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High-Resolution Modeling of Canadian Rockies Snow Pack as part of the Canadian Land Data Assimilation System (CaLDAS)

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Land surface models and assimilation systems have been used for a few decades to provide surface conditions and fluxes in numerical weather prediction (NWP) systems. Efforts to improve the representation of land surface prediction and analysis at Environment Canada have focused upon the development of a new version of the Canadian Land Data Assimilation System (CaLDAS). In this study we discuss the development and validation of the land-surface modeling component used in CaLDAS to provide the first guess (or background state) of the land surface. In the context of a project funded by the National Agri-Environmental Standards Initiative (NAESI), the Interaction Sol-Biosphère-Atmosphère (ISBA) land-surface model was integrated in an external mode to produce a six-year reanalysis of water balance indicators for the South Saskatchewan River Basin (SSRB) in western Canada. Owing to the impact of snow accumulation and subsequent melt upon the streamflow regime within the SSRB, we present an evaluation of the simulated Rocky Mountain snow pack, including issues related to both the snow water equivalent (SWE) and snow cover extent and duration. A series of manual snow surveys combined with snow cover data from the Interactive Multisensor Snow and Ice Mapping System (IMS) analysis is used to evaluate the snow pack simulations. This work is a precursor to the assimilation of space-based remote-sensing data for snow coverage area (MODIS optical data) and for snow water equivalent (AMSR-E microwave emissions).