FROZEN GROUND EFFECTS ON INFILTRATION AND RUNOFF

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ABSTRACT

Frozen soils in cold regions play a very dominant role in hydrologic processes. Both seasonal frost and permafrost can significantly reduce both infiltration into and migration through soils; at the same time, the amount of water that can be stored in the soil is severely reduced when permafrost exists. The behavior of frozen soils is most critical in determining the amount of groundwater recharged and the amount of runoff generated. Groundwater recharge from snowmelt in cold regions can be very important when the snowpack represents a large percentage of the annual precipitation. The moisture distribution within the frozen soil is the most significant factor in determining the hydrologic response of the soil. High moisture contents within the frozen soil can reduce the hydraulic conductivity of the soil by several orders of magnitude; such reductions will drastically influence both the volume and peak values of runoff. Most existing hydrologic models do not take into consideration the changes that occur in the hydraulic properties of seasonally frozen soils. Therefore, these models cannot be calibrated to accurately predict runoff when there are large variances in hydrologic properties.

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