

Pietro de Anna

CONTACT INFORMATION

Postdoctoral associate, Department of Civil
and Environmental Engineering (Ruben
Juanes group) - MIT

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RESEARCH INTERESTS

Fluid Dynamics, Mixing and Reactive Transport, Biological Activity under Heterogeneous
Flows Conditions.

EDUCATION

Ph.D., **University of Rennes 1** Rennes, France - July 2012

- Thesis Topic: *Reactive transport in heterogeneous porous media*
- Advisors: Philippe Davy and Tanguy Le Borgne
- Area of Study: Hydrology

M.S., **University of Florence**, Italy, February 2009

- Thesis Topic: *Collective dynamics in a protocell: analytical and numerical study*
- Advisor: Duccio Fanelli
- Area of Study: Statistical Mechanics

REFEREED JOURNAL PUBLICATIONS

P. K. Kang, P. de Anna, Joao P. Nunes, Branko Bijeljic, Martin J. Blunt, and Ruben
Juanes. Pore-scale intermittent velocity structure underpinning anomalous transport
through 3-D porous media. *Geophys. Res. Lett.*, 10.1002/2014GL061475 (2014).

P. de Anna, M. Dentz, A. Tartakovsky and T. Le Borgne. The filamentary structure
of mixing fronts and its control on reaction kinetics in porous media flows. *Geophys.
Res. Lett.*, **41** (2014).

P. de Anna, J. Jimenez-Martinez, H. Tabuteau, R. Turuban, T. Le Borgne, M Derrien
and Y. Meheust. Mixing and Reaction Kinetics in Porous Media: An Experimental
Pore Scale Quantification *Environ. Sci Technol.* **48**, 508-516 (2014).

P. de Anna, T. Le Borgne, M. Dentz, A. Tartakovsky, D. Bolster and P. Davy Flow
Intermittency, Dispersion, and Correlated Continuous Time Random Walks in Porous
Media. *Phys. Rev. Lett* **101**, 184502 (2013).

A. Boisson, P. de Anna, O. Bour, T. Le Borgne, and L. Aquilina. Quantifying nitrate
consumption, nitrous oxide and nitrite production during denitrification by push-pull
tests through first order reaction chain *Journal of Contaminant Hydrology* **148**, 1-11
(2013)

D. Bolster, P. de Anna, D.A. Benson and A.M. Tartakovsky. Incomplete Mixing and
Reactions with Fractional Dispersion. *Advances in Water Resources*,37 86-93 (2012)

A. Tartakovsky, P. de Anna, T. Le Borgne, A. Balter and D. Bolster. Effect of spatial
concentration fluctuations on non-linear reactions in diffusion-reaction systems. *Water
Resources Research*, 48 W02526 (2012).

P. de Anna, T. Le Borgne, M. Dentz, D. Bolster, and P. Davy. Anomalous kinetics in
diffusion limited reactions linked to non-Gaussian concentration probability distribution
function. *J. Chem. Phys.* **135**, 174104 (2011).

T. Le Borgne, D. Bolster, M. Dentz, P. de Anna and A. Tartakovsky. Effective Pore-Scale Dispersion Upscaling with a Correlated CTRW Approach. *Water Resources Research*, 47 W12538, (2011)

P. de Anna, F. Di Patti, D. Fanelli, A. J. McKane, and T. Dauxois. Spatial model of autocatalytic reactions. *Phys. Rev. E* **81**, 056110 (2010).

INVITED TALKS

P. de Anna, T. Le Borgne, A. Tartakovsky and M. Dentz. *Kinetics of Front Reactions driven by Microscopic Mixing Dynamics*, SIAM Geosciences conference, June 17-21 2013 Padova, Italy.

P. de Anna, T. Le Borgne, A. Tartakovsky and M. Dentz. *Effective mixing and reaction front kinetics*. In: Goldschmidt conference, 24-29 June 2012 Montreal, Canada.

P. de Anna, T. Le Borgne, A. Tartakovsky and M. Dentz. *Effective kinetics of 2D reactive ($A + B \rightarrow C$) front in heterogeneous porous media*. In: EGU General Assembly, 22-27 April 2012 Vienna, Austria.

SELECTED TALKS

P. de Anna, Y. Yawata, R. Stocker, R. Juanes. *Disrupting bacteria accumulation in heterogeneous flow structures by chemotaxis*. Flow & Transport in Permeable Media (Gordon Research Seminar and Conference), Bates College July, 2014.

P. de Anna, J. Jimenez-Martinez, H. Tabuteau, R. Turuban, T. Le Borgne, M. Derrien and Y. Meheust. *Mixing and Reaction Kinetics in Porous Media: An Experimental Pore Scale Quantification*. In: *AGU fall meeting*, December, 2013 San Francisco, California USA. Poster.

P. de Anna, T. Le Borgne, A. Tartakovsky, M. Dentz, D. Bolster and P. Davy. *Flow Intermittency, Dispersion, and Correlated Continuous Time Random Walks in Porous Media*. In: *APS, DFD meeting*, November, 2013 Pittsburgh, USA. Oral presentation.

P. de Anna, T. Le Borgne, A. Tartakovsky and Marco Dentz. *Effective kinetics of 2D reactive ($A + B \rightarrow C$) front in heterogeneous porous media*. In: *AGU fall meeting*, December, 2012 San Francisco, California USA. Poster.

P. de Anna, T. Le Borgne, A. Tartakovsky, M. Dentz and P. Davy. *Upscaling of transport in correlated non Gaussian velocity fields: consequences for modeling mixing and reactions in porous media*. In: *Sigma - Phi*, July, 2011 Larnaca, Cyprus. Oral presentation.

P. de Anna, T. Le Borgne, A. Tartakovsky, M. Dentz, D. Bolster and P. Davy. *Intermittency-like transport in porous media*. In: *Turbulent Mixing and Beyond*, August 21–28, 2011 ICTP - Trieste, Italy. Oral presentation.

LEARNING

- *Groundwater biogeochemistry summer school/workshop*, at the School of Geosciences, University of Edinburgh, 2011.
- *Groundwater modelling workshop*, at Politecnico di Milano (Polimi), 17–21 January, 2011. Milan, Italy.
- *Flow and transport in porous and fractured media summer school* at the Institut d'Etudes Scientifiques de Cargese in Corsica, 16–28 August 2010.

TEACHING EXPERIENCE

University of Rennes 1 Rennes, France

- November 2011, Hydrology Master degree program, lecture on *Reactive transport in porous media*.

- November 2010, Hydrology Master degree program, lecture on *Chemical reactions and transport in porous media*.

SERVICE

Co-advising with prof. Ruben Juanes a PhD student, at Civil and Environmental Engineering dept. of MIT (2012-present), working on the impact of viscous fingering on mixing.

Co-advised with prof. Yves Meheust for 6 month an undergraduate student, at Geosciences Rennes (2012), developing a 2d Particle Tracking experiment in porous media.

Co-advised with prof. Yves Meheust for 3 month an undergraduate student, at Geosciences Rennes (2011), studying Lagrangian pore scale velocities.

MEETINGS
ORGANIZATION

P. de Anna, T. Le Borgne and M. Dentz, session 23f entitled *Mixing, Chemical Reactions and Biological Activity in Porous Media* at the Goldschmidt conference in Florence, Italy (2013).

I am the director of the 3rd summer school entitled *Flow and Transport in Porous and Fractured Media, Development, Protection, Management and Sequestration of Subsurface Fluids* at the I.E.S.C. in Cargese, France (2015).

REFERENCES
AVAILABLE TO
CONTACT

Ruben Juanes (e-mail: juanes@mit.edu)

- Professor, Department of Civil and Environmental Engineering, MIT
- ◊ 77 Massachusetts Av. 02139 Cambridge
- ★ *Prof. Juanes is currently my P.I.*

Philippe Davy (e-mail: Philippe.Davy@univ-rennes1.fr)

- Professor, Geosciences department, The University of Rennes 1
- ◊ 263 Avenue General Leclerc 35042 RENNES
- ★ *Dr. Davy was my PhD adviser.*

Marco Dentz (e-mail: marco.dentz@idaea.csic.es)

- Research Professor,
- ◊ Department of Geosciences, CSIC Barcelona
- ★ *I am collaborating with Prof. Dentz since the last 4 years.*