

# Morgane Desmau

PHD · EARTH AND ENVIRONMENTAL SCIENCE

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## Interests

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My research focus on the biogeochemical cycles of anthropogenic and natural pollutants in terrestrial environments, mostly aquatic rivers, soils and sediments, to understand the impact of climate change and anthropogenic forcing on their environmental cycles and impacts

Among pollutants, I'm more specifically interested in the behavior (transformations, interactions, diffusion...) of metals, metalloids and nanomaterials and their interactions with micro-organisms.

## Education

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### PhD in Earth and Environmental Science

PARIS DIDEROT UNIVERSITY - INSTITUT DE PHYSIQUE DU GLOBE DE PARIS

*Paris, FRANCE*

- Course: Speciation and Bioavailability, Antwerpen, Belgium, 2017
- Course: Learning how to make people learn in the university of the 21st century, IPGP, Paris, France, 2017
- Course: Training in Absorption X to Control a Line using the Synchrotron, ESRF/CNRS, Grenoble, France, 2016
- Course: Microorganism / mineral interactions in the history of biogeosphere, MNHN, Paris, France, 2016

*Oct. 2015 - Dec. 2018*

### MSc Degree in Geochemistry, Geobiology, Geomaterials and Environment

PARIS DIDEROT UNIVERSITY - INSTITUT DE PHYSIQUE DU GLOBE DE PARIS

*Paris, FRANCE*

- Aquatic geochemistry, isotopy, cosmochemistry, modelling, data analysis, soils' physico-chemistry, organic matter geochemistry, geobiology, etc.

*Sept. 2013 - June 2015*

### BSc Degree in Geosciences

PARIS-SUD UNIVERSITY

*Orsay, FRANCE*

- Crystallography, mineralogy, paleontology, geochemistry, geophysics, cartography, tectonics, geotechnics, magmatism, petrography, hydrology, etc.
- 6 field trips (cartography, magmatism...)

*Sept. 2010 - June 2013*

## Research Experiences

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### YukonU - Northern Mine Remediation Research Program

POSTDOCTORAL RESEARCHER

*Whitehorse, Yn, Canada*

Mitacs Accelerate Scholarship Recipient

Projects:

- Study of Oxygen Diffusion in Saturated Covers in the case of freeze-thaw cycles
- Studying bacterial populations' adaptation to seasonal freeze and thaw cycles and their capacity to remove pollutants

*Mar. 2022 - now*

Supervisor: Guillaume Nielsen ([gnielsen@yukonu.ca](mailto:gnielsen@yukonu.ca))

## Deutsches Elektronen-Synchrotron (DESY) - Photon Science Department

### POSTDOCTORAL RESEARCHER

Role: beamline scientist at the P65 beamline (user support, beamline development)

P65 supervisor: Edmund Welter (edmund.welter@desy.de)

Personal research projects:

- Characterization, quantification and transport of incidental nanomaterials from wildland-urban fires in surface waters (PI: Mohammed Baalousha, University of South Carolina, USA / collaborators: Sandrine J. Matiassek and Jackson P. Webster, California State University-Chico, USA / NSF award ID 2101983)
- Fe-Mn oxides impact on trace elements cycle in China red soils (PI: Marc F. Benedetti, Institut de Physique du Globe de Paris, France/ EC2CO #14499)
- Quantification of magnetite oxidation by reactive oxygen species using X-ray Absorption Spectroscopy (collaborator: Thais Couasnon, Deutsches GeoForschungsZentrum GFZ, Germany)
- Probing Hg speciation at the outer and inner membrane of bacteria (collaborators: Erik Björn, Umea Universitat, Sweden and Ulf Skyllberg, SLU, Sweden)

Hamburg, Germany

Aug. 2020 - Jan. 2022

## Northwestern University - Civil and Environmental Engineering Department

### POSTDOCTORAL RESEARCHER

Projects:

- Study of the potential environmental impact on metals release of urban fire in North California and field testing of cell-free synthetic biology platform for water quality monitoring
- Study of Sn and Zn speciation in toothpastes by X-ray Absorption Spectroscopy and Sn interactions with bacteria from dental microbiome

Supervisor: Jean-François Gaillard (jf-gaillard@northwestern.edu)

Evanston, IL, USA

May 2019 - May 2020

## Institut de Physique du Globe de Paris - Environmental Biogeochemistry Lab.

### PHD STUDENT & TEACHING ASSISTANT

Title: Impact of bacterial biofilm on the fate of manufactured nanoparticles in soil

Supervisors: Marc F. Benedetti (benedetti@ipgp.fr) and Alexandre Gélabert (gelabert@ipgp.fr)

Paris, FRANCE

Oct. 2015 - Feb. 2019

## UC Berkeley - Department of Environmental Sciences, Policy and Management (Pallud Lab.) and Institut de Physique du Globe de Paris

### MASTER'S DEGREE INTERNSHIP

Title: Transport and fate of Quantum Dots in soil columns in the presence and absence of bacterial biofilms

Supervisors: Céline Pallud (UCB) and Alexandre Gelabert (IPGP)

Berkeley, CA, USA and Paris, France

Jan. 2015 - Jun. 2015

## Teaching Activities

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### Paris Diderot University

#### TEACHING ASSISTANT AT UNDERGRADUATE LEVEL

- Tutored Project : comprehension and capacity to explain scientific paper from international review on geosciences field - 120h
- General Chemistry : basic skills in solution chemistry applied in Geosciences and practical work - 48h
- Introduction to Geosciences : basic skills on geosciences (solar system formation, datation, geological time scale...) - 32h
- Thermodynamics : basic skills in thermodynamic (first laws of thermodynamics, chemical potential...) 20h

Paris, France

Sept. 2015 - Feb. 2019

## Technical Skills

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### GENERAL SKILLS

- Project management
- Student mentoring
- Development and maintaining of successful international collaborations
- Proposal writing for beamtime allocation (APS, SOLEIL, ESRF, Petra III)
- Analysis and acquisition of experimental data
- Scientific paper writing and reviewing
- Scientific oral presentation
- Teaching and transmission of scientific knowledge
- Languages: French (mother tongue), English (fluent)

### COMPUTER SKILLS

- Long Period-X-ray Standing Waves-Fluorescence Yield (LP-XSW-FY) data treatment (ENVI-IDL)
- Modeling of LP-XSW-FY (MatCab)
- X-ray Absorption Spectroscopy (XAS) data treatment (IFFEFIT : Demeter package - SIXPACK - Larch - Araucaria)
- Metal speciation modelling (Visual Minteq)
- Office Pack (Word, Excel, Powerpoint)
- Other : LaTeX, Inkscape, Python

### ANALYTICAL TECHNIQUES

- Synchrotron related techniques :
  - Long Period - X-ray Standing Waves - Fluorescence Yield
  - X-ray Absorption Spectroscopy
- Silver nanoparticles and Quantum Dots synthesis
- Bacterial/Biofilms cultures
- Development and adaptation of laboratory experiments in geochemistry and biology
- Field water sampling
- Scanning Electron Microscopy
- UV-Vis Spectroscopy
- Inductively Coupled Plasma - Atomic Emission Spectroscopy
- Inductively Coupled Plasma - Mass Spectrometry
- Flame Atomic Absorption and Emission Spectrometry
- X-ray Fluorescence
- Ion Exchange Chromatography
- Potential Zeta and Dynamic Light Scattering measurements

## Synchrotron beamtime

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### ESRF, EUROPEAN SYNCHROTRON RADIATION FACILITY (BM16 & BM30)

(High Energy Resolution Fluorescence Detected) X-ray Absorption Spectroscopy

*Grenoble, France*

*Sept. 2021, Nov. 2021*

### PETRA III, DESY (P65)

X-Ray Absorption Spectroscopy

*Hamburg, Germany*

*Nov. 2020, May 2021, Oct. 2021*

### SLAC, STANFORD SYNCHROTRON RADIATION LIGHTSOURCE (11.2)

Grazing Incidence X-ray Absorption Spectroscopy

*Menlo Park, CA, USA*

*Feb. 2017*

### SOLEIL SYNCHROTRON (SAMBA & DIFFABS)

X-ray Absorption Spectroscopy

Fluorescence mapping associated with X-ray Absorption Spectroscopy

*Gif-sur-Yvette, France*

*Sept. 2016*

*Dec. 2018*

### ADVANCED PHOTON SOURCE, GEOSOLENIROCARS (13ID,C) & DND-5BMD

Long Period - X-ray Standing Waves - Fluorescence Yield

X-Ray Absorption Spectroscopy

*Chicago, IL, USA*

*Mar. 2014 - Apr. 2015 - Apr. 2016*

*Jun. 2019 - Dec. 2019*

## Funding and responsibilities

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### Funded projects

*NSF, EC2CO*

- NSF award ID #2101983, PI: Mohammed Baalousha. Duties : management of XAS analysis (samples preparation, analysis, data processing)

*2020 -*

- EC2CO #14499, PI: Marc F. Benedetti. Duties : support and management of XAS analysis (proposal writing/beamtime request, analysis, data processing)

### Reviewer for high impact journal

Environmental Science & Technology: Letters

*2019 -*

### Funded beamtime

*SOLEIL / APS / ESRF / DESY*

PI: writing and proposal submission (proposal ID #20151047 (SOLEIL), proposal ID #46378 (APS - 2 years project), proposal ID #89356 (ESRF), proposal ID I-20210471 (Petra III)), beamtime preparation, analysis, data treatment

*2015-2021*

## Setting up a workshop (Fête de la Science)

Creation of the workshop, reception of students (elementary to high school), public welcome

*Fête de la Science*

2016

## Organization of the 22nd edition of the IPGP PhD students congress

Logistics management

*IPGP PhD students congress*

2016

## Publications

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Lallemand C., Ambrosi JP., Borschneck D., Angeletti B., Chaurand P., Campos A., **Desmau M.**, Fehlau T., Auffan M., Labille J., Roche N., Poizat L., Collin B., Rose J., Levard C.

Potential of Ligand-Promoted Dissolution at Mild pH for the Selective Recovery of Rare Earth Elements in Bauxite Residues

*ACS Sustainable Chemistry & Engineering*

Accepted

2022

Li H., Hua W., Liu-Théato X., Fu Q., **Desmau M.**, Missyul A., Knapp M., Ehrenberg H., Indris S.

New Insights into Lithium Hopping and Ordering in LiNiO<sub>2</sub> Cathodes during Li (De)intercalation

*Chemistry of Materials*

DOI:10.1021/acs.chemmater.1c02680

2021

**Desmau M.**, Alsina M. and Gaillard J-F.

XAS study of Sn speciation in toothpaste

*Journal of Analytical Atomic Spectrometry*

DOI:10.1039/D0JA00392A

2021

**Desmau M.**, Levard C., Vidal V., Ona Nguema G., Charron G., Benedetti M. F. and Gélalbert A.

How microbial biofilms impact the interactions of Quantum Dots with mineral surfaces?

*NanoImpact*

DOI:10.1016/j.impact.2020.100247

2020

**Desmau M.**, Carboni A., Le Bars M., Doelsch E., Benedetti M. F., Auffan M., Levard C. and Gélalbert A.

How Microbial Biofilms Control the Environmental Fate of Engineered Nanoparticles?

*Frontiers in Environmental Science*

DOI:10.3389/fenvs.2020.00082

2020

Jung J. K., Alam K. K., Verosloff M. S., Capdevila D. A., **Desmau M.**, Clauer P. R., Wook Lee J., Nguyen P. Q., Pastén P. A., Matiasek S., Gaillard J-F., Giedroc D. P., Collins J. J. and Lucks J. B.

Cell-free biosensors for rapid detection of water contaminants

*Nature Biotechnology*

DOI:10.1038/s41587-020-0571-7

2020

Lecuyer T., Durand M. A., Volatron J., **Desmau M.**, Lai-Kuen R., Corvis Y., Seguin J., Wang G., Alloyeau D., Scherman D., Mignet N., Gazeau F. and Richard C.

Degradation of ZnGa<sub>2</sub>O<sub>4</sub>:Cr<sup>3+</sup> luminescent nanoparticles in lysosomal-like medium

*Nanoscale*

DOI:10.1039/C9NR06867H

2020

**Desmau M.**, Gélalbert A., Levard C., Ona Nguema G., Vidal V., Stubbs J. E., Eng P. J. and Benedetti M. F.

Dynamics of silver nanoparticles at the solution/biofilm/mineral interface

*Environmental Science: Nano*

DOI:10.1039/C8EN00331A

2018

## Communication at international conferences and seminars

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- Desmau M.,** Lucks J. B., Jung J. K., Alam K. K., Webster J., Matiasek S., Gaillard J-F. *100th American Geophysical Union*  
Poster: Assessing metal release in the wildland-urban interface of Paradise following the Camp Fire *Dec. 2019*
- Desmau M.** *USA & Canada*  
Seminar: How biofilm/mineral interface impact Quantum Dots fate? *Jan. 2019*  
University of Minnesota, Minneapolis, MN  
Northwestern University, Evanston, IL  
University of Montréal, Montréal, QC
- Desmau M.** *CEREGE, France*  
Seminar: Silver nanoparticles dynamics at the biofilm/mineral interface *Mar. 2018*
- Desmau M.,** Gélabert A., Levard C., Ona Nguema G., Sivry Y., Vidal V., Eng P. J., Stubbs J. E., Charron G., Brown G. E., Benedetti M. F. *Goldschmidt Conference*  
Oral presentation: Quantum dots fate at the biofilm/mineral interface *Aug. 2017*
- Desmau M.,** Gélabert A., Levard C., Ona Nguema G., Vidal V., Auffan M., Stubbs J. E., Eng P. J., Benedetti M. F. *253rd American Chemical Society*  
Oral presentation: Silver nanoparticles fate at the solution/biofilm/mineral interface *Apr. 2017*
- Desmau M.,** Gélabert A., Levard C., Ona Nguema G., Vidal V., Sivry Y., Eng P. J., Stubbs J. E., Charron G., Brown G. E., Benedetti M. F. *253rd American Chemical Society*  
Poster: In-situ study of the evolution of quantum dots in contact with the biofilm/mineral interface *Apr. 2017*

## Miscellaneous

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- Since Aug. 2021 **Volunteer for The Equality, Diversity, & Inclusion in Geoscience (EDIG) - Subgroup Social Media** *Online*
- Dec. 2020 **Attendee to The Equality, Diversity, & Inclusion in Geoscience (EDIG) Conference** *Online*
- Dec. 2019 **Volunteer for the Buffalo Field Campaign** *West Yellowstone, MT, USA*
- 2011-2012 **Secretary of the organization "La K'fet sur Yvette"** *Orsay, France*