Kick-off Meeting ENIGMA ITN

30/01/2017, Paris

General Presentation

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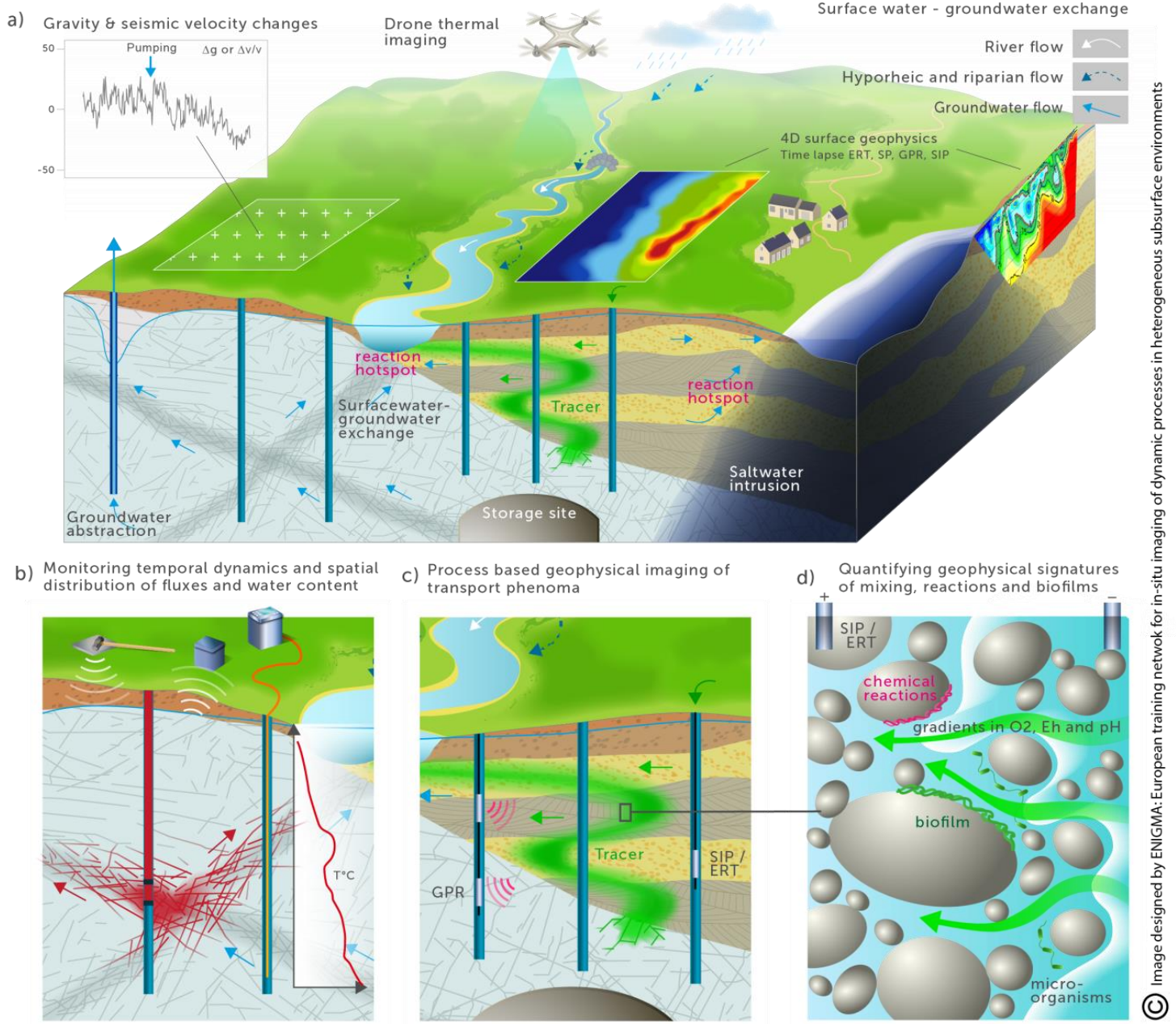
ITN Enigma

European training **N**etwork for **I**n situ ima**G**ing of dyna**M**ic processes in heterogeneous subsurf**A**ce environments



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Partners

Academic

- CNRS H+: Rennes, Poitiers, Montpellier, LSBB
- Helmoltz TERENO: Julich, Leipzig
- CSIC Barcelone
- University of Liège, University of Mons
- University of Tübingen
- University of Copenhagen
- University of Lausanne
- University of Neuchatel
- Stanford
- Oregon State University
- BRGM

Non-academic

- μQuans, ITASCA
- SILIXA, SKB
- Geotechnik Heiligenstadt
- Aquale
- Agencia Catalana del Aigua

Field Infrastructures (& H+ Hyderabad)

Field infrastructures	Unique attributes
Krauthausen (FZJ), Hermalle (ULG), Lauswiesen (TU), H+ Poitiers (CNRS)	Hydrogeophysical test sites with high borehole density and large hydrogeophysical databases
H+ Ploemeur (CNRS) H+ Hyderabad (BRGM) Aspo Hard Rock Laboratory (SKB)	Fractured rock observatories for long term monitoring and in situ experiments
TERENO- Selke (UFZ) HOBE obs. (UCPH) Emme (UNINE)	Nested observatories in highly instrumented catchments
Llobregat-Argentona (CSIC) H+ Mallorca (CNRS)	Salt water intrusion monitoring and experimentation
H+ Larzac (UM) H+ Low Noise Lab. (CNRS)	Unsaturated zone observatories for long term monitoring and in situ experiments

15 ESR – PhD positions : Presentation of each PhD (2 slides for 5' including questions) : 14h30-16h

1	CSIC M. Dentz	Mixing and reactions in saline-freshwater systems	**Llobregat-Argentona**: reactive tracer tests in the saline freshwater mixing zone
2	UFZ J. Fleckenstein	Flow and reactions in stream-riparian zone systems	**TERENO Selke**: imaging methods for quantifying flow and reaction in riparian zone **River Emme**: same in a pre-alpine context
3	UNINE P. Brunner	Flow and transport in hyporheic-meander systems	**River Emme** and **TERENO Selke**: application of imaging methods for quantifying flow and reaction in riparian zone
4	ITASCA C. Darcel	Flow and transport in fracture networks	**Äspö hard rock laboratory**: GPR imaging of tracer motion in fracture networks
5	CNRS L. Longuevergne L. Bodet	Passive and active seismic imaging of water content distributions	**H+ Ploemeur**: fractured media flow **Krauthausen** heterogeneous porous media flow **H+ LSBB**: thick unsaturated zone, extreme rainfall
6	CNRS O. Bour	Active fiber-optic DTS for imaging subsurface flow distributions	**H+ Ploemeur**: fractured media flow **Llobregat-Argentona**: saline intrusion flow **TERENO Selke**, **Hermalle**: hyporheic exchange
7	UCPH K. Jensen	Multi-scale thermal imaging of groundwater upwelling	**HOBE**: test and validation of the method **TERENO Selke**, **river Emme**: application in different geomorphological contexts
8	µQS O. Desruelle/ C. Champollion	Absolute gravimeter for monitoring water content distribution	**H+ Larzac, H+ LSBB**: test and validation by comparison with fixed supraconductor gravimeter in karstic aquifers **HOBE**: comparison with soil moisture data

15 ESR – PhD positions -

9	UNIL N. Linde	Geophysical signatures of spreading and mixing	Primarily lab experiments and if possible field testing at the **Llobregat-Argentona site**
10	FZJ J. Van der Kruk	GPR full-waveform inversion for high resolution imaging of transport processes	**Krauthausen**: imaging mixing fronts in tracer tests **H+** Ploemeur: fractured rock imaging **HOBE** : imaging mixing fronts in tracer tests **Lauswiesen**: image structural properties
11	ULG A. Dassargues J. C. Maréchal	Joint heat and solute tracer test inversion for imaging preferential pathways	**Hermalle**: heat and solute tracer tests in alluvial aquifer **H+ Hyderabad**: idem in a fractured aquifer under overexploitation
12	FZJ S. Huisman D. Jougnot	SIP monitoring for quantifying biochemical reactions	Primarily lab experiments and subsequent validation at **H+ Ploemeur** site
13	UT O. Cirpka	Fully coupled hydrogeophysical inversion of 3D tracer tomography	**Lauswiesen**: methodology validation **Krauthausen**, **Hermalle**: alluvial aquifer imaging **TERENO Selke**: stream and groundwater mixing
14	CSIC J. Carrera	Geologically constrained joint inversion of hydraulic, tracer and ERT data for process imaging	**HOBE**: validation of the inversion methodology **Llobregat-Argentona**: application in saline intrusion context
15	ULG F. Nguyen	Integration of dynamical hydrogeophysical data in a multiple-point geostatistical framework	**Hermalle**: validation of the methodology **Llobregat-Argentona**: application in a saline intrusion context **River Emme:** application in a surface-water groundwater exchange context

Discussion of the Selection Committee (SC)

Tuesday, January 31st : 10h30 -12h & 14h -15h30	**Supervisor for this KOM meeting :** Niklas Linde	**Deliverable for this KOM :** **Summary of the SC review with :** - Validation of the accepted applicants - Re direction of applicants if relevant

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Work Packages

WP No	Work Package Title	Start month	End Month	Lead beneficiary	Deputy partner	Activity Type	ESR involvement	Supervisors for the 4 separate meetings 16h30-17h30 & CCL : 17h30 – 18h30	Deliverables for the KOM today
1	Explore coupled dynamic processes in highly instrumented sites	6	48	FZJ	SILIXA	Research	**1,2,3,4**	Sander Huisman	**Separate meetings 16h30-17h30 :** **1.New opportunities** = collaborations/ exchanges between ESR, (re)define the ESRs if necessary… 2. **Management/ distribution of the deliverables** **General discussion 17h30 – 18h30 :** 1 document with the previous conclusions
2	Enhance our capacity to monitor temporal changes in the spatial distribution of subsurface water content and fluxes	6	48	UCPH	µQUANS	Research	**5,6,7,8**	Karsten Jensen	
3	Create new methods for tracking the transport and reactivity of chemical species in subsurface fluids	6	48	UNIL	SKB	Research	**9,10,11,12**	Niklas Linde	
4	Design inverse modelling strategies for imaging dynamic processes in complex subsurface structures	6	48	UT	ITASCA	Research	**13,14,15**	Olaf A. Cirpka	
5	Training	1	48	ULG	UFZ	Training	all	Discussion 18h30-19h30	
6	Network management & Dissemination outreach	1	48	CNRS	CSIC	Management	all	---	

Deliverables of the project – 1/2

Scientific Deliverables				
WP N°	**Title**	**WP**	**Lead**	**Due date**
1.1	In-situ datasets on space and time patterns of fluxes and reactivity in mixing interfaces	1	UFZ	48
1.2	In-situ datasets on flow distributions and transport patterns in fractured media	1	ITASCA	48
1.3	Report on the added value of in situ experimentation for understanding and quantifying coupled flow, transport and reaction processes	1	CSIC	48
2.1	Validated prototype of portable absolute gravimeter	2	µQuans	36
2.2	Field test of novel techniques for quantification of water content spatial distributions and temporal fluctuations	2	UNINE	24
2.3	Report: critical assessment of emerging techniques for in situ monitoring of water content, flow distributions and groundwater-surface water fluxes	2	UCPH	24
3.1	Laboratory facility: geophysical millifluidic lab for validating emerging geophysical techniques for monitoring transport and reaction processes	3	CNRS	36
3.2	In situ datasets that couple tracer experiments and geophysical monitoring	3	FZJ	48
3.3	Report on process-based geophysical methodologies to monitor subsurface transport, mixing and reaction	3	UNIL	36
4.1	Validated algorithms for fully coupled 3D inversion for tomographic datasets	4	UT	24
4.2	Report on joint inversion procedures for multiple and disparate datasets with realistic subsurface structure reconstruction methods	4	ULG	24

Deliverables of the project – 2/2

	Management, training, recruitment and dissemination deliverables			
N°	**Title**	**WP**	**Lead benef.**	**Due date**
5.1	Progress reports from trainees	5	ULG	12,18, 24,36,42
5.2	Training Needs Assessment Plan	5	UCPH	12, 24
5.3	1st workshop	5	ULG	7
5.4	2nd Workshop	5	CNRS	9
5.5	3rd Workshop	5	ULG	14
5.6	ENIGMA Summer School	5	CNRS	18
5.7	4th Workshop	5	UNIL	22
5.8	Mid-term training progress reports by supervision committee	5	ULG	24
5.9	5th Workshop	5	UNINE	30
5.10	ENIGMA final conference	5	UZJ CNRS UFZ	38
5.11	Career development plan	5	ULG	40
6.4	Publications in peer reviewed journals	6	UZJ	20-48
6.5	Public engagement	6	UZJ	20-48
6.6	Outreach to the policy community	6	UZJ	36-48
6.10	ENIGMA white paper	6	UT	48

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Workshops

Main Training Events & Conferences	Lead beneficiary	Deputy partner	Month	
Network meetings	CNRS	FZJ	every 6 months	Discussion about the workshops and the summer school 18h30-19h30 Frédéric Nguyen
Secondments and visits	All		6-32	
1st workshop on advanced subsurface imaging techniques	FZJ & ULG	AQUA & GEOTH	7	
2nd Workshop on multi-scale investigation of fractured media	CNRS & ITASCA	SKB & SILIXA	9	
3rd Workshop: Predictive modelling and upscaling of flow and reactive transport in heterogeneous aquifers	CSIC & UT	SHS & SKB	14	
Summer School: sensing and modelling of flow and transport process dynamics in heterogeneous subsurface environments	CNRS & CSIC	OSU & ITASCA	18	
4th Workshop on advanced inverse modelling and stochastic representations of heterogeneous porous and fractured media	UNIL & UNINE	STAN & AQUA	22	
5th Workshop on life time skills	ULG	All industrial partners	30	
Final conference: innovative methods for imaging heterogeneous aquifers: bridging the worlds of subsurface hydraulics, geophysics, geochemistry and microbiology	FZJ, UFZ, CNRS, UCPH	All industrial partners	36	

Thank you for your attention !