

# Ghislain Vieilledent

*Ecology – Applied Statistics*

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born in 1979 in Nantes (FR)



CV updated on March 28, 2023.

## Positions

- 2019 – pres. **Research scientist**, *Cirad, UMR AMAP*, Montpellier (France), Study of tropical forests.
- 2015 – 2018 **Seconded National Expert (SNE)**, *European Commission, Joint Research Center*, Ispra (Italie), Modelling and forecasting anthropogenic deforestation in the tropics.
- 2009 – 2012 **Detached researcher in Madagascar**, *Cirad, dP Forêts et Biodiversité*, Antananarivo (Madagascar), Functioning and conservation of tropical forest ecosystems in Madagascar.
- 2009 – 2018 **Research scientist**, *Cirad, UPR Forêts et Sociétés*, Montpellier (France), Study of tropical forests.

## Research topics

**Climate change and tropical forests.** Anticipating the impact of climate change on tropical forests and assessing the role of tropical forests in the global carbon cycle.

**Community ecology.** Explaining the distribution of tree species and their coexistence through the analysis of tropical forest inventory data and the use of theoretical models.

**Sustainable management of tropical forests.** Improving the realism of forest dynamics models so that they can be used for forest management.

**New statistical methods for ecology.** Developing new statistical approaches and computer tools to answer new questions in ecology.

## Background and diploma

- 2006 – 2009 **Cemagref de Grenoble (now INRAE), AgroParisTech.** *PhD thesis.* Structuring uncertainty and variability in allometric and demographic functions used in forest dynamics models to identify coexistence mechanisms of tree species in the mountain forests of the Alps.
- 2004 – 2006 **Chambre d'Agriculture de la Lozère, CLAPE-LR, FREDEC-MP.** Engineer in agronomy in charge of agronomic and environmental studies.
- 2003 – 2004 **National Museum of Natural History (MNHN), INA-PG, Paris VII.** *Master.* "Environment: natural areas, technics, and societies". Conservation and sustainable development.
- 2001 **Escuela Técnica Superior de Ingenieros Agronomos y Montes (ETSIAM), Córdoba (Spain).** Forestry and conservation of Mediterranean habitats.
- 2000 – 2003 **Ecole Nationale Supérieure Agronomique de Rennes (ENSAR).** *Diploma of Engineer in Agronomy.* Agronomy, quantitative ecology, and biodiversity conservation.
- 1996 – 1999 **Lycée Georges Clémenceau, Nantes.** 1997 – 1999: Student in preparatory classes BCPST (biology and mathematics). 1996 – 1997: Baccalauréat S with a major in mathematics.

## Programming and foreign languages

**Programming** R, Python, C/C++, Bash, SQL

**GIS** GRASS GIS, QGIS

**OS** Linux (Debian)

**English** Very good level reading, writing, and speaking. Two-month stay in North Carolina (Duke University).

**Spanish** Very good level reading, writing, and speaking. Six-month stay both in Spain and Peru.

**Italian** Good level reading, writing, and speaking. Detached researcher in Italy for three years.

## Research projects

Since 2009: coordination of 3 scientific projects, in charge of work-packages for 1 project, participation in 4 other projects, and 6 consultancy works.

📄 Complete description: <https://ecology.ghislainv.fr/research.html#projects>.

### Project coordination

- 2020 – 2023 **METRADICA**, Mechanistic traits to predict shifts in tree species abundance and distribution with climate change in the Amazonian forest, **Labex CEBA**, 200,000 €. <http://www.labex-ceba.fr/projets-strategiques>
- 2020 – 2022 **INTRACO**, Role of intraspecific variability in tree species coexistence in tropical forests, **FRB-Cesab – sDiv**, 4 international workshops (~ 40,000 €). Webpage on Cesab's website.
- 2014 – 2019 **BioSceneMada**, Biodiversity scenarios under the effects climate change and deforestation in Madagascar, **FRB – FFEM**, 116,748 €. <https://bioscenemada.cirad.fr>

### In charge of work-packages

- 2019 – 2022 **RELIQUES**, Effect of forest fragmentation on biodiversity in ultramafic forests of New-Caledonia, **CNRT**, 251,380 €. Coordination: Philippe Birnbaum (Cirad, UMR AMAP). <https://cnrt.nc/reliques>

### Participation in projects

- 2023 – 2026 **EDENE** project, "Ecological Dynamics behind species Extinctions in Novel Ecosystems", **ANR**, 302,165 €. Coordination: Robin Pouteau (IRD, UMR AMAP).
- 2022 – 2025 **ALT** project, "Amazonian Landscapes in Transition", **ANR**, 659,799 €. Coordination: Jérôme Chave (CNRS, University of Toulouse).
- 2022 – 2025 **GUARDEN** project, "safeGUARDing biodiversiTy aNd critical ecosystem services across sectors and scales", **European Union**, Horizon Europe, 4.5M €. Coordination: Pierre Bonnet (Cirad, UMR AMAP).
- 2019 – 2023 **GAMBAS** project, "Generating Advances in Modeling Biodiversity And ecosystem Services (GAMBAS): statistical improvements and ecological relevance of joint species distribution models", **ANR**, 569,033 €. Coordination: Frédéric Mortier (Cirad, UPR Forêts et Sociétés).

### Consultancy works

- 2023 Validation of global forest cover change maps in New Caledonia for the periods 2000–2010–2020 using photo-interpretation, **Oeil**, 12,000 €.
- 2022 Developing the **riskmapjnr** Python package for obtaining maps of deforestation risk following the JNR (Jurisdictional Nested REDD+) methodology, **FAO**, 28,000 €.
- 2012 – 2013 Technical assistance to Office National pour l'Environnement for implementing REDD+ in Madagascar, **AFD**, 290,210 €.
- 2012 Forest inventories and development of height-diameter allometric equations for Madagascar dry forests, **WWF**, 3500 €.
- 2011 – 2012 Modelling deforestation (intensity and location of the deforestation) in Madagascar, **GoodPlanet**, 9000 €.
- 2010 – 2011 Developing biomass allometric equations for Madagascar forests, **WWF – GoodPlanet**, 8750 €.

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## Software development

Since 2009: Development and maintenance of 4 R packages and 3 Python packages. Contribution to 1 R package. Provision of 70 public GitHub repositories and 6 Cirad Dataverse repositories.

📁 Complete description: <https://ecology.ghislainv.fr/software.html>.

### R packages

- gecevar** The **gecevar** package extracts climatic or other environmental variables (topography, soils) from various online datasets for any region of interest and resolution ( $\geq 250\text{m}$ ) specified by the user. <https://ecology.ghislainv.fr/gecevar>
- jSDM** The **jSDM** package provides functions for estimating parameters of joint species distribution models. <https://ecology.ghislainv.fr/jSDM>
- hSDM** The **hSDM** package allows estimating parameters of hierarchical Bayesian species distribution models. <https://ecology.ghislainv.fr/hSDM>
- twoe** **twoe** (2e) is the name of an R package and a Capsis module for estimating demographic parameters of tree species and simulating forest dynamics from permanent forest inventory plots. <https://twoe.sourceforge.net>
- MCMCpack** (contribution) Functions developed within the **MCMCpack** package allow estimating parameters of generalized linear mixed effect models (glmm). <http://cran.r-project.org/package=MCMCpack>

### Python packages

- forestatrisk** The **forestatrisk** package provides functions to model deforestation and predict forest cover changes under various scenarios of deforestation in tropical countries. <https://ecology.ghislainv.fr/forestatrisk>
- pywdpa** The **pywdpa** package extracts informations from the World Database on Protected Areas (WDPA) for a given country. <https://ecology.ghislainv.fr/pywdpa>
- riskmapjnr** The **riskmapjnr** package provides functions to derive map of the deforestation risk following the JNR (Jurisdictional Nested REDD+) methodology. <https://ecology.ghislainv.fr/riskmapjnr>

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## Teaching and supervision

Since 2009: 2 post-docs (+ 2 in collaboration), 4 PhD students (+3 in collaboration), 14 Master students.

📁 Complete description: <https://ecology.ghislainv.fr/people.html>.

- 2019 Using species distribution modelling for predicting their vulnerability to climate change. Capacity building workshop. Students, technicians, and engineers. Campus Numérique Francophone. Antananarivo (Madagascar). 2d.
- 2018–2019 Modelling and forecasting deforestation in the tropics. Capacity building workshop. Students, technicians, and engineers. CeRSAE FOFIFA and Campus Numérique Francophone. Antananarivo (Madagascar). 5d.
- 2012 Statistical regressions and biomass allometric models. Learning how to use the R software. Capacity building workshop. Students, technicians, and engineers. Office National pour l'Environnement. Antananarivo (Madagascar). 3.5d.
- < 2009 Theoretical models in ecology. Theoretical classes. Master students in Biology, Ecology, and Environment. University Joseph Fourier. Grenoble (France). 3h.
- < 2009 Theoretical models in ecology. Practical work. Solving systems of differential equations for studying species coexistence mechanisms. Master students in Biology, Ecology, and Environment. University Joseph Fourier. Grenoble (France). 16h.
- < 2009 Forest dynamics models. Practical work. Learning how to use the Capsis software with the Samsara module. Master students. FIF-ENGREF. Nancy (France). 4h.

## Scientific publications

Since 2009: 47 articles published in scientific journals, 4 pre-prints, 4 book chapters, and 3 popular science articles. H-index: 32 (GScholar), 24 (WoS).

📄 Complete list at: <https://ecology.ghislainv.fr/publications.html>.

### Selection of five publications as first author

- [5] **Vieilledent G., C. Vancutsem, C. Bourgoïn, P. Ploton, P. Verley, and F. Achard.** 2022. Spatial scenario of tropical deforestation and carbon emissions for the 21<sup>st</sup> century. *bioRxiv*, 485306. [doi: 10.1101/2022.03.22.485306]
- [4] **Vieilledent G., C. Grinand, F. A. Rakotomalala, R. Ranaivosoa, J.-R. Rakotoarijaona, T. F. Allnutt, and F. Achard.** 2018. Combining global tree cover loss data with historical national forest-cover maps to look at six decades of deforestation and forest fragmentation in Madagascar. *Biological Conservation*, 222: 189–197. [doi: 10.1016/j.biocon.2018.04.008]
- [3] **Vieilledent G., O. Gardi, C. Grinand, C. Burren, M. Andriamanjato, C. Camara, C. J. Gardner, L. Glass, A. Rasolohery, H. Rakoto Ratsimba, V. Gond, and J.-R. Rakotoarijaona.** 2016. Bioclimatic envelope models predict a decrease in tropical forest carbon stocks with climate change in Madagascar. *Journal of Ecology*, 104: 703–715. [doi: 10.1111/1365-2745.12548]
- [2] **Vieilledent G., R. Vaudry, S. F. D. Andriamanohisoa, O. S. Rakotonarivo, H. Z. Randrianasolo, H. N. Razafindrabe, C. Bidaud Rakotoarivony, J. Ebeling, and M. Rasamoelina.** 2012. A universal approach to estimate biomass and carbon stock in tropical forests using generic allometric models. *Ecological Applications*, 22(2): 572–583. [doi: 10.1890/11-0039.1]
- [1] **Vieilledent G., B. Courbaud, G. Kunstler, J.-F. Dhôte, and J. S. Clark.** 2010. Individual variability in tree allometry determines light resource allocation in forest ecosystems: a hierarchical Bayesian approach. *Oecologia*, 163(3): 759–773. [doi: 10.1007/s00442-010-1581-9]

### Selection of five publications as coauthor

- [5] **Girard-Tercieux C., I. Maréchaux, A. T. Clark, J. S. Clark, B. Courbaud, C. Fortunel, J. Guillemot, G. Kunstler, G. le Maire, R. Pélissier, N. Rüger, and G. Vieilledent.** 2023. Rethinking the nature of intraspecific variability and its consequences on species coexistence. *Ecology and Evolution*, 13(3): e9860. [doi: 10.1002/ece3.9860]
- [4] **Vancutsem C., F. Achard, J.-F. Pekel, G. Vieilledent, S. Carboni, D. Simonetti, J. Gallego, L. E. O. C. Aragão, and R. Nasi.** 2021. Long-term (1990–2019) monitoring of forest cover changes in the humid tropics. *Science Advances*, 7: eabe1603. [doi: 10.1126/sciadv.abe1603]
- [3] **Strona G., S. D. Stringer, G. Vieilledent, Z. Szantoi, J. Garcia-Ulloa, and S. A. Wich.** 2018. Small room for compromise between oil palm cultivation and primate conservation in Africa. *Proceedings of the National Academy of Sciences (PNAS)*, 115: 8811–8816. [doi: 10.1073/pnas.1804775115]
- [2] **Kunstler G., D. Falster, D. Coomes, F. Hui, R. Kooyman, D. Laughlin, L. Poorter, M. Vanderwel, G. Vieilledent, [...], and M. Westoby.** 2016. Plant functional traits have globally consistent effects on competition. *Nature*, 529: 204–207. [doi: 10.1038/nature16476]
- [1] **Chave J., M. Réjou-Méchain, A. Búrquez, E. Chidumayo, M. S. Colgan, W. B. C. Delitti, [...], and G. Vieilledent.** 2014. Improved allometric models to estimate the aboveground biomass of tropical trees. *Global Change Biology*, 20: 3177–3190. [doi: 10.1111/gcb.12629]