Review of the discussion paper in Geoscientific Model Development:

SaLEM (v1.0) – A Soil and Landscape Evolution Model for simulation of regolith in periglacial environments

This manuscript is dealing with a new concept for dynamic modeling of parent soil material and periglacial layers by the parameters of different bedrock material and climate conditions. This is an innovative approach to delineate soil texture in areas of higher latitude. However, as the authors mention themselves, it is a first step on the way to a complex model, which needs to include at least more calibration parameters and especially more precise validation data during further research. Actually, this kind of research meets the state of art for digital soil mapping and therefore meets the subject of the journal Geoscientific Model Development and should be published after small revisions.

In the following comments, I will first give some general ideas about adding specific information into the thematic frame of the manuscript. Then I propose some potential changes or supplements line by line in detail comments.

General comments:

A big difference of the presented model SaLEM to existing procedures is the dynamic modelling of the temporal development and vertical extension of the regolith layer by the parametrization of the geomorphological processes and paleoclimate. However, it is a common method to divide the periglacial layers in up to 4 stratigraphic units, also named cover-beds or in the German soil science known as Basislage, Mittellage, Hauptlage and sometimes Oberlage. The stratification of the periglacial layers is connected to periods of specific climatic conditions, which induce different morpho-dynamic processes. The variation in geomorphological activity should occur in the processed data when including paleoclimatic time sequences. In addition, the effective amount of aeolian sediment input during different glacial periods has an influence on the vertical composition of the regolith. This background makes it is necessary do discuss this phenomenon and how it is treated in model with few sentences. Is there any evidence for vertical soil texture distribution in the processed data? There is no information about this problem in the manuscript.

In most cases, SaLEM produces regolith thickness of more than 1 m. In contrast, the maximum depth of soil cover in the validation data is 1 m. Therefore, the evaluation by this data makes only sense for mu or summit areas. Spending few days of fieldwork to execute some Pürckhauer drillings deeper than 1 m at specific sites would strongly increase the reliability of validation of the model results.

At several parts of the manuscript dimensions, parameter and values need more detailed explication. This I will mention in the detailed comments.

Detailed comments:

Page Line: Comment

P2 L4:   authors (they are 2!)

P2 L5:   give detailed information about scale of time and area, see also repetition of this fact at page 6 line 5-8

P5 L16: During the glacial periods …

P5 L23: distinct thickness : If it is distinct give accurate amount of thickness!

P6 L16: .. considered as highly evident ..

P6 L17: . However, for the period ..

P6 L18: .. for the initial topography

P 6 L19: .. covering the bedrock, is the results of various natural processes ….

P6 L20: Solid bedrock is weakened by ..

P6 L23: "discrete periods": Please give detailed information about time and naming of the periods

P6 L24   .. material are evident, in particular aeolian sediments like loess.

P6 L25: There are several multi-material-layers covering the solid rock ..

P6 L26: "coat" change to "cover"

P6 L30: .. not available for all …

P7 L3:   .. it became ..

P7 L5-6: Give literature or internet source for high resolution data

P7 L10: "calibrated"; Calibration would mean more computing than only constantly increasing the values. I would prefer to say "adapted" or "transformed".

P7 L17: What is the required temporal resolution of the model? Please give information.

P7 L19: What is the amount of the temperature value increase for the study area? Please inform.

P7 L20: Revise sentence, because you begin talking about the temperature signal, which has nothing to do with the spatial resolution of the precipitation data.

P9 L14: Erase point behind (2008)

P9 L20: Explain the parameters T, Tmin, Tmax, is it daily, annual, seasonal temperature? In the formula you use an "a" and in the text an "α" for the buffering parameter.

P12 L15: Describe the constitution of the initial regolith cover in detail. How it was designed?

P13 L14-17: This sentence about the three variants of modelling should appear in the beginning of the paragraph because it needs to be explained first that the result shown in figure 7 is computed without aeolian deposits.

P13 L14: .. sediment cover (7), ..

P15 L14: I think you used the variation 3 of the generated model data for validation. This information is missing and need to be given here.

P17 L6, L10, L13: Space between number an m, cm or points

Figure 1c): Black lines in the map need to be explained in the legend, where is the mm, middle Muschelkalk?

Figure 2:   .. (dashed line) (after Alley, 2000) and the …

Figure 3a): Give more space for the coordinates in the map frame. The geographic coordinates in the map should be placed more systematically.
Figure 3b) and c) are inverted in the legend, the x-axes as time scale should be divided into 4 seasons

Figures 11, 13: Please indicate the statistical background in the diagrams, for example maximum and minimum values, standard deviation along x and y-axes.