An evaluation of Community Land Model version 3.5 - Dynamic Global Vegetation Model over deciduous forest in Korea and sensitivity test

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The performance of Community Land Model version 3.5 - Dynamic Global Vegetation Model (CLM-DGVM) has been evaluated through a comparison with the observation over temperate deciduous forest in Gwangneung, Korea. In this study, the influence of plant phenology, plant composition, and climate variability on carbon exchange was focalized. To get an equilibrium carbon storage, the model was run for 400 years driven by the observed atmospheric data at the deciduous forest of the year 2006. We have run the model for 2006 with the equilibrium carbon storage at Gwangneung forest and compared the model output with the observation.

A comparison of leaf area index (LAI) between the model and observation indicated that the phenology module poorly represented the timing of budburst, leaf fall and evolution of canopy LAI of the deciduous forest. Senescence of the phenology was delayed about four weeks and the simulated maximum LAI (of 5.8 m2 m-2) was greater than the observed value (of 4.5 m2 m-2). However, the simulated tree carbon storage was comparable with the reported values at the site.

Although the observed phenology is used for carbon exchange in the model, the model overestimated both gross primary productivity and ecosystem respiration. The coexistence of deciduous and needle leaf forests did not make a significant difference in carbon exchange amounts compared to the amount generated from single existence of deciduous forest. When the influence of climate variability on carbon exchange was examined, the simulated inter-annual variation of carbon exchange depended on annual mean air temperature and total insolation amount but not precipitation amount.