Poster # H11B-1259

Modification of Soil Temperature and Moisture Budgets by Snow Processes

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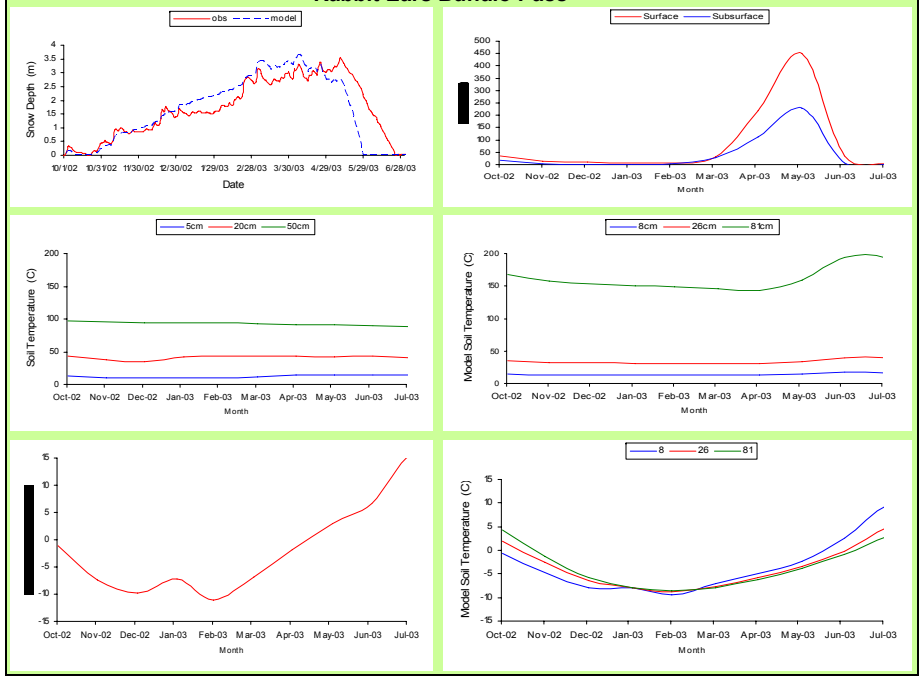
Objective

To understand and predict the energy and moisture exchange between surface and subsurface associated with snow accumulation and ablation.

Experiment

Numerical simulations were performed at Rabbit Ears Buffalo Pass and North Park Illinois River of the Cold Land Processes Field Experiment (CLPX) using the Center for Ocean-Land-Atmosphere (COLA) Simplified Version of the Simple Biosphere Model (SSiB) between September 2002 to September 2003.

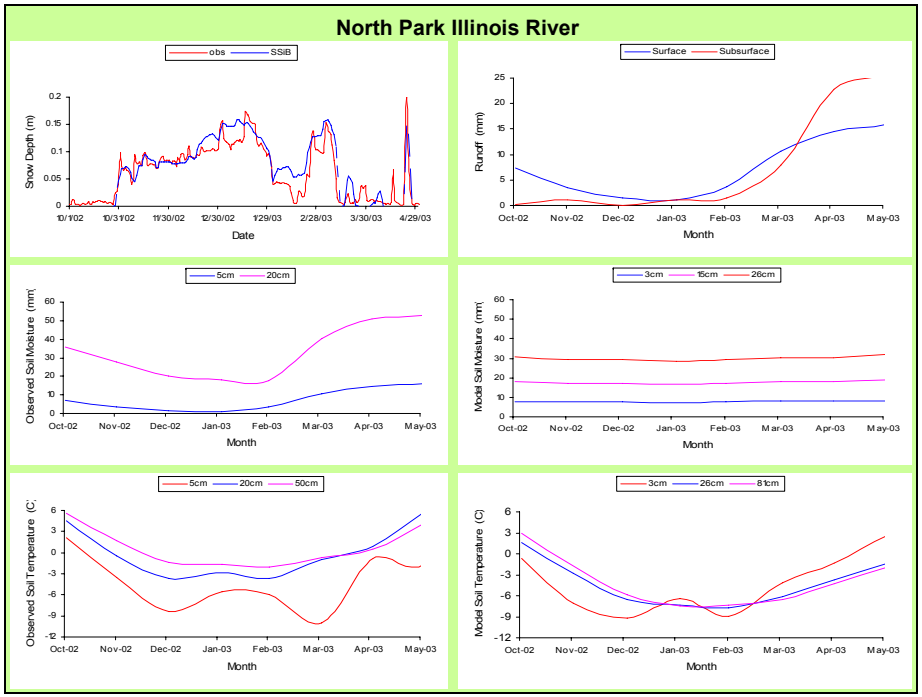
Rabbit Ears Buffalo Pass



Summary I

The seasonal cycle of soil moisture is realistically reproduced which is consistent with observation, soil moisture at upper layers exhibits slight variation during snow accumulation and snow ablation. However, soil moisture is underestimated at upper levels. Soil temperature at different layers shows small discrepancy during snow accumulation period.

North Park Illinois River



Summary II

The variation of seasonal soil moisture is due to several snow melting episodes at mid winter; which is not captured by model. Seasonal variation of soil temperature is reproduced, soil temperature near the surface shows large variation which is associated with soil moisture change. The soil temperature is underestimated.

Conclusion

Thermal insulation effect becomes significant for deep snowpack with few melting episodes at Rabbit Ears Buffalo which considerably contributes to small variation of soil moisture and deep soil temperature. For thin snow with several melting events at North Park Illinois River, near surface soil shows large oscillations associated with varied surface snow but deep snow exhibits small variation.

The underestimations of soil moisture and soil temperature relate to insufficient moisture and energy transport between surface and subsurface, and adjacent subsurface layers. In addition, soil parameters such as porosity, water wilt point and water holding capacity also add uncertainty for treatment of subsurface thermodynamic and hydrological processes.