David Mainprice : Activity report of my stay at ERI Tokyo from 4/04/2017-2/05/2017

4-7 April: Initial activity consisting of discussing our joint objectives during my stay with Dr. Takehiko Hiraga-sensei. Given recent developments Dr. Hiraga's research group, who are the world experts on producing pure and ultra-fine grained synthetic samples of polycrystalline olivine, it was obvious that we should work on these samples. As ultra-fine grained samples have an exceptional density of grain boundaries, which results in special mechanical properties of these samples. Hence we decided focus on the develop a scheme to measure grain boundary plane orientations using ultra-fined grained forsterite as part of the 5-parameter macroscopic grain boundary characterization that includes the misorientation of between grains adjacent to the boundary defined by 3 euler angles and boundary plane defined by two polar angles. As ultra-fined grained samples can be produced with no crystal-preferred orientations all possible boundary orientations can be sampled, making these samples ideal for grain boundary studies. A special technique was developed to measure boundary plane orientation to be combined with 2-D EBSD to measures of the misorientation parameters. We examined EBSD data previously measured in Tokyo on JEOL SEM.

On Friday 7th April I have a seminar to ERI members 4 pm "Length and time scales in mineral and rock physics – what relationship to seismology?"

As previously planned I gave 3 day short course from 6-10 April, people from ERI, the Tokyo area, Tsukuba, and some coming some distance, so we started at 10:00 am the first day. A total 20 participants.

3 day Short Course 10-12 April 2017 at Earthquake Research Institute, Tokyo
"Texture Analysis with MTEX emphasizing EBSD Data Analysis"
Local contact : Dr. Takehiko Hiraga hiraga@eri.u-tokyo.ac.jp

David Mainprice
Géosciences Montpellier UMR CNRS 5243
Université de Montpellier, France

	(Day 1) 10th April	(Day 2) 11th April	(Day3) 12th April
9:30 am		9:30 am Lecture Introduction to PFs, IPFs and ODFs and their quantification	10:00 Lecture Anisotropic physical properties 2th rank
	Coffee break	Coffee break	Coffee break
10.00 am	Lecture Overview of MATLAB/MTEX	Exercise with PC Plotting ODF to PFs, IPFs and ODFs Analysis with MTEX	10:00 Lecture Anisotropic physical properties 4th rank
	Lunch break	Lunch break	Lunch break
2.00 pm	Lecture Introduction to Crystallography	Lecture EBSD from 2D pixel maps to grains	Visit EBSD facility – discussion of practical aspects of EBSD
3.00 pm	Lecture Introduction to EBSD	Lecture Grains and grain boundaries	Exercise with PC Physical property calculations
	Coffee break	Coffee break	Coffee break
4.00 pm	Exercise with PC Practical Introduction to MATLAB/MTEX	Exercise with PC EBSD maps	Exercise with PC Open session

After the short course we decided it would be useful to visit the EBSD facilities in Tokyo to see if the measurements could be improved by changing the working distance, the beam current or the specimen to screen distance. However, surface pollution soon became a problem if the beam current was increased. May be a difference measuring technique starting at the bottom and moving upwards would reduce the influence of surface pollution or using a square pattern rather a hexagonal pattern.

26th April I gave a lecture to Dr. Hiraga's research group on the 5-parameter grain boundary description in much greater detail than MTEX short course. A MTEX script that determines the boundary plane from 2D-EBSD data using various hypothesise was developed during the visit. We are now going to compare these theoretical calculations with physical measurements by Dr. Hiraga's research group.