Curriculum Vitae of Ronan PAUGAM

Overview

I am currently setting up an agreement between the US Forest Service and the Universitat Politècnica de Catalunya in Barcelona (UPC) to start working at UPC this coming autumn with Dr Elsa Pastor. I have nearly 10 years of experience in fire science on both active fire monitoring and fire-plume modelling. I have been working as a postdoctoral researcher at CERFACS in Toulouse with Dr Melanie Rochoux for a year between 2018 and 2019. Previously I was a visiting scholar at the University of Washington for 2 years working with Dr William MELL from the US Forest Service, and a postdoctoral researcher for 8 years in the Department of Geography of Kings College London (KCL) with Prof. Martin WOOSTER. My main scientific product achievement so far is the development of a parameterization for fire plume injection height which is now running operationally in the IFS model of ECMWF. More recently, over the last couples of years, I worked on the development of a simulation strategy for the modelling of radiative transfer in large-scale fire plume. The end objective of this latter development is to help improving Earth Observation fire remote sensing product by creating a virtual fire laboratory. I am particularly interested in designing and conducting fieldwork campaign, integrating fire radiation measurement from prescribed burn into atmospheric meso-scale model, and in fine generating realistic fire scene for radiative transfer model.

Personal Data

Nationality:	French
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url:	https://ronanpaugam.github.io/

Professional Background

June 2018 – May 2019	**Post Doctoral Researcher, CERFACS (Toulouse, France).** Supervisor Dr Melanie Rochoux. - Work in the continuity of the collaboration with Dr. William Mell when at Seattle (See below). - Large Eddy simulation of Fire Plume with the coupled fire-atmosphere model MesoNH-ForeFire - Airborne Image processing for Fire behaviour metrics, in particular Rate of Spread and flaming residence time calculation - Deep Learning application to segmentation of fire front in Infra Red fire observation.
Mars 2016 – Feb 2018	**Visiting Scholar, US Forest Service / University of Washington, Seattle**

USA. Collaboration with Dr William Mell.

- Large Eddy simulation of Fire Plume with the coupled fire-atmosphere model MesoNH-ForeFire
- Airborne Image processing for Fire behaviour metrics, in particular Rate of Spread and flaming residence time calculation
- Airborne Image georeferencing in collaboration with the Canadian Forest Service.
- Development of a methodology for Fire Intensity estimation from small scale fire monitored with low cost UAV.

Oct 2008 - Dec 2015

Post Doctoral Research Associate, Dept Geography Kings College London (KCL, London,UK). Supervisor: Prof. Martin Wooster

- Development of a parameterization for wildfire emission injection height estimation in large scale transport model for ECMWF.
- Implementation of mapping methodology to airborne thermal data for derivation of the Fire Radiative Power product.
- Development of a fire scene simulation algorithm and coupling with the Radiative transfer model DART (Cesbio, France) for the simulation of the Fire Radiative Power product.
- Multiple Fieldwork participations with organisation position in several of them.
- Successful Grant application as Co-PI for 3 NERC, 1 ESA and 2 internal KCL projects.
- Master student co-supervision
- Published in refereed journal and presented in international conferences.

Jan 2005 - May 2008

PhD Student, Ecole Centrale Paris (Chatenay-Malabry, France) and team Aviation Environment of CERFACS (Toulouse, France). Advisor: Dr. Daniel Cariolle

Thesis title: Numerical study of a contrail evolution and its interaction with the atmospheric turbulence.

- Large-Eddy simulation of aircraft wake instabilities and atmospheric-contrail interaction.
- Published in refereed journal and presented in international conferences.

Studies

Jan 2005 - May 2008

PhD in Computational Fluid Mechanics

	Ecole Centrale Paris and CERFACS.
Sep 2002 - Dec 2004	**Engineering School**
	Ecole Centrale Paris option Applied Mathematics
Sep 2003 - Sep 2004	**MSc in numerical methods**
	Ecole Normale Superieure de Cachan
Sep 1998 - June 2002	**BSc, and a Magistere degree in Fundamental Physics**
	Paris-South University, Centre of Orsay.

Early Research Experiences (internships)

Jun-Oct 2004	research project in oceanography physics, Department of Meteorology - University of Reading (U.K.) Supervisor: Prof David Marshall subject: Study of the Upper Limb of a Closed Ocean Basin in the hypothesis of Basin Modes and Geostrophic Turbulence
Apr-Jul 2002	research project in atmospheric dynamic, Department of Applied Mathematics and Theoretical Physics - University of Cambridge (U.K.) Supervisor: Prof Micheal McIntyre subject: Interaction wave – vortex
Jun-Jul 2001	research project in Fundamental Physics, Laboratoire de l'Accelerateur Lineaire, Paris-South University, Centre of Orsay (France) Supervisor: Pr. Francois Couchot subject: Short-Range Gravitation Forces

Research Projects

Participation as a Co-PI:

NERC small grant	"Determining convective/radiative energy portioning in large scale open fire", NE/J014060/1, £58k
NERC knowledge exchange	"Improving representation of the effects of Biomass Burning Smoke Emissions in a Key UK/European Operational Atmospheric Monitoring and forecasting scheme", NE/I022116/1, £99.5k
ESA	"3D Fire Radiative Power Approach Modelling Approach", ESA ITT 1-6811/11/NL/AF, 249keuro
contract with the Canadian Forest Service	"geo-correct thermal Infrared imagery collected from a fixed wing aircraft", equivalent 65k Canadian$

Participation in Consortium project:

FASMEE	Fire and Smoke Model Evaluation Experiment. Joint Fire Science Program grant. Jan 2016-Apr 2017

SAMBBA	South American Biomass Burning Analysis. NERC consortium grant. Sep 12 – Aug 16
MACC-III	Monitoring Atmospheric Composition and Climate- Interim Implementation. EU H2020, Aug 2014 - Jun 2015
MACC-II	Monitoring Atmospheric Composition and Climate - Interim Implementation. D-Fire sub-project. EU FP7, 2011-2014
QUANTIFY	Quantifying the Climate Impact of Global and European Transport System, EU FP6, 2005-2009

Teaching

2013-2015: 'Fire Carbon Cycle' course and practical for the MSc Remote Sensing and Environmental Mapping delivered jointly by University College London (UCL) and KCL (6h).

Invited Presentations

Sep 2015: Meteorology and Climate - Modeling for Air Quality (MAC-MAQ) workshop. Sacramento, US

Oct 2011: National Institute for Space Research (INPE), visiting researcher, Sao Jose dos Campos, Brazil.

Research Interest and Expertise

- Physical processes of Wildfire, in particular radiation
- Developing coarse/empirically based Radiative Transfer model for large fire.
- Fire Radiation Measurement – Remote Sensing techniques for prescribed burn.
- Meso Scale Atmospheric Dynamics
- Coupling of physical processes and turbulent atmospheric dynamics

Languages

- French: mother tongue
- English: fluent reading and writing

Computer skills

- Scientific programming: Python (opencv, gdal libraries), IDL, Fortran90
- System: Linux (server installation and maintenance)

- Software: Latex, Office package, visualisation tools (tecplot, paraview, ENVI),

List of Publications

Peer-reviewed publications:

1. Evangeliou, N., Kylling, A., Eckhardt, S., Myroniuk, V., Stebel, K., **Paugam**, **R**., Zibtsev, S., and Stohl, A.: Open fires in Greenland in summer 2017: transport, deposition and radiative effects of BC, OC and BrC emissions, Atmos. Chem. Phys., 19, 1393-1411, 2019.
2. Andela, N., Morton, D. C., Giglio, L., **Paugam**, **R.**, Chen, Y., Hantson, S., van der Werf, G. R., and Randerson, J. T.: The Global Fire Atlas of individual fire size, duration, speed, and direction, Earth System Science Data 11 (2), 529-552, 2019
3. Liu Y., Kochanski A., Baker K. R., Mell W., Linn R., **Paugam R.**, Mandel J., Fournier A., Jenkins M. A., Goodrick S., Achtemeier G., Zhao F., Ottmar R., French N. H. F., Larkin N., Brown T., Hudak A., Dickinson M., Potter B., Clements C., Urbanski S., Prichard S., Watts A., McNamara D. Fire behaviour and smoke modelling: model improvement and measurement needs for next-generation smoke research and forecasting systems. International Journal of Wildland Fire 28, 570-588, 2019.
4. Johnston J.M., Wheatley M.J., Wooster M.J., **Paugam R.**, Davies G.M., DeBoer K.A.: Flame-Front Rate of Spread Estimates for Moderate Scale Experimental Fires Are Strongly Influenced by Measurement Approach. Fire, 1, 16., 2018
5. Sauvage, B., Fontaine, A., Eckhardt, S., Auby, A., Boulanger, D., Petetin, H., **Paugam**, **R.**, Athier, G., Cousin, J.-M., Darras, S., Nédélec, P., Stohl, A., Turquety, S., Cammas, J.-P., and Thouret, V.: Source attribution using FLEXPART and carbon monoxide emission inventories: SOFT-IO version 1.0, Atmos. Chem. Phys., 17, 15271-15292, https://doi.org/10.5194/acp-17-15271-2017, 2017.
6. Johnston J. M., Wooster M. J., **Paugam R.**, Wang X., Lynham T. J., Johnston L. M.: Direct estimation of Byram's fire intensity from infrared remote sensing imagery. International Journal of Wildland Fire 26, 668-684, 2017.
7. Rémy, S., Veira, A., **Paugam, R.**, Sofiev, M., Kaiser, J. W., Marenco, F., Burton, S. P., Benedetti, A., Engelen, R. J., Ferrare, R., and Hair, J. W.: Two global data sets of daily fire emission injection heights since 2003, Atmos. Chem. Phys., 17, 2921-2942, doi:10.5194/acp-17-2921-2017, 2017.
8. Evangeliou, Nikolaos; Zibtsev, S.; Myroniuk, V.; Zhurba, M.; Hamburger, Thomas; Stohl, Andreas; Balkanski, Y.; **Paugam, R.**; Mousseau, T.A.; Møller, A.P.; Kireev, S.I.: Resuspension and atmospheric transport of radionuclides due to wildfires near the Chernobyl Nuclear Power Plant in 2015: An impact assessment. Scientific Reports, Nature, doi:10.1038/srep26062, 2016.
9. **Paugam, R.**, Wooster, M., Freitas, S., and Val Martin, M.: A review of approaches to estimate wildfire plume injection height within large-scale atmospheric chemical transport models, Atmos. Chem. Phys., 16, 907-925, doi:10.5194/acp-16-907-2016, 2016.

10. **Paugam, R.**, Wooster, M., Atherton, J., Freitas, S. R., Schultz, M. G., and Kaiser, J. W.: Development and optimization of a wildfire plume rise model based on remote sensing data inputs -Part 2, Atmos. Chem. Phys. Discuss., 15, 9815-9895, doi:10.5194/acpd-15-9815-2015, 2015. [kept in review for acp]
11. Gonzi, S., Palmer, P. I., **Paugam, R.**, Wooster, M., and Deeter, M. N.: Quantifying pyroconvective injection heights using observations of fire energy: sensitivity of spaceborne observations of carbon monoxide, Atmos. Chem. Phys., 15, 4339-4355, doi:10.5194/acp-15-4339-2015, 2015.
12. N. Evangeliou, Y. Balkanski, A. Cozic, W. M. Hao, F. Mouillot, K. Thonicke, **R. Paugam**, S. Zibtsev, T. A. Mousseau, R. Wang, B. Poulter, A. Petkov, C. Yue, P. Cadule, B. Koffi, J. W. Kaiser, and A. P. MÃ¸ller. Fire evolution in the radioactive forests of Ukraine and Belarus: future risks for the population and the environment. Ecological Monographs 85:49-72. 2015
13. **Paugam R**., Wooster, M. J. and Roberts, G, 2013: Use of Handheld Thermal Imager Data for Airborne Mapping of Fire Radiative Power and Energy and Flame Front Rate of Spread, Geoscience and Remote Sensing, IEEE Transactions on , vol.51, no.6, pp.3385,3399
14. Rochoux, M. C., Cuenot, B., Ricci, S., Trouve, A., Delmotte, B., Massart, S., Paoli, R. & **Paugam, R.**: Data assimilation applied to combustion, COMPTES RENDUS MECANIQUE. 341, 1-2, p. 266-276 11 p., DOI: 10.1016/j.crme.2012.10.011 , Jan 2013
15. Val Martin, M., R. A. Kahn, J. A. Logan, **R. Paugam**, M. Wooster, and C. Ichoku, 2012: Space-based observational constraints for 1-D fire smoke plume-rise models, J. Geophys. Res., 117, D22204
16. **Paugam R.** , R. Paoli, and D. Cariolle, 2010: Influence of vortex dynamics and atmospheric turbulence on the early evolution of a contrail, Atmospheric Chemistry and Physics, Vol. 10, pp. 3933-3952.
17. D. Cariolle, D. Caro, R. Paoli, D. Hauglustaine, B. Cuenot, A. Cozic, and **R. Paugam**, 2009: Introduction of non-linear plume chemistry into large scale atmospheric models: application to aircraft emissions, Journal of Geophysical Research, Vol. 114, D19302.

Book chapters:

- Schiks T., Cantin A.S., Johnston J.M., **Paugam R.**, Whitman E. (2019) Satellite-Based Fire Detection. In: Manzello S. (eds) Encyclopedia of Wildfires and Wildland-Urban Interface (WUI) Fires. Springer, Cham
- Whitman E., Johnston J.M., Schiks T., **Paugam R.**, Cantin A.S. (2019) Imaging Postfire Environments. In: Manzello S. (eds) Encyclopedia of Wildfires and Wildland-Urban Interface (WUI) Fires. Springer, Cham
- Johnston J.M., **Paugam R.**, Whitman E., Schiks T., Cantin A.S. (2019) Remote Sensing of Fire Behavior. In: Manzello S. (eds) Encyclopedia of Wildfires and Wildland-Urban Interface (WUI) Fires. Springer, Cham

Referenced conference publications:

- Liu, Yongqiang; Kochanski, A; Baker, K; Mell, W; Linn, R; **Paugam, R**; Mandel, J; Fournier, A; Jenkins, M A; Goodrick, S; Achtemeier, G; Hudak, A; Dickson, M; Potter, B; Clements, C;

Urbanski, S; Ottmar, R; Larkin, N; Brown, T; French, N; Prichard, S; Watts, A; McNamara, D. 2017. Fire and Smoke Model Evaluation Experiment (FASMEE): Modeling gaps and data needs. In: Proceedings for the 2nd International Smoke Symposium November; 14-17, 2016, Long Beach, California, USA. Missoula, MT: International Association of Wildland Fire. 13 p.

- Dold John, Tsitsopoulos V, Khan I, Scott K, McMorrow J, Lowe E, Danson F M, Ramirez A, Doerr S, Bryant R, Harris M, Tollitt T,Allen K, **Paugam R**, Freeborn P, Smith T, Davies H, Wooster M, Legg C, Gibson S, Elliott A, Yearsley S, 2010. Report on field experiments in Northumberland, March 2010 a multidisciplinary approach to assess fire behaviour and effects in a temperate climate. Proc. 6th Int. Conf. Forest Fire, Res.
- **R. Paugam**, M. Wooster, G. Papadakis, and M. Schultz: Estimation of the Injection Height of Biomass Burning Emission, Proceeding for the ESA-iLEAPS-EGU joint conference, Frascati, Italy, November 2010
- **R. Paugam**, R. Paoli, D. Cariolle and B. Cuenot: Numerical simulation of aircraft plume evolution using a mesoscale code, Proceedings of the International Conference on Transport, Atmosphere and Climate, Oxford, UK, June 2006.

Main Conference Abstracts

- **R. Paugam**, JP Gastellu-Etchegorry, W Mell, J .Johnston, JB Filippi: Prescribed Burn, Helicopterborne Infrared Imagery, and 3D Plume Model for Synthetic FRP Product Simulation. Earth Observation Submit, Montreal 2017.
- **R. Paugam**, JP Gastellu-Etchegorry, W Mell, J .Johnston, JB Filippi: Modelling Middle Infrared Thermal Imagery from Observed or Simulated Active Fire, AGU Fall Meeting Abstracts, 2016
- **R. Paugam**, M. Wooster, J. Johnston, J.P. Gastellu-Etchegorry: FRP product simulation tools. Numerical Wildfire workshop, Cargese France 2013
- **R Paugam**, M Wooster, J Atherton, S Beevers, N Kitwiroon, JW Kaiser, S Remy, SR Freitas: Wildfire Emission, injection height: Development, Optimization, and Large Scale Impact - AGU Fall Meeting Abstracts, 2013
- **R Paugam**, M Wooster, J Atherton, JW Kaiser, S Freitas: On the parameterization of Injection Height and the use of the MISR plume height project data - Vol. 15, EGU2013-13779, 2013
- **R Paugam**, M Wooster, S Freitas, S Gonzi, P Palmer: Parameterization of Fire Injection Height in Large Scale Transport Model - Vol. 14, EGU2012-8366, 2012
- **R Paugam**, M Wooster, G Papadakis, M Schultz: Estimation of the Injection Height of Biomass Burning Emission - Vol. 13, EGU2011-1097, 2011