

Wetter or drier? A model intercomparison of soil moisture and runoff predictions in permafrost landscapes

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With the predicted loss of permafrost, there is a large uncertainty in future predictions of hydrological conditions across the Arctic. Since hydrology plays a fundamental role in biogeochemical cycles and potential climatic feedbacks, there is a need to better understand how models represent permafrost hydrology and how different representations affect wetting and drying of permafrost landscapes. This study aims to advance understanding of where, when and why the arctic will become wetter or dryer in the soil column. In particular, we assessed and compared models predictions of the spatial and temporal distribution of soil moisture and runoff across permafrost regions and geographical domains (e.g. Boreal N. America, Boreal Europe, etc.) and highlighted the main factors responsible for observed changes. Then, we evaluated fundamental differences in how models simulate soil moisture and runoff. This study serves as a baseline to improve conceptual issues of arctic and boreal hydrology among models and reduce uncertainty in predictions. In addition, this study highlights the need for developing and improving benchmark datasets with seasonal dynamics to evaluate model responses in the permafrost region.