THE LSBB UNDERGROUND RESEARCH LABORATORY: A UNIQUE FACILITY FOR FUNDAMENTAL & APPLIED LOW BACKGROUND INTER-DISCIPLINARY GROUND AND UNDERGROUND SCIENCE & TECHNOLOGY

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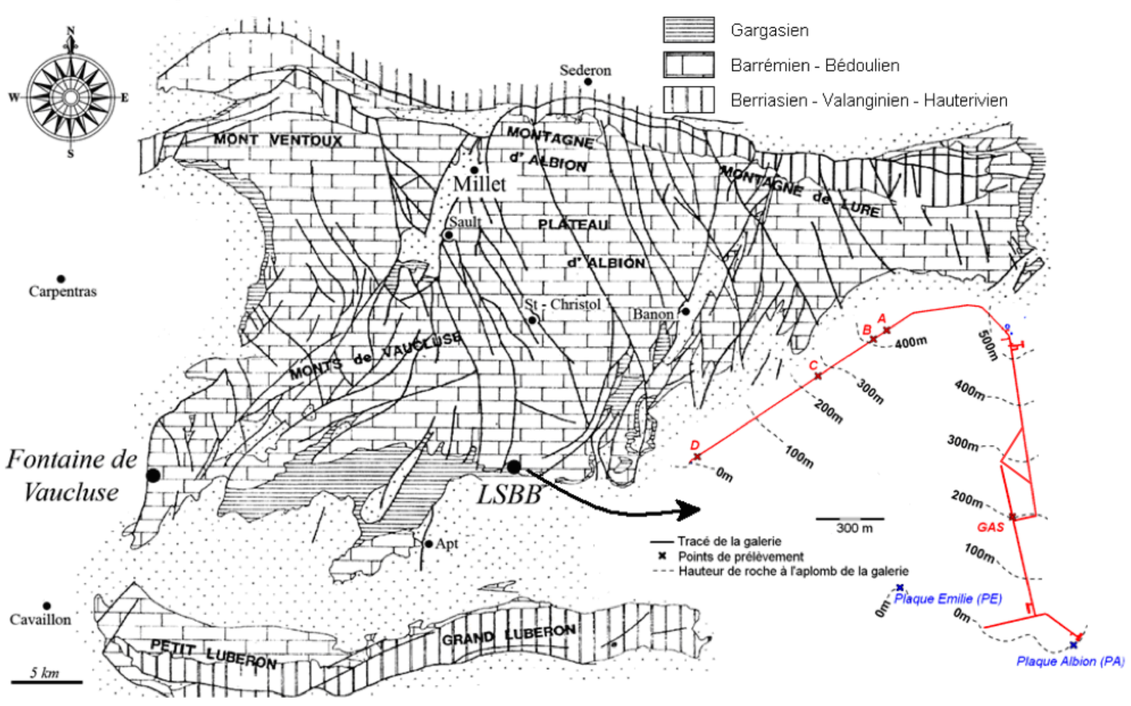
LSBB Laboratoire Souterrain à Bas Bruit
Low Noise Inter-Disciplinary Underground Science & Technology

cnrs · Université Côte d'Azur · Avignon Université · Pays d'Apt Luberon · Département de Vaucluse · Région Sud Provence Alpes Côte d'Azur · Liberté • Égalité • Fraternité République Française · Ministère de l'Enseignement Supérieur et de la Recherche · Union Européenne Fonds Européen de Développement Régional

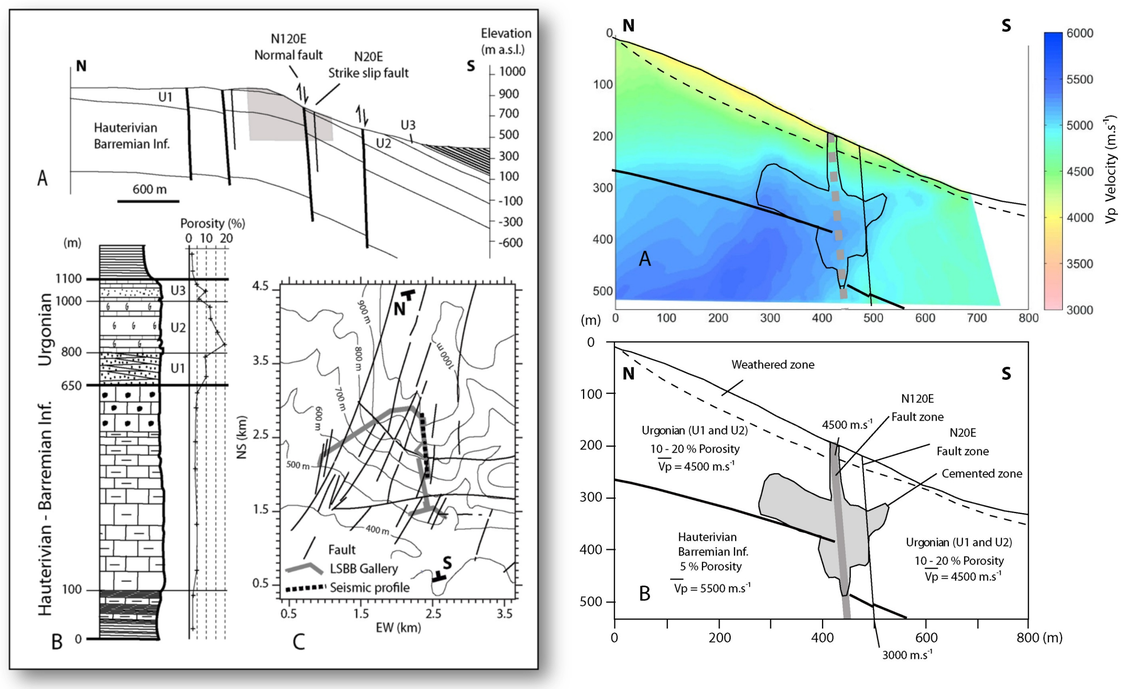
The low background noise interdisciplinary ground and underground based research laboratory (LSBB, CNRS Mixed Service Unit) contributes to the development of knowledge and know-how at national, European and international levels. As an interdisciplinary research facility, the LSBB is able to (i) accommodate large instruments, (ii) host scientific platforms, (iii) provide real-time measurements to national observatories, (iv) develop and to welcome ultra-sensitive multiphysics instrumentations of both academic and industrial collaborations in a low-anthropic-noise environment with particular interest in geological, electromagnetic and hydrogeological fields.

Easy access to the shallow and deep unsaturated zones of the Fontaine-de-Vaucluse aquifer



Garry et al., 2008; Blondel et al., 2010; Carrière et al., 2013; Gaillardet et al., 2018; Jourde et al., 2018; Ollivier et al., 2019; Barbel-Périneau et al., 2019

Access to Urgonian facies analog to oil fields of the Middle East



Maufroy et al., 2012; Bereš et al., 2013; Barruol et al., 2017; Matonti et al., 2017; Frau et al., 2018; Godeau et al., 2018; Tendil et al., 2018

Addressing societal challenges

- Increasing stress on water resources due to climate change and anthropogenic impact
- Seismic hazard
- Optimization of oil bearing in carbonate reservoirs

Interest of LSBB's location

- Access to underground water
- Karstic environment
- Within a main seismogenic zone
- Access to carbonated platform

Platform for instrumentation characterization

- Development and characterization of high sensitivity technology
- Interdisciplinary test site for benchmarks
- Synergy between academics and industry

LSBB know-how

- Development, implementation & characterization of sensors
- Interactions between research teams
- Data quality and reliability management
- Coupling between instrumentation and environment

Environment and resources characterization

Instrumentation and metrology development

Unique facility and potential for experimentation

Measurements of waves and radiation

Research infrastructure

- Accommodation of large experiments in controlled environments
- Underground operation

The LSBB offers

- Potential for multi-scales & multi-depths projects
- Permanent staff to ensure the experiment survey
- Fine monitoring of environmental parameters
- Boreholes at different depths and locations
- Easy access for materials and water, electricity and network availability
- Surface and underground facilities in a low-background noise environment
- Underground vaults, clean room, electromagnetically shielded spaces

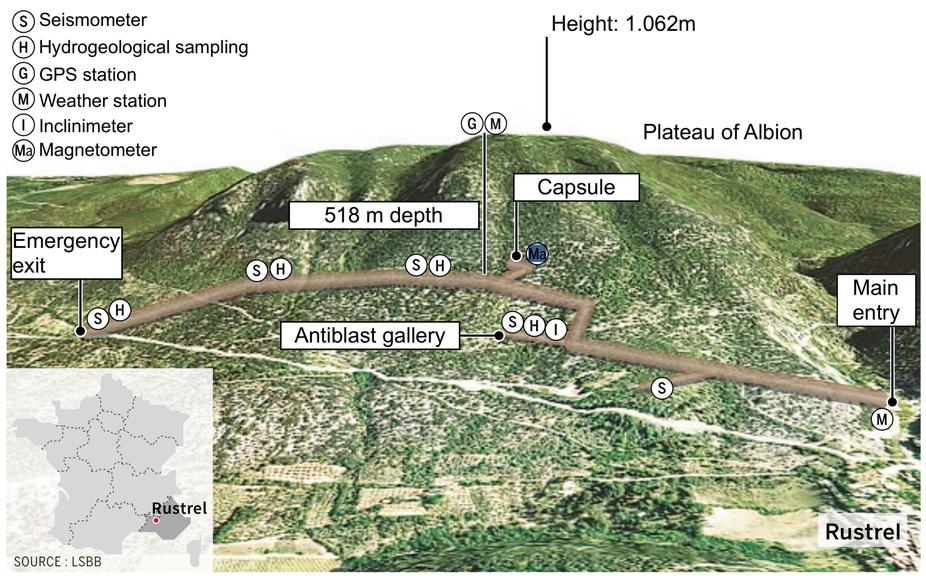
Long term observation

- Assure long term data acquisition provided to SNO

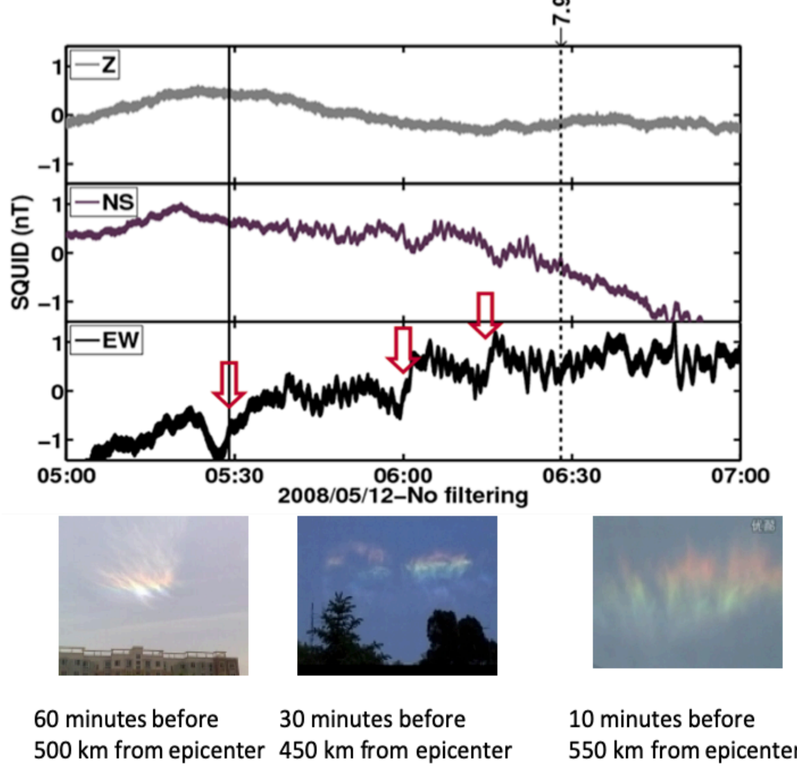
LSBB multi-physics instrumentation

- Magnetometry
- Densitometry
- Gravimetry
- Hydrogeological survey
- Gravitational waves
- Neutron spectrum
- Clinometry
- Seismometry
- Optic fiber
- Muography
- Rotation
- Atm. EM & rad. Phenomena

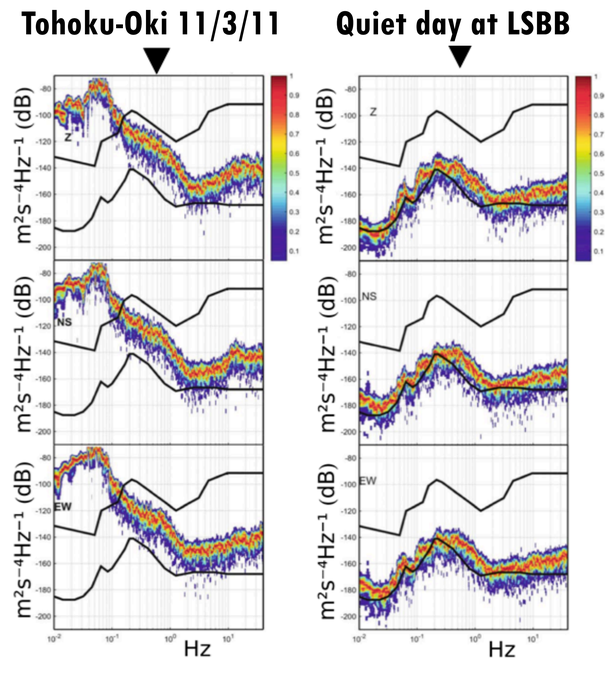
... and others!



The LSBB counts with 54ha of surface and 4 km of underground galleries with depths ranging from 0 to 518 m



Jumps of magnetic field in time coincidence with "rainbow clouds" observed at different locations before Sichuan earthquake



PSD (top to bottom: Z, NS, EW) vs Peterson's high and low noise models