phenology) important for snow-albedo feedback?
This can be important (e.g. Cook et al. 2008). We will add text to the manuscript discussing this.

Minor comments:

1. Table 1.1. I hope the authors could mention more details about how snow-vegetation interaction is described by different land surface models.
   We will include additional information on snow-vegetation interactions in our manuscript.

2. Line 155. Do the deciduous and evergreen forests use the same albedo for free-snow surface and snow cover surface? These two types of forests have a big difference for the winter albedo.
   Deciduous and evergreen forests use the same albedo. Barlage et al. (2005) show that the values for snow covered evergreen needleleaf forests and deciduous broadleaf forest were 0.34 and 0.35, respectively. These differences are small and a recent study by Mooney et al. (2021) showed that the effect of evergreen needleleaf on afforestation in Norway was not significantly different from that of mixed forests which used the same albedo as deciduous forests. We will add text about this to the manuscript.

3. Figure 2. It would be nice to see the effects of afforestation by illustrating the difference between the forest run and grassland run.
   We will add plots to Figure 2 showing this.

4. Figure 3. How to explain the impact of afforestation (FOREST-GRASS) on snow water equivalent (SWE) also differs the sign among regional climate models.
   As discussed in our paper, it is widely known that climate models struggle to simulate snow water equivalent (SWE).

5. In the discussion part, it is worth mentioning the importance of surface roughness length and windblown snowdrift in the regional climate model to quantify snow-albedo effects of afforestation.
   This is a very good suggestion. We will certainly add some text on this important issue. Thank you for bringing it to our attention.