

Geosci. Model Dev. Discuss., referee comment RC1  
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## Comment on gmd-2021-275

Anonymous Referee #1

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Referee comment on "A new snow module improves predictions of the isotope-enabled MAIDENiso forest growth model" by Ignacio Hermoso de Mendoza et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-275-RC1>, 2021

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### General comments

The manuscript "A new snow module improves predictions of isotope-enabled MAIDENiso forest growth model" describes a new approach to simulate a soil moisture taking into account off-growing-season precipitation (snow, ice) and snow melting. The authors have made a considerable effort to improve the soil water block of the MAIDENiso by introducing an one of the principal water source (snow/ice) for trees growing up in boreal zone. The paper is well structured and written. The introduction provides a comprehensive overview of the background information and the pertinent literature, and demonstrated the need for the current study. They involved a wide range of statistical and modeling techniques for checking their hypothesis and confirming their results. The new block of the soil water procedure improves the understanding some biological and ecological processes, particularly the influence of winter precipitation on  $\delta^{18}\text{O}$ .

But there is a serious issue which should be considered in the MS. Calibration of any multidimensional model can be considered as a fitting observed values of some process by the model optimization. But independent validation (or verification) of the model is using to estimate a forecast ability of it. In the MS I did not find how the new block was validated independently. Based on my own experience we can fit even a stochastic process by multidimensional model using advanced optimization procedure very well. But we are not able to forecast that process (we cannot fit stochastic values by the calibrated model on independent time interval). To be sure that the model is able to forecast I recommend the authors to calibrate the model on some time interval and then check how the calibrated model works on independent time interval.

I would suggest to publish the MS after major revision.

### Specific comments

**Section 50:** The authors wrote: "Among the previously mentioned models, the only exception is the Biome3 model (Rathgeber et al., 2003)..." It is not correct! As an example, the VS-model has a sub-block of snow melting (see Vaganov et al., 2006; Shishov et al., 2016). Could the authors introduce additional references there?

**Paragraph 2.1.1:** I would suggest to make the Paragraph 2.1.1 shorter, and simplify it by moving some formulas and description into appendix section. The well-known MAIDENiso is not a topic of the MS discussion.

**Paragraph 2.1.2:** How many new parameters involved in the soil moisture block? I would suggest to introduce a table there with short description of new parameters (included their dimensions).

**Section 170:** Is the new code of the MAIDENiso available in some public depositories?

**Paragraph 2.2** Along with calibration I strongly recommend to describe a validation procedure of the model.

**Paragraph 3.1** I would recommend to calibrate and validate the new model on two independent time intervals.

**Section 275.** The authors wrote: "The values obtained for both sites were quite different". What does "quite different" mean? Are they statistically different?

**Section 275:** This part "This potentially indicates that the physical factors that are neglected when assuming a constant  $r_a$  (such as wind speed) are quite different between the two sites. The higher values at Tungsten indicates that snow sublimates at a slower rate, likely because the average wind speed during winter at this site is smaller than at Caniapiscau" is an interpretation which can be moved to discussion section

**Sections 280-285** can be moved to Discussion section.

**Section 295.** It seems to me the simulation GPP results with(without) snow are statistically the same (or even identical). Could the authors check it and indicate this in the MS?

**Section 315** can be moved to Discussion section.

**Section 330:** Could the authors statistically check a difference between two simulations (Fig. 8c,

**Figure 5:** Where is the red curve on the Figure 5? Possibly, both versions (with/without snow) produce the same GPP results.