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Project No 0902-003 Completed

Project title: International Workshop on Tree Stability Modelling
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Unit managing the project: AMAP (Botany and computational plant architecture) [CIRAD, INRA, IRD, UMII, CNRS]

Project leaders: Thierry Fourcaud [thierry.fourcaud(a)cirad.fr] (AMAP) and Tancrede Almeras (LMGC)

Countries involved in the project: United Kingdom, Canada, Finland

Subthematic axes: IPB-1 (Integrative Plant Biology 1: *Genetics and genomics, plant breeding, ecophysiology*)

Objectives:

Tree stability to high winds is a major socio-economic and environmental question because of the increased frequency of extreme weather events (storms, hurricanes, etc.) related to climate change. Research conducted over many years in this area was so far limited to particularly sensitive areas (North of the UK, Scandinavia, Canada). However, the damage caused by storms in recent years, particularly in Europe, has generated renewed interest in these issues by extending the international scientific community working on the stability of forest stands. An international group of researchers involved in studies on tree wind firmness was formed in 2008 with the first organization of a workshop on "tree pulling", which was held on 22 to 24 October 2008 in Edinburgh, Scotland (<http://www.forestresearch.gov.uk/fr/INFD-7DPDGA>). The goal of this first workshop was to present both different methods for testing the strength of trees *in situ* and analysis tools, and then to define standard experimental approaches to address specific problems.

UMR AMAP is now organizing the second workshop on tree stability in Montpellier (October 21-23, 2009). This is not an open event and participants (about 30) will be invited by a scientific board. This meeting aims in encouraging open discussions on standardization and genericity of tree stability models and methods of investigation, as well as in presenting software, models, and mathematical libraries during working sessions.

It will be decided about the future animation of the tree stability group (establishment of a European COST project and definition of collaborative projects). This workshop has an international character with participants from Europe (mainly France, Germany, UK, Finland, Sweden and Netherland), Canada, USA, Japan, China, Australia and New Zealand. It is complementary to more formal conferences organized on the subject, in particular the *Wind Effects on Trees* conference that will be held 13-16 October 2009 (one week before), in Freiburg, Germany.

Action carried-out and results obtained:

This workshop aimed in: (i) presenting the actual models, methods and computing tools that are available for tree stability investigations and prediction at the tree and stand scales; (ii) discussing about standardisation and integration of these methods and tools in decision support systems; (iii) deciding how to strengthen and make permanent the animation of this tree stability research network, and how to enhance and support international collaborations on this topic.

The workshop hosted 32 participants, including 3 invited speakers, from 9 different countries (Brazil, Canada, Finland, France, Germany, Italy, Japan, New Zealand, and United Kingdom). Presentations took the form of short talks (18) and software demonstrations (5). A large place was devoted to open discussions. The program was split into three main sections devoted to (i)

mechanical models of tree/stand stability; (ii) making the connexion between tree/stand growth and tree stability models; (iii) computer platforms that can host these models.

In addition, an introduction to the concepts and models of tree architecture has been presented at the beginning of the workshop. How to describing and model tree architecture, i.e. the dynamical evolution of tree topology and geometry, have been widely investigated in AMAP (the research unit which host this workshop), and we think that these concepts will help in improving approaches and models to study tree mechanical stability. An example of collaborative software development and sources sharing was also presented. At the end of these three days, a round table was organized in order to conclude this workshop and to decide about the future of this tree stability group.

Prospects for the future:

It was first decided to continue organizing regular workshops (1 per year) on the topic of wind hazards in forest. The next one will be devoted to tree acclimation and adaptation to wind and will take place in UMR PIAF, Clermont-Ferrand (France).

The group also proposed to make an European COST action that could help in animating the network and encouraging collaboration projects.

Last, we building the foundations for the development of a software platform dedicated to the simulation of wind risks in forest. This project should be further discussed within the group.

Total Agropolis Fondation funding: €4,805

Funding category(ies): Agropolis Fondation small grants (support for the organisation of high-level scientific events (conferences, seminars))

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