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Hydrological response of two high altitude Swiss catchments to energy balance and temperature index melt schemes

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1 **HYDROLOGICAL RESPONSE OF TWO HIGH ALTITUDE SWISS**
2 **CATCHMENTS TO ENERGY BALANCE AND TEMPERATURE INDEX**
3 **MELT SCHEMES**

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16 **ABSTRACT**

17 Comparison of energy Balance (EB) and temperature Index (TI) snow/ice melt
18 methods for glacio-hydrological modeling in the Alps has been the subject of
19 numerous studies; however, the debate on which method is preferable under which
20 conditions and for which application is still ongoing. In this study, both melting
21 routines were tested within the common numerical framework of the fully distributed
22 model (Alpine3D) to analyze the differences. We included two high-altitude Swiss
23 alpine glaciated catchments, which represent two distinct types of glaciers, namely
24 cirque and valley glaciers, with different weather conditions, topography, and data
25 type. In this experiment, hydrological discharge in the Damma catchment was
26 overestimated by the model with EB approach, which demonstrated Nash-Sutcliffe
27 efficiency (NSE) of 0.61 mainly due to the overestimation of wind speed and
28 longwave radiation. On the other hand, the TI approach obtained a high NSE of 0.93,
29 as this simple conceptual model does not rely on the abovementioned variables. For
30 the Arolla catchment, better results were observed for both EB and TI approaches,

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