

Detailed description of CliMag equipments

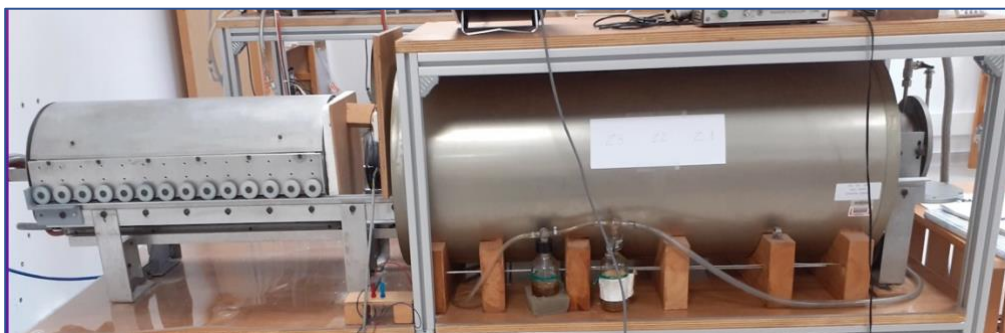
1 EQUIPMENTS FOR PALEOMAGNETISM AND ROCK MAGNETISM

1.1 In the low-field room

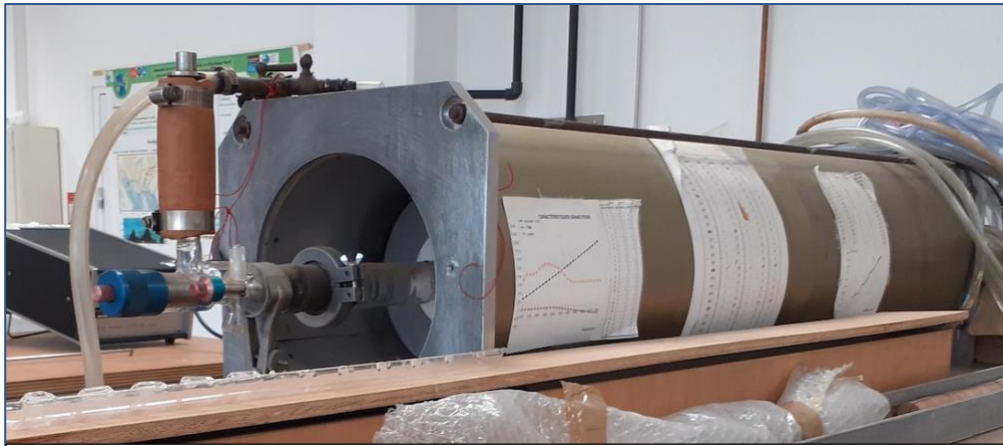
- 1.1.1 **Three paleointensity furnaces** (Pyrox and home-made). Uniform temperature controlled by 3 independent heating zones.
Heating and cooling in air or under Argon flow continuously passing over the samples and controlled by a bubbler.



Big capacity paleointensity furnace.
Up to 72 standard size samples.
Measurement in the morning, heating
in the afternoon, cooling overnight.

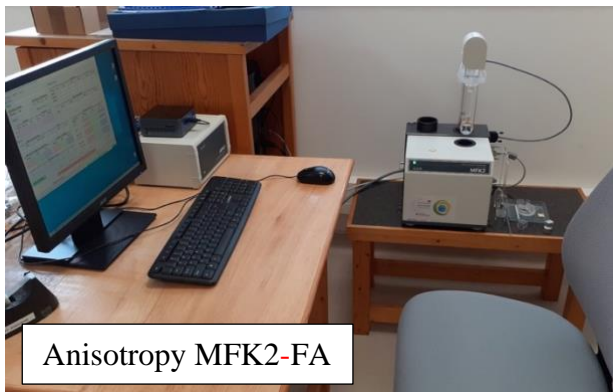


Mobile medium capacity furnace for paleointensity.
Up to 48 standard size samples. Furnace kept at the right temperature and positioned over the tube containing the samples for the time needed for the heating. Cooling either by inertia or with air-circulation around the tube.



Low capacity paleointensity furnace
For specific experiments. Sample holder in quartz for 8-9 samples

1.1.2 Measurements of low-field susceptibility



Anisotropy MFK2-FA



Anisotropy KLY3S

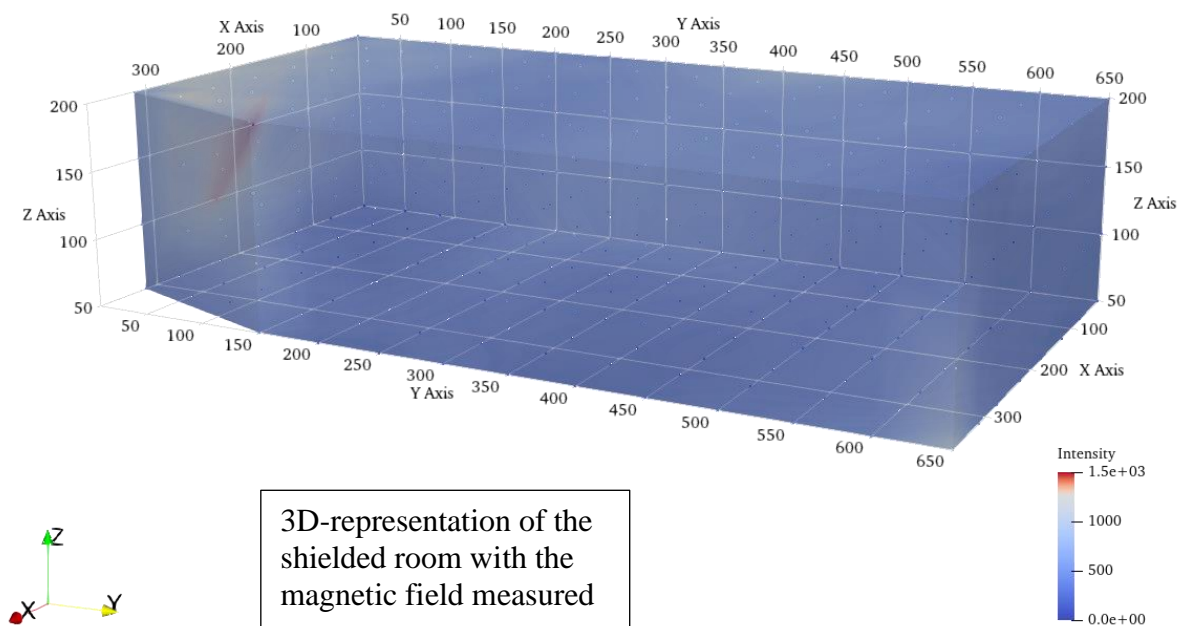


Measurements of continuous sequences (e.g., u-channels) with a MS2C Bartington coil, automated with a step motor

1.2 In the shielded room



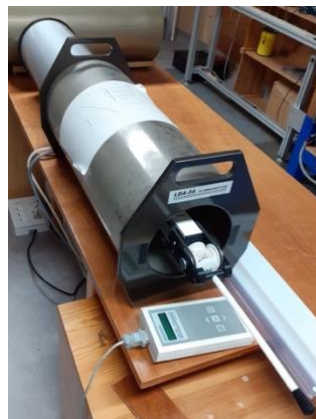
1.2.1 Map of the shielded room and performances



3D-representation of the shielded room with the magnetic field measured

1.2.2 AGICO LDA-3A

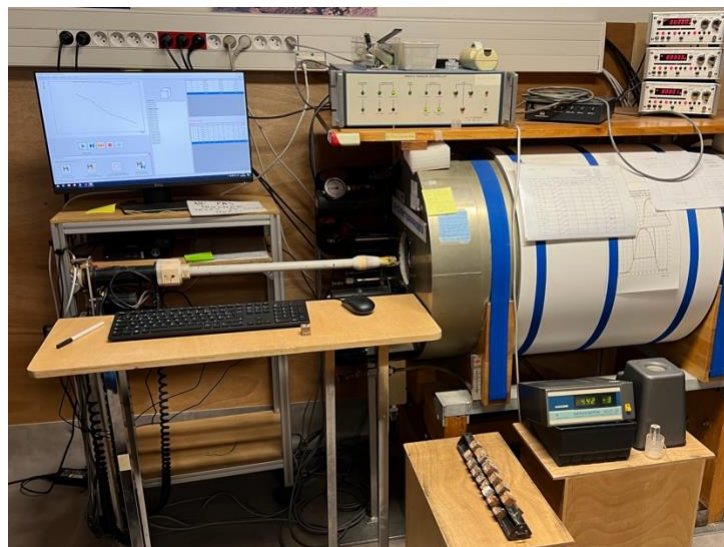
For AF demagnetization and ARM (and AARM) acquisition.
Manual position or tumbler



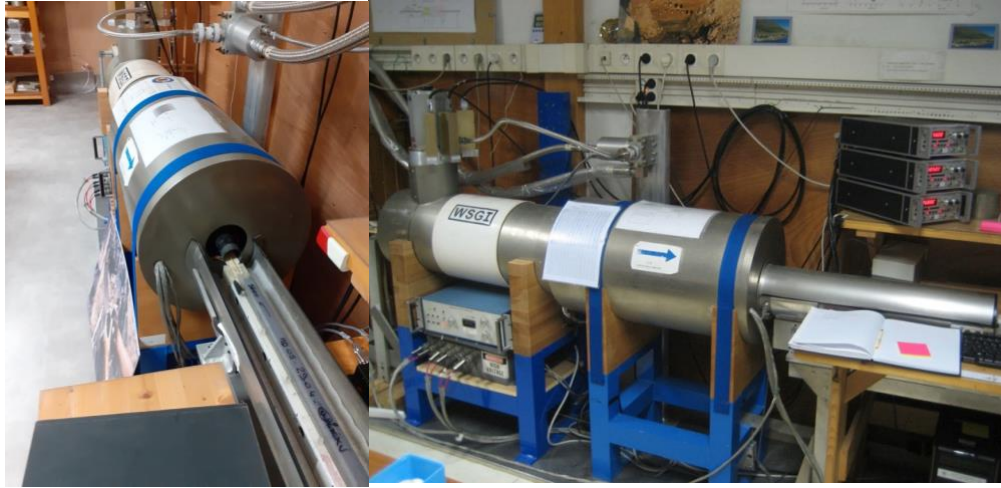
1.2.3 **Two zero-field furnaces** with a capacity of 24 samples each in one run. Heating chamber independent from cooling one so that 48 samples can be treated at the same time in each furnace. Field in the cooling part: 2 to 5 nT



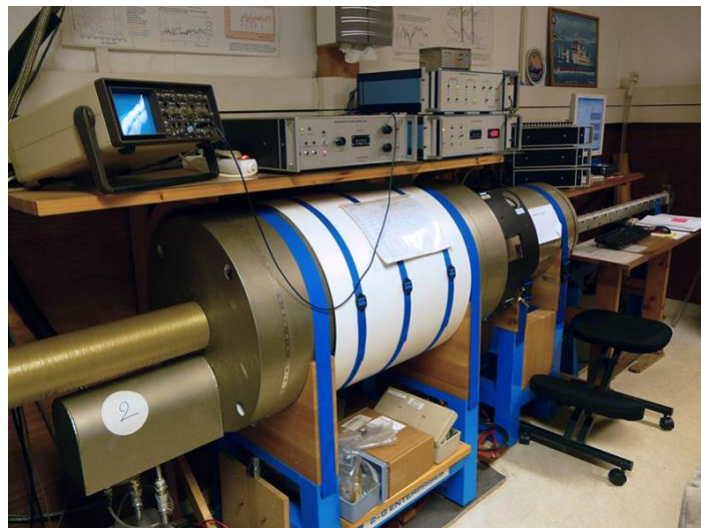
1.2.4 **Helium cryogenic magnetometer** equipped with high-homogeneity pick-up coils. Used for discrete cubic and cylindrical samples, automated translation and rotation



1.2.5 **Helium-free cryogenic magnetometer** equipped with high-resolution pick-up coils, in-line three axes degausser and ARM solenoid. Used for NRM and ARM acquisitions and demagnetizations on continuous sediment sequences (u-channels)



- 1.2.6 **Helium cryogenic magnetometer** equipped with high resolution pick-up coils, in-line three axes degausser and IRM pulse solenoid. Used for IRM acquisitions and demagnetizations on continuous sediment sequences (u-channels)



1.3 Specific technical room

All devices creating noise, magnetic perturbations and warmth are placed here. The “satellite” of each magnetometer is on a separate stand (compressor, motor drivers etc...)



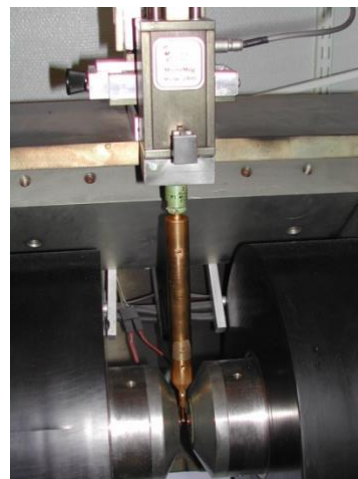
1.4 In the high-field room

1.4.1 **Vibrating Sample Magnetometer (VSM LakeShore 8600)**

Hysteresis and FORC measurements at room temperature and at variable temperatures from 100K to 950K. 2T electromagnet.



1.4.2 **AGM 2900 (Princeton Instrument)**



Measurements of hysteresis cycles and FORC at room temperature on very small samples (a few mg)

1.4.3 **Variable Field Translation Balance (VFTB - Mag-Instruments)**

Thermomagnetic cycles on small powdered samples (a few g)

In-field measurements up to 1 T, room temperature to 700°C, dynamic range 10^{-8} - 0.1 Am^2



1.4.4 Extraction of the magnetic fraction



2. ELEMENTAL ANALYSES (managed by CliMag and used by several groups at LSCE)

2.1 XRF core scanner (model Avaatech 4th generation)

Semi-quantitative, high resolution, very rapid and non-destructive measurements (cm to submm down to 100 μ) of the chemical composition of marine and continental sediments. Gives access to the content in major and minor elements (Mg to Ba).



2.2 Energy-Dispersive X-ray Fluorescence (ED-XRF) spectrometer, model PANalytical Epsilon 3XLE



Quantitative analysis of the concentration in 19 major and minor elements (Al, As, Ca, Ba, Co, Cr, Cu, Fe, K, Mg, Mn, Ni, Pb, Rb, Si, Sr, Ti, Zn, Zr) at the surface of dried and finely crushed sediments.

3. SEDIMENTARY GRANULOMETRY (managed by CliMag and used by several groups at LSCE)

3.1 Beckman Coulter



Particle sizer using Coulter principle (Electrical principle). Used in our group to determine precisely the mean grain-size of the Sortable Silt (10 to 63 μm)

3.2 Malvern 3000E



Particle sizer using laser diffraction principle (size range : 0.1 to 1000 μm)