

Platform LÉXPLORE

Annual report from July 2024 to December 2025



LÉXPLORE platform ©Natacha Pasche, April 2025

Summary

This extended reporting period marked several significant achievements for LÉXPLORE. Three partner institutions confirmed their commitment to continue collaboration beyond 2026. A first business case was developed with a focus on fundraising, and the official concession was successfully renewed. The annual LÉXPLORE workshops were notably successful, featuring mature scientific results and excellent discussions. Over the period, 26 projects utilized the platform. Similar to previous years, the platform was used 53% of the working days. As this report covers more than a year, the goal moving forward is to deliver annual reports on full calendar years.

1. Activities from the LÉXPLORE Steering Committee

During this period, four Steering Committee (SC) meetings were held on 16 October 2024, 20 January 2025, 14 May 2025, along with a key meeting with leaders of partner institutions on 18 November 2025.

The SC prepared a new governance structure and a financial business case for beyond 2026. At the November meeting, institutional leaders confirmed that Eawag, Unil, and EPFL will continue collaborating post-2026, while CARTEL has opted out and UNIGE will provide a decision by the end of 2026.

LÉXPLORE successfully secured the official concession to operate until 2037. The SC is now focusing on developing an operational scenario for platform activities from 2027 onward, prioritizing expanded research capacity and addressing future challenges.

2. Activities from the Limnology Center

For the extension of LÉXPLORE, Natacha Pasche diligently followed all necessary steps, resulting in the concession being extended until December 2037 via an addendum signed on 16th October 2025. With the finances team at EPFL, Natacha Pasche also helped to establish new tariffs for platform usage, making LÉXPLORE eligible for SNSF funding based on the utilization data from 2023. The LIMNC has continued to manage day-to-day operations and oversee major repairs. In 2025, the two upper cables anchoring the platform on the western side were replaced due to wear.

Guillaume Cunillera led the Technical Pool of six technicians, including Jérémy Keller. During Guillaume's paternity leave, Jérémy took over his responsibilities. The LIMNC technicians, with greater involvement, manage most technical tasks, troubleshooting, and coordinate monthly platform maintenance.

Led by LIMNC, the FLAKE project improved the data transfer pipeline and developed an integrated quality assurance tool within the Datalakes system, working closely with the LÉXPLORE community to enhance data reliability, accountability, and open research compatibility.

3. Activities from the LÉXPLORE Technical Pool

The technicians of the LÉXPLORE Technical Group met once per month to carry out two days of maintenance dedicated to the core dataset. In addition, one extra day every two months was allocated to infrastructure maintenance.

During the reporting period, personnel changes occurred on the UNIGE side, including maternity leave and retirement. Christelle Vignoli has since been appointed to support LÉXPLORE activities. On the CARTEL side, the technician also retired and will be replaced.

3.1 Infrastructure

Throughout the reporting period, the LÉXPLORE platform infrastructure required continuous monitoring, maintenance, and several targeted interventions to ensure operational reliability and long-term sustainability.

In November 2024, the platform deck was sanded and repainted to prevent the propagation of corrosion originating from existing rust spots. As part of a preventive maintenance strategy, the repainting of the interior of the platform compartments has been scheduled for spring 2026.

Several connectivity issues were encountered due to limitations in data usage associated with the internet connection. This led to the installation of a new modem and the adoption of a revised subscription plan to improve data transmission reliability.

Regarding the buoy perimeter, navigation lights were transferred to the secondary buoys. The B3 buoy, attached to the transversal line, was regularly subjected to excessive tension and was occasionally submerged several meters below the surface. It was therefore replaced. Subsequent inspections of the buoy anchoring system using a remotely operated vehicle (ROV) confirmed that the anchoring points and the Dyneema ropes remained in good condition.

A structural assessment of the platform carried out by SAN (navigation department) in March 2025 confirmed its overall integrity.

In April 2025, an aluminum structure was installed on the southern side of the platform. This structure is intended to host various scientific instruments and provides additional functionalities, including use as a sheltered workspace and as a take-off and landing platform for drones.

Damaged upper anchoring cables located on the southwest and northwest sides of the platform were replaced in September 2025 in collaboration with ASN and Orlatti. However, the pulleys installed on the platform corners that guide these cables still require replacement and are planned for a subsequent intervention.

A major issue identified in 2025, particularly with the onset of winter, was a noticeable decline in the capacity of the platform's battery system. The batteries are aging and approaching the end of their operational lifetime. Consequently, the generator has been used more frequently to maintain the platform's power supply. A full battery replacement is planned for summer or autumn 2026.

3.2 Core dataset

In 2025, a comprehensive instrument control program was implemented for the LÉXPLORE core dataset. This program includes automated monitoring and an alarm system designed to detect instrument malfunctions or abnormal behavior, significantly improving responsiveness and data reliability.

The Technical Pool faced several challenges related to CTD instrumentation. Following the bankruptcy of Sea & Sun Technology, one CTD probe was returned without calibration. In parallel, the situation with Idronaut instruments proved complex. Nevertheless, one Idronaut CTD was successfully sent for calibration and upgraded with a new turbidity sensor.

The cable of the Idronaut profiler was frequently damaged and was therefore replaced in February 2025 with a reinforced, armored cable providing improved protection. To accommodate this new cable, the winch drum had to be mechanically adapted. Since this modification, the new system has been operating reliably.

The Thetis profiler encountered failure of its internal winch system and has been out of the water since February 2025. During this period, the associated sensors were sent for calibration. Repair operations are still ongoing.

The wave buoy was sent to Nexsens for a major upgrade. Two new parameters were added: Wave energy spectrum and average wave period and the measurement frequency was increased. The upgraded wave buoy is expected to be redeployed on the platform in early 2026.

The former RBR temperature chains (two chains of 24 sensors) were replaced with a new inductive temperature profiling system supplied by Soundnine, consisting of 26 sensors and one modem. Several technical issues were encountered with two spare modems, which had to be returned to Soundnine for repair. Since September 2025, the new temperature chain has been fully operational.

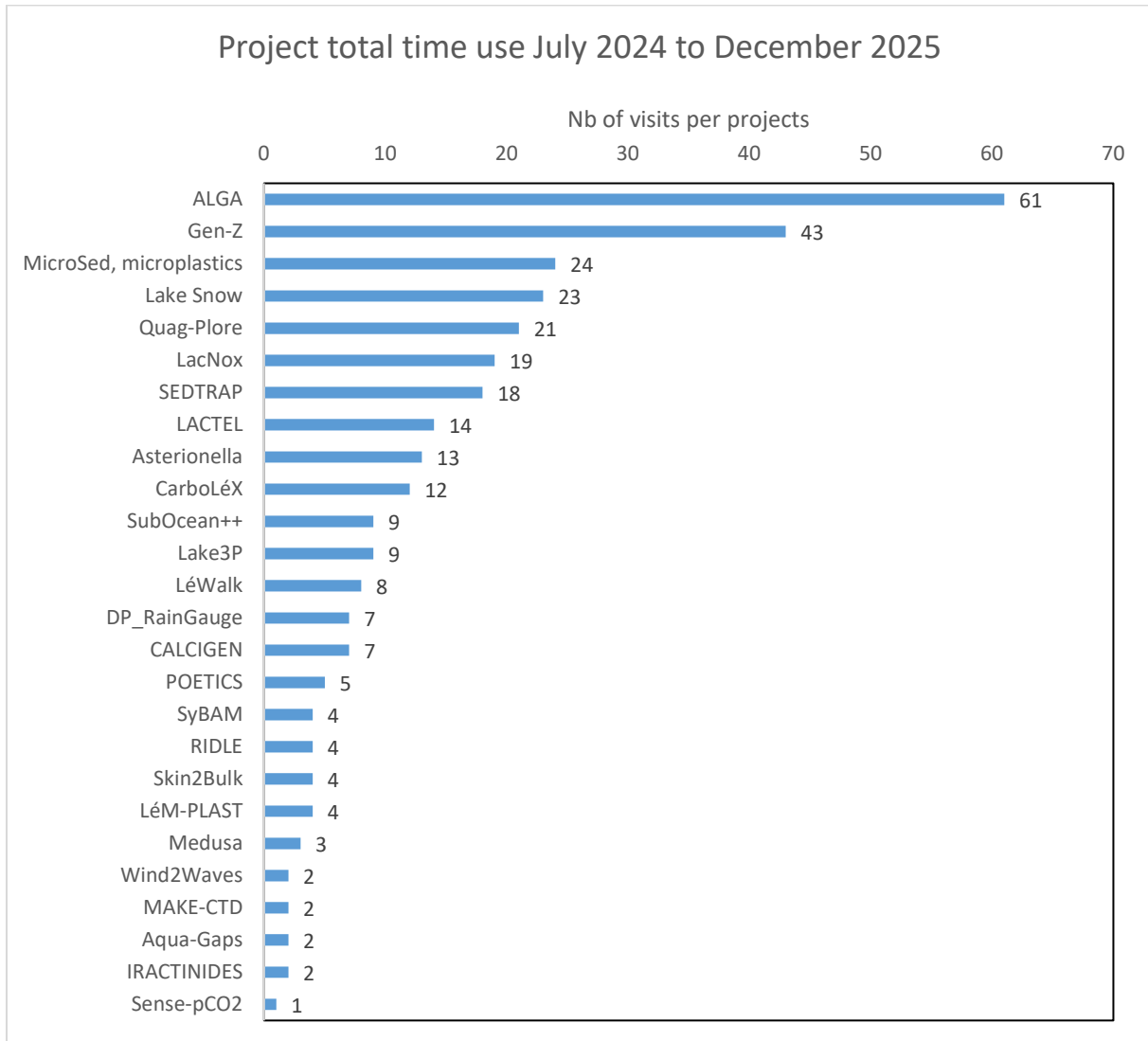
The subsurface OxyPARs mooring failed in July 2025. The sensor line was subsequently recovered using a remotely operated vehicle (ROV) and successfully redeployed in October 2025.

The meteorological station, installed in early 2024, continued to operate reliably throughout 2025. An upgrade carried out during the year allowed the original sensors to be sent for factory calibration without interrupting data acquisition.

The year 2025 was also marked by the FLAKE project (FAIRifying LÉXPLORE: enhancing open research data pipelines for Advanced LaKe Science), conducted in collaboration with the IT4R team at EPFL. The main objectives of this project were to improve the platform's data pipelines and to simplify and standardize data flagging procedures, fostering collaborative workflows and enhancing overall data quality.

4. LÉXPLORE usage

To monitor the use of LÉXPLORE, each team leader recorded their visits in the logbook. From 1st July 2024 to 31th December 2025, the platform was visited 527 times: 321 times for the projects, 143 times for technical operations, and 63 times to fulfil special requests. The special requests comprised: 19 for the media, 29 visits, 11 teaching activities, and 3 punctual sampling and one instrument testing. Like previous years, the platform was used during 210 days in total, which represents 53% of the working days. The number of visits per project were distributed as shown in the following graph.



5. Scientific Projects

During the reporting period, a total of 26 projects were active on LÉXPLORE. A [detailed scientific report](#) outlines the results of the projects every year. The list of active projects are presented below with their titles, collaborators, and funding source.

1. Cusnir Ruslan, Jaccard Samuel. **Measuring the bioavailability of radionuclides in Lake Léman using diffusive gradients in thin films (IRACTINIDES)**. Lab internal funding.

2. Chappellaz Jérôme, Nouvel Armance, Tellier Alexandre, Sbicego Mauro, Lunven Bénédicte, Cruz Hugo, Lavanchy Sébastien. **An open source, low- tech and performant CTD for lakes and oceans (MAKE-CTD)**. Lab internal funding & additional contribution from the MAKE initiative from EPFL.
3. Ludwig Christian, Breider Florian, Rossi Michel, Pick Horst, Wang Yang. **A Physical-Chemical Approach Towards the Assessment of the Degradability of Plastics (Lém-PLAST)**. Swiss governmental funding of the ETH domain (EPFL project GR-LUD 0234), EPFLglobalLeaders (co-funded by European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No 945363) and the China Scholarship Council.
4. Khatun Santana, Chappellaz Jérôme, Perga Marie-Elodie, Lavanchy Sébastien, Cruz Hugo, **Nitrous Oxide (N₂O) emission from Lake Geneva (LacNox)**. Lab internal funding.
5. Ibelings Bastiaan, Dugenne Mathilde, Thomas Mridul, Fillion Roxane, Gios Matteo, UNIGE Master students, Carratalà Anna, Muscas Irene, Janssen Elisabeth. **Algal blooms in Lake Geneva facing global changes: from a better understanding of the ecology of harmful and potentially toxic species to preserving good water quality and lake ecosystem-services through the development of decision tools. (ALGA)**. INTERREG.
6. Perga Marie-Elodie, Devkota Nischal, Sanoza Wyndel. **Quantifying the Zooplankton link in lakes: Lake GENEva as a sandbox (GEN-Z)**. SNSF.
7. Romanello Luca, Holdcroft Kevin, Wolfart Gaston, Orr Lachlan, Tuareg Albert, Paoli Lucas, Kovac Mirko. **MEDUSA: multi-robot aerial system for underwater sampling (MEDUSA)**. Fondation F.-A. Forel (SCNAT).
8. Jérôme Chappellaz, Sébastien Lavanchy: **Tests and improvements of the SubOcean probe (SubOcean++)**. Lab internal funding.
9. Pierre Rossi, Emmy Oppliger: **Quantification of Quagga mussels within the EPFL water cooling system (Quagplore)**. EPFL-VPO.
10. Lisa Morales, Matteo Gios, Bastiaan Ibelings: **Asterionella chytrids (Asterionella)**. SNSF.
11. Natacha Tofield-Pasche, Marc-Antoine Courtois, Louise Noël du Payrat, Guillaume Cunillera: **Dynamics of the settling particulate matter in Lake Geneva (Lake Snow)**. ENAC call for equipment and Lab internal funding.
12. Neronov Andrii, Kneib Jean-Paul, Shutska Lesya, Bernard Florian, Lesrel Jean, Haefeli Guido: **LAC TElescope (LACTEL)**. Lab internal funding.
13. Didier Jézéquel, Paris Jean-Daniel, Lozano Mathis, Ruffine Livio, Fandino-Torres Olivia, Grilli Roberto, Chappellaz Jérôme, Mettra François, Perga Marie-Elodie, Berg Jasmine, Khatun Santana: **High-frequency monitoring of CO₂ and CH₄ fluxes at LÉXPLORE station by combining different methods (CarboLÉX)**. PEPR Carbonium.
14. Breider Florian, Hanahan Jonathan, Vernez Karine, Coudret Sylvain, Loizeau Jean-Luc: **Deposition and Accumulation of Microplastics in Lake Sediments (Microsed)**. Limnology Center then Lab internal funding.
15. Bouffard Damien, Bieito Fernandez Castro, Piccolroaz Sebastiano, Michäel Plüss, Sebastien Lavanchy, Wüest Alfred: **Investigating the surface boundary layer (Skin2Bulk)**. Lab internal funding.

16. Weyermann Céline, Estoppey Nicolas, Pfeiffer Fabienne, Glanzmann Vick, Reymond Naomi, Huismann Sofie: **Aqua-Gabs/MONET in Lake Lemman (Aqua-Gabs)**.
17. Mariethoz Gregoire, Koch Erwan, Berne Alexis: **Installation of a drip-based rain gauge on LÉXPLORE (RainGauge)**. Lab internal funding.
18. Natacha Tofield-Pasche, Guillaume Cunillera, Nathalie Dubois, David Janssen: **Temporal and spatial variations of the settling particles fluxes in Lake Geneva (SEDTRAP)**. Lab internal funding.
19. Odermatt Daniel, Werther Mortimer, Wydler Jonas, Irani Rahaghi Abolfazl, Damm Alexander, Pasche Natacha, Alikas Krista, Soomets Tuuli, Spyarakos Evangelos: **Monitoring Lake Primary Production using the PACE satellite (Lake3P)**. SNSF.
20. Brunetti Maura, Babanin Alexander, Kasparian Jérôme: **Wind2Waves**. Lab internal funding.
21. Bouffard Damien, Gil Coto Miguel, Lavanchy Sébastien, Fernandez Castro Bieito, Doda Tomy : **autonomous turbulence profiling (LÉWalk)**. Lab internal funding.
22. Ibelings Bastiaan, Thomas Mridul, Fillion Roxane, Matteo Gios, MUSE-Master students: **PlanktOn vErTICal Structure (POETICS)**. Lab internal funding. Completed project.
23. Tercier-Waeber Mary-Lou, Ibelings Bastiaan, Layglon Nicolas, Gressard Tanguy: **Synergic interaction between arsenic species and microorganisms in freshwater contrasting dynamic conditions (SyBAM)**. Limnology Center. Completed project.
24. Vennemann Torsten, Mottet Lucia, Lutz Samuel, Miesen Floreana. **Rhône River Intrusion and Interflow Dispersion of Nutrients and Organic Matter in Lac Léman (RIDDLE)**. Lab internal funding. Completed project.
25. Nicolas Escoffier, Jérémy Keller, Santona Khatun, Isabel Herr, Marie-Elodie Perga: **Calcite precipitation dynamics in Lake Geneva (Calcigen)**. Lab internal funding. Completed project.
26. Alexandre Tellier, Sébastien Lavanchy, Jérôme Chappellaz: **Design and construction of a probe for continuous monitoring of dissolved CO₂ in seawater from a sailboat or a small ship (Sense-pCO₂)**. Lab internal funding. Completed project.

6. Communication and events

The following communication, events and outreach activities took place during the report period:

- 4th September 2025: the 5th LÉXPLORE workshop brought together 55 participants, offering a rich platform for scientific exchange and networking. The program featured a keynote by Francesco Pomati on *Aquascope: automated imaging and machine learning to understand and forecast plankton community dynamics in lakes*. Four plenary project presentations and 16 flash talks, followed by a poster session, highlighted the diversity and dynamism of ongoing research on the platform.
- 3rd September 2025: Fondriest, Environmental Monitor, What's Floating on Lake Geneva? How LÉXPLORE is Revolutionizing Lake Science
- 15th August 2025 : TF1 info – Pollution plastique: pourquoi l'échec des négociations inquiète

- 31st July 2025 : SRF – Schweiz aktuell: Genfersee – LÉXPLORE die Forschungsplattform
- 23rd July 2025 : EPFL actu : Etude des gaz à effet de serre dans le lac Léman à bord de LÉxplore
- 13th April 2025 : Le Messenger : Sur le Léman, 6 outils qui font de LÉXPLORE un laboratoire unique au monde
- 9th April 2025: Le Messenger : A la découverte d'un laboratoire unique au monde sur le Léman
- 21st March 2025 : RTS CQFD – La journée mondiale de l'eau et ses enjeux en Suisse
- 15th March 2025 : RTS Forum des Idées – Lémanscope, un projet de science participative pour connaître l'état de santé du lac Léman
- 26th December 2025 : RFI, Pollutions, empreinte carbone, moule quagga: à bord de LÉxplore, observatoire flottant du lac Léman
- 31th October 2024 : Unil – Des scientifiques de l'UNIL expliquent pourquoi le Léman émet de grosses quantités de CO2
- 31st October 2024 : RTS 12h45, Pourquoi le Léman émet de grosses quantités de gaz carbonique?
- 31st October 2024 : Forum, Pourquoi le Léman émet de grosses quantités de gaz carbonique?
- 5th September 2024: the **4th LÉXPLORE workshop** gathered 44 scientists and was an excellent opportunity for networking. Florian Breider presented a keynote speech, on *Tracking microplastics: a comprehensive study of water and sediment in Lake Geneva*. Four research projects were presented in the plenum, as well as 15 pitches followed by a poster session.
- 16th August 2024 : RTS – Les scientifiques innovent pour comprendre le réchauffement des lacs suisses – rts.ch – Sciences-Tech
- 22 August 2024 : la Télé : L'EPFL a besoin de votre aide
- 15th August 2024 : RTS – Quelles conséquences après les températures records des lacs?
Interview de Natacha Tofield-Pasche – rts.ch – Portail Audio
- the LIMNC team also performed eleven days of public visits for a total of 328 visitors

In addition, the following educational activities took place:

- 9th December 2025: visit of scientists from the Red Sea through EPFL
- 5th December 2025: visit of first year bachelor students from UNIL
- 17th October 2025: visit of first year bachelor students from UNIL
- 6th May 2025: camp for 11 master student from UNIL
- 2nd May 2025: Visit of 14 master student from EPFL
- 4th December 2024: Visit of 14 master students from UNIGE
- 18th and 25th October 2024: Visits of Bachelor students from UNIL
- 10th and 13th May: first visits for school classes

7. Scientific Publications

During the reported period, eight publications and three PhD theses were completed.

2025 (5)

Mittelbach BVA., White ME, Rhyner TMY, Haghipour N, Perga M-E, Dubois N, and Eglinton T. (2025)

Deltaic burial of authigenic calcite modulates the carbon balance of hardwater lakes,

Biogeosciences, 22, 6749–6763, doi.org/10.5194/bg-22-6749-2025

Mori-Bazzano L, Hguyen N H A, Sevcu A, Riha J, Fu T, Slaveykova V I, Ibelings BW. (2025) **Plastic degradation in Lake Geneva: Influence of depth, seasonal shifts, and bacterial community dynamics.** Science of The Total Environment: 983, 179615. doi.org/10.1016/j.scitotenv.2025.179615

White M E, Mittlebach B V A, Escoffier N, Rhyner T M Y, Haghipour N, Janssen D J, Perga M E, Dubois N, Eglinton T I. (2025) **Seasonally Dynamic Dissolved Carbon Cycling in a Large Hard Water Lake.** J. Geophys. Res. Biogeosciences 130: e2024JG008645. [doi:10.1029/2024JG008645](https://doi.org/10.1029/2024JG008645)

Gupana, R S, D Odermatt, A I Rahaghi, C Minaudo, M Werther, C Giardino, and A Damm (2025) **Remote sensing of sun-induced fluorescence in a deep lake: Disentangling quenching mechanisms improves relationship with chlorophyll-a concentration estimates.** IEEE J. Sel. Top. Appl. Earth Obs. Remote Sens. 1–20. [doi:10.1109/JSTARS.2025.3528911](https://doi.org/10.1109/JSTARS.2025.3528911)

Niveen Ismail, Paul Seguin, Lola Pricam, Elisabeth M.L Janssen, Tamar Kohn, Bas W. Ibelings, Anna Carratalà (2025) **Seasonality of cyanobacteria and eukaryotes in Lake Geneva and the impacts of cyanotoxins on growth of the model ciliate Tetrahymena pyriformis.** Aquatic Toxicology, Volume 279, February 2025, 107262. [doi:10.1126/sciadv.ado5924](https://doi.org/10.1126/sciadv.ado5924)

2024 (4)

Many G, Escoffier N, Perolo P, Bärenbold F, Bouffard D, Perga M-E (2024) **Calcite precipitation: The forgotten piece of lakes' carbon cycle.** Science Advances 10: eado5924. [doi:10.1126/sciadv.ado5924](https://doi.org/10.1126/sciadv.ado5924)

Khatun S, Berg JS, Jézéquel D, Moiron M, Escoffier N, Schubert CJ, Bouffard D, Perga M-E (2024) **Long-range transport of littoral methane explains the metalimnetic methane peak in a large lake.** Limnology and Oceanography. doi.org/10.1002/lno.12652

Zhou L, Masset T, Breider F (2024) **Adsorption of copper by naturally and artificially aged polystyrene microplastics and subsequent release in simulated gastrointestinal fluid.** Environ. Sci.: Processes Impacts, 26, 411-420. doi.org/10.1039/D3EM00354J

Irani Rahaghi A, Odermatt D, Anneville O, Sepúlveda Steiner O, Reiss RS, Amadori M,..., & Bouffard D (2024) **Combined Earth observations reveal the sequence of conditions leading to a large algal bloom in Lake Geneva.** Communications Earth & Environment, 5(1), 229. doi.org/10.1038/s43247-024-01351-5

8. Doctoral theses

Mittelbach BVA, 2025. **Tracing Carbon Sources and Turnover Times Using Sedimentary Radiocarbon Signatures in Swiss Lakes.** PhD Thesis, ETHZ. <https://doi.org/10.3929/ethz-b-000748923>

9. Way Forward

The next steps for LÉXPLORE include:

- Enhancing the operational efficiency and utilization of the platform and its infrastructure.
- Strengthening data quality control for the core dataset on the DATALAKES platform.
- Showcasing LÉXPLORE's research outcomes at national and international conferences.
- Fostering interdisciplinary dialogue through the annual LÉXPLORE workshop.
- Expanding international collaborations and joint scientific projects associated with LÉXPLORE.
- Supporting the integration of LÉXPLORE into summer school programs.
- Developing new operational scenarios and strategies for LÉXPLORE beyond 2026.

Pictures from scientists and technicians on the LÉXPLORE platform, and participants in the LÉXPLORE workshop

