

Renato Kerches Braghieri, Ph.D.

NASA Jet Propulsion Laboratory
M/S 233-305F
4800 Oak Grove Drive
Pasadena, CA 91109
☎ +1 (626) 491 – 3675

✉ renato.braghiere@jpl.nasa.gov
renato.braghiere@gmail.com
🌐 science.jpl.nasa.gov/people/Braghiere/
renatobraghiere.com
🐦 [@RenatoBraghiere](https://twitter.com/RenatoBraghiere)

Professional Appointments

2022 – Present **Research Scientist** at California Institute of Technology/ NASA JPL

Global Environmental Center, Caltech/ NASA Jet Propulsion Laboratory,
Pasadena, CA, USA.

2019 – 2022 **Post-Doctoral Research Scientist** at NASA Jet Propulsion Laboratory

Joint Institute for Regional Earth System Science and Engineering, UCLA/
NASA Jet Propulsion Laboratory, Pasadena, CA, USA.

2018 – 2019 **Post-Doctoral Research Fellow** at INRAE

Joint Research Unit Functional Ecology & Soil Biochemistry & Agro-
Ecosystems, INRAE, Campus SupAgro, Montpellier, France.

Education

2013 – 2018 **Philosophy Doctor** in Atmosphere, Oceans and Climate

Department of Meteorology, University of Reading, Reading, UK.
Project title: “Improving the treatment of vegetation canopy architecture in
Land Surface Models”
Supervisor: Dr. Tristan Quaife; Co-supervisor: Dr. Emily Black

2011 – 2013 **Master of Science** in Atmospheric Sciences

Department of Atmospheric Sciences, University of São Paulo, São Paulo,
Brazil.
with fieldwork period in the Amazon rainforest, Uatumã Biological Reserve,
AM, Brazil.
Dissertation title: “Evaluation of CO₂, Sensible and Latent Heat Turbulent
Fluxes as Function of Aerosol Optical Depth over the Deforestation Arch in the
Legal Brazilian Amazon”
Supervisor: Prof. Dr. Márcia Akemi Yamasoe

2007 – 2010 **Bachelor of Science** in Meteorology

Department of Atmospheric Sciences, University of São Paulo, São Paulo,
Brazil.

Visiting Scientist

Sept, 2019 **Visiting Scientist** at ORNL

The Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.

Apr – Jun, 2015 **Visiting Scientist** at ICTP

The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy.

Honours and Awards

2014 **Outstanding M.Sc. Dissertation** – Department of Meteorology

University of São Paulo, Brazil.

Grants

2020 **Postdoctoral NASA/ABOVE fellowship** – NASA JPL, USA.

2019 **Postdoctoral DOE/NASA fellowship** – NASA JPL, USA.

2017 **Postdoctoral EU H2020 fellowship** – INRAE, France.

2013 **Ph.D. CAPES fellowship** – University of Reading, United Kingdom.

2011 **M.Sc. CAPES fellowship** – University of São Paulo, Brazil.

2009 **Undergraduate CAPES fellowship** – University of São Paulo, Brazil.

2008 **Undergraduate Santander fellowship** – University of São Paulo, Brazil.

Publications

Wang, Y., Köhler, P., He, L., Doughty, R., **Braghiere, R. K.**, Wood, J. and Frankenberg, C. (2021). Testing stomatal models at stand level in deciduous angiosperm and evergreen gymnosperm forests using CliMA Land (v0.1), *Geosci. Model Dev.*, 1–35, [doi:10.5194/gmd-2021-154](https://doi.org/10.5194/gmd-2021-154)

Braghiere, R. K., Fisher, J. B., Fisher, R. A., Shi, M., Steidinger, B. S., Sulman, B. N., Soudzilovskaia, N. A., Yang, X., Liang, J., Peay, K. G., Crowther, T. W. and Phillips, R. P. (2021). Mycorrhizal Distributions Impact Global Patterns of Carbon and Nutrient Cycling, *Geophys. Res. Lett.*, 48(19), [doi:10.1029/2021GL094514](https://doi.org/10.1029/2021GL094514)

Braghiere, R. K., Wang, Y., Doughty, R., Sousa, D., Magney, T., Widlowski, J.-L., ... et al. (2021). Accounting for canopy structure improves hyperspectral radiative transfer and sun-induced chlorophyll fluorescence representations in a new generation Earth System model. *Remote Sensing of Environment*, 261, 112497. [doi:10.1016/j.rse.2021.112497](https://doi.org/10.1016/j.rse.2021.112497)

Braghiere, R. K., Quaife, T., Black, E., Ryu, Y., Chen, Q., Kauwe, M. G. De, & Baldocchi, D. (2020). Influence of sun zenith angle on canopy clumping and the resulting impacts on photosynthesis. *Agricultural and Forest Meteorology*, 291(May), 108065. [doi:10.1016/j.agrformet.2020.10065](https://doi.org/10.1016/j.agrformet.2020.10065)

Braghiere, R. K., Gérard, F., Evers, J., Pradal, C. and Pages, L., 2020: Simulating the effects of water limitation on plant biomass using a 3D functional-structural plant model of shoot and root driven by soil hydraulics, *Annals of Botany*, doi:10.1093/aob/mcaa059

Braghiere, R. K., Yamasoe, M. A., do Rosário, N. M., da Rocha, H., de Souza Nogueira, J. and de Araújo, A. C., 2020: Characterization of the radiative impact of aerosols on CO₂ and energy fluxes in the Amazon deforestation arch using artificial neural networks, *Atmos. Chem. Phys.*, 20(6), 3439–3458, doi:10.5194/acp-20-3439-2020

Braghiere, R. K., Quaife, T., Black, E., He, L. and Chen, J. M., 2019: Underestimation of Global Photosynthesis in Earth System Models Due to Representation of Vegetation Structure, *Global Biogeochem. Cycles*, 33(11), 1358–1369, doi:10.1029/2018GB006135

Hogan, R. J., Quaife, T., and **Braghiere, R.**, 2018: Fast matrix treatment of 3-D radiative transfer in vegetation canopies: SPARTACUS-Vegetation 1.1, *Geosci. Model Dev.*, 11, 339-350. doi:10.5194/gmd-11-339-2018

Braghiere, R.K., Yamasoe, M.A., 2013.: Evaluation of CO₂ flux modification as a function of aerosol optical depth at Bananal Island, Tocantins, Brazil, in: AIP Conference Proceedings. pp. 552–555. doi:10.1063/1.4804829

Under review

Braghiere, R. K., Fisher, J., Allen, K., Brzostek, E., Shi, M., Yang, X., Ricciuto, D. M., ... et al. Modeling global carbon cost of plant nitrogen and phosphorus acquisition. *Under review JAMES*.

Book chapter

Yamasoe, M. A., Rosario, N. E., Costa, T. S., **Braghiere, R. K.**, Leiva, E. A., Zanchi, F. B., Silva, B. L., Morais, J. C., 2015. Medições e Estimativas Numéricas da Irradiância Solar Descendente em Superfície – Estudos de Casos em Humaitá, AM, in: *Ciência das mudanças climáticas e sua interdisciplinaridade* by Ambrizzi, T., Jocobi, P. R., Dutra, L. M. Annablume, São Paulo, p. 282.

Expert Reviewer

IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

Languages

- **Portuguese** Native speaker
- **English** Advanced
- **Spanish** Advanced
- **French** Intermediate
- **Italian** Basic
- **German** Basic

Programming skills

- **Python** Advanced
- **Fortran** Advanced

- C++ Advanced
- **MATLAB** Intermediate
- **Java** Intermediate
- **R** Intermediate

Research/Data Experience

- **Land Surface Models** – e.g., JULES, SiB2, CLM, ELM
- **Satellite data** – e.g., MODIS, GOME-2, OCO-2/3
- **Flux tower data** – e.g., AmeriFlux, ICOS, FLUXNET
- **Earth System Models** – e.g., UKESM, CESM, E3SM, CliMA

Lecturing Experience

2017/2018 Monitor, Department of Meteorology, University of Reading.

Internship in module “*Surface Energy Exchange*”.

2nd sem. 2012 **Internship** (Program of Teaching Improvement), Department of Atmospheric Sciences, University of São Paulo.

Internship in module “*Agrometeorology*”.

1st sem. 2012 **Internship** (Program of Teaching Improvement), Department of Atmospheric Sciences, University of São Paulo.

Internship in module “*Introduction to the Atmospheric Sciences*”.

2nd sem. 2011 **Internship** (Program of Teaching Improvement), Department of Atmospheric Sciences, University of São Paulo.

Internship in module “*Meteorology by Satellites*”.

1st sem. 2011 **Demonstrator**, Department of Atmospheric Sciences, University of São Paulo.

Demonstrator in module “*Physics Meteorology II*”.

2009 - 2010 **Scientific Initiation** in Radiation, Aerosols, Amazon, Plant Productivity under supervision of Prof. Dr. Marcia Akemi Yamaose.

2008 - 2009 **Scientific Initiation** in Atmospheric Chemistry, Tropospheric Ozone under supervision of Dr. Claudia Boian. Fellowship from Santander/SA.

Synergistic Activities & Professional Development

Mar, 2020 **CLM/CTSM Workshop**
NCAR, USA.

Feb, 2019 **CLM/CTSM Tutorial**
NCAR, USA.

Jun, 2017 **4th ICOS Summer School**

Hyytiälä, Finland.

Jun, 2016 **Flux Course 2016**
Boulder, Colorado, USA.

Apr – Jul, 2015 Visiting period at the **International Centre for Theoretical Physics, UN**
Trieste, Italy.

Oct, 2014 Environment YES **NERC Workshop**
Syngenta, Bracknell, UK.

Jun, 2014 **INRA Summer School 2014**, Transfer and Interactions between ecosystems
University of Bordeaux, France.

Apr, 2014 Earth System Science **NERC Spring School 2014**
University of Lancaster, UK.

Oct, 2012 **Workshop** in Hydrological Modelling.
By Texas A&M University, USA, at University of São Paulo.

Oct, 2012 **Workshop** in Chemical Modelling.
By NOAA, USA, at University of São Paulo.

Presentations

2021

CMIP6 Carbon Cycle Uncertainties in Arctic-Boreal Ecosystems. **ABoVE Science Team Meeting**. Virtual meeting, USA. 11 May

Simulating the effects of water limitation on crop biomass production using a functional-structural plant 3D model of shoot and root driven by soil hydraulics. **Invited Speaker** SupAgro, Virtual INRAE, Montpellier, France. 06 May

Global Carbon Costs of Phosphorus Acquisition: Outcomes from the P-enabled FUN model. **Invited Speaker** NGEE-Tropics, Virtual Lawrence Berkeley National Laboratory. 19 April

Better representing vegetation canopy structure in Earth System Models. **European Geophysical Union virtual meeting 2021**. 19 April

Climate Change Impacts on Mycorrhizae Amplify Nitrogen Limitation on Global Plant Growth. **CESM Land Model and Biogeochemistry working group virtual meeting**. 25 February

2020

Considering the effects of canopy structure on hyperspectral radiative transfer and terrestrial photosynthesis. **American Geophysical Union meeting 2020**. Online Everywhere. 9 December

Better representing vegetation canopy structure in Earth System Models. NASA-JPL, Pasadena, California, USA. **Invited Speaker**. https://youtu.be/_D9g0Nt8LFs 10 September

Adding different explicit spatial representations of plant symbiotic status in CLM. Boulder, Colorado, USA. **CLM Group Meeting 2020**. 03 March

2019

Considering carbon costs of plant phosphorus acquisition in Earth System Models. **American Geophysical Union meeting 2019**. San Francisco, CA, USA. 9 December

From the atmosphere to the land surface: improving representations of atmosphere-biosphere interactions. NASA-JPL, Pasadena, California, USA. **Invited Speaker**. 11 February

2017

Improving the treatment of vegetation canopy architecture in radiative transfer schemes. Department of Meteorology, University of Reading, UK. **Departmental Seminar**. 27 June

2016

Evaluating radiative transfer schemes treatment of vegetation canopy architecture in land surface models. **European Geophysical Union meeting 2016**. Vienna, Austria. 28 April

2015

Improving Land Surface Model treatment of vegetation canopy architecture. **Quo Vadis**. Department of Meteorology. University of Reading, UK. March

Improving Land Surface Model treatment of vegetation canopy architecture. ICTP, Trieste, Italy. (**Invited**) <http://indico.ictp.it/event/7444/> . 20 March.

2014

The Effects of Canopy Stand Structure on Ecosystem Functioning. University of Lancaster, Lancaster, UK. **Spring School**

2012

Evaluation of CO₂ Flux Modification as Function of Aerosol Optical Depth in the Bananal Island, Tocantins, Brazil. Poster. **International Radiation Symposium**. Berlin, Germany. 10 August

2011

Avaliação da Fração da Radiação Fotossinteticamente Ativa Absorvida pela Floresta Tropical Primária na Amazônia. Poster. **XV Simpósio Brasileiro de Sensoriamento Remoto**. Curitiba, Brazil. 4 May

2010

Evaluation of Photosynthetically Active Radiation Fraction Absorbed by Primary Tropical Forest in the Amazon during the Dry Season of 2007. Poster. **AGU - The Meeting of the Americas**. Foz do Iguaçu, Brazil. 12 August

Avaliação da Fração da Radiação Fotossinteticamente Ativa Absorvida pela Floresta Tropical Primária na Amazônia. Poster. **XV Simpósio de Iniciação Científica do IAG**. Sao Paulo, Brazil

2009

Avaliação da Qualidade do Ar para a Região Metropolitana de Campinas. Poster. 17º Simpósio Internacional de Iniciação Científica da USP. Avaliação da Qualidade do Ar para a Região Metropolitana de Campinas. **XIV Simpósio de Iniciação Científica do IAG**. Sao Paulo, Brazil

Professional Services

Reviewer for: Journal of Geophysical Research: Biogeosciences; Remote Sensing of Environment; Climate Resilience and Sustainability; Water Resources Research; Geoscientific Model Development; Global Change Biology.

Expert reviewer for NASA Carbon Program Panel

Public Outreach & Volunteer Experience

[“Climate change affects key tree-fungi interactions” – Purdue University](#)

[Amazon Tall Tower Observatory \(ATTO\) project – Blog post about my time in the Amazon](#)

[“3D model of shoot-root-soil hydraulics” – Botany One press release](#)

[Including vegetation structure improves photosynthesis in land surface models](#)

[4th ICOS Summer School](#)

[The impact of vegetation structure on global photosynthesis](#)

Instructor, ‘Alegria de Crescer’ High School, Capivari, Sao Paulo, Brazil September 2016

Taught ‘*Science as a career*’

Instructor, Sao Paulo State University, UNESP-Bauru, Sao Paulo, Brazil September 2016

Taught ‘*PhD: Each is a unique journey*’

Memberships & Affiliations

European Geophysical Union; American Geophysical Union

List of Referees

1) Individual Referee

Name: Dr. Christian Frankenberg

Position: Professor of Environmental Science & Engineering

Research scientist, JPL

Address: Mail Code 131-24

Pasadena, CA 91125-2300

Office: 203 Linde+Robinson

Telephone number: +1 (626) 395 2331

E-mail address: cfranken@caltech.edu

2) Individual Referee

Name: Dr. John R. Worden

Position: JPL Principal Scientist

Address: 4800 Oak Grove Dr.

MS 233-200

Pasadena, CA, 91109

Telephone number: +1 (818) 393 7122

E-mail address: john.worden@jpl.nasa.gov

3) Individual Referee

Name: Dr. Joshua Fisher

Position: Associate Project Scientist at Chapman and JIFRESSE UCLA

Telephone number: +1 (821) 354-0934

E-mail address: joshbfisher@gmail.com

4) Individual Referee

Name: Dr. Frédéric Gerard

Position: Junior Scientist (CRN)

Address: Eco&Sol - Department of Environment and Agronomy

French National Institute for Agricultural Research

2, Place Pierre Viala – Campus SupAgro

Montpellier 34060

France

Telephone number: +33 (0) 499 613 024

E-mail address: frederic.gerard@inrae.fr

5) Individual Referee

Name: Dr. Tristan Quaife

Position: Associate Professor

Address: Department of Meteorology

5th floor Lyle Building University of Reading

Reading RG6 6BX

United Kingdom

Telephone number: +44 (0) 118 378 8743

E-mail address: t.l.quaife@reading.ac.uk

6) Individual Referee

Name: Dr. Emily Black

Position: Senior Research Scientist (NCAS-Climate)

Address: Department of Meteorology

5th floor Lyle Building University of Reading

Reading RG6 6BX

United Kingdom

Telephone number: +44 (0) 118 378 6608

E-mail address: e.c.l.black@reading.ac.uk

7) Individual Referee

Name: Prof. Dr. Marcia Akemi Yamasoe

Position: Professor Doctor

Address: Instituto de Astronomia, Geofísica e Ciências Atmosféricas

Universidade de São Paulo
Rua do Matão, 1226 - Cidade Universitária
São Paulo – SP 05508-900
Brazil

Telephone number: +55 (11) 3091 4682

E-mail address: marcia.yamasoe@iag.usp.br