Platform LéXPLORE

Annual report June 2018 to June 2019

Summary

During this reporting period, LéXPLORE platform was constructed and anchored in Lac Leman on 19th February 2019. In June 2019, it became operational with multiple high-tech instrumentations with over 13 scientific projects. This set of instruments already acquired observations at fine temporal and vertical resolution from different disciplines. This dataset will allow to understand key processes in lake functioning. The communication around LéXPLORE was intense with a film, two media events, two presentations to the public and a successful event baptising LéXPLORE.

1. Administration

The LéXPLORE Steering Committee (SC) held 9 meetings on the following dates: 31st July 2018, 24th September 2018, 24th October 2018, 13th December 2018, 30th January 2019, 5th March 2019, 10th April 2019, 15th May 2019 and 24th June 2019.

During these meetings, the SC monitored the construction and installation phases that took into account their recommendations for key technical issues. For science, the SC validated the first projects applications, and agreed on the minimum dataset (see appendix 2) that will be offered to any researcher as background information.

The SC has set up a technical committee (see picture below) with a Technical Officer (TO) from each institution at 10% (23 days per year). On 24th October 2018, the SC appointed Sebastian Lavanchy as Chief Technical Officer (CTO) at 20%. Their work descriptions were elaborated to include the platform maintenance and the installation of scientific instruments. Finally, the SC also negotiated the admission of a new partner.

Technical Committee, from left to right : Aurélien Ballu (Unil), Roxane Fillion (UniGE), Sébastien Lavanchy (EPFL), Michael Plüss (Eawag), Philippe Quétin (CARRTEL)

On 20th June 2019, the Alpine Research Center on Trophic Networks from Limnic Ecosystems (CARRTEL) officially joined the consortium as a new partner. This mixed research unit between INRA and University of Savoie Mont-Blanc will bring expert knowledge on Lake Leman's ecosystem. Jean Guillard is their representative within the SC.

2. Construction

Protection circle with surface buoys

By 27th July 2018, Rampini & Cie had installed the protection circle. However, on 10th August after a strong storm, the surface rope of the circle broke in multiple locations. The company Intrasub reinforced it with subsurface cables between the buoys. Rampini & Cie also improved their structure that was completed on 9th October 2018. The first moorings with scientific instruments were installed on 11th October 2018.

On 25th April 2019, the mooring cable from one principal buoy broke after a storm on the previous day. We have declared this incident to LéXPLORE insurance, which will cover the reparations proposed by Intrasub (except 2'500 CHF).

Platform

The four sections of the pontoon were constructed in Germany and transported to La Sagrave in Le Bouveret. There, Shiptec AG assembled and equipped the pontoon from 24th October to 20th December 2019. The equipment includes a dry/wet laboratory, two moonpools, a restroom, two A-frames and a crane. The electricity is generated by 28 solar panels with batteries that can hold a full capacity during 5 days without sun, and is secured by a soundproof generator of 30kVA.

ASN International GmbH proposed to anchor the platform with 3 tons gravity anchors. Given the bad experiences with the protection circle, the SC mandated the external company, Vuyk Engineering Rotterdam, to review of the anchoring system. To hold a storm of 100-year return, Vuyk recommended to add additional chains on all the mooring lines and to slightly move the positions of the anchors. Following these recommendations, ASN successfully anchored the platform on Lac Leman on 18th and 19th February 2019.

3. Exploitation

The Limnology Center managed the day-to-day exploitation of LéXPLORE, that included: to register LéXPLORE (VD 40 882), to equip it with the required safety equipment, to contract insurances, to purchase a data acquisition system, to buy and find a place for a common Zodiac, to repair the protection circle and to solve other technical problems.

The technical committee worked intensively to set up the safety and basic equipment on LéXPLORE. By 20th June 2019, the technical officers had installed most of the scientific equipment that will provide data for the minimum dataset: temperature chains, meteorological station, acoustic Doppler current profilers, autonomous multi-parameter profiler Thetis, Primary Production mooring. In addition, they installed equipment that is specific to each project, whose operation and maintenance is then the responsibility of the project leader.

A logbook was set up to monitor the use of LéXPLORE. From 19th February to 10th July 2019, the platform was used 71 times during 45 days: 15 Technical interventions, 11 for LéXPLORE (media, construction), 1 for the visit of 100 UNIL students, as well as 16 for Primary Production, 13 for Micro-Titrator, 13 for CARBOGEN, 8 for CO2LEX scientific projects.

According to the consortium agreement, each research project should contribute to the annual use of LéXPLORE. The exploitation costs were estimated to 60'000 CHF per year. At the moment, the current spendings amount to 34'000 CHF (see point 5). The SC has not defined these contributions yet and the Limnology Center is currently trying to make LéXPLORE recognized as a national infrastructure within SNF.

4. Scientific Projects

The SC has set up an application form so that each researcher can apply for a project on LéXPLORE. The CTO gives his technical recommendations, and then the SC can validate the application.

Currently, the following 14 projects (PI, **title**) were accepted:

- Johny Wüest, **Primary production under oligotrophication in lakes:**
  Quantification of primary production, vertical microstructure, water inherent optical properties
- Marie-Elodie Perga, **CARBOGEN: carbon cycling in Lake Geneva:**
  Determining carbon fluxes, the dynamics of calcite precipitation and of dissolved organic matter
- Damien Bouffard, **Buoyancy driven nearshore flows in lakes (Thermal Syphon):**
  Investigating lateral transports driven by surface cooling, to couple the littoral and the pelagic zone
- Bastiaan Ibelings, **Revisiting the phytoplankton paradox:**
  High-frequency plankton community to quantify the role of abiotic versus biological interactions
- Jean Guillard, **LéXfish:**
  Determining the presence, distribution and behaviour of fish below LéXPLORE
- Jonas Sukys, **DATALAKES**
  Developing an end-to-end data platform to provide and analyze lake data at high resolution
- Beat Müller, **In situ pursuit of whitening events applying a micro-titrator for alkalinity:**
  Investigating what drives calcite precipitation with a newly developed microtitrator at Eawag
- Alexander Bahr, **SubMule:**
  Testing new modem to offload data from a submerged instrument in the water
- Cary Troy, **Surface Turbulence and CO_2 Lake Exchange Experiment (CO2LEX):**

Quantifying the exchange of CO_2 to the atmosphere and linking it with near-surface turbulence

- Daniel Odermatt, **Whitening detection and optical characterization (w-doc):** Using Inherent Optical Properties in satellite images to distinguish the sources of whitenings
- Florian Breider, **MICROSED - Deposition and accumulation of microplastics in lake sediments:** Determining the distribution, temporal dynamics and past evolution of microplastics
- Yves Bellouard, **All-glass sensors for deep chlorophyll maxima algae population monitoring:** Investigating a new, fast algae detection method for first-time validation in a field study
- Stéphane Joost, **Local Adaptation of bacteria Communities to environmental conditions (LAC):** Characterizing bacteria populations and distributions in function of ecological niches
- Kristin Schirmer, **Rainbow$_{flow}$ chip$_{online}$: Fishcell biosensor for automated water quality testing:** Constructing the first flow-through biosensor chips for live-cell monitoring

We were particularly pleased with the multidisciplinary work during a 24h cycle on 13th and 14th June 2019 that mobilized 15 researchers from Eawag, EPFL, and Unil on 4 different projects.

4. Communication

On 4th April 2019, the media contact points from the four initial institutions agreed on a strategy for LéXPLORE communication. The main conventions were to use: **#Leman_explore** with @EawagResearch for Eawag on the social media, use the logos in alphabetic order with first logo with the institution responsible for the communication, and during media event to alternate researchers from each institution.

The following communication events took place during the reported period:

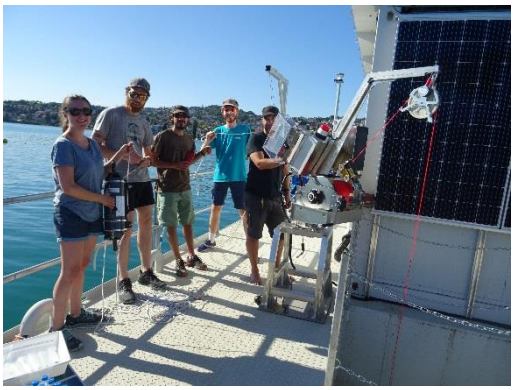
- 25th July 2018: 24 heures – *Mystère levé sur le cercle des bouées jaunes*
- 13th September 2018: Presentation of LéXPLORE to Rotary Club in Pully
- 12th October 2018: 24 heures – *Première mesures avant l'arrivée de la plateforme scientifique*
- 19th February 2019 : large Media event "platform on water" with RTS Téléjournal de 19h30, RTS radio La matinale, Press release by the academic institutions (Eawag, EPFL, UniGE, UniL), 24heures: Une île flottante ancrée à Pully, SRF Tagesschau, Swiss administration, MyScience, La Liberté, Zentralschweizertafelrunde, Nashagazeta, Agenparl
- 24th June 2019: LéXPLORE baptism with 20 VIPs and all SC members
- 26th June 2019: Presentation of LéXPLORE to Club de Sauvetage and Diver Club in Lutry
- 28th June 2019: installation of LéXPLORE information panel on Pully harbour. A designer created this panel, which was validated by the SC, the City of Pully and the four media contact points.
- 4th July 2019: Media event "platform operational" with an article on 24heures and one from Keystones ATS published in 11 different journals (20 minutes, Tribune de Genève, Le Matin, Swissinfo, RTN, la Liberté, TWnews, Bote, RFJ, Bluewin, Watson). Additional articles will soon appear in Terre et Nature, Le Courrier de Lavaux-Oron, Revue Skippers and CQFD on RTS.

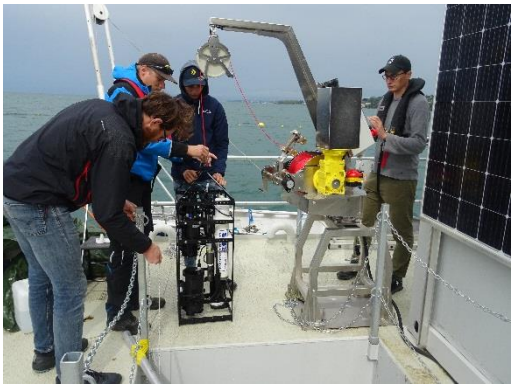
The SC decided to create a film about LéXPLORE construction, where each SC member has an interview in their mother-tongue. The 6.10 min film was produced by the audiovisual service (SAVE) at EPFL, with images also collected by UNIL and Eawag. Currently, a version with French subtitles is available here. An English and German version is also planned together with a shorter version of 2 min for social medias.

6. Way forward

The next steps for LéXPLORE are the following:

- Install the data acquisition system for remote operation and other future scientific instruments, as well as to ensure LéXPLORE maintenance.
- Organize a data pipeline with quality check within the DATALAKES project, and make the minimum dataset available online in collaboration with CARRTEL's Research Engineer.
- Find additional funds to cover the current construction deficit.
- Evaluate LéXPLORE exploiting costs end 2019, and clarify the contributions for the research projects. The goal is to have balanced finances for LéXPLORE by end 2020.
- Promote interdisciplinary exchanges during a scientific workshop on LéXPLORE first results on 13th November 2019.
- Promote scientific projects on LéXPLORE by updating www.lexplore.ch with relevant information and by presentations in scientific conferences with LéXPLORE film.
- Engage navigators for a participatory science project in collaboration with the Association pour la Sauvegarde du Léman (ASL) in the next years.
- Provide public presentations when requested, and organize two annual visits for the public. Make data on lake temperature and meteostation available for the public.



Images from scientists at work on the platform