

Dr ALIENOR LAVERGNE

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My research interests: I am a young and enthusiastic research scientist working in environmental, ecological and climate sciences. My interests are centred on understanding the interactions between the terrestrial carbon and water cycles and vegetation functions under changing environmental conditions. My work combines ecological datasets from different observational scales (e.g. stable carbon and oxygen isotopic composition in tree-rings, eddy-covariance flux measurements) and vegetation models of different complexities to gain a mechanistic understanding of the key physical and biological processes at play. I enjoy bridging different scientific communities and collaborating across fields, including ecophysiology, earth system modelling and atmospheric sciences. I am open to new challenges and I like to broaden my research portfolio and to explore new research avenues.

EDUCATION

2017	Teaching qualification from the French National Council of Universities (CNU) Sections: Meteorology, Oceanography and Physical Environment (37), Solid Earth: geodynamics of upper envelopes, paleobiosphere (36) and Structure and evolution of the earth and other planets (35)
2012 – 2016	Ph. D. in Dendroisotopy/Paleoclimatology Laboratoire des Sciences du Climat et de l'Environnement, Gif-sur-Yvette, France & Instituto Argentino de Nivologia, Glaciologia y Ciencias Ambientales, Mendoza, Argentina University Paris-Saclay / University Versailles Saint-Quentin, Versailles, France
2011 – 2012	MSc. in Climatology and Environmental Sciences University Versailles Saint-Quentin, Versailles, France
2010 – 2012	Graduate in Geosciences Ecole Normale Supérieure, Paris, France
2006 – 2010	BSc. in Geosciences University Paris-Sud 11, Orsay, France

EMPLOYMENT

10/2019 – present	Research Associate (Marie Skłodowska-Curie Individual Fellow) Dept. of Physics, Imperial College London, London, UK
10/2017 – 09/2019	Research Associate (Newton International Fellow of the Royal Society) Dept. of Life Sciences, Imperial College London, Silwood Park, Ascot, UK
09/2016 – 08/2017	Research Associate / lecturer Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement, Aix-en Provence, France Aix-Marseille University, Marseille, France
09/2015 – 08/2016	Research Associate / lecturer Laboratoire des Sciences du Climat et de l'Environnement, Gif-sur-Yvette, France University of Versailles Saint-Quentin, Versailles, France
08/2012 – 09/2012	Laboratory engineer and Research Assistant Laboratoire Environnements, Dynamiques et territoires de la Montagne, Le Bourget-du-Lac, France

FELLOWSHIPS, GRANTS AND AWARDS

2019	Marie Skłodowska-Curie Individual Fellowship 838739 ECAW-ISO (MSC Actions, European Union) 2019-2021 (€212,934 for 2 years)
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2017	Newton International Fellowship NF170082 (The Royal Society, London, UK), 2017-2019 (£58,500 for 2 years)
2017/2018	Marie Skłodowska-Curie Actions Seal of Excellence award (European Union)
2016	100 Talents 2016 of L'Oréal-UNESCO For Women in Science foundation award (France)
2014/2016	Symposium grants from AFEQ CNF-INQUA (France) to participate to EGU conference (2014) and TRACE conference (2016)
2012	LEFE - PATISO (Paramètres des cernes des arbres patagoniens et indice d'Oscillation Antarctique), France, 2012-2014, PI: V. Daux, Function: main PhD researcher
2012	PhD thesis merit scholarship (UVSQ, France), 2012-2015 (€57,000 for 3 years)

AFFILIATIONS AND OTHER EXPERIENCES

- **Fellowship application symposium** (invited) organized by Department of Chemical Engineering, Imperial College London on H2020 Marie Curie Actions
- **Panel discussion speaker** (invited) at event on the IPCC Special Reports organised by the Royal Meteorological Society and Grantham Institute (London, UK) (18 November 2019)
- **Working group member** (invited) of Royal Society briefing on the IPCC Special Report on *Climate Change and Land* (London, UK) (September-November 2019)
See <https://royalsociety.org/-/media/policy/projects/climate-change/IPCC-special-report-briefing-climate-change-and-land.pdf>
- **Co-organizer of weekly Ecology and Evolution seminars** of Imperial College London's Department of Life Sciences (Silwood Park, Ascot, UK) (May 2018-August 2019)
- **Reviewer for Journals:** *Global Change Biology* (3), *New Phytologist* (1), *Journal of Geophysical Research-Biogeosciences* (1), *Geophysical Research Letters* (1), *Forest Ecology and Management* (1), *Climatic Dynamic* (1), *Climate of the past* (1), *Science of the Total Environment* (2), *Climatic Change* (1), *Forests* (2), *Dendrochronologia* (2) (2017-present)
- **Reviewer for grant applications:** Estonian Research Council (1)
- **Reviewer for book Chapter:** Tree-ring research (1)
- **Representative of non-permanent staff** (postdoctorate researchers and PhD students) at Physics Department, Imperial College London (2020-present), at LSCE (2013-2016)
- **PhD student representative** at the council of the Environmental Sciences Doctoral School (ED129, France) (2013-2015)
- **Organizer of monthly scientific seminars** of Theme 1 'Archives & Tracers' *Café des Sciences* (LSCE, Gif-sur-Yvette, France) (2014-2015)
- **Scientific volunteer facilitator:** Science Festival 2016 (Aix-en-Provence, France), Forum of Climate 2014 (Troyes, France), International forum of Meteorology 2014 (City Hall of Paris, France), Science Festival 2013 (Gif-sur-Yvette, France)
- **Membership:** American Geosciences Union (AGU, 2019-present), European Geosciences Union (EGU, 2014, 2019-present), British Ecological Society (BES, 2018-present), Association of Tree-Ring Research (ATR, 2018-2019), Association Française pour l'Etude du Quaternaire - CNF INQUA (AFEQ-CNF INQUA, 2014-2018)

RELEVANT SKILLS

- **Spoken languages:** French (*native*), Spanish (*bilingual*), English (*fluent*), Italian (*basic*)
- **Scientific writing:** Scientific papers for peer-reviewed journals. Applications for grant and fellowships. Blog articles (e.g. <https://prenticeclimategroup.wordpress.com/>)
- **Numerical and data analysis software:** R Statistics, Python, Matlab, C++, Fortran. Expertise in working with dendrochronological, meteorological, eddy-covariance and remotely-sensed datasets. Meteorological data homogenization, tree-ring data cross-dating softwares. Eddy-covariance flux data processing.
- **Computing tools:** Proficient in using Microsoft Office (Word, Excel, Power Point) and LaTeX.

- **Fieldwork:** Assisted in multiple field campaigns in Southern and Northern Patagonia (Argentina) involving the extraction of tree-ring cores, the setup of permanent meteorological stations for measuring temperature, precipitation amount or snow cover, and the installation of dendrometer sensors.
- **Laboratory experiences:** Extensive experience in preparing samples for tree-ring width measurements and stable isotope analyses (dating, cutting, milling and chemical extraction of cellulose according to the soxhlet method). High level of knowledge of stable isotopes measurements with elemental analyser coupled to a mass spectrometer.
- **Teaching and mentoring:** 4 years experienced in teaching at the university for BSc. and MSc. Levels Lead supervisor of UROP (Undergraduate Research Opportunities Programme) project from Master student Leonardo Bossi (8 weeks, summer 2020)

PEER-REVIEWED PUBLICATIONS AND CONFERENCES

Publications: Google scholar (Citations: 118; h-index: 6; i10 index: 5), Scopus (Citations: 89; h-index: 6). Update on September 15th, 2020

13. Hare, V.J. & **Lavergne, A.** (submitted) The difference in $\Delta^{13}\text{C}$ between angiosperm and gymnosperm woody plants is related to atmospheric $\text{O}_2:\text{CO}_2$ ratio, physiology, and environment: implications on geological timescales
12. Harrison, S.P., Cramer, W., Franklin, O., Prentice, I.C., Wang, H., de Boer, H., Keenan, T.F., **Lavergne, A.**, Manzoni, S., Morfopoulos, C., Rebel, K.T., Smith, N.G., Stocker, B.D., Wright, I., Brännström, Å., Joshi, J., Peñuelas, J. and Dieckmann, U. (in revision) Modelling the land biosphere: eco-evolutionary optimality and the new data-rich world
11. **Lavergne, A.**, Sandoval, D., Hare, V.J., Graven, H. and Prentice, I.C. (in press) Impacts of soil water stress on the stomatal limitation of photosynthesis: insights from stable carbon isotope data, *Global Change Biology*
10. Belmecheri, S. and **Lavergne, A.** (2020) Compiled records of atmospheric CO_2 concentration and stable carbon isotopes to reconstruct climate and derive plant ecophysiological indices from tree rings, *Dendrochronologia* **63**, 125748, <https://doi.org/10.1016/j.dendro.2020.125748>
9. **Lavergne, A.**, Voelker, S., Csank, A., Graven, H., de Boer, H.J., Daux, V., Robertson, I., Dorado-Linan, I., Martinez-Sancho, E., Battipaglia, G., Bloomfield, K.J., Meinzer, F.C., Camarero, J.J., Fang, Y., Clisby, R., Menzel, A., Still, C.J., Keen, R.M., Roden, J.S., Dawson, T.E. and Prentice, I.C. (2020) Historical changes in the stomatal limitation of photosynthesis: empirical support for an optimality principle, *New Phytologist* **225**, 6, 10.1111/nph.16314.
8. **Lavergne, A.**, Graven, H., De Kauwe, M.G., Keenan, F.T., Medlyn, B.E. and Prentice, I.C. (2019). Observed and modelled historical trends in the water use efficiency of plants and ecosystems, *Global Change Biology* **25**, 2242-2257, 10.1111/GCB.14634.
7. Daux, V., Michelot, A., **Lavergne, A.**, Pierre, M., Stievenard, M., Bréda, N. and Damesin, C. (2018). Comparisons of the performance of $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ of *F. sylvatica*, *P. sylvestris* and *Q. petraea* in the record of past climate variations, *Journal of Geophysical Research – Biogeosciences* **123**, 1-16, 10.1002/2017JG004203.
6. **Lavergne, A.**, Daux, V., Pierre, M., Stievenard, M., Srur, A.M. and Villalba, R. (2018). Past summer temperatures inferred from dendrochronological records of *Fitzroya cupressoides* on the eastern slope of the northern Patagonian Andes, *Journal of Geophysical Research – Biogeosciences* **123**, 32-45, 10.1002/2017JG003989.
5. Allen, K., Villalba, R., **Lavergne, A.**, Palmer, J.G., Cook, E.C., Fenwick, P., Nichols, S.N., Drew, D.M., Turney, C.S.M. and Baker, P. (2018). A comparison of some simple methods used to detect unstable temperature responses in tree-ring chronologies, *Dendrochronologia* **48**, 52-73, 10.1016/j.dendro.2018.02.002.
4. **Lavergne, A.**, Gennaretti, F., Risi, C., Daux, V., Boucher, E., Savard, M., Naulier, M., Villalba, R., Bégin, C. and Guiot, J. (2017). Modelling tree-ring cellulose $\delta^{18}\text{O}$ variations in two temperature-sensitive tree species from North and South America, *Climate of the Past* **13**, 1-12, doi:10.5194/cp-2017-93.
3. **Lavergne, A.**, Daux, V., Villalba, R., Pierre, M., Stievenard, M. and Srur, A.M. (2017). Improvement of isotope-based climate reconstructions in Patagonia through a better understanding of climate

influences on isotopic fractionation in tree rings. *Earth and Planetary Science Letters* **459**, 372-380, doi:10.1016/j.epsl.2016.11.045.

2. **Lavergne, A.**, Daux, V., Villalba, R., Pierre, M., Stievenard, M., Srur, A.M. and Vimeux, F. (2016). Are the oxygen isotopic compositions of *Fitzroya cupressoides* and *Nothofagus pumilio* cellulose promising proxies for climate reconstructions in northern Patagonia? *Journal of Geophysical Research - Biogeosciences* **121**, doi:10.1002/2015JG003260.
1. **Lavergne, A.**, Daux, V., Villalba and Barichivich, J. (2015). Temporal changes in climatic limitation of tree-growth at upper treeline forests: contrasted responses along the west-to-east humidity gradient in Northern Patagonia. *Dendrochronologia* **36**, 49-59, doi:10.1016/j.dendro.2015.09.001.

First author oral presentations (2013-present):

- 14 Implementation of stable carbon isotopes into JULES model: A novel approach for evaluating the coupled carbon and water cycles as represented in UKESM, September 2020, JULES (virtual) meeting, UK
13. Estimating and Tracking the Exchange of Carbon and Water between the Vegetation and the Atmosphere using a Model-data approach, December 2019, American Geosciences Union, San Francisco, USA
12. Modelling carbon isotopes in land surface models: a valuable but under-utilized approach for constraining stomatal activities (**invited**), November 2019, Centre for Ecology & Hydrology, Wallingford, UK
11. Modelling historical changes in the water use efficiency of plants and ecosystems with different vegetation models, July 2019, JULES annual meeting, Edinburg, UK
10. Advancing the understanding of forest responses to environmental stimuli through a model-data approach, May 2019, Tree Rings in Archaeology Climatology and Ecology conference, San Leucio-Caserta, Italy
9. Trends in plant water-use efficiency, June 2018, The 10th World Dendro Conference, Thumphu, Bhutan
- 8 Changes in the water-use efficiency by plants over the past century, April 2018, DoLS Postdoc Symposium, London, UK
- 7 Modelling $\delta^{18}\text{O}$ of tree-ring cellulose in American temperature-sensitive forests (**invited**), June 2017, CEREGE Climate Seminar, Aix-en-Provence, France
6. Improving tree-ring based climate reconstructions with recent advances in dendroisotopy in southern South America (**invited**), March 2017, Group Seminar, Technische Universität München, Freising, Germany
5. Stable isotopes in tree-rings of Patagonian trees are promising proxies for reconstructing past temperature variations in Southern Hemisphere, October 2016, The 8th International Symposium on Isotopomers, Nantes, France
4. Evaluation de l'archive naturelle cernes d'arbres comme traceur paléoclimatique au sud de l'Amérique du sud (**invited**), October 2016, CEREGE Seminar, Aix-en-Provence, France
3. Are the isotopic compositions of cellulose of *Fitzroya cupressoides* and *Nothofagus pumilio* promising proxies for paleoclimate reconstructions? March 2016, The Third American Dendrochronology Conference, Mendoza, Argentina
2. Potential of the isotopic composition of tree cellulose for past climate reconstructions in Northern Patagonia, South America, March 2015, The Fourth Asian Dendrochronological Conference, Kathmandou, Nepal
1. Tree-ring based reconstruction of precipitation in southern Patagonian Andes since AD 1735, April 2013, Inter-American Institute for Global Change Research Meeting, Uspallata, Argentina

First author posters (2013-present):

- 9 Disentangling the relative contributions of atmospheric demand for water and soil water availability on the stomatal limitation of photosynthesis, May 2020, European Geosciences Union (virtual EGU)
- 8 Causes of variations in observed and modelled historical trends in water use efficiency of plants and ecosystems, April 2019, European Geosciences Union, Vienna, Austria
7. Stable isotopes in tree-rings of Patagonian trees are promising proxies for reconstructing past temperature variations in Southern Hemisphere, May 2016, Tree Rings in Archaeology, Climatology and Ecology, Bialowieza, Poland

6. Temporal changes in climatic limitation of *Nothofagus pumilio* growth at upper treeline forests in northern Patagonia, March 2016, The Third American Dendrochronology Conference, Mendoza, Argentina
5. La composition isotopique de l'oxygène et du carbone de la cellulose des arbres patagoniens peut-elle être utilisée pour reconstituer les variations climatiques du dernier millénaire?, December 2015, AFEQ-CNF/SGF, Paris, France
4. Changing growth response of North Patagonian trees along an environmental gradient, March 2015, ASIANDENDRO, The Fourth Asian Dendrochronological Conference, Kathmandou, Nepal
3. Adaptability of trees to climate change in North Patagonia, July 2014, LOTRED-SA, 3rd International Symposium, Medellin, Colombia
2. North Patagonia climate over the last millennium inferred from variations in tree-ring width and isotopic composition, May 2014, European Geosciences Union, Vienna, Austria
1. Tree-ring based reconstruction of the southern Patagonian Andes precipitation since AD 1735, May 2013, AMERIDENDRO, Second American Dendrochronology Conference, Tucson, Arizona, USA

Theses:

- Evaluation of tree-ring natural archive as paleoclimate tracer in north Patagonia (2016). Global Changes, *Université Paris-Saclay*, English. NNT: 2016SACLV004. *Ph.D. Thesis available at <https://tel.archives-ouvertes.fr/tel-01368294/document>*.
- Reconstruction of Southern Patagonia precipitations since AD1735 with tree-ring records (2012). *Université Versailles Saint-Quentin*, English. *Master's degree 2 thesis*.
- Continuous Flow Analysis of Antarctic ice core with high-resolution (2011). *Ecole Normale Supérieure de Paris*, English. *Master's degree 1 thesis*.

TEACHING EXPERIENCES

05/2019	Guest lecturer in eChange summer school for MRes, Ecosystem and Environmental Changes (1 hour) Imperial College London, London, UK "Stable isotopes in tree-rings"
01/2019	Guest lecturer in BSc., Biological Sciences (4 hours) Imperial College London, London, UK "Climate change: science and policy": Third year 'Global Change Biology' module
09/2016 – 08/2017	Contract lecturer in MSc. and BSc., Geosciences (192 hours) Aix-Marseille University, Marseille, France <i>Ocean structure and evolution, Statistics, Dynamics of surface envelopes, Scientific project in geosciences, The Earth in the Universe, Computing tools</i>
09/2015 – 08/2016	Contract lecturer in BSc. Biology - Environment (192 hours) University Versailles Saint-Quentin, Versailles, France <i>Introduction to the Earth environments, Applied environments and geosciences, Geology introduction, Endogen petrology, Geology and field trip, Biophysics</i>
10/2013 – 08/2015	Contract lecturer in BSc. Biology - Environment/ Geography (128 hours) University Versailles Saint-Quentin, Versailles, France <i>Geology introduction, Geology and field trip</i>