



**HAL**  
open science

## **ALEA: A software for integrating analysis and simulation tools for 3D architecture and ecophysiology**

Christophe Pradal, Nicolas Donès, Christophe Godin, Pierre Barbier De Reuille, Frédéric Boudon, A. Adam, Hervé Sinoquet

### ► To cite this version:

Christophe Pradal, Nicolas Donès, Christophe Godin, Pierre Barbier De Reuille, Frédéric Boudon, et al.. ALEA: A software for integrating analysis and simulation tools for 3D architecture and ecophysiology. 4th International Workshop on Functional-Structural Plant Models, 2004, Montpellier, France. pp.406, 2004. hal-00830075

**HAL Id: hal-00830075**

**<https://inria.hal.science/hal-00830075>**

Submitted on 4 Jun 2013

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

---

## ALEA: A software for integrating analysis and simulation tools for 3D architecture and ecophysiology

Christophe Pradal<sup>1</sup>, Nicolas Dones<sup>2</sup>, Christophe Godin<sup>1</sup>, Pierre Barbier de Reuille<sup>1</sup>, Frédéric Boudon<sup>1</sup>, Boris Adam<sup>2</sup>, Hervé Sinoquet<sup>2</sup>

<sup>1</sup>UMR AMAP, Montpellier France, <sup>2</sup>UMR PIAF, Clermont Ferrand, France

---

In several circumstances, and in particular at the first workshop on functional-structural models held in Helsinki, December 1996, the fact that the plant structure-function modelling community should have a coordinated effort in the development of data standards, tools and software was underlined. The **ALEA** project, initially sponsored by the Réseau d'Ecophysiologie de l'Arbre from INRA, aims at providing modellers and biologists with a homogeneous software platform, integrating various tools and models for studying plant architecture and its development. This platform is intended to have the following features:

- It should allow the integration of tools and models that currently exist in different laboratories within a unique software framework. These modules, possibly written in different languages (C, C++, Fortran, ...) should be integrated in ALEA without rewriting them.
- It should provide a set of general-purpose tools (3D plant representation, data structure standards, ...) that can be reused by every modeller.
- It should provide a common high-level language interface to all tools and models.
- It should provide an open-software kernel, developed by a community of people from interested institutes;
- It should define a user-friendly graphic interface to the different modules.
- It should be available on Linux and Windows operating systems.
- It should be able to communicate with other main softwares about plant architecture (like L-Studio, Grogra, Lignum, ...)

The first kernel of ALEA was developed in 2003. It is based on the Python language (<http://www.python.org>) that aims at being both a "glue" language for the different modules and an efficient modelling language for developing new models and tools. ALEA currently includes the following modules:

- **AMAPmod**, analysis of plant architecture developed by C. Godin, Y. Guédon et al. at UMR AMAP, Montpellier, France
- **RATP**, radiative transfer, transpiration and photosynthesis developed by H. Sinoquet at UMR PIAF, Clermont-Ferrand, France
- **Archimed**, contains several models of ecophysiology, developed by J. Dauzat at UMR AMAP, integrated in ALEA by C. Pradeille, Montpellier, France
- **Canestra**, radiative transfer, developed by M. Chelle and integrated in ALEA by H. Autret, at INRA Paris-Grignon,
- **PlantGL** (Plant Geometric Library), a 3D geometric library dedicated to plant architecture representation, developed by F. Boudon, C. Pradal, et al. at UMR AMAP, Montpellier, France
- **A user-friendly graphic interface**, centered on 3D vegetal scene interaction, developed by Nicolas Dones, Boris Adam, Christophe Pradal et al. at UMR PIAF, Clermont-Ferrand, France.

Integration of other modules and development of connections with other software are planned in 2004.