



Influence of surface litter layer on surface energy flux over temperate deciduous forests

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We have incorporated surface litter layer above the mineral soil in community land model (CLM3.5) to examine its impact on energy and water exchanges over Gwangneung temperate deciduous forest in Korea. Model performance has been evaluated using the eddy-covariance observations. Due to low thermal conductivity and large porosity, the importance of peat in energy and water exchange has been recognized in northern circumpolar regions where soil carbon content is high. Although temperate soil does not have high soil carbon content, surface litter layer plays an important role in water and energy exchange in deciduous forest during the non-growing seasons when the litter layer is relatively thick. The observed soil temperatures at 10 cm depth do not fall below the freezing point in even very cold days, indicating significant insulating effect of surface litter layer in temperate deciduous forest.

The used depth of surface litter layer is 3 cm, which is comparable to the depth of surface litter layer in temperate deciduous forest during the non-growing seasons. Thermal conductivity, hydraulic conductivity and maximum porosity have been modified to simulate surface litter layer.

Inclusion of the surface litter layer improves the simulation of seasonal variation of water vapor flux by capturing the reduction of soil evaporation in early spring. And also it removes unrealistic sensible heat fluxes in very cold days, which resulted from the large thermal conductivity of mineral soil in the original model. This study suggests that the surface litter layer in temperate deciduous forest also need to be considered as well as deep organic layer in Boreas forest in land surface models.

Keywords: Community land model, Insulation, Surface litter layer, Temperate deciduous forest