CoNnEcted
Colloid Transport Simulations

JÜLICH
Forschungszentrum

Forest Ecosystem modeling

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The project CoNnEcTed

- Understanding the role of colloid-facilitated transport in nutrient cycling within forest ecosystems
- Objectives:
  - integrating a forest growth module into the existing agroecosystem AgroC model
  - quantifying parameters for modeling colloidal transport, using HYDRUS-1D
  - implementing a simplified approach to account for colloid genesis and its association with P transport in the AgroC model

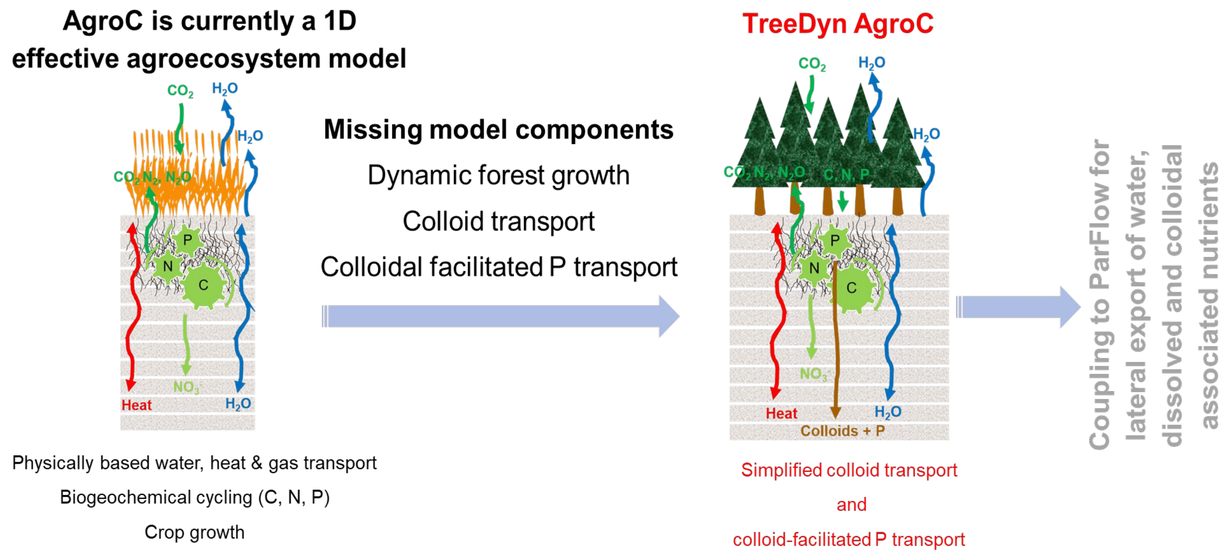

Figure 1. Model Concepts

The Agro-Tree module

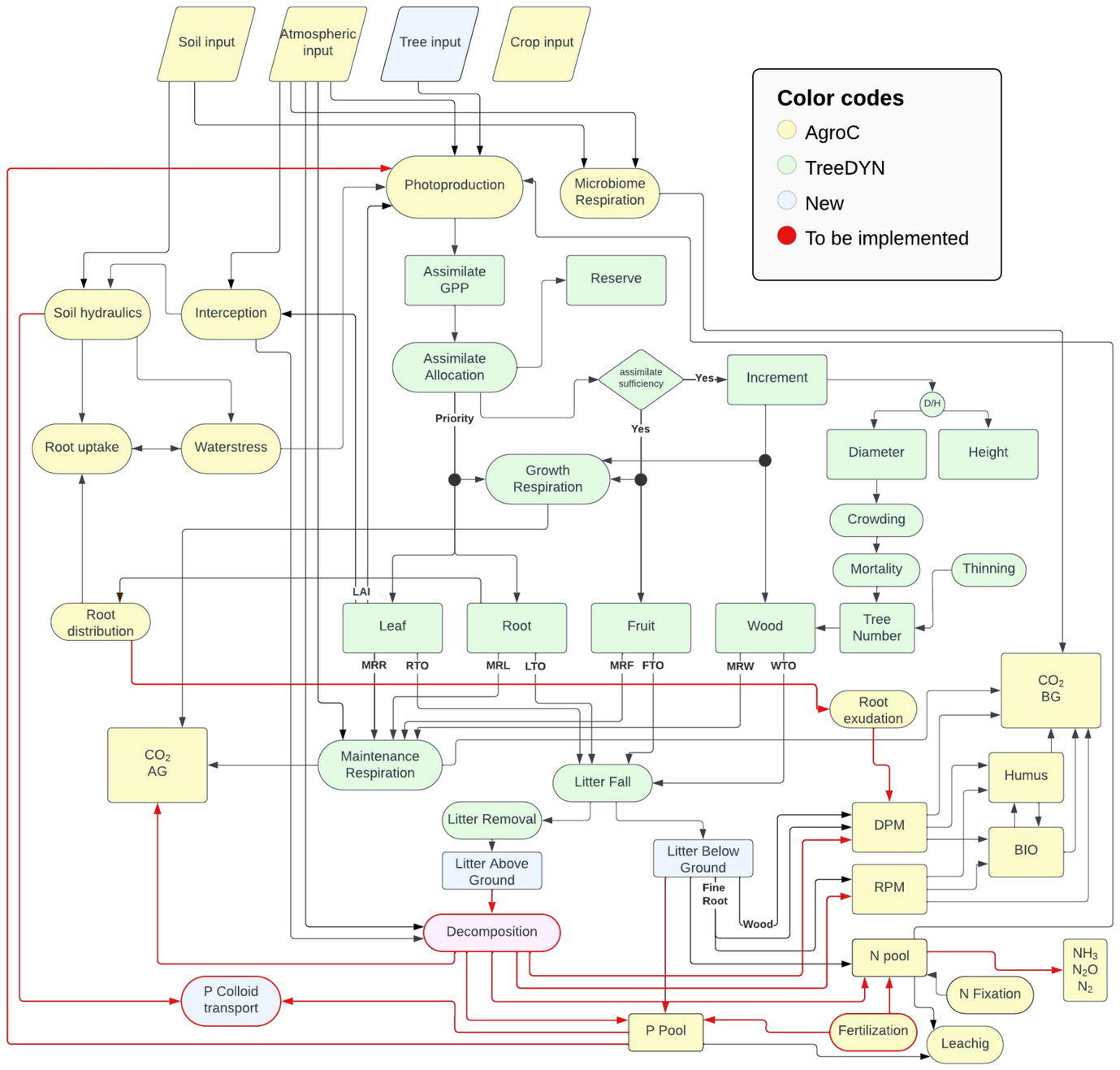

Figure 2. Flowchart of the architecture of the Trees module.

Guidelines and inspiration for the forest growth are taken from the TreeDYN3 model by Bossel (1996). The merging of the models required careful selection of approaches and adaptations to ensure the full compatibility. As many of the original routines of the crops module of AgroC were carried on into the new module.

Results

Simulations of Spruce and Corn at hourly time step from 2011 to 2022. Soil and meteorology from the Wüsterbach forest measurements

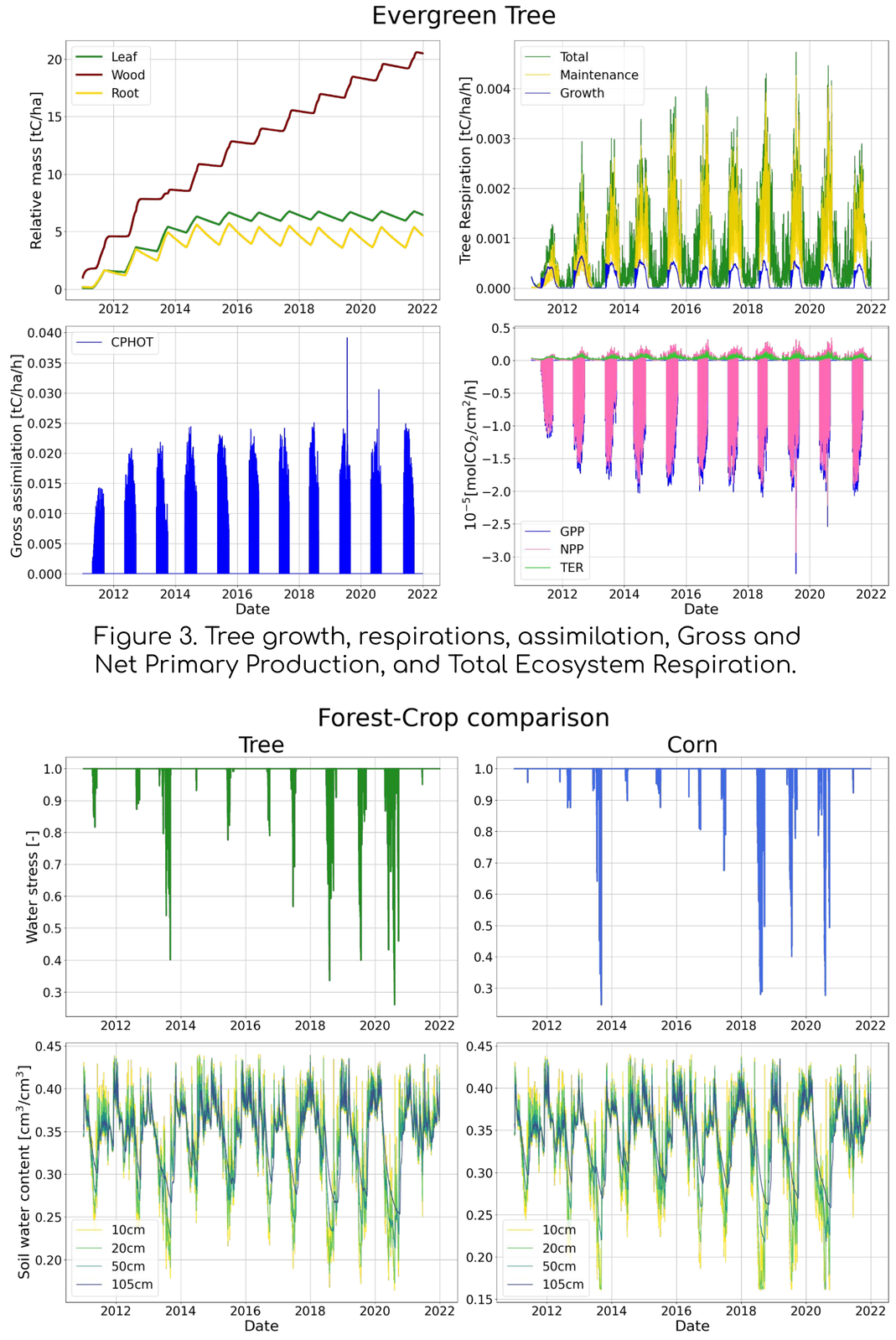

Figure 3. Tree growth, respirations, assimilation, Gross and Net Primary Production, and Total Ecosystem Respiration.

Figure 4. Top: water stress of the plant where 1 = no stress, 0 = no activity. Bottom: volumetric water content at different depths.

References

[Bossel, 1996] Bossel, H. (1996). TreeDYN3 forest simulation model. Ecological Modelling, 90(3):187–227.

[Herbst et al.,] Herbst, M., Hellebrand, H., Bauer, J., Huisman, J., Šimůnek, J., Weihermüller, L., Graf, A., Vanderborght, J., and Vereecken, H. Multiyear heterotrophic soil respiration: Evaluation of a coupled CO2 transport and carbon turnover model. 214(2):271–283.