ADRIAN PASCUAL
ASSISTANT RESEARCH PROFESSOR, GEOGRAPHICAL SCIENCES,
UNIVERSITY OF MARYLAND, COLLEGE PARK

Dr. Adrian Pascual is Assistant Professor in the Department of Geographical Sciences at the University of Maryland. He supports the NASA Global Ecosystem Dynamics Investigation (GEDI) mission as Science Team (ST) member. He graduated from his Ph.D. in 2018 at the University of Eastern Finland. His research interests are in the areas of forest carbon & biodiversity and applied decision-making. He makes remote sensing data products actionable and operational for decision-making. He is a current Science Team Member of the GEDI mission, the new NASA FireSense program and co-I in 2022-funded projects through NASA's Carbon Monitoring Systems and a GEDI ST grant to study post-fire forest recovery. His previous appointments included postdoctoral positions (2019-21) at Professor Gregory Asner's Lab & United States Forest Service, and at the University of Lisbon.

EDUCATION

Ph.D.	Oct-2018	University of Eastern Finland, Finland, Forestry
Master	June-2012	University of Valladolid, Spain, Engineering
Bachelor	June-2010	University of Valladolid, Spain, Engineering

HONORS

2019 Best Ph.D. in forest sciences by the Spanish Society of Forest Sciences.
2024 Outstanding Doctoral Research Award. World's Best PhD in Forest Assessment, Modelling and Management. Awarded during the World IUFRO Congress 2024 in Sweden.

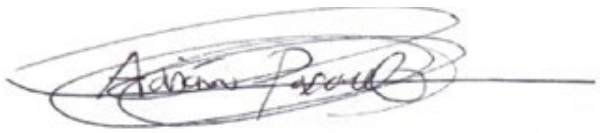
Science Leadership

Editorial Board of Forest Ecology and Management – 2024/
Associate Editor in Remote Sensing in Ecology and Conservation - 2024/
Associate Editor, Forest Policy and Economics – 2022/24
NASA's GEDI Science Team Member
NASA's FireSense Science Team Member

RECENT REPRESENTATIVE PUBLICATIONS
(H-INDEX = 14, i-10 index = 21)

Curriculum Vitae

Notarization. I have read the following and certify that this *curriculum vitae* is a current and accurate statement of my professional record.



Signature Date 10.04.2024

I. Personal Information

I.A. Adrian Pascual, apascual@umd.edu.
4600 River Road, Suite 301. UMD GEOG Bio

I.B. Academic Appointments at UMD

Assistant Research Professor (since 2022)
Department of Geographical Sciences - NASA GEDI & FireSense Science Mission Teams

I.C. Other Employment

Post-doctoral Research Associate
Global Discovery and Conservation Science – Arizona State University
Partner of USDA Forest Service Institute of Pacific Island Forestry and The Asner Lab
2020-2021

Post-doctoral Research Associate
Instituto de Agronomia (ISA, Universidade de Lisboa, Portugal). 2019-2020

PhD researcher and Post-doctoral Research Associate
Doctoral studies at the University of Eastern Finland (UEF, Joensuu (Finland)). 2014-2018

I.D. Educational Background

D.Sc, Decision-making & Planning & Remote sensing
Doctoral studies at the University of Eastern Finland (UEF, Joensuu (Finland)). 2014-2018

MSc & Bachelor, Natural resource engineering and forestry
University of Valladolid, Spain. 2006-2012

II. Research, Scholarly, Creative and/or Professional Activities

II.A. Refereed Journals (41)

1. Hunka, N., Duncanson, L., Armston, J., Dubayah, R., Healey, S. P., Santoro, M., May, P., Araza, A., Bourgoin, C., Montesano, P. M., Neigh, C. S. R., Grantham, H., Potapov, P., Turubanova, S., Tyukavina, A., Richter, J., Harris, N., Urbazaev, M., **Pascual, A**., … Melo, J. (2024). Intergovernmental Panel on Climate Change (IPCC) Tier 1 forest biomass estimates from Earth Observation. Scientific Data, 11(1), 1127. https://doi.org/10.1038/s41597-024-03930-9

2. **Pascual, A**., Grau-Neira, A., Morales-Santana, E., Cereceda-Espinoza, F., Perez-Quezada, J., Cardenas-Martinez, A., Fuentes-Castillo, T. Old-growth mapping in Patagonia's evergreen forests must integrate GEDI data to overcome NFI data limitations and to effectively support biodiversity conservation. Forest Ecology and Management, 568, 122059. https://doi.org/10.1016/j.foreco.2024.122059

3. Guerra-Hernández, J., C Pereira, J. M., Stovall, A., & **Pascual, A**. (2024). Impact of fire severity on forest structure and biomass stocks using NASA GEDI data. Insights from the 2020 and 2021 wildfire season in Spain and Portugal. Science of Remote Sensing, 100134. https://doi.org/10.1016/j.srs.2024.100134

4. Tupinambá-Simões, F., **Pascual, A**, Guerra-Hernández, J., De Conto, T., Ordonez, A.C., Bravo, F. Accuracy of hand-held laser scanning in tree mapping comparing leaf-on and leaf-off conditions in Mediterranean mixed forests. Journal of Forestry Research.

https://doi.org/10.1007/s11676-024-01747-1

5. Guerra-Hernandez, J., **Pascual, A**., Tupinambá-Simões, F., Godinho, S., Botequim, B., Jurado-Varela, A., Sandoval-Altelarrea, V. (2023). Using bi-temporal ALS and NFI-based time-series data to account for large-scale aboveground carbon dynamics. The showcase of Mediterranean forests. European Journal of Remote Sensing 57:1, 2315413. https://doi.org/10.1080/22797254.2024.2315413

6. Hunka, N., Santoro, M., Armston, J., Dubayah, R., McRoberts, R. E., Næsset, E., Quegan, S., Urbazaev, M., **Pascual, A**., May, P. B., Minor, D., Leitold, V., Basak, P., Liang, M., Melo, J., Herold, M., Málaga, N., Wilson, S., Durán Montesinos, P., … Duncanson, L. (2023). On the NASA GEDI and ESA CCI biomass maps: Aligning for uptake in the UNFCCC global stocktake. Environmental Research Letters, 18(12), 124042. https://doi.org/10.1088/1748-9326/ad0b60

7. Liu, S., Brandt, M., Nord-Larsen, T., Chave, J., Reiner, F., Lang, N., Tong, X., Ciais, P., Igel, C., Li, S., Mugabowindekwe, M., **Pascual, A**., Guerra-Hernandez, J., Saatchi, S., Yue, Y., Chen, Z., & Fensholt, R. (2023). The overlooked contribution of trees outside forests to tree cover and woody biomass across Europe. Science Advances, 9(37), eadh4097. https://doi.org/10.1126/sciadv.adh4097

8. Turubanova, S., Potapov, P., Hansen, M., Li, X., Tyukavina, A., Pickens, A., Hernandez-Serna, A., **Pascual, A**., Guerra-Hernandez, J., Senf, C., Häme, T., Valbuena, R., Eklundh, L., Brovkina, O., Navrátilová, B., Novotný, J., Harris, N., Stolle, F., Tree canopy extent and height change in Europe, 2001-2021, quantified using Landsat data archive. Remote Sensing of Environment, 298, 113797. https://doi.org/10.1016/j.rse.2023.113797

9. **Pascual, A**., Guerra-Hernandez, J., An integrated assessment of carbon emissions from forest fires beyond impacts on aboveground biomass. A showcase using airborne lidar and GEDI data over a megafire in Spain. Journal of Environmental Management, 345, 118709. https://doi.org/10.1016/j.jenvman.2023.118709

10. **Pascual, A**., Guerra-Hernández, J., Godinho, S. Integrated LiDAR-supported valuation of biomass and litter in forest ecosystems. A showcase in Spain. Science of Total Environment, 897, 165364. https://doi.org/10.1016/j.scitotenv.2023.165364

11. **Pascual, A**., & Guerra-Hernández, J. (2023). Correction of phenology-induced effects in forest canopy height models based on airborne laser scanning data. Insights from the deciduous mountain forests in Picos de Europa National Park in Spain. Ecological Informatics, 75, 102092. https://doi.org/10.1016/j.ecoinf.2023.102092

12. **Pascual, A**., Guerra-Hernández, J., Armston, J., Minor, D. M., Duncanson, L. I., May, P. B., Kellner, J. R., & Dubayah, R. (2023). Assessing the performance of NASA's GEDI L4A footprint aboveground biomass density models using National Forest Inventory and airborne laser scanning data in Mediterranean forest ecosystems. Forest Ecology and Management, 538, 120975. https://doi.org/10.1016/j.foreco.2023.120975

13. Tupinambá-Simões, F., **Pascual, A.**, Guerra-Hernández, J., Ordóñez, C., de Conto, T., Bravo F. (2023). Assessing the Performance of a Handheld Laser Scanning System for Individual Tree Mapping—A Mixed Forests Showcase in Spain. Remote Sensing 15(5):1169. https://doi.org/10.3390/rs15051169

14. Guerra-Hernández, J., Narine, L., **Pascual, A**., Gonzalez-Ferreiro, E., Botequim, B., Malambo, L., Neuenschwander, A., Popescu, S.C., Godinho, S. (2022). Aboveground biomass mapping by

integrating ICESat-2, Sentinel-1, Sentinel 2, ALOS-2/PALSAR-2 and topographic information in Mediterranean forest. GIScience & Remote Sensing 59, 1, 1509-1533. https://doi.org/10.1080/15481603.2022.2115599

15. **Pascual, A**. de-Miguel, S. (2022). Evaluation of mushroom production potential by combining spatial optimization and LiDAR-based forest mapping data. Science of the Total Environment, 850, 157980. https://doi.org/10.1016/j.scitotenv.2022.157980

16. **Pascual, A**. De Conto, T., Tupinambá-Simões, F (2022). Using multi-temporal tree inventory data in eucalypt forestry to benchmark global high-resolution canopy height models. A showcase in Mato Grosso, Brazil. Ecological Informatics 70, 101748. https://doi.org/10.1016/j.ecoinf.2022.101748

17. **Pascual, A**., Guerra-Hernández, J., (2022) Spatial connectivity in tree-level decision-support models using mathematical optimization and individual tree mapping. Forest Policy and Economics, 139: 102732. https://doi.org/10.1016/j.forpol.2022.102732

18. **Pascual, A**, Tupinambá-Simões, F., Guerra-Hernández, J., Bravo, F. (2022). High-resolution Planet satellite imagery and multi-temporal surveys to predict risk of tree mortality in tropical eucalypt forestry. Journal of Environmental Management 310, 114804. https://doi.org/10.1016/j.jenvman.2022.114804

19. **Pascual, A,** Giardina, C., Povak, N., Hessburg, P.H., Asner, G.P. (2022). Integrating ecosystem services modeling and efficiencies in decision-support models conceptualization for watershed management. Ecological Modelling. 466, 109879. https://doi.org/10.1016/j.ecolmodel.2022.109879

20. Tupinambá-Simões, F., Guerra-Hernández, J., Bravo, F, **Pascual, A**. (2022). Assessment of drought effects on survival and growth dynamics in eucalypt commercial forestry using remote sensing photogrammetry. A showcase in Mato Grosso, Brazil. Forest Ecology and Management. 505: 119930. https://doi.org/10.1016/j.foreco.2021.119930

21. **Pascual, A**.; Giardina, C., Povak, N. Hessberg, P., Salminen E., Heider, C., Asner, G.P. (2022). Optimizing invasive species management using mathematical programming to support stewardship of water and carbon-based ecosystem services. Journal of Environmental Management 301: 113803. https://doi.org/10.1016/j.jenvman.2021.113803

22. Dorado-Roda, I., **Pascual, A**., Sergio Godinho, Silva C.A., Rodríguez-González, P., Eduardo González- Ferreiro, Juan Guerra-Hernández. (2021). Assessing the accuracy of GEDI data for canopy height and aboveground biomass estimates in Mediterranean forests. Remote Sensing 13, 2279. https://doi.org/10.3390/rs13122279

23. **Pascual, A**., Giardina, C.G., Selmants, P., Laramee, L.E., Asner, G.P. (2021). Developing remote sensing-based indicators to support land carbon management and carbon neutrality across Hawaiian forest ecosystems. Forest Ecology and Management. 494: 119343. https://doi.org/10.1016/j.foreco.2021.119343

24. **Pascual, A**. Building Pareto Frontiers under tree-level forest planning using airborne laser scanning, growth models and spatial optimization. (2021). Forest Policy and Economics 128: 102475. https://doi.org/10.1016/j.forpol.2021.102475

25. **Pascual, A,** Tóth, S. (2022). Using mixed integer programming and airborne laser scanning to generate forest management units. Journal of Forestry Research. https://doi.org/10.1007/s11676-021-01348-2

26. Guerra-Hernández, J., **Pascual, A**. (2021). Using GEDI lidar data and airborne laser scanning to assess height growth dynamics in fast-growing species: a showcase in Spain. Forest Ecosystems 8(14): 1-17. https://doi.org/10.1186/s40663-021-00291-2

27. **Pascual, A**. (2021). Multi-objective forest planning at tree-level combining mixed integer programming and airborne laser scanning. Forest Ecology and Management. 118714. https://doi.org/10.1016/j.foreco.2020.118714

28. Guerra-Hernández, J.; Arellano, S., Gonzalez-Ferreiro, **Pascual, A**., Sandoval, V. Ruiz-Gonzalez, A.D., Alvarez-Gonzalez, J.A. (2021). Developing a site index model for P. Pinaster stands in NW Spain by combining bi-temporal ALS data and environmental data. Forest Ecology and Management 481(2): 118690. https://doi.org/10.1016/j.foreco.2020.118690

29. **Pascual, A**.; Guerra-Hernández, J.; Cosenza, D.N.; Sandoval, V. Using enhanced data co-registration to update Spanish NFI and optimize sampling intensity with LiDAR-assisted inference. 2020. International Journal of Remote Sensing. 42:1, 126-147. https://doi.org/10.1080/01431161.2020.1813346

30. Packalen, O., Pukkala, T., **Pascual. A**. (2020). Combining spatial and economic criteria in tree-level harvest planning. Forest Ecosystems 7, 18; https://doi.org/10.1186/s40663-020-00234-3

31. Consenza, D., Luísa Gomes-Pereira, l., Guerra-Hernández, J., **Pascual, A**., Soares, P., Tomé, M. (2020). Impact of calibrating filtering algorithms on the quality of LiDAR-derived DTM and on forest attribute estimation through area-based approach. Remote Sensing, 12, 918; https://doi.org/10.3390/rs12060918

32. **Pascual, A**.; Guerra-Hernández, J.; Cosenza, D.N.; Sandoval, V. (2020). The Role of Improved Ground Positioning and Forest Structural Complexity When Performing Forest Inventory Using Airborne Laser Scanning. Remote Sensing, 12, 413. https://doi.org/10.3390/rs12030413

33. **Pascual, A**. (2019). Using Tree Detection Based on Airborne Laser Scanning to Improve Forest Inventory Considering Edge Effects and the Co-Registration Factor. Remote Sensing, 11, 2675. https://doi.org/10.3390/rs11222675

34. **Pascual, A**. (2019). Mejorando la gestión forestal a base de integrar datos laser y rodales dinámicos basados en optimización espacial. Proceedings Spanish Society of Forest Sciences 45(2), 161-170. https://doi.org/10.31167/csecfv5i45.19869

35. **Pascual, A**.; Rivera, R.; Gómez, R.; Domínguez-Lerena, S. (2019). Monitoring Water-Soil Dynamics and Tree Survival Using Soil Sensors under a Big Data Approach. Sensors 19, 4634. https://doi.org/10.3390/s19214634

36. **Pascual, A**., Bravo, F., Ordoñez, C. (2019). Assessing the robustness of variable selection methods when accounting for co-registration errors in the estimation of forest biophysical and ecological attributes. Ecological Modeling 403(7), 11-19. https://doi.org/10.1016/j.ecolmodel.2019.04.018

37. **Pascual, A**., Pukkala, T., de-Miguel, S., Pesonen, A., Packalen, P. (2018). Influence of size and shape of forest inventory units on the layout of harvest blocks in numerical forest planning. European Journal of Forest Research. https://doi.org/10.1007/s10342-018-1157-5

38. **Pascual, A**. (2018). Improving forest management planning by means of airborne laser scanning and dynamic treatment units based on spatial optimization. Dissertationes Forestales 257. https://doi.org/10.14214/df.257

39. **Pascual, A**., Pukkala, T., de-Miguel, S. (2018). Effects of plot positioning errors on the optimality of harvest prescriptions in spatial forest planning based on ALS data. Forests, 9(7), 371. https://doi.org/10.3390/f9070371

40. **Pascual, A**., Pukkala, T., de-Miguel, S., Pesonen, A., Packalen, P. (2018). Influence of timber harvesting costs on the layout of cuttings and economic return in forest planning based on dynamic treatment units. Forest Systems, 27, 1. https://doi.org/10.5424/fs/2018271-11897

41. **Pascual, A**., Pukkala, T., Rodríguez, F., de-Miguel, S. (2016). Using Spatial Optimization to Create Dynamic Harvest Blocks from LiDAR-Based Small Interpretation Units. Forests, 7(10), 220. https://doi.org/10.3390/f7100220

II.B. Conferences, Workshops, and Talks

As presenting author (26):

- Experts Round Table to support the Ministry of Energetic Transition in Spain and the National Program of Airborne Lidar Data Acquisition. "Synergies between airborne lidar mapping, the latest NASA mission on forest canopy and biomass mapping, and National Forest Inventory data. Online presentation. September 25, 2024.

- ASEAN Region Carbon Trading Workshop. "Building Better Markets Through Digitalization Session 4: Digital Tools for Voluntary Carbon Markets". Online presentation. August 22, 2024. Invited by the US State Department in Jakarta (Indonesia).

- Digital Mission, Reduction and Verification (DMRV) Workshop organized by The World Bank. "Supporting global dMRV with multimodal fusion: high resolution biomass and structure mapping using GEDI and TanDEM-X". Oral presentation and Panel in the Forest Carbon Session. June 17th. In-person at WB's HQ.

- Technical meeting with the Spanish National Forest Inventory Team - Roadmap the next NFI5 in Spain. Title: "Synergistic use of GEDI measurements combined with NFI data in Spain for mission data recalibrations. Insights of NFI refinements for IFN5 from the optics of GEDI and airborne lidar mapping. Online presentation. June 5-7, 2024

- Technical meeting with the Ministry of Foresty of Lao People's Democratic Republic (Lao PDR or LPDR) invited by The World Bank's Forest Carbon Parternship Facility. Title:" Pantropical structure and biomass mapping using the fusion of GEDI and TanDEM-X data: Phase II Expansion to new regions and estimating change". May 23rd and June 20th, 2024. Online.

- Technical meeting with the Ministry of Foresty of VietNam and the World Bank to present GEDI data applications. Title:" Pantropical structure and biomass mapping using the fusion of GEDI and TanDEM-X data: Phase II Expansion to new regions and estimating change". May 8th, 2024. Online.

- Technical meeting with the Coordinating Ministry for Maritime & Investment Affairs), KLHK (Ministry of Environment and Forestry), BRGM (Peat Restoration Body Republic of Indonesia), Jambi technical team (ISFL), East Kalimantan Technical team (FCPF, The World Bank). April 18th, 2024. Title:" Pantropical structure and biomass mapping using the fusion of GEDI and TanDEM-X data: Phase II Expansion to new regions and estimating change".

- Anthromes, CO2, and Terrestrial Carbon – From the deep past to net-zero. Oak Ridge National Laboratory. Potomac, MD. Title: Showcasing NASA GEDI mission data for aboveground carbon monitoring and for applications. Potomac (Maryland). March 28th, 2023. In-person.

- GLOBE NSF-NASA Seminar series (#55). The NASA GEDI mission.
  Available: https://www.globe.gov/web/trees-around-the-globe/overview/webinars.
  March 11th, 2023. Online

- AEOIP GEDI Webinar. NASA GEDI Mission
  Link; https://pikesmeetings.wixsite.com/aeoip. (Educational Video). October 21st, 2022. Online

- University of Hawaii'i Manoa (Honolulu, HI). Carbon Mapping in Hawai'i. December 11th, 2022. Masterclass in the Research Seminar Series & University of Hawaii'i Hilo Campus (Hawaii'i Island, HI). December 11th and 14th, 2022. In-person.

- USFS & NASA-supported Space and Sustainability Colloquium in Mexico to foster discussion in Mexico about the current state of the use of Earth observation technology. Oral presentation Day 1: The Global Ecosystem Dynamics Investigation (GEDI) Mission. November 15th, 2023. Guadalajara (Mexico). Online

- USFS & NASA-supported Space and Sustainability Colloquium to foster discussion in Mexico about the current state of the use of Earth observation technology. Oral presentation Day 1: Data application showcases and potential uses of GEDI data. November 16th, 2023. Guadalajara (Mexico). Online

- NASA Goddard. Oral presentation about GEDI status to NASA engineers and program managers involve in GEDI. Title: Mapping Ecosystem Structure and Understanding Global Carbon Balance with GEDI". June 5th, 2023. Greenbelt (Maryland, US)

- University of Chile. Masterclass on GEDI. Title: Chile Mission, status and forest carbon and biodiversity mapping globally. Focus on the Chilean Patagonia. September 4th, 2023. Santiago de Chile. In-person.

- Ministry of Environment, Chile. Talk to inform ministry officers on GEDI data access and mission status. Title:" Chile Mission, status and forest carbon and biodiversity mapping globally using GEDI". September 12th, 2023. Santiago de Chile. In-person.

- Forestry Comission, Castilla y Leon region (Spain). Oral presentation for federal officers and forest managers. Title: *Procesado y comparación de vuelos LiDAR: factores, control de errores y aplicaciones en gestión*. September 29th, 2022. Online

- Government of Indonesia, Ministry of Environment. GLAD-GEDI workshop to support Bilateral Climate Working Group Task Force Two. Oral presentation and training. Jakarta. July 26-28th, 2023. In-person.

- US Embassy in Jakarta. Overview of GEDI and mission status overview for Embassy officers and invited NGOs (WWF), representatives from other countries (Norway, Italy) and international organizations such as FAO or Conservation International. Jakarta. July 2th, 2023. In-person.

- Government of Indonesia, Ministry of Environment and FAO. Symposium: Data Analysis in Supporting the Redesign of the National Forest Inventory. Presentation title: Mission, status and forest carbon and biodiversity mapping in Indonesia. Jakarta. 23rd November, 2023. Online. 30 min and discussions.

- GEO BON Open Science International Conference. 6-10 July 2020 | Leipzing, Germany. Using the GEDI satellite lidar mission with nationwide airborne laser scanning surveys in fast changing forest ecosystems. Oral presentation

- International Tropical Islands Water Conference. Hawaii in April 2021. Using mathematical optimization to manage and value land-water ecosystem services and invasive species in Hawai‘i Island, USA". Oral presentation

- Ecosystem Services Science, Policy and Practice in the face of Global Changes (Estonia). Valuation of land-water ecosystem services and invasive species when using Pareto Frontiers: a showcase in Hawai‘i Island, USA. Oral presentation

- The International Society for Ecological Modelling Global Conference 2019. 1-5 October 2019 | Salzburg, Austria. Importance of edge-tree detection when modelling tree and forest characteristics. Oral presentation

- Symposium on Systems Analysis in Forest Resources. March 2019. (Chile). Towards enhanced tree-level planning using laser scanning and spatially-explicit tree selection methods. Oral presentation.

- Symposium on Systems Analysis in Forest Resources. 2017. (Washington, USA). Assessing the role of forest inventory units to compose dynamic treatment units in forest management planning. Session Chair & Oral presentation

As co-author (9):

- *Conference: Remote Sensing Annual Convention - Spain*

Title: Optimización de la geolocalización de datos GEDI para cartografiar la altura de la vegetación en el Parque Nacional de Sierra de las Nieves
Author(s): Cardenas-Martinez, Aaron; Pascual, Adrian; Canero, Francisco M.; Guisado-Pintado, Emilia; Rodriguez-Galiano, Victor.

- *Conference: IGARSS 2024*

Title: Assessing the impact of enhanced geolocation of GEDI data for canopy height mapping in Southern Spain's Mediterranean endemic forests.
Author(s): Cardenas-Martinez, Aaron; Pascual, Adrian; Canero, Francisco M.; Guisado-Pintado, Emilia; Rodriguez-Galiano, Victor.

- *Conference: Silvilaser 2023*
  Title: A global assessment of GEDI and ICESat-2 canopy height measurement performance.
  Author(s): Armston, John; Urbazaev, Mikhail; Dubayah, Ralph; Hofton, Michelle; Blair, Bryan; Duncanson, Laura; **Pascual, Adrián**; Luthcke, Scott.

- *Conference: Silvilaser 2023*
  Title: GEDI past and future: assessing four years of ecosystem structure observations from NASA's Global Ecosystem Dynamics Investigation
  Author(s): Dubayah, Ralph; Armston, John; Blair, J. Bryan; Duncanson, Laura; Fatoyinbo, Lola; Goetz, Scott; Hancock, Steve; Hansen, Matt; Healey, Sean; Hofton, Michelle; Hurtt, George; Kellner, James; Luthcke, Scott; Patterson, Paul; Tang, Hao; May, Paul; Minor, David; **Pascual, Adrian**; Qi, Wenlu

- *Conference: Silvilaser 2023*
  Title: Estimating forest structural complexity from GEDI waveforms
  Author(s): de Conto, Tiago; **Pascual, Adrian**; Armston, John; Dubayah, Ralph

- *Conference: 4th International ESP Latin America and Caribbean Conference 2023, La Serena, Chile.*
  Title: Estimating Forest carbon stocks from field, satellite and drone observations: Monitoring of Conservation Easements in the Chilean Patagonia.
  Author(s): Fuentes-Castillo, Taryn; **Pascual, Adrián**; Pérez-Quezada, Jorge; Grau-Neira, A.; Cereceda-Espinoza, F.; Morales-Santana, E.

- *Conference: AGU 2023*
  Title: On-orbit performance of GEDI aboveground biomass density algorithms.
  Author(s): James R. Kellner, John Armston , Laura I. Duncanson , James B. Blair , Jamis Bruening , Tiago de Conto , Steve Hancock , Sean Healey , Michelle Hofton , Scott Luthcke , David M. Minor, **Adrian Pascual**, Paul Patterson, Hao Tang.

- *Conference: XV Young Researchers Meeting on Conservation and Sustainable Use of Forest Systems*
  Title: Assessing the impacts caused by drought in a eucalyptus plantation in Mato Grosso-Brazil.
  Author(s): Simões, F., Pascual A., Guerra-Hernández, J., Bravo, F.

- *Conference: XV Young Researchers Meeting on Conservation and Sustainable Use of Forest Systems*
  Title: Using handheld and airborne laser scanning to improve tree-level mapping. A mixed-forest showcase in Spain.
  Author(s): Simões, F., Pascual A., Guerra-Hernández, J., Bravo, F.

II.C. Professional and Extension Publications

1. Mamani N, **Pascual A**, Finer M (2024) Estimating Carbon in Amazon Protected Areas & Indigenous Territories. MAAP: 213. https://www.maaproject.org/2024/carbon-gedi-amazon/

II.D. Completed Creative Works and Scholarship

II.H.1 Datasets

GEDI Data products release through ORNL DAAC (2):

1. Dubayah, R. O., Armston, J., Healey, S. P., Yang, Z., Patterson, P. L., Saarela, S., Stahl, G., Duncanson, L., Kellner, J. R., Bruening, J., & **Pascual, A**. (2023). Global Ecosystem Dynamics Investigation

(GEDI). GEDI L4B Gridded Aboveground Biomass Density, Version 2.1 [COG]. 0 MB. https://doi.org/10.3334/ORNLDAAC/2299

2. Armston, J., Dubayah, R. O., Healey, S. P., Yang, Z., Patterson, P. L., Saarela, S., Stahl, G., Duncanson, L., Kellner, J. R., **Pascual, A**., & Bruening, J. (2023). Global Ecosystem Dynamics Investigation (GEDI)GEDI L4B Country-level Summaries of Aboveground Biomass [CSV]. 0 MB. https://doi.org/10.3334/ORNLDAAC/2321

Other data products (3):

3. Siyu Liu, Martin Brandt, Thomas Nord-Larsen, Jerome Chave, Florian Reiner, Nico Lang, Xiaoye Tong, Philippe Ciais, Christian Igel, Sizhuo Li, Maurice Mugabowindekwe, **Adrian Pascual,** Juan Guerra-Hernandez, Sassan Saatchi, Yuemin Yue, Zhengchao Chen, & Rasmus Fensholt. (2023). Canopy height and biomass map for Europe. https://doi.org/10.5281/ZENODO.8154445 & https://ee-chm-eu-2019.projects.earthengine.app/view/euchm

4. Turubanova S., Potapov P., Hansen M.C., Li X., Tyukavina A., Pickens A.H., Hernandez-Serna A., **Pascual, A**., Guerra-Hernandez J., Senf C., Häme T., Valbuena R., Eklundh L., Brovkina O., Navrátilová B., Novotný J., Harris N., Stolle F. (2023). Tree Canopy Height Change in Europe, 2001-2021. https://glad.earthengine.app/view/europe-tree-dynamics

5. Guerra-Hernandez, J., & Pascual, A. (2024). High-resolution Canopy Height Model of Hawaii Island 2018-2020 [Data set]. Zenodo. https://doi.org/10.5281/zenodo.13151991

II.E. Significant Works in Public Media

1. The GEDI mission

"Por qué la NASA dispara rayos láser a los árboles desde la Estación Espacial Internacional"
Number of People who Read the Publication: Over 8.5 million monthly unique visitors read BBC Mundo stories. Summary of Article's Focus: The NASA GEDI mission.
Links: https://www.bbc.com/mundo/noticias-62479696 & https://www.youtube.com/watch?v=scvyyWqOpww

2. Supporting biodiversity conservation in the Chilean Patagonia

Date Published: September 2023 (media articles)

- El Pais
  https://elpais.com/chile/2023-10-31/la-nasa-colabora-con-una-empresa-chilena-para-mapear-los-bosques-de-la-patagonia.html

- BioBio Chile & Diario Financiero
  https://www.ciperchile.cl/2024/03/10/incendios-y-dano-ecologico/
  https://www.biobiochile.cl/especial/aqui-tierra/noticias/2024/08/26/nasa-concluyo-que-los-bosques-de-la-patagonia-chilena-son-de-los-que-mas-almacenan-carbono-en-el-mundo.shtml

3. On the Valparaiso 2023 fires

- Ciper Diario
  https://www.biobiochile.cl/especial/aqui-tierra/noticias/2023/09/20/mision-gedi-de-la-nasa-estuvo-en-chile-para-medir-la-biomasa-de-la-patagonia-de-que-se-trata.shtml
  https://diariofinanciero.pressreader.com/article/282205130505826

4. Use of GEDI to support conservation in the Amazon

- America Futura. Return Of The GEDI: Scanning The Amazon With Lasers.
  https://www.sciencefriday.com/articles/gedi-mission-deforestation-carbon-amazon/
- El Pais
  La misión que escanea la Amazonia con rayos láser para saber cuánto carbono almacena.
  https://elpais.com/america-futura/2024-05-29/la-mision-que-escanea-la-amazonia-con-rayos-laser-para-saber-cuanto-carbono-almacena.html

5. The monitoring of the Andean Amazon

- Conservacion Amazonica
  MAAP #213: Estimating Carbon in Amazon Protected Areas & Indigenous Territories
  https://www.maaproject.org/2024/carbon-gedi-amazon/

6. The IUFRO Outstanding Doctoral Research Award

- El Norte de Castilla
  https://www.elnortedecastilla.es/valladolid/vallisoletano-estudia-secretos-bosques-rayos-laser-dispara-20240721084336-nt.html
- IUFRO2024
  https://iufro2024.com/iufro-outstanding-doctoral-research-award-winners-odra-2024/
  https://vimeo.com/970012093

II.F. Works in Progress

Manuscripts in review (3):

- Tupinambá-Simões, F., **Pascual, A**, Guerra-Hernández, J., Ordonez, A.C., Barreiro, S., Bravo, F. Monitoring the forest carbon sink in Mediterranean mixed forests using vegetation profiles derived from hand-held laser scanning and drone lidar. A showcase in Central Portugal. In Review at European Journal of Forest Research.

- Qi, W., Armston, J., Choi, C., **Pascual, A**., Dubayah, R. Mapping Large-Scale Pantropical Forest Canopy Height by Integrating GEDI Lidar and TanDEM-X InSAR Data. In Review at Remote Sensing of Environment.

- Cardenas-Martinez, A., **Pascual, A**. Using airborne lidar and enhanced-geolocated GEDI structural metrics to map ecological indicators over Mediterranean endemic forests in Southern Spain. In review at Journal of Geovisualization and Spatial Analysis

Manuscripts in Progress (3):

- Armston, J., De Conto, T., **Pascual, A**., Global Measurements of Canopy Structure: Performance of the NASA Global Ecosystem Dynamics Investigation 2019 – 2022.

- **Pascual, A**., May, P., Cardenas-Martinez, Guerra-Hernandez, J., Hunka, N., Bruening, J., Healy, S., Dubayah, R. Calibration of aboveground biomass using NFI plots of enhanced geolocation and canopy height data derived from waveform imputation, airborne lidar and GEDI estimates. A benchmark over Mediterranean forests.

- González-Mesquida, José, Mauro-Gutiérrez, F., Rodriguez-Puerta, …, **Pascual, A**. Can full-waveform lidar satellite (GEDI) replace Airborne Laser Scanning (ALS) as auxiliary information in forest biomass estimation using Fay-Herriot models?

6.A. Sponsored Research and Programs – Administered by the Office of Research Administration (ORA)

1. NASA 2022 Carbon Monitoring System Call
Reference: 22-CMS22-0038- "Pantropical structure and biomass mapping using the fusion of GEDI and TanDEM-X data - Phase II: expansion to new regions and estimating change".
Status: In-progress. Contribution as Co-I: 10%. PI: Ralph Dubayah
Total budget: USD 1.185 million

2. NASA 2023 GEDI Science Team Call
Reference: 23-GEDI23-0030 - "Understanding post-fire disturbance forest recovery in Mediterranean ecosystems using GEDI".
Status: Recommended for funding. Contribution as Co-I: 10% salary + travel. PI: Atticus Stovall.
Total budget: USD 530,224

3. NASA 2023 FireSense Science Team Call
Reference: 23-FSIT23-0034- "Adrian Pascual Application to the FireSense Implementation Team".
Status: Recommended for funding. Contribution as PI: 25% salary + travel.
Total budget: USD 209,547

4. NASA 2024 Earth Action: Wildland Fires
Reference: 24-WF24-0011- "Integration of spatial optimization into decision-making models to optimize fuel treatments and improve forest resilience using spaceborne lidar and multispectral thermal imagery"
Status: Submitted. Contribution as PI: 15% salary + postdoctoral research + travel.
Total budget: USD 380,545

5. Species Detection - Robotic Services Inc.
Award Number: 310634-00001 - "Pohakuloa Training Area: Species Detection".
Status: Completed. PI: Adrian Pascual. Co-PI: Ralph Dubayah
Total budget: USD 12,879

6.B. Research Fellowships, Prizes and Awards

1. IUFRO World Congress 2019/23 Outstanding Doctoral Research Award.
The award recognizes path-breaking doctoral dissertations completed in the period 2018–2023 within the fields of research covered by IUFRO. Ceremony: June 26th, 2024. Stockholm (Sweden). My thesis "*Improving forest management planning by means of airborne laser scanning and dynamic treatment units based on spatial optimization*" and post-doctoral career since graduation in October 2018 have given this prestigious award that recognizes a few early-career forest scientists every 4 years.

2. Best PhD thesis in Spain
My PhD thesis was awarded as the best PhD thesis in Spain for year 2018. It was awarded by the Spanish Society of Forest Sciences.

7. Teaching, Extension, Mentoring, and Advising

7.A. Professional and Extension Education

III.C. Advising:

III.C.3. Doctoral

- Levi Madenberg: UMD GEOG PhD Student. Title:" "Enhancing Forest Structure and Biomass Mapping: Integrating High-Resolution Optical Data with Spaceborne Lidar for Improved Accuracy and Large-Scale Application". Role: Appointed Committee Member. Progress: Ongoing, first stages of the research.

III.D. Mentorship PhD Students

- Frederico Tupinambá-Simões. PhD Student. Title: "Use of mobile lidar data to support small-scale forestry applications. Role: Advisor. Status: Mr. Tupinambá-Simões has produced three manuscripts and plans to graduate in 2025.
- Aaron Cardenas Martinez. Secondment at UMD during Fall 2023. Role: Advisor on laser scanning processing. Status: Mr. Cardenas Martinez completed a secondment (2nd chapter of his PhD) and there is one manuscript in revision. Institution: University of Sevilla (Spain).

III.F. Professional and Extension Education

III.F.3. Workshops

- University of Eastern Finland (18 h). Teaching Assistant (2016-2018):
  - Teaching Assistant: Spatial optimization and utilization of new data sources in forest planning.
  - Advanced Remote Sensing.
  - Forest Biometrics.
- University of Valladolid (Spain) (76 h):
  - Main lecturer: Winter 2017 (25 h). Host: Professor Felipe Bravo. Supported by Erasmus+ EU program Remote sensing applications for forest inventory and forest management planning
  - Winter 2018 & 2019 (30 h). In cooperation with Professor Felipe Bravo and Dr. Juan Suarez (Forestry Commission, UK). Role: lecturer on data visualization, data processing and modelling. Thematic: lasers for forestry applications.
  - Spring 2019. (21 h). Associated Researcher for the MedFor Consortium. Theory on forest management planning, basics of remote sensing 7
  - Advanced data processing for laser applications in forestry and integration of satellite image information into decision-making in natural resource assessment.
- European Forest Institute School (8 h). Summer school on Forest Data Management and Analysis. Visiting Lecturer (Spring 2018)
- University of Concepción (15 h). Introduction to Laser Scanning Applications for 3D Forestry. Visiting Lecturer (Spring 2019)

8. Service and Outreach

8.A. Editorships, Editorial Boards, and Reviewing Activities

Name of Organization: **Forest Ecology and Management**
Role: *Editorial Board.* Dates of Service: Since 2024
Forest Ecology and Management focuses on scientific articles linking forest ecology with forest management, with potential application of biological and ecological knowledge to the management and

conservation of plantations and natural forests.
Responsibilities: Revise articles and advice senior editors.

Name of Organization: **Forest Policy and Economics**
Role: *Associate Editor.* Dates of Service: Three years (2022/24)
FPE is a leading scientific journal that publishes peer-reviewed policy and economics research relating to forests, forested landscapes, forest-related industries, and other forest-relevant land uses.
Responsibilities: Handle submissions, revise articles and advice senior editors.
Total: 23 revisions handled as AE in FPE

Name of Organization: **Remote Sensing in Ecology and Conservation**
Role: *Associate Editor.* Dates of Service: Since 2024
RSEC is multidisciplinary research journal at the interface between remote sensing science and ecology and conservation. The journal prioritizes findings that advance the scientific basis of ecology and conservation, promoting the development of remote-sensing based methods relevant to the management of land use and biological systems at all levels, from populations and species to ecosystems and biomes
Responsibilities: Handle submissions, revise articles and advice senior editors.
Total: 0 revisions handled as AE in RSEC

Other academic journals I have reviewed for since 2018:

Canadian Journal of Forest Research
Canadian Journal of Remote Sensing
Ecological Modelling
Environmental Research Letters
Environmental Research: Ecology
Environmental Science and Pollution Research
Forest Ecology and Management
Forest Ecosystems
Forest Policy and Economics
Forest Science
Forests
GIScience & Remote Sensing
Global Ecology and Conservation
Heliyon
International Journal of Digital Earth
International Journal of Remote Sensing
ISPRS International Journal of Geo-Information
ISPRS Journal of Photogrammetry and Remote Sensing
Journal of Environmental Management
Journal of Forest Research
Methods in Ecology and Evolution
Nature
Journal of Selected Topics in Applied Earth Observations and Remote Sensing
New Forests
Open Research Europe
Regional Environmental Change
Remote Sensing
Remote Sensing Applications: Society and Environment
Scandinavian Journal of Forest Research
Scentia Agricola
Science of Total Environment
Scientific Reports
Silva Fennica
SN Applied Sciences
Trees, Forests and People

Total: 74 manuscripts revised as reviewer.

8.B. Committees, Professional & Campus Service
2023 UMD Geography Promotion Committee. Postdocs to Assistant Research Professor. 2 evaluations
2024 UMD Geography Promotion Committee. Postdocs to Assistant Research Professor. 2 evaluations
2024 Participation in NASA Review Panel for Carbon Monitoring Systems solicited in 2023
2024 Invited to NASA Review Panel for Supporting Climate Resilient Communities solicited in 2023

8.C. External Service and Consulting
Consulting for NASA on calval activities for the GEDI mission. Winter 2022
Consulting for Kamehamkeha Schools on forest carbon mapping. December 2022
Consulting for Hawaii Forestry and Wildlife Department and the USDA Forest Service Fall 2020