Capsis Project Activity : 2021 - 2022

FOREM 2022 meeting
22-23 March 2022 - Orléans

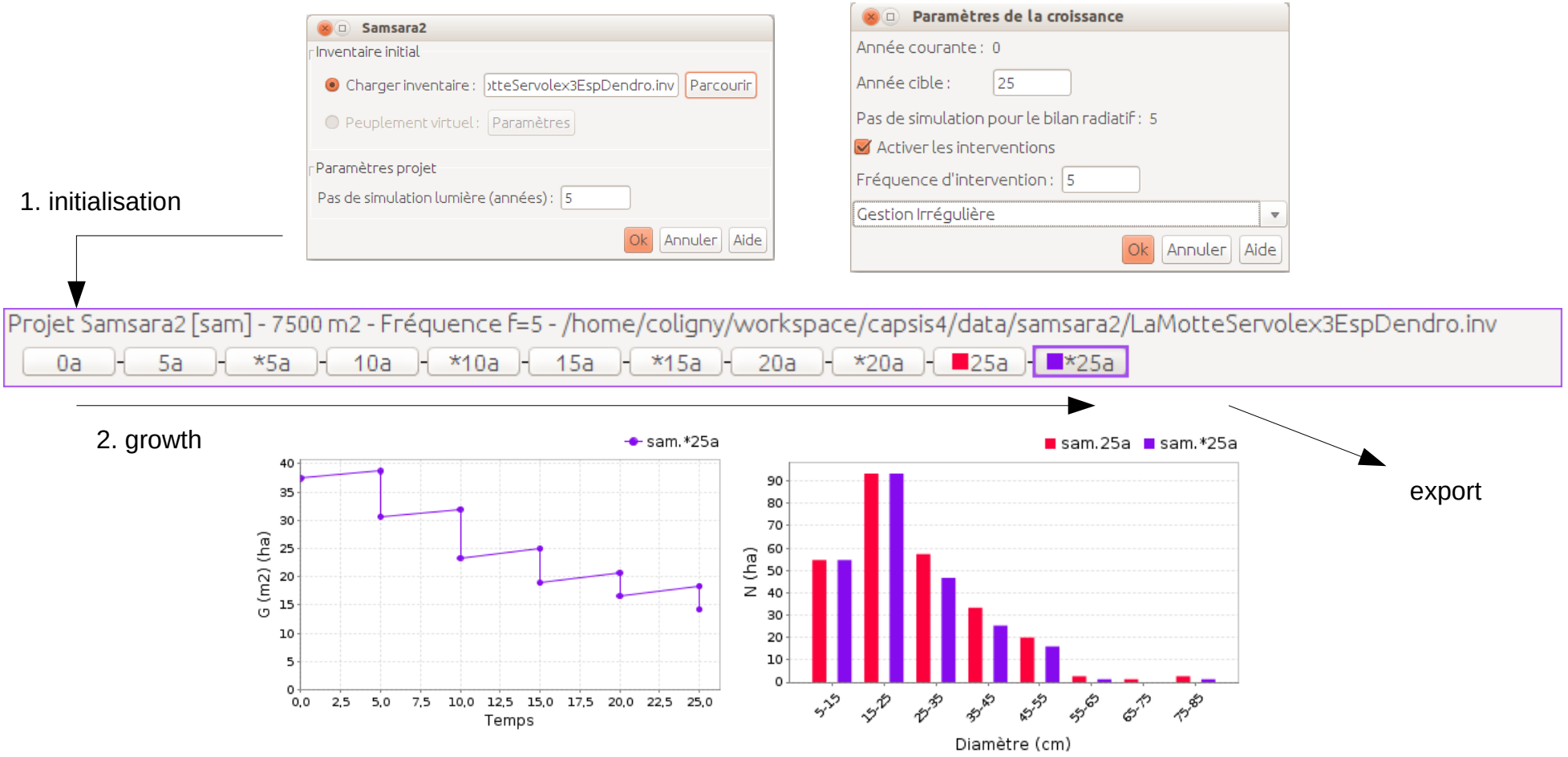
Francois de Coligny

INRAE - AMAP
botany and modelling of plants architecture and vegetations

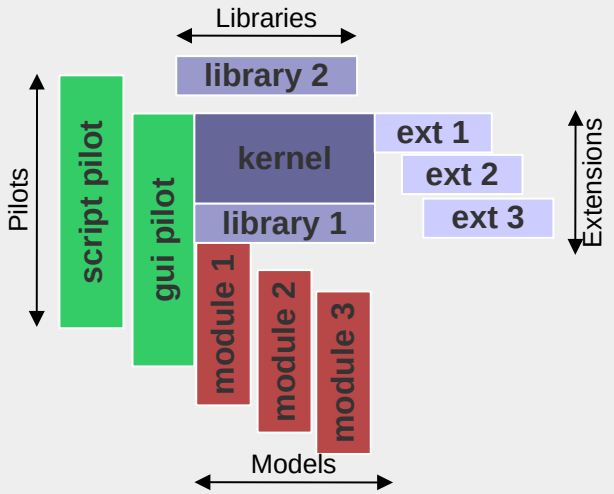
Capsis objective

Computer-Aided Projections of Strategies In Silviculture

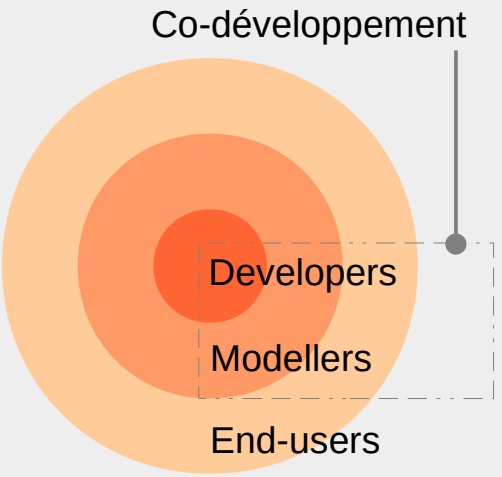
Build **a software platform** to integrate **forest growth and dynamics models** for **modellers, forest managers and training**



A co-development oriented organisation



Software architecture



Actors and roles

Free software (LGPL)

Capsis charter :
- property
- sharing with other co-developers

Clear property rules

Capsis charter

Accepted by all members

- aims at sharing and intellectual property respect
- compatible with academic and private field partners

http://www.inra.fr/capsis/charter

Capsis Charter

Main points

1. **Free kernel**: the Capsis4 kernel is a free software (LGPL licence) : kernel + generic pilots + extensions + libraries (all the capsis.* packages)
2. **Development**: the modellers are in charge of the development of their models into Capsis
3. **Support**: They can have support from the developers : training sessions, design, starting help, further assistance
4. **Free access in the community**: All the source codes are freely accessible by all members in the Capsis community, modules may become the base for new modules, code can be shared…
5. **Respect of intellectual property**: all members respect the intellectual property of the other members.
6. **Validations**: developers deal with technical validation, modellers deal with functionnal validation.
7. **Distribution**: the stabilized / validated modules may be distributed when the author decides and chooses a licence (LGPL free license suggested), possible download from a ftp site.
8. **Decentralization**: modellers manage directly the relations with their end-users: financing, training, assistance, models documentation, contracts…

To comply with the charter, the modellers may **distribute** the Capsis platform with their own modules but **NOT with the modules of the other modellers**. The modules (i.e. the growth models) are indeed not free and belong to their authors who may decide to distribute them with the license they choose. The section 4 of the charter grants access on all the modules to the modellers of the Capsis community but only to them, resulting in this distribution restriction.

Method: care for the modellers

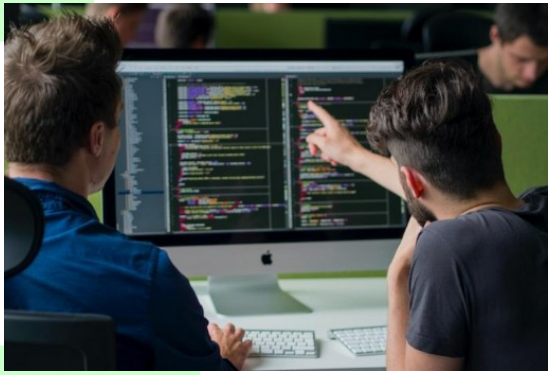
Targeted public: a modeller has designed a forestry growth model and wishes to integrate it in Capsis to get a simulator for his own objectives

- discussion
- accept the charter
- training
- immediate working session to start together
  (never start alone)

Or in video conference...

Goal: get quickly a running prototype
-> often in few days / during few weeks

Start in 'pair programming' on the same machine
-> the developer masters the technique
-> the modeller masters his model
-> the simulator is valid technically and fonctionally



The modeller can then continue by himself with simple tools...

... and a Long term support

Main activity 2021-2022

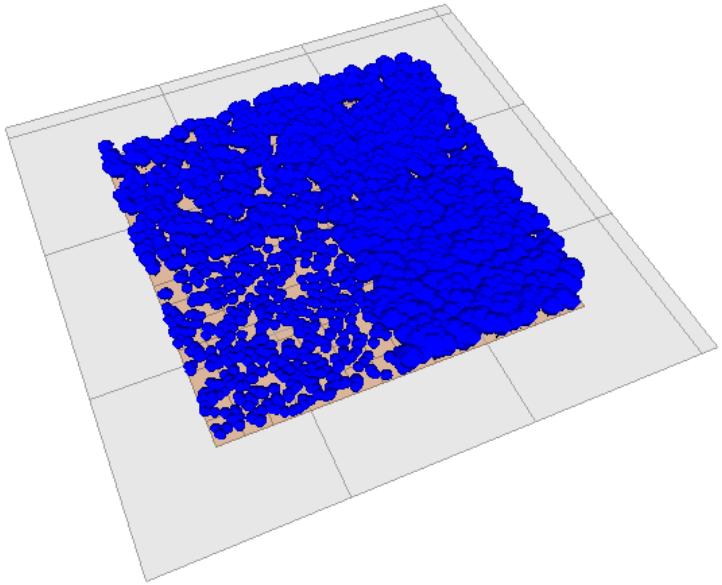
Main actions on existing projects:

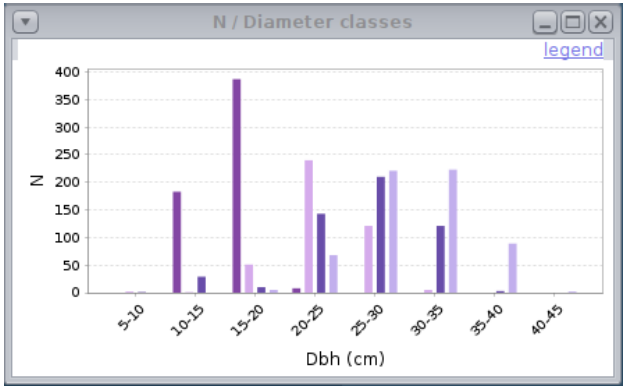
- **Luberon2** (Victor Fririon, Francois Lefèvre, INRAE URFM Avignon) (> 16 days)
- **PDGLight** (Camille Rouet, Hendrik Davi, INRAE URFM Avignon)
- **Heterofor** (Arthur Guignabert, Frédéric André, Mathieu Jonard, UCL, Belgium)
- **Sureau / planthydraulics lib** (Nicolas Martin, INRAE URFM Avignon)
- **Samsara2** (Benoit Courbaud, INRAE Lessem Grenoble)
- **Ecoaf** (Frédérique Santi, INRAE Biofora Orléans, Francois Warlop, GRAB Avignon, Fabien Liagre, Agroof Anduze)
- **Forceeps** (Xavier Morin, Freya Way, CNRS CEFE Montpellier)
- **Phenofit 4 et 5** (Isabelle Chuine, Victor Van der Meersch, CNRS CEFE Montpellier)
- **Ibasam** (Amaia Lamarins, Mathieu Buoro, INRAE Ecobiop, St Pée / Nivelle)
- **C-Stability, SimcopQual** (Julien Sainte-Marie, AgroParisTech Silva Nancy, Thomas Aiguier, INRAE Silva Nancy)
- **Woudyfor** (Florian Delerue, ENSEGID Bordeaux)

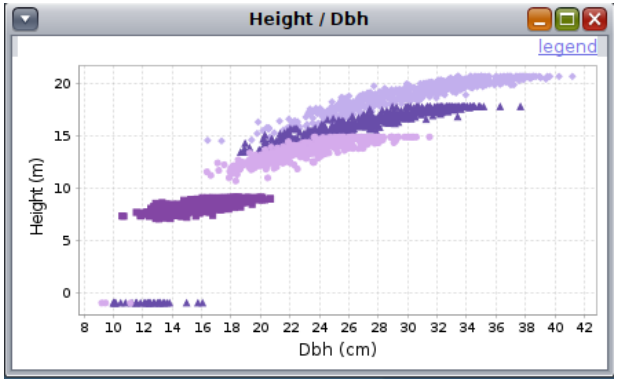
Focus - Luberon2

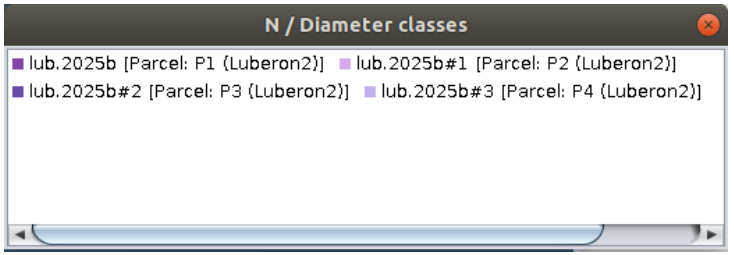
A distance-dependent tree model for Cedrus with genetics

- adapted to accept several species (was Cedrus only)
- **added Douglas** species (from Gymnos, G. Ligot, Gembloux Belgium)
- Hdom, diameter and height growth, regeneration, disturbances...
- new graphs
- adapted Gymnos thinning tools to Luberon2
- species groups auto-creation





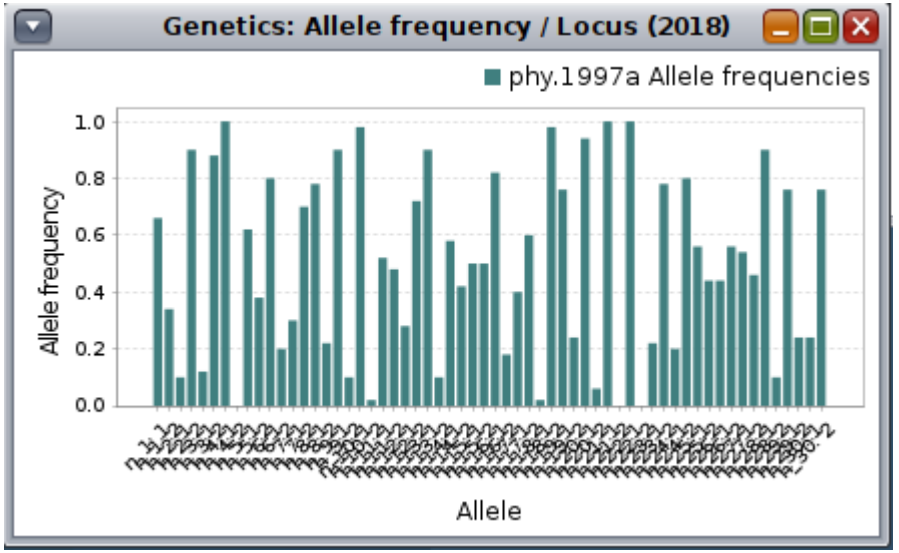


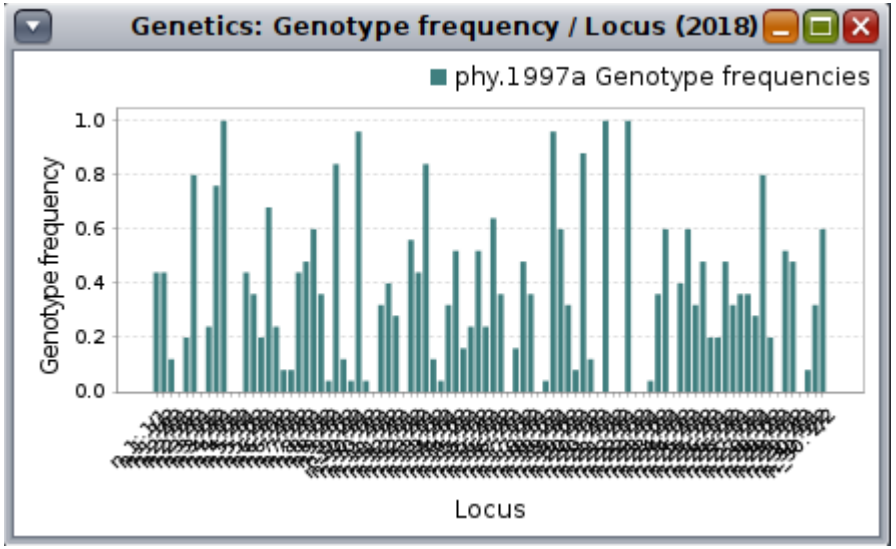


Focus - PDGLight

PhysioDemoGenetics (PDG) aims at studying the genetic adaptation through natural selection driven by climatic variables in a continuous tree population.

- Demography + Castanea + genetics + altitude
- **Adapted PDG to the SamsaraLight** radiative balance
- Implemented Legacy and Tag mode (with the help of Frédéric André) to get details during leaves unfolding and senescence

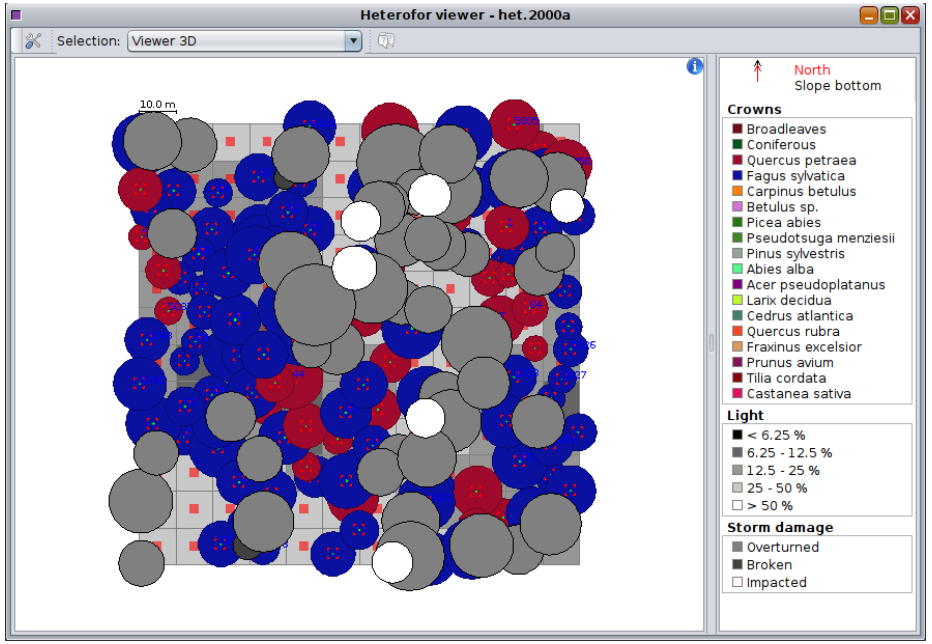


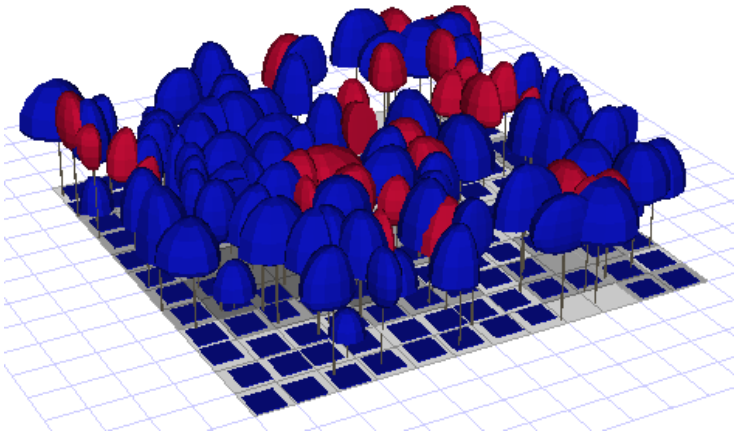


Focus - Heterofor

Heterofor is a spatially-explicit and individual-based model. The objective is to elaborate a model describing tree growth and resource use (solar radiation, water and nutrients) in heterogeneous forests (mixed and uneven-aged).

- Added a **ForestGales Tree Level** library (Nicoll et al. 2006) capsis.lib.**forestgalestreelevel2022**
- Detect wind gusts from the climate file, with a direction and a strength
- Apply it to the scene, find falling trees (broken or uprooted)
- Report their impact: neighbouring trees may fall too
- Added **ungulate browsing**
- Adapted to the **capsis.lib.regeneration understorey**

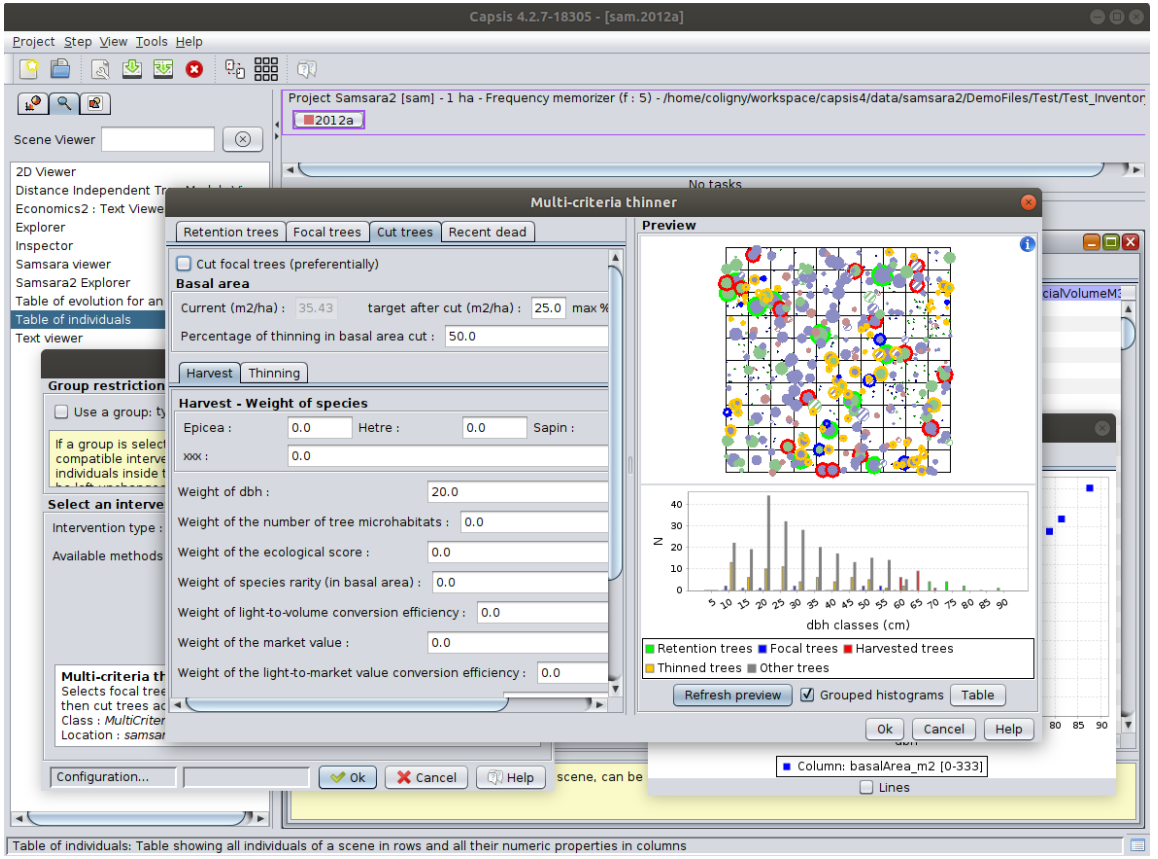




Focus - Samsara2

A Distance-Dependent Tree Model for several mountain species (Spruce, fir, broadleaved…)

- Adapted by Samuel Quevauvillers to the **SamsaraLight library** (now parallel)
- Adapted by Samuel Quevauvillers to the **regeneration library** (Ph. Balandier)
- More features in the **Multi criteria thinner** (harvest / thinning, histograms, more variables...)
- Upgraded the **species id** management, not in sequence any more, more stable

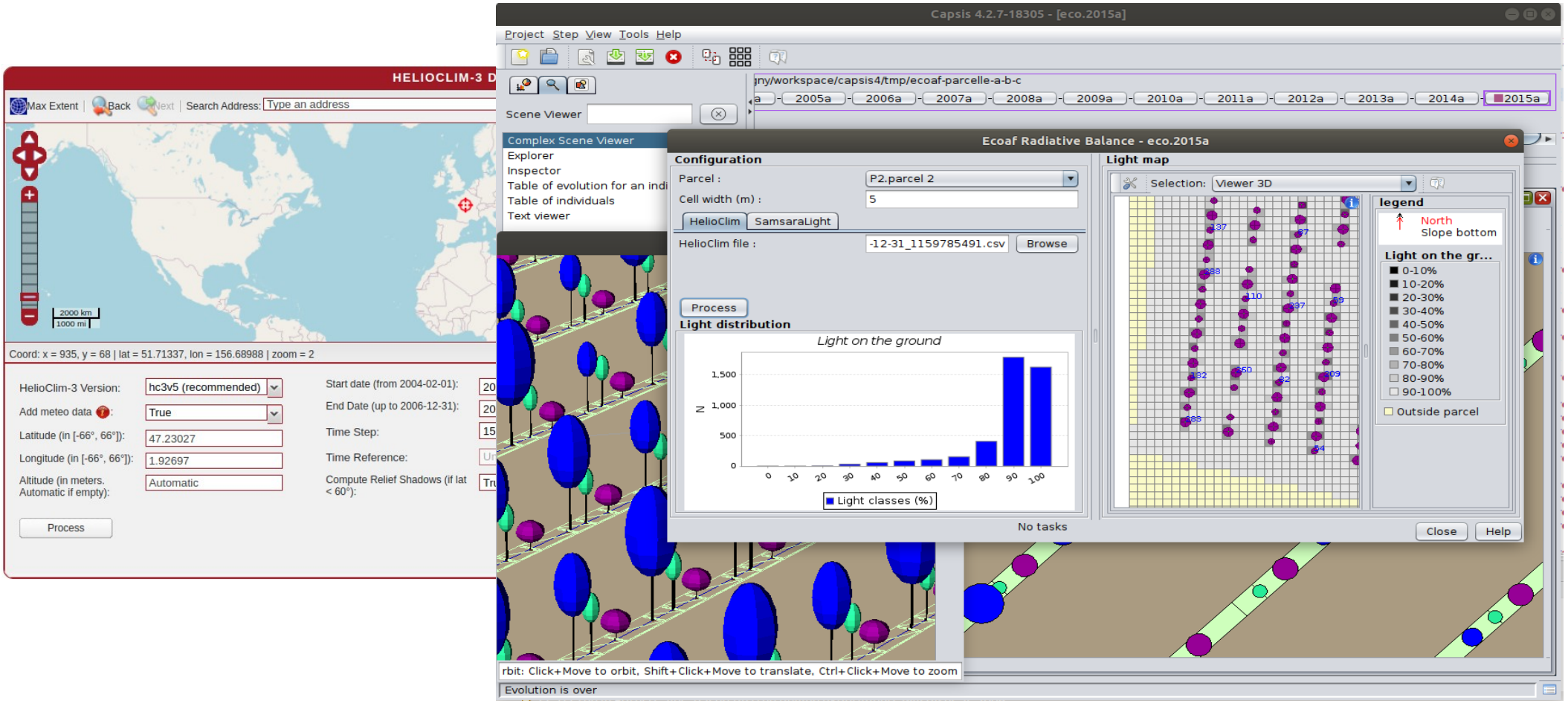


Frédérique Santi, INRAE Biofora Orléans, Francois Warlop, GRAB Avignon, Fabien Liagre, Agroof Anduze

Focus - Ecoaf

An Agroforestry model

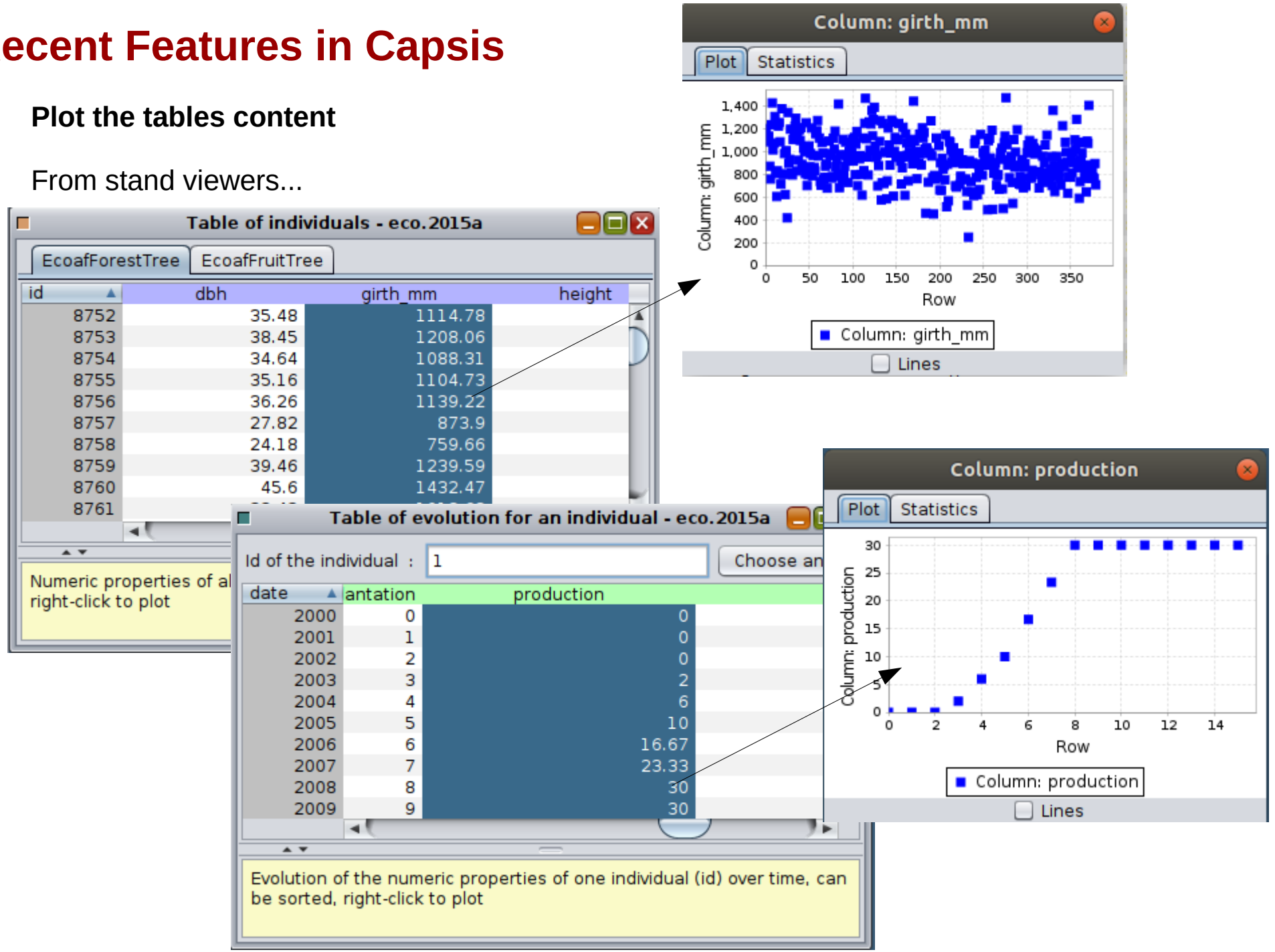
- Species production over time graph
- Production export
- Possible to run a **SamsaraLight simulation** on a given parcel
- The plot **radiative conditions are picked from the HelioClim / Soda website**



Recent Features in Capsis

Plot the tables content

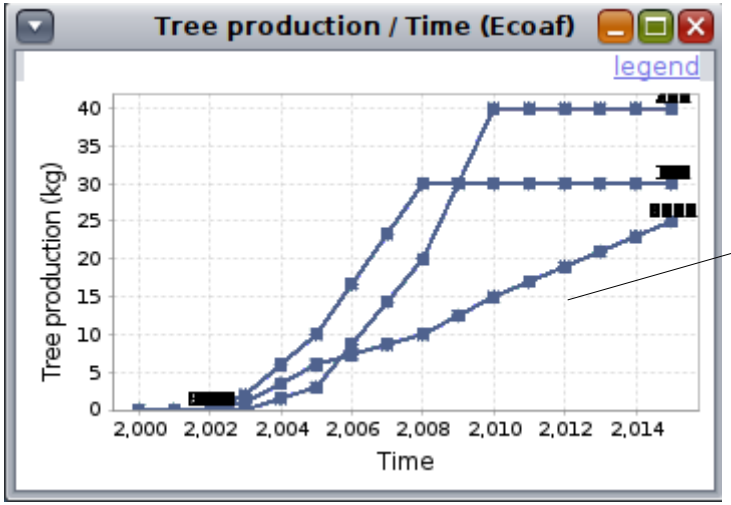
From stand viewers...

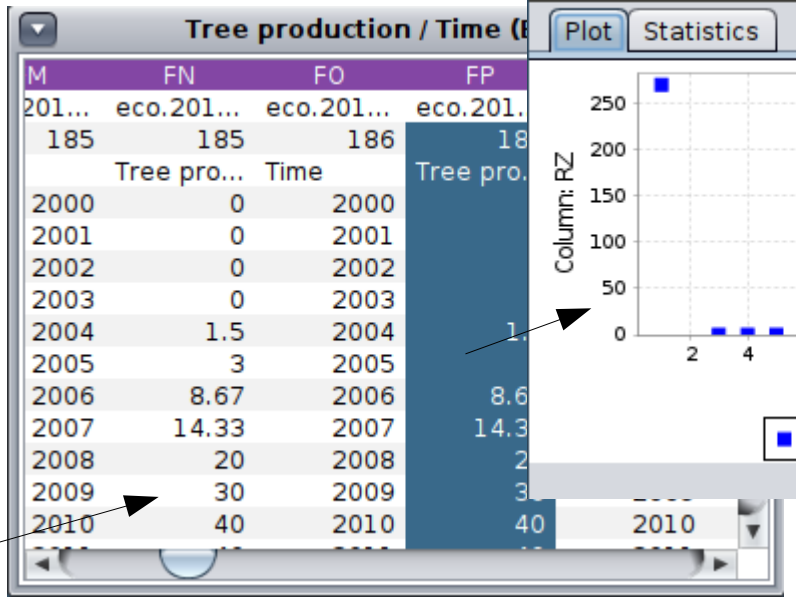


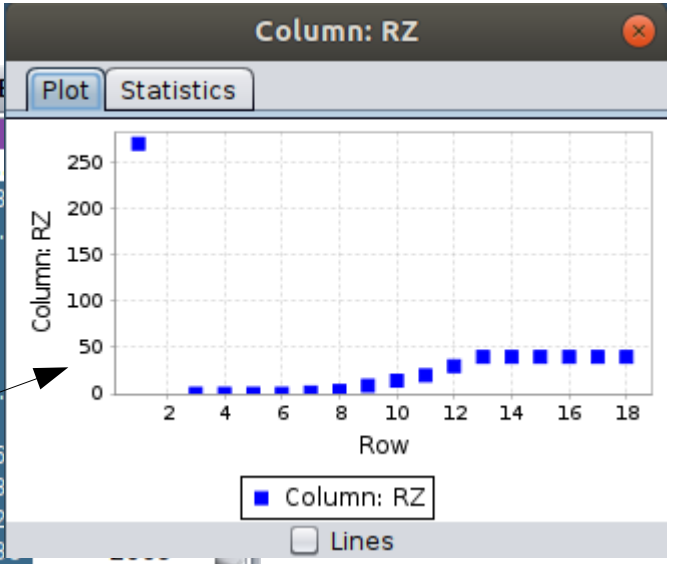
New Features in Capsis

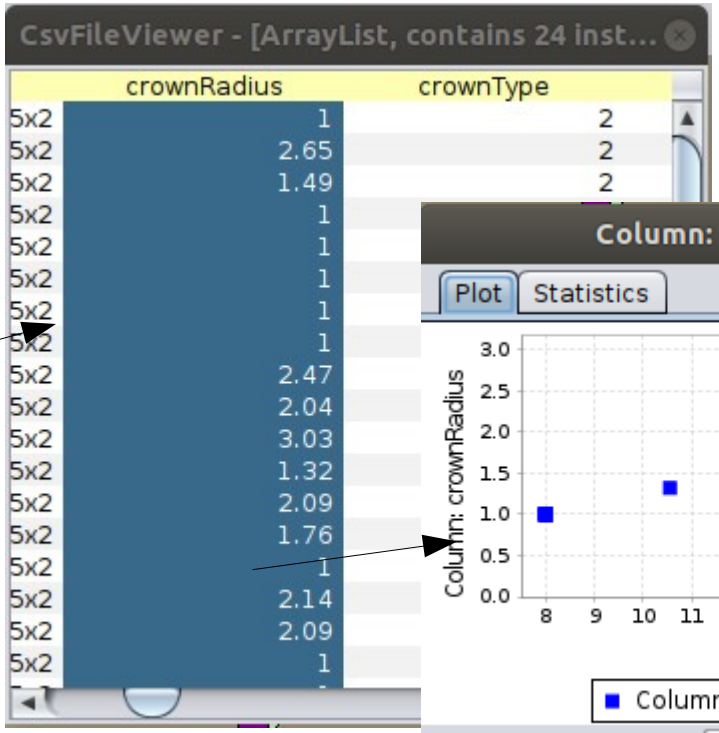
Plot the tables content

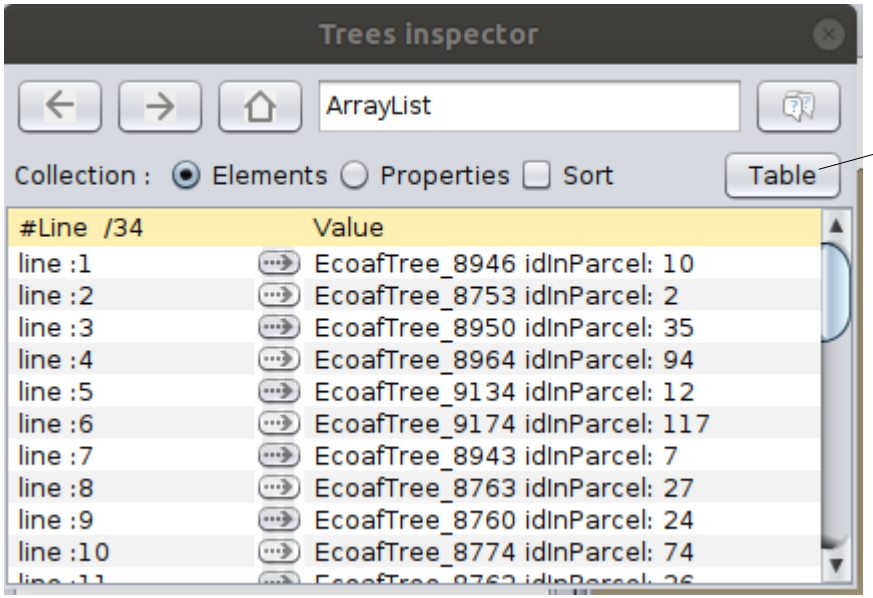
From graphs and lists in inspectors...

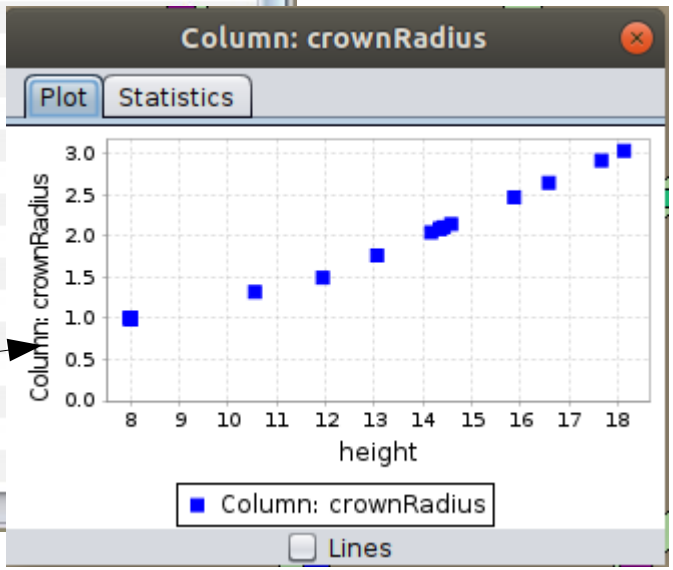








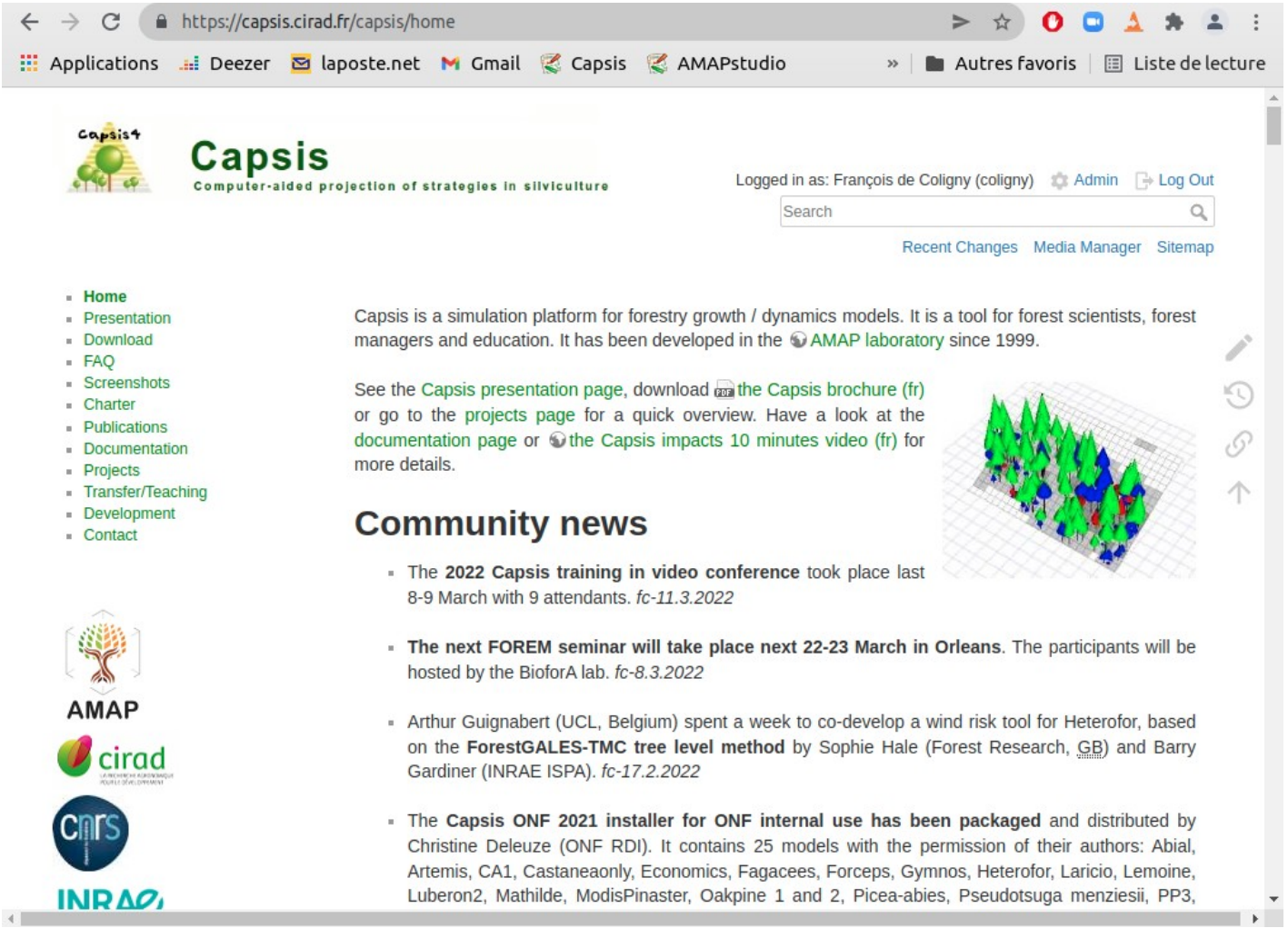




Capsis web site upgrade

Upgrade required for security reasons -> https://

- A new version of Dokuwiki
- Restored access with the 'Capsis login' (Redmine login data base)
- Moved to a new Cirad virtual machine (no change for users)
- With the key help of Philippe Verley (IRD AMAP)



With the help of Philippe Verley (IRD AMAP)

Capsis Training Sessions

8-9 Mach 2022 : 9 people
Online supports and exercices
Video conference mode

Capsis
Computer-aided projection of strategies in silviculture

Sitemap Login

- Home
- Presentation
- Download
- FAQ
- Screenshots
- Charter
- Publications
- Documentation
- Projects
- Transfer/Teaching
- Development
- Contact

The Capsis training online

fc-January 2021

This is an online version of the supervised exercises within the Capsis training, built to better fit the training by video conference.

- The Capsis training online
- Installation, video links and organisation
- The java exercises online (first afternoon)
- The Capsis exercises online (second afternoon)

Note: this training online material is part of the annual session of the Capsis training course, for registered modelers or students.

Installation, video links and organisation

Before d-day, please see the installation section below:

- 0. Installation

On d-day, video conference links (will be updated):

- **Foxtrot** video (**F**rancois), click or copy this link in your browser: https://meet.google.com/quf-jrru-uxw
- **Papa** video (**P**hilippe) click or copy this link in your browser: https://meet.google.com/ces-eznb-mbi
- **Golf** shared document (**G**oogle Doc) editable by all (hopefully) click here

In the morning, **everybody connects to the Foxtrot** video conference for the courses. In the afternoon, we will start on Foxtrot, then some may switch to Papa.

Problems:

- I'm lost, I don't remember where to go… → go to the Foxtrot video link upper, will always stay open (hopefully)
- I can not connect to this video link
  - try with **another browser** (Chrome, Firefox…)
  - try **from your phone** (if it is smart enough), you might join us this way and you could download the presentation pdfs on your computer to follow the courses

AMAP cirad cnrs INRAE IRD

The java exercises online (first afternoon)

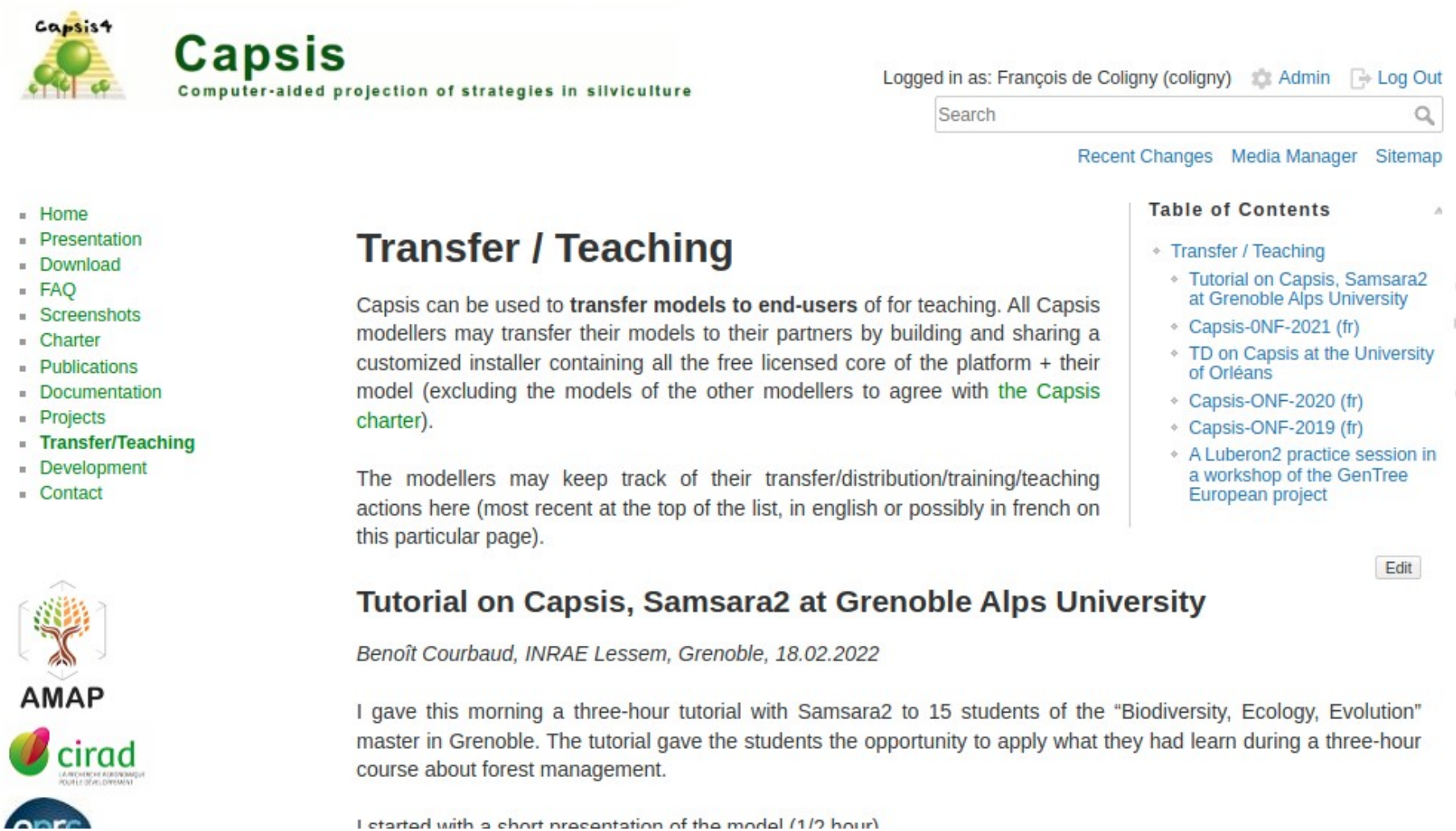
- 1. Create a minimal program
- 2. Create a Tree class
- 3. Create a SpatializedTree class
- 4. Add instance variables in the tree
- 5. Add methods in the tree
- 6. Write a method to create a list of trees
- 7. Write the trees in a file
- 8. Pass parameters on the command line

The Capsis exercises online (second afternoon)

- 10. Create a new module in Capsis called training
- 11. Random regeneration
- 12. Mortality
- 13. Add a geometrical plot made of square cells
- 14. Make a graph: N / Time
- 15. Script
- 16. Regeneration around the mothers

Transfer 1/2

The Capsis transfer page : https://capsis.cirad.fr/capsis/transfer



Transfer 2/2

The **Capsis-ONF-2021** distribution

- packaged by Christine Deleuze (ONF RDI) in January 2022
- **25 modules in 2021** : abial, artémis, CA1, castaneaonly, economics, fagacees, forceps, gymnos, heterofor, laricio, lemoine, luberon2, mathilde, modispinaster, oakpine 1 et 2, picea-abies, pseudotsuga menziesii, pp3, regix, salem, samsara2, sydy, sylvestris and simcop

Direction Forêt et Risques Naturels – Département RDI

Tel : 06 10 33 10 47, Mél : christine.deleuze@onf.fr

Objet :	🕮	**CR d'installeur Capsis ONF 2021 version 4.2.6**
Date :		31 janvier 2022
Rédacteur :	✎	Christine Deleuze
Destinataires :		DFRN-RDI, Thierry Sardin, Médéric Aubry, Fabrice Coq, Marie-Claire Maréchal, Anna Schmitt, Paul Del-Rey, Stéphane Dumas, Francis Maugard, Denis Feuillerat, Pauline Delord, Sébastien Laguet, tous les développeurs CAPSIS participants et François de Coligny !

Dossier partagé : PartageRDI\04-Outils\06-Capsis\Capsis_ONF2021

Publication

The Capsis Publication page, 2022, extract :

Delalandre L., Gaüzère P., Thuiller W., Cadotte M., Mouquet N., Mouillot D., Munoz F., Denelle P., Loiseau N., Morin X. and Violle C. **2022**. Functionally distinct tree species support long-term productivity in extreme environments. **Proc. R. Soc. B.** 289:20211694 http://doi.org/10.1098/rspb.2021.1694

de Wergifosse, L., André F., Goosse, H., Boczon, A., Cecchini, S., Ciceu, A., Collalti, A., Cools, N., D'Andrea, E., De Vos, B., Hamdi, R., Ingerslev, M., Alban Knudsen, M., Kowalska, A., Leca, S., Matteucci, G., Nord-Larsen, T., GM Sanders, T., Schmitz, A., Termonia, P., Vanguelova, E., Van Schaeybroeck, B., Verstraeten, A., Vesterdal, L., Jonard, M., **2022**. Simulating tree growth response to climate change in structurally diverse oak and beech forests. **Science of The Total Environment**, Volume 806, Part 2, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2021.150422.

Aussenac R., Pérot T., Fortin M., de Coligny F., Monnet J-M., Vallet P. **2021**. The Salem simulator version 2.0: a tool for predicting the productivity of pure and mixed forest stands and simulating management operations. **Open Research Europe 2021**, 1:61, accepted (https://open-research-europe.ec.europa.eu/articles/1-61)

André, F., de Wergifosse, L., de Coligny, F., Beudez, N., Ligot, G., Gauthray-Guénet, V., Courbaud, B., Jonard, M., **2021**. Radiative transfer modeling in structurally-complex stands: towards a better understanding of parametrization. **Annals of Forest Science**, (2021) 78:92, https://doi.org/10.1007/s13595-021-01106-8, view

Jourdan, M., Cordonnier, T., Dreyfus, P., Riond, C., de Coligny, F., Morin, X, **2021**. Managing mixed stands can mitigate severe climate change impacts on French alpine forests. **Regional Environmental Change**, Springer Verlag, 2021, 21 (3), ⟨10.1007/s10113-021-01805-y⟩. ⟨hal-03349111⟩

Costa, P., Cerveira, A., Kašpar, J., Marušák, R., Fonseca, T.F. **2021**. Forest Management of Pinus pinaster Ait. in Unbalanced Forest Structures Arising from Disturbances—A Framework Proposal of Decision Support Systems (DSS). **Forests** 2021, 12, 1031. https://doi.org/10.3390/f12081031

Cochard, H., Pimont, F., Ruffault, J., Martin-StPaul, N. **2021** . SurEau: a mechanistic model of plant water relations under extreme drought. **Annals of Forest Science** 78, 55 (2021). https://doi.org/10.1007/s13595-021-01067-y

Serrano-León H, Ahtikoski A, Sonesson J, Fady B, Lindner M, Meredieu C, Raffin A, Perret S, Perot T, Orazio C, **2021**. From genetic gain to economic gain: simulated growth and financial performance of genetically improved Pinus sylvestris and Pinus pinaster planted stands in France, Finland and Sweden. **Forestry: An International Journal of Forest Research**. https://doi.org/10.1093/forestry/cpab004

Conclusions

- A request ro replace Nicolas Beudez has been resent
- Continuing work in video conference with the modellers on a routine basis, 2 to 4 days per week
- Video training with online support for the exercises

Thanks for your attention