Replies to reviewer

"Benchmarking convection-permitting climate simulations for hydrometeorological characterizations: A comparative study of WRF-SAAG and observation-based products in Chile"

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We thank the reviewer for his/her time, revision, and suggestions, which have improved the scientific quality of the research considerably. We respond to each point below. For clarity, the reviewer comments are given in black italics, and our responses are given in plain blue text.

1. *The normalization of simulated soil moisture by field capacity to obtain the degree of saturation is reasonable. I suggest clarifying that the "surface soil moisture (saturation) %" refers to the reference product from the Copernicus Climate Change Service Climate Data Store (line 365). In addition, I recommend revising the statement that "the surface soil layer represented in the TUW model is unknown." The TUW model should have conceptual assumptions about soil moisture storage (e.g., through field capacity or an equivalent storage parameter), so describing the layer as "unknown" is not fully accurate.*

   We thank the reviewer for this comment. We have clarified in the revised text that the reference variable "Surface soil moisture (saturation) %" corresponds to the C3S Satellite Surface Soil Moisture product described in Section 3.4.2. We have also revised the statement regarding the soil depth represented by the TUW model. We agree that describing it as "unknown" was imprecise, since the model does include a conceptual assumption about soil moisture storage through the field capacity parameter (FC). We have rephrased this to clarify that the model represents soil moisture as a single conceptual storage reservoir not tied to an explicit physical depth and is, therefore, not necessarily comparable in depth to the 2–5 cm surface layer represented by the satellite product. This is why we assessed soil moisture performance using the Pearson correlation coefficient (temporal dynamics) rather than the absolute magnitude of the degree of saturation.

   Therefore, lines 363-367 in the previous version have been modified as follows (see 363-369 in the revised manuscript):
   "For soil moisture, simulated values were normalized by the field capacity parameter (FC, mm; Table 3) to obtain a dimensionless variable representing the degree of saturation. Then, the simulated degree of saturation was evaluated using the "surface soil moisture (saturation) %" from the C3S Satellite Surface Soil Moisture product (Copernicus Climate Change Service, 2018) – which represents a soil layer of 2–5 cm depth – as the observational reference. The TUW model represents soil moisture storage as a single

conceptual reservoir bounded by FC, without an explicitly defined physical soil depth. Because this conceptual storage is not necessarily equivalent to the shallow surface layer captured by the satellite product, soil moisture performance was assessed using the Pearson correlation coefficient to focus on the temporal dynamics (timing) of soil moisture variations rather than on the absolute magnitude of the degree of saturation."

2. *Figure 9 caption: In the third-to-last line, "vertical line" should be changed to "horizontal line," as the boxplots are oriented vertically. The same correction applies to Figure 10.*

   Thank you for pointing this out. We have corrected the captions of Figures 9 and 10 by replacing "vertical line" with "horizontal line" as suggested.

3. *Line 555: Should "as synoptic scale activity" be revised to "such as synoptic-scale activity"?*

   Thank you for the suggestion. We have revised the sentence in line 558, replacing the sentence to "such as synoptic-scale activity," as suggested.

4. *Lines 675–677: The logic of this sentence is difficult to follow. As written, the causal link between the satisfactory precipitation performance and the conclusion that alternative hydrological model structures should be tested is unclear. Please fix.*

   We thank the reviewer for pointing out this lack of clarity. Upon reflection, we agree that the causal link in this sentence was not adequately supported by our results, so we have removed this sentence (previously lines 675–677) from the manuscript.