# Assimilate the big data from satellite observations into simulation: optimization of the phenology model using data assimilation

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To optimize simulation models, the computational method called data assimilation (DA) is widely used. However, for terrestrial ecosystem models, due to their complexity, DA is not applied sufficiently. In this study, the particle filter method, one of the numerical methods of DA, is utilized to optimize a terrestrial ecosystem model with abrupt behavior. Leaf onset and offset phenology of deciduous stands was the target of this study. Previously, leaf onset and offset phenology was modeled using cumulative temperatures of growth degree days, and the parameters of those models were not statistically tested nor optimized sufficiently. In this study, we used satellite-observed leaf area index as the input data, and showed that the ~10 parameters in the model was optimized simultaneously. Using a large cluster computer, ~10,000 grids of deciduous stands in Japan were targeted for DA. As a result, the mean annual temperature of the grid has a significant impact for the parameters of the phenology model, which were assumed to be fixed numbers previously. Moreover, we made different DA runs for specific tree species.

Keywords: data assimilation, phenology, simulation, terrestrial ecosystem, biogeochemistry

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