**Subject title:**

Integrative modelling of thinning effects on tree water status and vulnerability to cavitation in Atlas cedar plantations

**Postdoc contract duration (in the event fund application is successful):**

12 months or less, as it must end in 2022.

**Host laboratory:** Ecologie des Forêts Méditerranéennes (URFM), INRAE, Avignon, France

**Summary:**

Using thinning to decrease tree density is one of the main recommendations to adapt forest management to warmer and drier climates. Thinning reduces competition for light and water between the remaining trees, which leads to both better growth and better water status. Thinning also leads to a less favorable micro-climate within the canopy. The *in-situ* observed result of those antagonistic effects is almost universally positive, but fades as the stand foliage regrows. Yet, some studies show that a positive effect on tree water status is still measurable a long time (>20 years) after thinning occurred. Such is the case of Atlas cedar plantations at Valliguières (Gard), even though the leaf area index is similar for all thinning levels.

This postdoc project has two goals: 1) explain the long term positive effect of thinning on tree water status at Valliguières, and 2) characterize the extend to which the negative effect of degrading micro-climate with thinning could become more prominent with climate warming. The work will make use of a process-based model, NOTG, which is individual-based and spatially explicit. This model is able to take into account the changes in the canopy spatial structure created by thinning, and, coupled with hydraulic processes, to predict the consequences of altered micro-climate on tree water status and vulnerability to cavitation.

**Required skills and education:**

- holding a PhD in a field related to the subject (ecology, plant physiology, bio-geochemistry);
- strong knowledge of plant ecophysiology, in particular of plant function at the soil-plant and leaf-atmosphere interfaces;
- experience in process-based modelling;
- ability to present and write scientific results in English.

**Other skills that could be beneficial:**

- experience in C++ programming;
- experience in using a spatially explicit model;
- knowledge of forest management;
- research experience on Mediterranean ecosystems and/or on drought effects on trees.

**Additional information:**

About the NOTG model:

Simioni G, Marie G, Huc R. 2016. Influence of vegetation spatial structure on growth and water fluxes of a mixed forest: Results from the NOTG 3D model. Ecological Modelling 328:119–135.

About the Valliguières experimental plantation (in french):

Courbet F, Martin-StPaul N, Simioni G, Doussan C, Ladier J, Badel E. 2019. Agir sur la sensibilité à la sécheresse par la sylviculture. Forêt-Entreprise 249:46-48.

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