1.1 - Introduction to process-based forest modelling

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Ecosystem Modelling Facility

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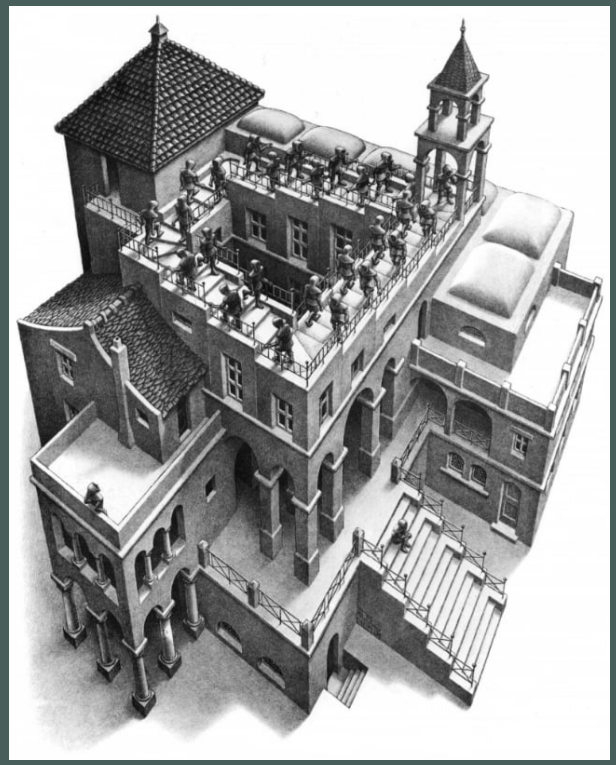

Outline

1. Fundamental concepts

2. Modelling cycle

3. Overview of process-based forest models

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- *Simulation model* - A numerical model that represents the development of a solution by incremental steps through the model domain.

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- *Constants* - Terms that are **fixed values under all runs**, representing known physical, biological or ecological activities (e.g. the speed of light).

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- *Sensitivity* - The degree to which the model outputs are **affected by changes in input parameters**.
- *Transparency* - The clarity and completeness with which data, assumptions, and methods of analysis are **documented**.

2. Modelling cycle

Modelling tasks: Development

1 - *Problem formulation*

- Definition of objectives
- Definition of the spatio-temporal physical domain

2 - *Model design and formulation*

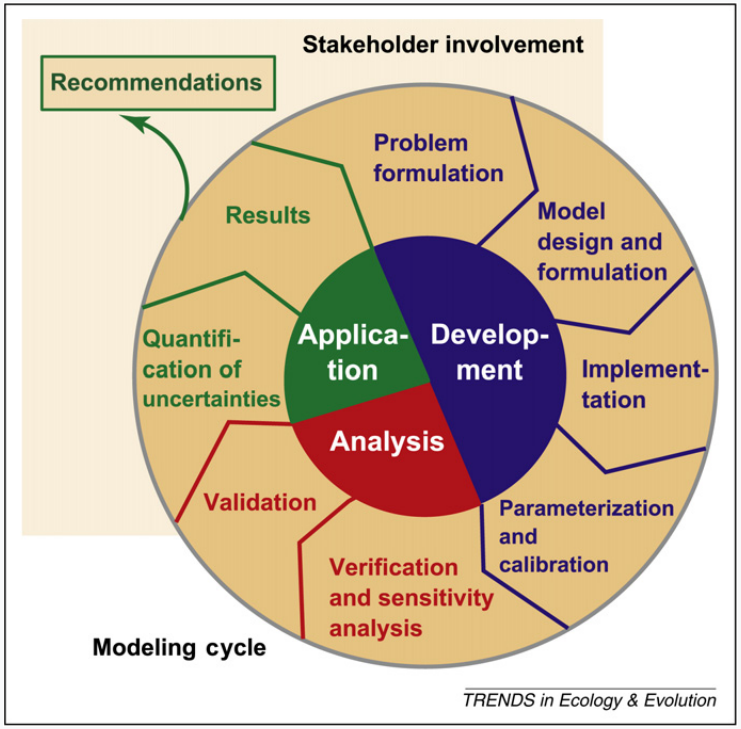
- Data availability
- Use of existing vs. new model
- Conceptual model
- Use of existing modules

3 - *Implementation*

- Algorithmic design
- Model coding (e.g. C++)
- Profiling and code optimization

4 - *Parameterization and calibration*

- Sources for direct parameter estimation
- Sources for parameter calibration
- Meta-modelling



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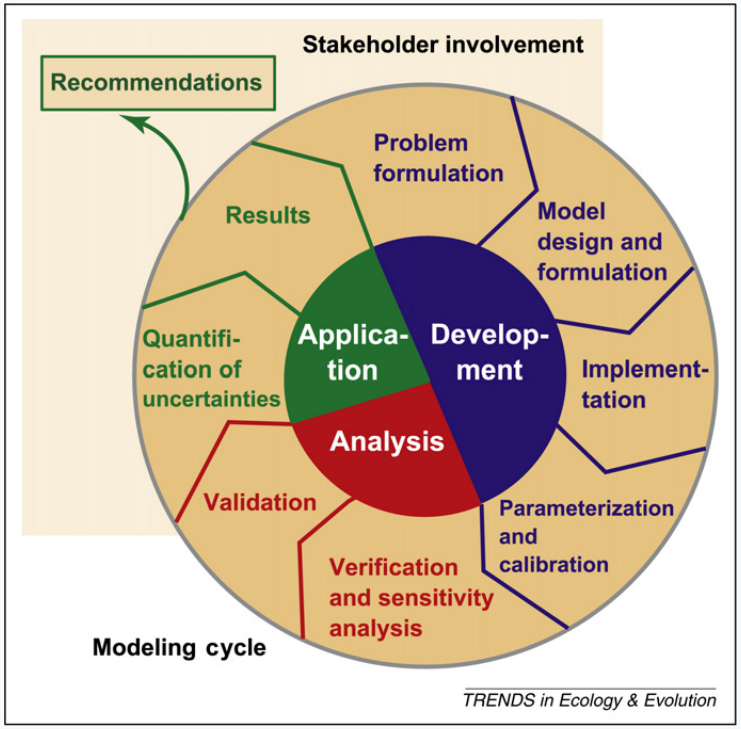
Modelling tasks: Analysis and application

5 - *Model analysis*

- Verification and qualitative assessment
- Sensitivity/uncertainty analysis
- Formal evaluation (validation)

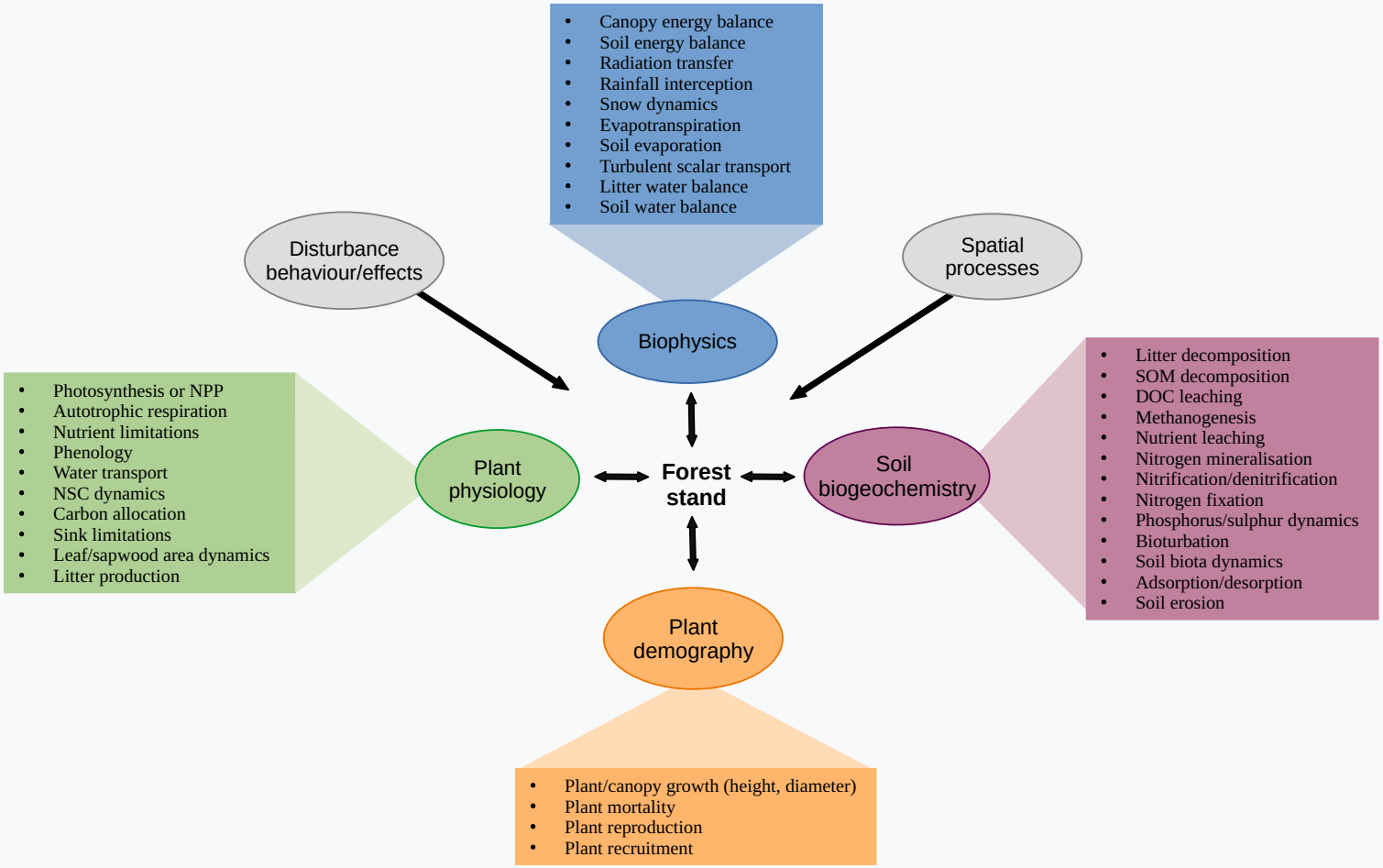
6 - *Model application*

- Simulation and documentation
- Quantifying uncertainty
- Evidence for decision



3. Overview of process-based forest models

A typology of forest processes



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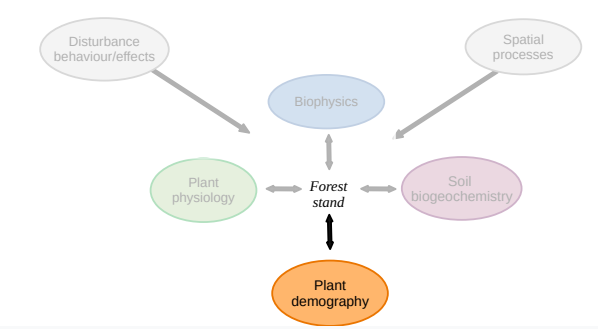
Forest gap models



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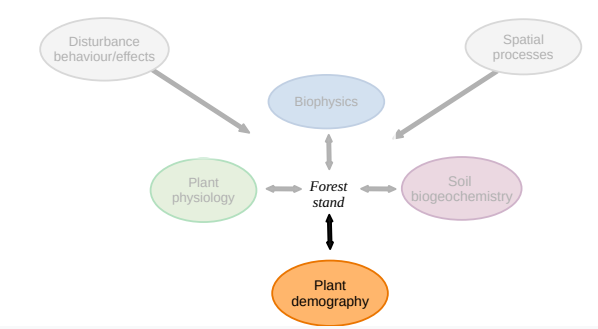

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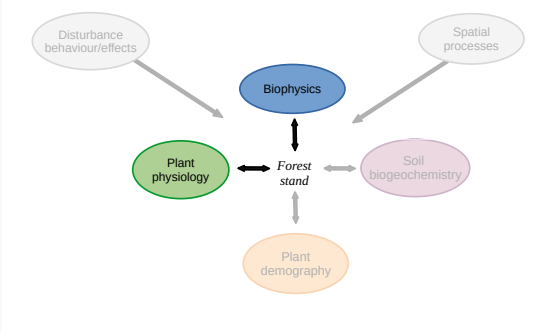
Soil-vegetation-atmosphere transfer model



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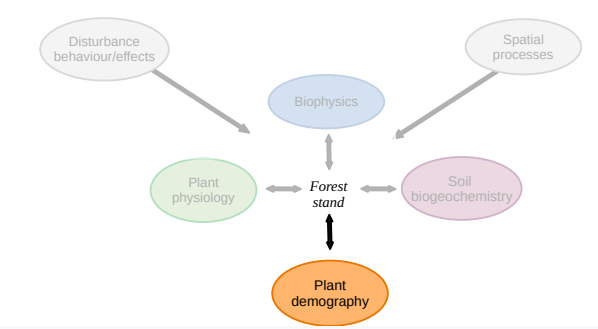

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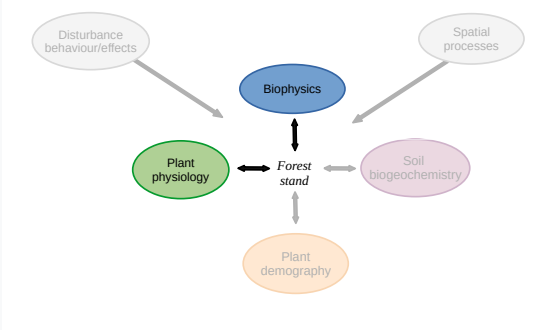

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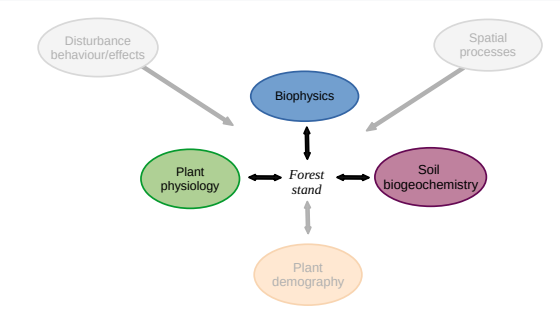
Forest biochemical model



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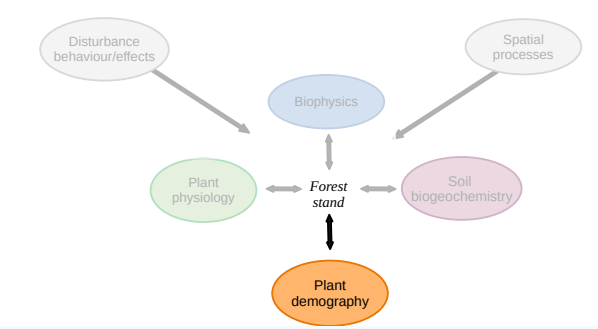

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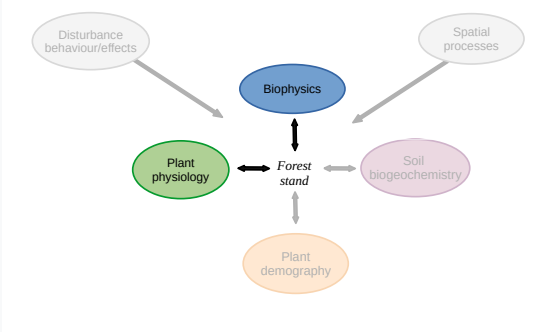

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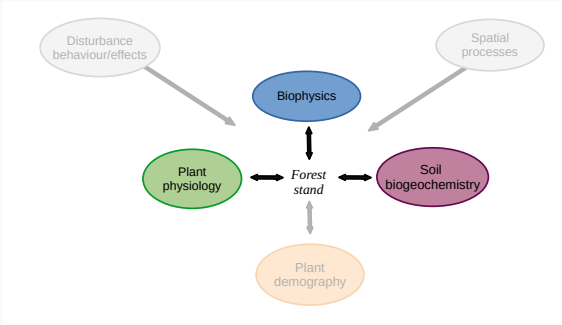

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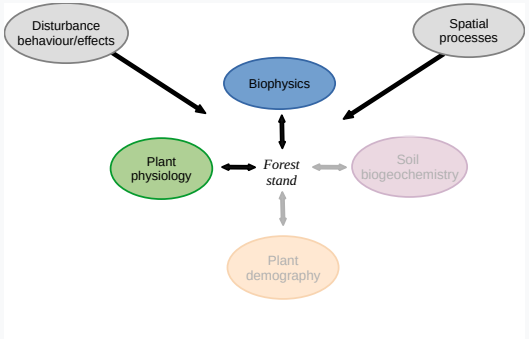
Watershed ecohydrological model



e.g., RHESYS, ECH2O, Tethys-Chloris

M.C. Escher - Ascending and Descending, 1960