

Biome-BGC v4.1.1 MPI

Challenge: Ecosystem functioning, climate change, and the interaction between ecosystem biogeochemical cycles and the climate system are leading-edge topics in recent research projects. Computer based, state-of-the-art terrestrial ecosystem models are widely used to support these efforts. The widely known Biome-BGC model estimates the ecosystem scale storage and fluxes of energy, carbon, nitrogen and water, controlled by various physical and biological processes on a daily time-scale. Although to perform a single simulation is not a challenging task for a researcher, to carry out more elaborated workflows like model sensitivity analysis, model-data fusion or to perform extensive spatial modeling on a single desktop computer is unfeasible. Terrestrial ecosystem modeling is widely used to understand and predict ecosystem functioning and the effects of different environmental changes on growth, mortality and biogeochemical cycles of ecosystems. These models are complex and computationally demanding applications.

Solution: An integrated but flexible tool within the BioVeL consortium with the cooperation of SZTAKI is developed to resolve the computational resource problems of researchers and to provide simple and user friendly scientific workflow management solution. The BiomeBGC model is used as the base software in these workflows. In order to calibrate the model or to make data model harmonization or spatially explicit simulations the model has to be executed typically thousands of times through a series of different data analysis steps. The integration of Taverna workflow management system, web services and desktop grid technology provide a powerful and sustainable service for biodiversity and ecosystem research (see Figure 5.2.1). The service is disseminated for scientific communities by the FP7 BioVel project. Researchers in the fields of ecology and climatology are the targeted user community.