Evaluation of snow properties for use in climate modeling applications

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A new parameterization scheme for snow cover to be incorporated into climate models (GCM) is under development. The scheme uses effective parameters of snow cover based on its vertical structure (snow types), typical for certain environmental conditions. The transformation of snow profile specifics (grains, crusts, depth hoar, etc.) is regarded as determined by meteorology (air temperature, precipitation sum and frequency, wind regime) and landscapes specific (vegetation type, exposition, soil conditions). These parameters control snow cover intraseasonal evolution at each particular location and therefore are responsible for a corresponding set of effective parameters required for a climate (hydrological) model, such as effective heat conductivity, surface albedo, liquid water holding capacity, etc. A detailed physical model of snow cover can be used for validation of the parameterization scheme, but not as a component of spatially-distributed climate model. The parameterization scheme uses interpretation of snow physics by simplified description of the effective parameters of snow cover. Such indirect usage of the vertical structure of snow cover in the 1-dimensional local model of energy/water exchange at the land surface allows improving modeling results in estimation of melting time, heat fluxes through the snow cover, water percolation, etc. At the same time, the scheme doesn't require too much computer resources. The modeling results for several testing sites in Eurasia show that usage of effective parameters based on the snow vertical structure classification leads to better evaluation of the energy/water balance. The study was supported by the Russian Foundation for Basic Research (04-05-64745), INTAS (03-51-5296) and NATO (ESP CLG 981842) grants.