MultiTree: Multi-scale modelling of tree growth, forest ecosystems, and their environmental control

Objectives

- Quantify the effect of environmental factors on forest growth
  - link models describing metabolic processes, structural regularities, allocation, and growth,
  - develop new integration methods for upscaling the results to tree and stand level.
- Develop new analytical methods for detecting the climatic signal in tree growth
  - quantify different sources of uncertainty; imperfect measurements, model parameterisation, model structure,
  - provide information on the relationship between tree growth and climate in different parts of Finland.
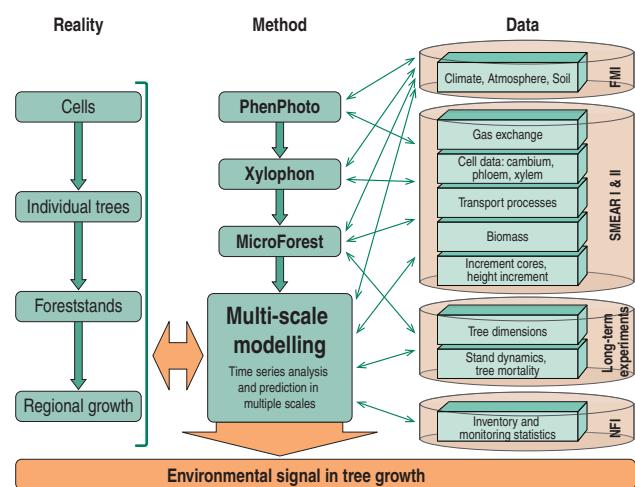
Impact

- Deeper insight into interplay between forest ecosystems and climatic variation
  - hierarchical forest–atmosphere model system for predicting the effects of environmental factors,
  - new computational methods for the analysing large and high-dimensional data sets,
  - applied in planning of means that help in mitigating and adapting to climate change.

Fig. 1. MultiTree is one of the first attempts to combine massive multiscale spatio-temporal data sets with theory-based models and domain knowledge in forest and computational science.
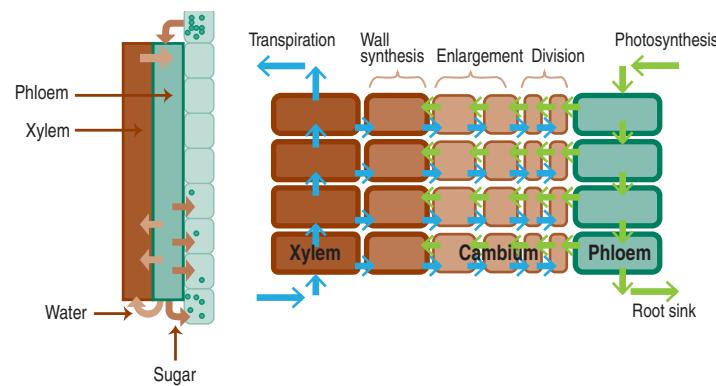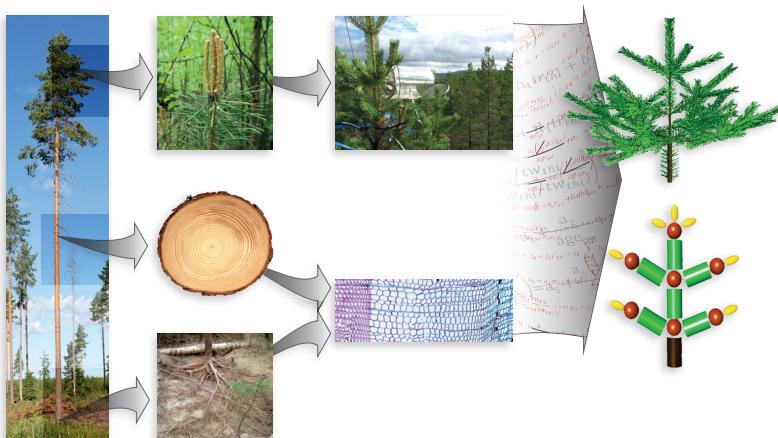

Fig. 2. Schematic presentation of the phenomenon, methods, and data sets used in the project.

Fig. 3. Modeling phloem and xylem transport within trees.
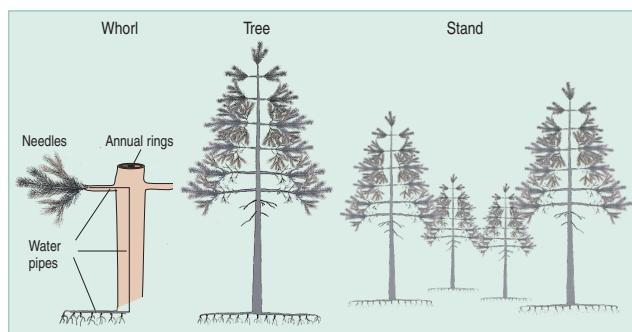
Fig. 4. The MicroForest model integrates individual tree growth to stand level.

Project partners

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