

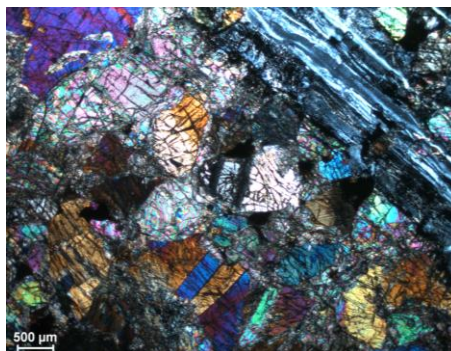
Labex MATISSE

Axe 5 MATERIALS UNDER EXTREME CONDITIONS

« Intermediate and Deep Earthquakes:
from the Lab to the Field »

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PLM image of a pseudotachylite in a Peridotite from Balmuccia, Italy.



Griggs experiments preparation at Ruhr Universität Bochum, Germany.

Hosting laboratories, teams and thesis supervisors names

Alexandre Schubnel – *Laboratoire de Géologie de l'Ecole Normale Supérieure, Paris*

Nadège Hilairet – *Unité Matériaux et Transformations, Lille*

Loïc Labrousse – *Institut des Sciences de la Terre de Paris, UPMC*

Christian Chopin – *Laboratoire de Géologie de l'Ecole Normale Supérieure, Paris*

Research project

The Ph.D. project focuses on mantle rheology. Its goal is to constrain the role played by the mineral phase transition of peridotite in the generation of intermediate and deep focus earthquakes in a subduction context. High-pressure experiments ($\sim 2-4$ GPa) have been carried out both in Griggs and D-DIA apparatus on sintered samples of varying degrees of serpentinization, synthesized from mixed powders of San Carlos olivine and Corsica antigorite (the HT temperature polymorph of serpentine). Experimental observations are compared with fossilized earthquakes, better known as pseudotachylites (PSTs) from an ophiolitic massif in Balmuccia (Italy), and with seismological data. A new HP apparatus (GRAAL) installed at ENS will soon permit us to investigate a wider range of parameters. We will also investigate the role played by the olivine-spinel (ringwoodite) phase transition on the triggering of deep focus earthquakes performing higher-pressure experiments in the D-DIA (~ 15 GPa).

Summarize your scientific results & impacts

Griggs experiments performed both on natural and sintered samples indicate a systematic failure of the peridotite samples (1.5 and 2.5 GPa, 500 to 700°C) at the onset of dehydration. During D-DIA experiments, we show that dehydration is accompanied by acoustic emissions (nano-earthquakes). Below 2 GPa acoustic emissions are more numerous for a small antigorite ratio; above 3 GPa it happens also for larger amounts. An interesting peridotite outcrop with PSTs in Balmuccia (Italy) has also been studied in details.

Main key facts

- **Talk at the Micro-Dice final conference** – March 2015 – *CNRS Montpellier*;
- **Talk at IPGP** – March 2015 – *STEP'UP doctoral school Ph.D. Meeting*;
- **Talk at ENS (Paris)** – February 2015 – *Laboratory Internal Seminar*;
- **Talk at IMPMC (Paris)** – November 2014 – *Matisse Axe-5 Meeting*;
- **Poster at the Gordon Conference and Seminar** – August 2014 – *Andover, NH, USA*;
- **Talk at the ZIP-Starter-2 Meeting (UMPC)** – July 2014 – *Sampeyre, Italy*;
- Popularization and teaching – *ENS*;
- Paper submitted to *Marine and Petroleum Geology* (related to mantle rheology).