Ghislain Vieilledent

Ecology – Applied Statistics

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born in 1979 in Nantes (FR)

CV updated on March 27, 2023.

Positions

2009 – 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 inventory data in tropical forests 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.

2000 – 2003 **Ecole Nationale Supérieure Agronomique de Rennes (ENSAR).** *Diploma of Engineer in Agronomy.* Agronomy, quantitative ecology, and biodiversity conservation.

2001 **Escuela Técnica Superior de Ingenieros Agronomos y Montes (ETSIAM), Córdoba (Spain).** Forestry and conservation of Mediterranean habitats.

1996 – 1999 **Lycée Georges Clémenceau, Nantes.** Student in preparatory classes BCPST (biology and mathematics) (1997 – 1999). Baccalauréat S with a major in mathematics (1996 – 1997).

Programming and foreign languages

Programming languages 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, Université de Toulouse).

2022 – 2025 **GUARDEN** project, "safeGUARDing biodivErsity aNd critical ecosystem services across sectors and scales", **Union Européenne**, 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 €.

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 ($\geq$ 250m) 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 the forest cover change 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`

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: 45 articles published in scientific journals, 5 pre-prints, 4 book chapters, and 3 popular science articles. H-index: 32 (GScholar), 23 (WoS).

Complete list at: `https://ecology.ghislainv.fr/publications.html`.

Selection of five publications as first author

[5] **Vieilledent G., C. Vancutsem, C. Bourgoin, P. Ploton, P. Verley, and F. Achard.** 2022. Spatial scenario of tropical deforestation and carbon emissions for the 21st 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]