



5th RhEoVOLUTION Meeting
23-26 January 2024, Villard de Lans (France)

Tuesday 23 January afternoon

14h-14h30 -AT – Presentation of the ERC RhEoVOLUTION project and team

Using surrogate AI models to efficiently (fast & memory saving) model multi-scale, multi-physics systems

14h30-15h30 : Using AI to predict the evolution of texture-induced anisotropy of elastic and viscous properties of olivine polycrystals

- Nestor Cerpa & Fernando Carazo: Predicting the elastic anisotropy of olivine polycrystals with machine learning models trained on databases produced by viscoplastic self-consistent simulations of texture evolution in 2D flows.
- Andréa Tommasi & Javier Signorelli : From elastic to viscoplastic anisotropy – what needs to be changed? How to construct the database: parcimonious representations of texture for olivine (& hexagonal materials)

15h30-16h : Buchanan Kerswell - ML models to replace thermodynamical calculations (phase diagrams) for estimating changes in density, seismic velocities, and melting in the convecting mantle

16h-16h30 : Pause

16h30-18h30 : Recrystallization – the major 'actor' for locally changing mechanical properties at the polycrystal scale.

16h30-17h30 – Romain Quey (Ecole de Mines de St. Etienne): Distribution of intragranular misorientations in aluminium & importance of deformation-induced local orientation distributions for nucleation of recrystallisation

17h30-18h30 – Gaetan Boissonneau - Dynamic recrystallization and mechanical behavior of Mg alloy AZ31: Constraints from tensile tests with in-situ EBSD analysis

Wednesday 24 January morning – Recrystallization – the major 'actor' for locally changing mechanical properties at the polycrystal scale (continuation)

9h-9h40 – Brigitte Bacroix (Univ. Paris 13) – Link between stored energy and recrystallization mechanisms in various cubic and hexagonal materials

9h40-10h20 - Jean Furtoss (Univ. Lille, visio) - Quantification of the mean and local grain boundary mobility in natural olivine by annealing experiments and full-field modelling

10h20-10h50 – Pause

10h50-11h30 – Maurine Montagnat - A physically-based formulation for texture evolution during dynamic recrystallization in ice polycrystals

11h30-12h30 – Discussion

Wednesday 24 January afternoon – Strain localization – interactions between scales

14h-15h - Anne Davaille (FAST, Orsay) – Strain localization and mechanical behavior at different scales in complex fluids

15h-16h – Andréa Tommasi, Michel Peyret, Julien Valentin - From microstructural heterogeneity to macro- and mesoscale shear zones: a recipe for ductile strain localization on Earth (focus on the analysis of the model ensembles, adimensionalization, characterisation of the strain localization, criteria for steady-state localized deformation, parameters controlling the intensity of strain localization, how to upscale/coarse-grain these results)

16h-16h30 - Pause

16h60 – 18h30 - Discussion (focus on the links between different spatial scales?)

Thursday 25 January morning - Deformation and fluids

9h-9h30 – Andréa Tommasi – Introduction : Feedbacks between deformation and melts or fluids in the mantle and in the crust

9h30-10h15 – Marialine Chadelin - Progressive strain localization and fluid-assisted deformation in mantle exhumation during rifting: Petrostructural constraints from the Zabargad peridotites, Red Sea

10h15-10h45 – pause

10h45-11h30 – Nicolas Berlie - What can we model in terms of feedbacks between ductile deformation and fluids and how?

11h30-12h30 – Discussion (with participation of J.P. Gratier in videoconference)

Thursday 25 January afternoon : Team building activity (snowshoe walk). Group work in the evening: preparation of WP reports for the discussion on Friday morning

Friday 26 January morning : Discussion and plans for the future

- Invited participants (by videoconference): What they take from these 3 days for their own work and suggestions for the project.
- RhEoVOLUTION team : Where we are, what remains to be done, and of the plans for the next 6 months (30 minutes p/ WP)

Participants

RhEoVOLUTION team - on site

1. Andréa Tommasi (GM)
2. Michel Peyret (GM)
3. Marialine Chardelin (GM)
4. Gaetan Boissonneau (GM)
5. Julien Valentin (GM)
6. Fernando Carazo (GM)
7. Buchanan Kerswell (GM)
8. Nicolas Berlie (GM)
9. Maurine Montagnat (IGE)
10. Nestor Cerpa (GM) = Wednesday to Friday
11. Véronique Dansereau (ISTerre) – Tuesday & Wednesday
12. Pierre Saramito (IMAG, Grenoble) – Wednesday

Invited participants - on site

1. Anne Davaille
2. Brigitte Bacroix – Tuesday & Wednesday
3. Romain Quey – Tuesday & Wednesday

Videoconference

1. Fabrice Barou (GM)
2. Marco Lopez-Sanchez (Univ. Oviedo)
3. Riad Hassani (GéoAzur)
4. Javier Signorelli (CONICET, AR)
5. Jean-Michel Brankart (IGE) – Wednesday
6. Jean Furtoss (Univ. Lille)
7. Jean-Pierre Gratier (IsTerre) – Thursday morning