



Frozen soil scheme for high latitude regions in land surface models

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Regional and global climate model simulated streamflows for high-latitude regions show systematic biases, particularly in the timing and magnitude of spring peak flows. Though these biases could be related to the snow water equivalent and spring temperature biases in the model, a big part is due to the unrealistic representation of frozen soil hydrologic properties including hydraulic conductivity. This is demonstrated by comparing two simulations performed with the Canadian Land Surface Scheme, over North-east Canada; the two simulations differ in the frozen soil scheme formulation, particularly hydraulic conductivity and supercooled water. Analysis of the linkages between the soil/surface variables such as soil-moisture, infiltration, snow water equivalent (SWE) and runoff in these two simulations with different frozen soil scheme formulations and comparison of simulated streamflows to those observed show significant improvements in the simulation that explicitly models the effects of frozen soil on hydraulic conductivity.