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CLIMATE WARMING IMPACTS ON SNOWPACK ACCUMULATION IN AN ALPINE WATERSHED

ABSTRACT

This paper combines a wide-area assessment of forecast changes in wintertime synoptic conditions over western North America with a meso-scale alpine hydrometeorology model to evaluate the impacts of forecast climate change on snowpack conditions in an alpine watershed. The synoptic analysis was used to generate long-term climate time series scenarios using the Canadian Centre for Climate Modelling and Analysis first-generation coupled general circulation model (GCM). The alpine hydrometeorology model SIMGRID is used to predict changes in wintertime precipitation at the watershed scale. The SNOPAC model is a simple snow model that predicts the overall snow accumulation throughout a watershed based on the output from SIMGRID. A vapour transfer model has been incorporated into the SNOPAC model to estimate snow volumes more accurately. The model is applied to a small alpine watershed in the southern Canadian Rockies. The synoptic analysis and GCM output forecasts a modest increase in both winter precipitation and temperatures in the study area. The hypothesis herein is that the increase in winter precipitation due to synoptic conditions will not compensate for regional changes in the rain-to-snow ratios. The net result will be a decline in winter accumulations of precipitation as snow, and hence an expected decline in spring runoff. Copyright (c) 2005 Royal Meteorological Society.

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