

Four-year funding for a PhD in forest modeling and simulation of multi-aged and mixed forests

RESEARCH PROJECT

While the management of monospecific plantations has often been the norm, the management of forest stands composed of a mixture of species without clear-cutting has been increasingly applied or even regulated by regional governments. The sensitivity of pure even-aged forests to climatic and health problems has been recognized, and forest policy and public expectations have evolved, with greater emphasis on the many forest ecosystem services, including biodiversity habitat, recreation, landscape aesthetics and carbon sequestration. Although the foundations of the multi-aged and mixed silviculture have long been described, the application of this silviculture remains recent in some regions or for some stand composition. For example, uneven-aged silviculture has long been applied in stands of Norway spruce in mountainous areas (e.g. in the Alps, Jura) while, in other regions (e.g. in Belgium), stands of Norway spruce have mostly been managed with plantations and clear-cuts. As a result, in many situations forest management is changing, but managers have so far little hindsight and few tools to predict the effects of their actions on future wood supply and ecosystem services. This thesis project aims to develop such tools. In addition, these tools will be used in combination with the marteloscope, i.e. permanent plots that are used for forest management education (<https://informar.eu/marteloscopes>). The result of this project will then enrich the teaching material used in the different marteloscopes. Among established marteloscope, study cases will be selected in stands of Norway spruce, Douglas-fir and mixture of oak and beech. Based on existing data (large permanent plots, national inventories, AFI plot network...), models (e.g. GYMNOS, http://copsis.cirad.fr/copsis/help_en/gymnos) and additional field work, the candidate will calibrate an existing forest dynamics model named SAMSARA2 (Courbaud et al., 2015) that is implemented in the Copsis4 platform (Dufour-Kowalski et al., 2012). In particular, tree growth and mortality as well as tree recruitment will be calibrated using Bayesian statistics (Kruschke, 2014). Then, simulation will be performed to evaluate different management guidelines. For this last task, new indicator will be developed to apprehend future forest resilience and ecosystem services. This project will be realized in collaboration with numerous French and German partners as it will take part in a larger European project that aims to promote multi-aged and mixed silviculture.

MISSIONS

- Calibrate some key processes of SAMSARA2 with Bayesian statistics;
- Conduct field monitoring in permanent plots in the Belgian Ardennes;

- Gather the required information from the literature;
- Develop and conduct new field measurement protocols to collect additional data;
- Elaborate virtual experiments and run model simulations;
- Take part to meetings with partners;
- Write reports, scientific and popular articles.

CANDIDATE'S PROFILE

The candidate should hold a master in ecological modeling, forest science, environmental science or statistics. The candidate should be very interested in forest modeling. The candidate will benefit from knowledge in statistical modeling (preferably with R), silviculture and forest ecology. Knowledge of a programming language (preferably Java) is a plus.

OUR OFFER

This position is opened at Gembloux Agro-Bio Tech, University of Liège (<https://www.gembloux.uliege.be>).

- Net monthly salary of about 2100 €/month
- Starting date: the 1st January of 2021
- The successful candidate will be based in Gembloux, but will have the opportunity to visit partner modeling groups in France (Grenoble, Montpellier), take part to meetings with project partners in France, Germany and Belgium, and present research results in international conferences.

APPLICATION AND CONTACT

Please send your application (curriculum vitae and a cover letter) or question to Gauthier Ligot (gligot@uliege.be). Application deadline: until position is filled

REFERENCES

Dufour-Kowalski, S., Courbaud, B., Dreyfus, P., Meredieu, C., & De Coligny, F. (2012). Capsis: an open software framework and community for forest growth modelling. *Annals of forest science*, 69(2), 221-233.
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Courbaud, B., Lafond, V., Lagarrigues, G., Vieilledent, G., Cordonnier, T., Jabot, F., & de Coligny, F. (2015). Applying ecological model evaluation: Lessons learned with the forest dynamics model Samsara2. *Ecological Modelling*, 314, 1-14. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0304380015002884>.
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