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# NEWSLETTER

### **Research for Integrative Numerical Geology**



### WELCOME

to the 2025 edition of the RING newsletter! It will give you an overview of the last months' activity & events, as well as our team life.



### **IN THIS EDITION**

- People & News
- The year in pictures
- More about us

### UPCOMING

2025 RING Meeting 16-19 September Nancy School of Geology

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# **RING PHD GRADUATES**





Linico SCARPA, PhD (ASGA) January 2025

Fabrice TATY MOUKATI, PhD (ASGA) December 2024

CONGRATULATIONS AND ALL THE BEST FOR THE FUTURE!

# **UPCOMING PHD DEFENSES**



Marius RAPENNE (CCR - ASGA) Autumn 2025



Giusi RUGGIERO (ASGA) Autumn 2025



Paul MARCHAL (UL - CREGU) Autumn 2025



Amandine FRATANI (ASGA) Winter 2025



Augustin GOUY , PhD (UL - BRGM - ANDRA) March 2025



Julien HERRERO , PhD (ASGA) May 2025

### AWARD

Augustin GOUY won the Young Karst Researcher prize, at EuroKarst (Rome, June 2024) for his presentation entitled "Simulation of the polyphasic karst system of the barrois limestones with a discrete karst network simulation method".



### **RESEARCH HIGHLIGHTS**

Amandine FRATANI (3rd year PhD student) is currently working on the problem of fault data association during geomodelling. From a set of observed faults, she considers a graph formalism where nodes are the observations, and the edges carry the probability that two nodes belong to the same structure.

She is computing these probabilities with potentials of pair and triplet association obtained with machine learning.

To enhance the training training data base used in machine learning, Machine Learning algorithm requires a set of training data. A set of synthetic geological model is currently being created, using the Noddy software with the team of Pr. Mark JESSEL of the Centre for Exploration Targeting in the University of Western Australia (Perth) where Amandine spent two months this year.



Loop | 3D Geological Modeling Conference **>** Fremantle, Western Australia April 2025

Amandine received a DrEAM grant (Doctor, Explore and Achieve More) from the University of Lorraine, a scheme that supports the international mobility for PhD students. She attended the 3D Geological Modelling Conference in Fremantle, where she presented her work on 'Fault data association with graphs in a mining context'.



Thrombolites **Q** Clifton Lake, WA



Ayoub BELHACHMI joined the team in November 2024 as a PostDoc Researcher (GeoRessources, UL - PEPR Sous-Sol).

Ayoub holds an engineering degree from Polytech Nice Sophia engineering school, specializing in numerical modeling and applied mathematics. He did his PhD, entitled 'An implicit Spline-based method with PDE-based regularization for the construction of complex geological models' at the Université Côte d'Azur in 2024.

COMBINING GEOSCIENCES, APPLIED MATHEMATICS, AND COMPUTER **PROGRAMMING**, WE DO **METHODOLOGICAL RESEARCH TO DESCRIBE THE GEOMETRY AND HETEROGENEITIES** OF THE SUBSURFACE **CONSISTENTLY WITH OBSERVATIONS AND** GEOLOGICAL **CONCEPTS** 



Salt Dome insertion. Bel Hachmi, 2025.

Ayoub is currently working on local mesh editing for geoscience applications, particularly the insertion of finite faults represented as finite surfaces into multimaterial tetrahedral meshes.

His main research interests include interpolation, smoothing, regularization, anisotropic partial differential equations, splines, and local model updating.

# THIS YEAR'S INTERNSHIPS



Anna RIZAKI worked at RING as an intern researcher (ASGA) for 8 months. Graduated with a Master in Applied Mathematics & Computer Science, Anna focused on mathematical modeling of fault structures using Markov Chain Monte Carlo (MCMC) methods. Her work involved programming in C++ and Python to analyze the geometric characteristics of these fault geometries. By applying statistical techniques, she aimed to derive insights into the properties and behaviors of fault systems, which will enhance our understanding of geological processes and improve risk assessment in various applications.

Five Numerical Geology 3rd year and MSc students from the School of Geology (ENSG) did a three-months internship at RING.

(left to right)

**Basile GANDON** (*PINNs for electrical resistivity tomography*)

Yanis HAOUCHINE (Deciphering of cave topographies) Aubin COUTARD (Transdimensional inversion of clinoforms)

**Alexandre BOUCARD** (Seismic-guided well correlation) **Laure-Océane BODOLEC** (Testing the value of NLP to make sense from the RING Proceedings)





**Lina BEN AISSA, CPP student** (*Polytechnique Preparatory Class*) did a 6-weeks internship at RING this Spring.

Lina worked on modeling transform faults from an analog geodynamic model. Line is very interested in pursuing studies in hydrology combined to SIG.

# JOIN US

### **MASTER OPPORTUNITIES**

We offer Master internships for students who undertake the ENSG Numerical Geology option. To apply, students must enter the ENSG's "Diplôme d'ingénieur" either in first year after an entry exam or a Bachelor, or in 2nd year after a M1. Students with a M1 (or a M2 in Sciences of the Earth) can also apply directly for a Master 2 STPE / GEIR. **To apply for the MSc specialty in numerical geology** : <u>e-candidat.univ-lorraine</u>

### **POSTDOC OPPORTUNITIES**

We welcome Post Doc researchers who are interested in working on RING's research topics and we support funding applications to Marie Skłodowska-Curie Actions, Fond National Suisse, and others.

#### Opportunities (start date from September 2025) :

- Accurate and efficient geophysical potential field response on implicit structural geological models
- New approaches for uncertainty quantification in stratigraphic correlation and modeling

Details and application information here.

RING RESEARCHERS AND STUDENTS HAVE A SOLID BACKGROUND IN APPLIED MATHEMATICS, STATISTICS AND PHYSICS, AS WELL AS AN EXPERIENCE IN COMPUTER PROGRAMMING

### PORTRAIT

#### Mustapha ZAKARI, Research engineer (OTELo-CNRS)



"I started my career as a mathematics teacher in high school, with a background in pure mathematics. Then I studied applied mathematics and I pursued with a PhD in plasma physics modeling. I developed a passion for numerical modeling and high performance computing (HPC) therefore I started a PostDoc in HPC for magneto-elastic modeling of ferromagnetic materials in Paris, and taught applied mathematics as well. This enabled me to join IPGP, CEA and Sorbonne University in Paris, and discover numerical modeling in geosciences and in geophysics. I joined the RING team of GeoRessources and the CRPG in Nancy in 2018 as an OTELo CNRS research engineer.I enjoy discovering how mathematics can be useful to study practical topics, and exchanging with students and researchers, which I find very rewarding and stimulating. The different topics studied in CRPG and RING, as well as the diversity of people makes it a great work environment, prone to progress!"

# **ALUMNI TESTIMONIAL**

### Paul BAVILLE - RING PhD student 2019-2022

"After enjoying my Master's project with the RING team, I joined them to pursue my PhD under the supervision of Guillaume Caumon, Cédric Carpentier (GeoRessources) and Marcus Apel (Equinor).



This experience allowed me to discover the exciting stimulation of scientific discussions within RING during our weekly seminars, to teach geostatistics and numerical modeling to ENSG students, and finally to travel and meet people from various fields (almost always related to geology) throughout Europe. I have very good memories of the people and experiences I had at RING, which is somehow why I decided to return this year as a teaching and research assistant within the RING team, after two years of postdoctoral research at KIT in Germany. What I appreciate about RING is the multidisciplinary and interdisciplinary nature of the research topics, which cover a wide range of subjects related to subsurface modeling and uncertainty quantification."

# **TEAM BUILDING**

THE WORK **ENVIRONMENT IS VERY IMPORTANT** TO US, WE ALL AIM TO CONTRIBUTE TO A HEALTHY AND WELCOMING WORKPLACE, BY **HELPING AND** SUPPORTING EACH **OTHER, AND** ORGANISING **ACTIVITIES THAT ALSO INCLUDE OUR COLLEAGUES** AND VISITORS





Team-Building activities are also part of the life at RING.

It matters to us that everyone feels included and are "part of the family" inside and outside work.



### **RING CONSORTIUM**

### **NEW MEMBERS**







**Industrial Sponsor** 

Geological Survey of Denmark and Greenland







### Academic Sponsor

Academic Sponsor

THE ANNUAL RING MEETING IS A GREAT OPPORTUNITY FOR NETWORKING, SHARING RESEARCH OUTCOMES AND PROJECTS, AS WELL AS REUNITING WITH FORMER STUDENTS AND COLLABORATORS



Simon LOPEZ 2025 RING Consortium Chairman

The RING Consortium brings together an international network of scientists, researchers from companies, universities and geological surveys.

The 2025 chairman of the Consortium is Simon LOPEZ (BRGM).

The <u>RING meeting</u> (page 6) is the annual event that enables interaction between students, researchers and RING Consortium members.

"Great opportunity to learn something, do some interesting networking, and enjoy the RING team great hospitality!"

Andrea BISTACCHI, University Milano-Bicocca

### **2024 RING MEETING**



RING Meeting **Vancy School of Geology** September 2024

The annual conference gathered 90 participants on-site and remotely.

They attended two days of technical conference, followed by two days of trainings & demos - from AspenTech with Charles REVAUX (right) & Christophe PRIJAC, from SLB with Thomas VIARD, and from RING, as well as meetings with fellow researchers and members of RING.



"Community" Anonymous



The technical conference included oral and poster presentations, from RING researchers and ENSG MSc students - here Romain BAVILLE (left) - and from members of the Consortium or external organizations.

"It was worth to travel 10 hours. I got many ideas and suggestions for my work."

Ines GÖRZ, Landesamt für Umwelt, Landwirtschaft und Geologie



The week was punctuated by social events: the welcoming cocktail at the School of Geology and a mid-week dinner - above at *Les Pissenlits* restaurant.

# **CONFERENCES & FIELD RESEARCH**

#### Saint-Pierre-Bois quarry Bas-Rhin, Alsace June 2024

Paul MARCHAL visited the Saint-Pierre-Bois quarry (Alsace, France), analogous to the Athabasca in terms of uncomformable contact between a fractured basement and a sedimentary basin. Paul attended the annual progress meeting for all GeoMin3D chair projects which includes his PhD thesis.







GeoStats 2024 & Fogo volcano field trip ♥ Ponta Delgada, Azores September 2024



#### Last September,

Guillaume CAUMON, Amandine FRATANI, Paul MARCHAL & Julien HERRERO presented their work at Geostats2024 in the Azores. They also had the opportunity to visit the island's geological sites, such as the Fogo Volcano and volcanic lake.

THE TEAM ATTENDS SEVERAL CONFERENCES, WORKSHOPS & FIELD TRIPS DURING THE YEAR. Giusi RUGGIERO attended the third EAGE Conference on Seismic inversion, held in the historical *Complesso Monumentale Santa Maria La Nova* in Naples, where she presented her work on "2D Downscaling inversion for structural uncertainty quantification" during the session "FWI and other methods".



EAGE Seismic inversion Naples, Italy November 2024



Mining well water sampling Provence, South France November 2024

Bastien MORIN, PhD student (BRGM-UL) collected water samples up to a depth of 700m, using a bottom sampling system, for chemical, isotopic and bacteriological analyses, in order to characterize the different levels of the mine water reservoir.



At the EGU conference in Vienna, Giusi RUGGIERO presented her work on "Quantifying fault-related uncertainty with inverse homogenization", as well as Julien HERRERO, who presented his research "From layer-cake models to complex subsurface structures: a flexible transdimensional inversion approach".



EGU Vienna, Austria April-May 2025

Guillaume CAUMON (Professor - Head of RING), Paul CUPILLARD (Associate Professor - RING) and Jérémie GIRAUD (Industry fellow at Univ. of Western Australia & Associate Researcher of the Univ. of Lorraine) attended the 3rd NuTS workshop in Grenoble, where they followed amazing talks & hands-on on workflows topological analysis and big data mining.

NuTS (Numérique pour la Terre Solide) network workshops & conference Institut d'informatique et mathématiques appliquées, Grenoble May 2025

Guillaume CAUMON, Paul MARCHAL, Giusi RUGGIERO, Loïs LETELLIER and Paul BAVILLE presented their work at EAGE in Toulouse, on Geological Interpretation, Uncertainty Quantification, Full Wave form Inversion and Geomodeling.

They also had the opportunity to attend some field trips: Paul M. and Loïs took part in a gold panning initiation (banks of the Salat river) & a core warehouse visit. During the 'Urban geology' trip. Paul B. visited the Blagnac heating network (1500m geothermal well) and an underground structure of the Toulouse metro.



EAGE **V** Toulouse June 2025

# **2025 RING CONSORTIUM**

### COMPANIES



### **UNIVERSITIES & RESEARCH INSTITUTES**

#### **Europe**

- 1. (be) Faculte Polytechnique de Mons
- 2. (ch) Basel University
- 3. (ch) ETH Zurich
- 4. (ch) Neuchatel University (CHYN)
- 5. (de) Bayerisches LfU Munchen 6. (de) BGE Bundesgesellschaft für Endlagerung
- 7. (de) BGR Hannover
- 8. (de) BSU Geological Survey Hamburg 9. (de) Bergakademie Freiberg
- 10. (de) Bremen University Marum
- 11. (de) Darmstadt Technische Universität
- 12. (de) Geologischer Dienst NRW
- 13. (de) Goettingen University GZG
- 14. (de) Hessisches Landesamt für Umwelt und Geologie (HLNUG Wiesbaden)
- 15. (de) IFG Geophysik Kiel University
- 16. (de) IFG Hannover University
- 17. (de) Karlsruher Institute für Technologie (KIT) 18. (de) LAGB Sachsen-Anhalt
- 19. (de) LBEG (NIfB Geological Survey) Hannover
- 20. (de) LBGR Brandenburg
- 21. (de) LGB MAINZ Landesamt fur Geologie und Bergbau Rheinland-Pfalz
- 22. (de) LGRB Freiburg University
- 23. (de) LIAG Institut Hannover
- 24. (de) LUNG MV Landesamt fur Umwelt, Naturschutz und Geologie
- 25. (de) Landesamt für Umwelt des Landes Schleswig-Holstein (LFUSH)
- 26. (de) LfULG Dresden Sachsisches Landesamt für Umwelt Landwirtschaft und Geologie
- 27. (de) Muenchen University
- 28. (de) TLUBN
- 29. (de) TU Munchen
- 30. (de) Senate Department for the Environment, Transport and Climate Protection
- 31. (dk) Geological Survey of Denmark and Greenland (GEUS)
- 32. (es) Barcelona University
- 33. (es) Consejo Superior de Investigaciones Científicas (CSIC) 34. (es) Institut Cartografic i Geologic De Catalunya (ICGC)
- 35. (fi) Geological Survey of Finland
- 36. (fi) Helsinki University Institute of Seismology 37. (fr) ARMINES - Paris School of Mines
- 38. (fr) Antilles University
- 39. (fr) CNRS France UNISTRA ENS
- 40. (fr) Cergy Pontoise University
- 41. (fr) Geosciences Rennes UMR 6118
- 42. (fr) Institut des Sciences de la Terre d'Orléans (ISTO)
- 43.(fr) LBL
- 44. (fr) LMTG Toulouse
- 45. (fr) Pau University
- 46. (fr) Provence University Aix-Marseille
- 47. (it) Milano Bicocca University
- 48. (pl) Polish Geological Institute National Research Institute Warsaw
- 49. (pt) LNEG Porto Laboratorio Nacional de Energia e Geologia
- 50. (se) LULEA University of Technology
- 51. (sl) Geological Survey of Slovenia 52. (uk) British Geological Survey
- 53. (uk) Heriot Watt University
- 54. (uk) Imperial College London

#### Asia

- 1. (cn) China University Geosciences WUHAN (CUG)
- 2. (cn) China University Of Petroleum (UPC)
- 3. (cn) Institute of Geology China Earthquake Administration
- 4. (kr) KIGAM Korea
- 5. (tw) National Taiwan University

#### **North America**

- 1. (ca) Alberta University 2. (ca) Geological Survey of Canada
- 3. (ca) INRS ETE
- 4. (ca) Manitoba Geological Survey
- 5. (ca) Northern Alberta Institute of Technology (NAIT)
- 6. (ca) Saskatchewan Geological Survey (Industry & Research at Saskatchewan)
- 7. (ca) Université du Québec en Abitibi-Témiscamingue (UQAT)
- 8. (us) BEG Texas University at Austin
- 9. (us) Geological Survey of Alaska DGGS
- 10. (us) Harvard Cambridge University
- 11. (us) Houston University Earth & Atmospheric Sciences
- 12. (us) LBL
- 13. (us) Stanford University
- 14. (us) Univ. California Santa Barbara ICS
- 15. (us) Washington and Lee University

#### **South America**

1 (br) UNISINOS Brazil

#### Oceania

- 1. (au) CSIRO
- 2. (au) Department of Water Western Australia
- 3. (au) Geological Survey of South Australia
- 4. (au) Geological Survey of Western Australia
- 5. (au) Geosciences Australia
- 6. (au) Geological Survey of Victoria
- 7. (au) Melbourne University 8. (au) Mineral Resources Tasmania
- 9. (au) Monash University
- 10. (au) Department of Regional NSW Resources
- 11. (au) Northern Territory Geological Survey
- 12. (au) Queensland Geological Survey
- 13. (nz) GNS Science New Zealand

### **THANK YOU FOR YOUR SUPPORT**