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A New Modular Biosphere Simulation Framework

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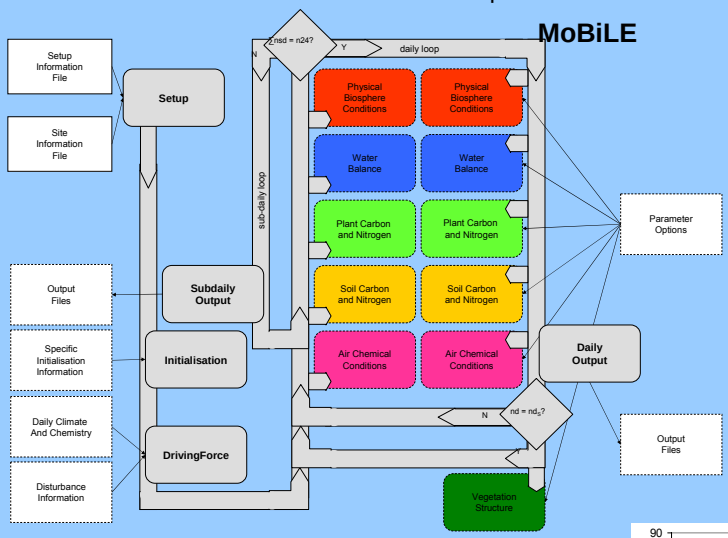
FEATURES of the Modular Biosphere Simulation Environment (MoBiLE)

- Provides weather generator and routines for estimating initial site conditions to bridges gaps in data records
- Integrates models that run on different time steps describing various biosphere processes from the leaf to the stand scale
- Simulates up to 5 different vegetation types in one ecosystem with selectable number and thickness of canopy and soil layers

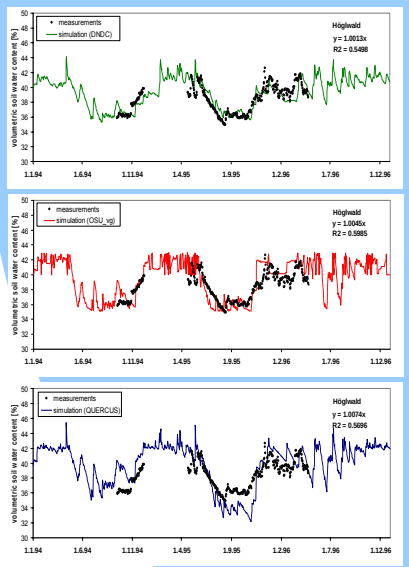
APPLICATIONS for the new Modelling Framework

- Introduce new dependencies and dynamic feedbacks to specific process based models
- Investigate the impact of processes at one temporal (and spatial) scale on another scale
- Investigate model sensitivities by using various models for only one task while describing other processes with the same module

Linkage Between Modules:
Various biosphere models have been prepared as modules for specific biosphere tasks (see Figure 1) that can be linked together according to the choice of the user. Examples for models already implemented are PNET-N, PSIM, DNDC, BROOK90, TREEDYN, and OSU.

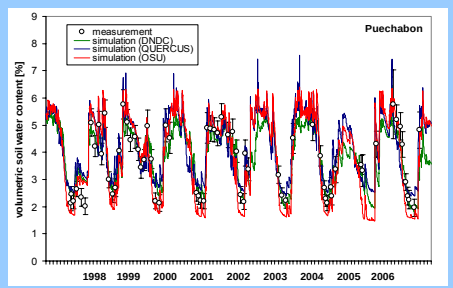


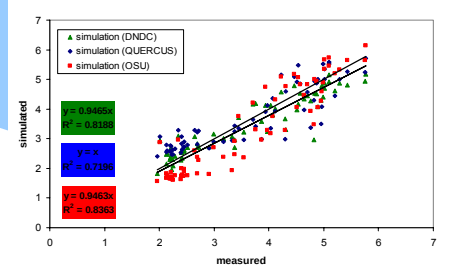
Linkage to Regional Models:
Besides getting initial data and driving forces from prepared tables, a regional climate and/or hydrological model can be used to provide necessary driving forces.
MoBiLE might therefore in future replace a conventional land surface module (LSM) within regional models enabling easy introduction of biogeochemical processes.

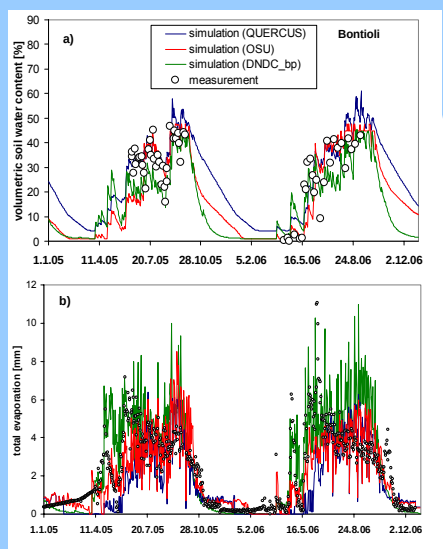


Example Application 1: Model comparison with the same boundary conditions
Three water balance models of different complexity (QUERCUS, DNDC, OSU) have been applied with initial values of a mixed spruce forest and driving force data of 3 years of daily climate. The simulation was carried out with the same plant biomass dynamics (PSIM) and soil physics (DNDC) modules.

Example Application 2: Model stability test with long–term simulations
Run of the same three water balance models for a Mediterranean site. The simulation ran over 9 years. It was carried out with considering dynamic tree growth (TREEDYN), plant biomass development (PSIM) and soil physics (DNDC).







Example Application 3: Multi-aspect evaluation
Run of the same three water balance models as in Application 1 for a Savannah grass site. Soil water content as well as evaporation are considered for evaluation. Again, site initials, physical and biological conditions were the same in all simulations.