



## ModPhenWood

**Ecophysiological modelling of the phenology of wood formation in temperate and boreal forest trees**

***Principle investigator: Cyrille Rathgeber, UMR 1434 Silva, INRAE Grand Est – Nancy***

***Avec la collaboration de : Nicolas Delpierre (ESE, Université Paris-Sud)***

***Context*** — Wood is the second largest continental biomass stock on Earth. Its production by woody plants helps to mitigate the current increase in atmospheric CO<sub>2</sub>. Wood formation, however, is a complex process. It is established now that its seasonality is not only driven by the processes of carbon assimilation. Indeed, environmental factors and the tissue development program have a crucial influence on the seasonality of wood formation. These facts run counter to current representations of wood formation in dynamic vegetation models, which assume that xylogenesis simply follow photosynthesis.

***Objectives*** — This thesis project aims to deepen our knowledge on the roles of environmental and ontogenetic constraints on wood formation phenology. A set of statistical and ecophysiological models simulating the occurrence of key stages of wood formation (resumption of cambium divisions, beginning and end of enlargement of new xylem cells, beginning and end of secondary wall deposition and lignification) will be developed. These models will explore both the roles of environmental constraints (temperature, soil moisture, photoperiod) and the ontogenetic sequence.

***Approaches*** — The models will be developed and tested using an existing database, comprising more than 300 site-years (a "site-year" is the total amount of data collected during one year at a given site) of weekly wood formation data for more than 20 coniferous species located in the Northern Hemisphere. The database will be extended to hardwoods, with a set of 30 site-years already identified for sessile oak and European beech.

***Expected results and impacts*** — The development of the model will make it possible to quantify the respective roles of environmental constraints and the ontogenetic sequence on seasonal patterns of wood formation as well as to evaluate the impact of climate change. This wood phenology model is intended to be integrated into vegetation models in order to improve their representation of carbon allocation.