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Characterizing biotic and abiotic properties of landscape and their implications for ecohydrological processes across scales

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Abstract

Ecohydrological processes governing the dynamics of terrestrial ecosystems and its response and feedback to climate change occur at diverse spatial and temporal scales. To accurately capture the dynamics of ecohydrological processes in the model, its critically important to capture the subgrid scale heterogeneity of the landscape and develop scale aware process representation and parameterization. This study focused on the Arctic tundra landscape at Seward Peninsula of Alaska. Ecohydrological processes in this sensitive landscape are strongly governed by the physical and structural properties (like topography, soil, permafrost, geomorphology etc.) of the landscape, environmental conditions (like temperature, precipitation, light, radiation) and biotic conditions (vegetation, above/below ground biomass and organic matter, disturbance history etc.). From site to watershed to regional scales (scales at which models often operate), landscape is a complex mosaic of a range of biotic and abiotic properties. We have developed and applied a hierarchical characterization and classification approach to segment the landscape in distinct units which can be used to develop and parameterize process models at local scale. We also analyze how the distribution and organization of the landscape units as building blocks influence and interact with ecosystem processes across scales. Our goals is understand the landscape organization principles and their roles to inform and improve process based models of ecohydrological processes in Arctic tundra landscape.

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