6.4 THE HALLE BUFFON

BUFFON is an interdisciplinary project which aims at reinforcing the infrastructures for environmental research in Rennes. It has been financially supported by the French government, regional and local authorities for a total budget of 8.6 M€ over the next 5 years. The objectives of BUFFON are threefold:

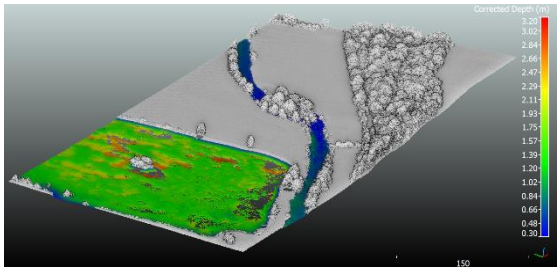
• strengthen the biological, chemical and genomics platforms' capacity to provide state-of-the-art analytical tools for rock, soil, water, plant and air samples and develop new intrusive and non-intrusive methods;

• Build an experimental hall which will allow the development of analogic models which mimic complex environmental mechanisms (e.g. slope erosion, stream channel transport and nutrient cycling, chemical transport in the vadose zone, wetland gas emissions under water table variations…). These analogic models will be surrounded with up to date sensors to monitor their evolution under controlled constraints;

• develop a virtual laboratory which aims at providing a series of connected tools to store observation, transform it into information and provide numerical models for understanding complex environmental systems and propose scenarios of change.

These 3 objectives will provide shared tools for interdisciplinary research in environment through interactive observation, experimentation and modelling approaches.

6.5 BI-SPECTRAL TOPO-B-ATHYMETRIC AIRBORNE LIDAR PLATFORM



Topographic airborne lidar imaging is a key remote sensing technology to monitor the dynamics of natural systems. One single dataset has a very large range of environmental applications ranging from risk mapping (floods, landslides, coastal erosion…), ecosystems monitoring (e.g., standing biomass calculation, species classification) to fundamental research on landscape geomorphology and connectivity. The universities of Rennes and Nantes have acquired a state of the art bi-spectral topo-bathymetric airborne lidar in 2015 (800 k€). It combines two ranging laser with wavelengths at λ =1064 nm and λ=532 nm. The 532 nm wavelegnth is dedicated to **shallow bathymetric** measurement that traditional topographic lidar cannot obtain. **Such capability is currently unique in France, and only 3 instruments of this type exists in Europe**. This instrument thus stands at a convergent point between environmental "end-user" scientists, experts in signal processing and computer vision scientists developing new machine learning and geospatial analysis. Several inter-disciplinary projects have started related to river bathymetry monitoring in relation to aquatic habitat and sediment transport, automatic identification of urban vegetation, tracking of vegetation development following dam removal…

One originality of this instrument is that it is currently operated in the context of a public/private partnership with the society FIT-CONSEIL which provides planes, pilot, operators and engineers to support the activities of academic research and the private sector (e.g., EDF).

6.6 PIMA: MULTIMODAL AIRBORNE PLATFORM

PIMA, *Mulitmodal Engineering Airborne Platform*, is a unifying project which provides an original airborne sensor which is unique in the European academic community, responding to the European NEREUS (Network of European Regions Using Space technologies) initiative and to the European COPERNICUS program (eg GMES). PIMA is an airborne platform that can carry onboard sensors covering the entire electromagnetic spectrum (from optical to microwave): multispectral and hyperspectral AISA Eagle cameras, thermal and optical high-resolution cameras for aerial photography and the PoSAR-MC system (Pocket-SAR Multi-Channels) which is a synthetic radar (SAR) offering polarimetric, interferometric and tomographic operating.

6.7 CONDATE-EAU PLATFORM

The groundwater dating platform allows all actors of water to preservation and management to access leading-edge technology in hydrogeology. Valorisation of previous scientific projects in groundwater dating, **the platform Condate Eau is unique in France.** It is equipped to analyse CFC and SF6 for residence time estimation.

Now specialized in all dissolved gases analyses, the platform helps in studies dealing with residence time (age) but also chemical and microbial reactivity, in-situ monitoring of groundwaters and rivers. **Scientifics but also stakeholders can benefit of this expertise** trough collaboration or all-in-one service in France but also internationally.

The Condate-Eau Platform provides a large and active range of analyses to water management structures (about 150,000 € annual budget). It also supports active research activities with close to 50 international publication from 2012. It allowed the development of innovative on-line continuous monitoring of gases through mass-spectrometry.

6.8 HUMAN AND ENVIRONMENTAL GENOMICS CORE FACILITY

The purpose of the Human and Environmental Genomics core facility (https://geh.univ-rennes1.fr/) is to carry out and assist the sequencing projects, from library preparation to primary bioinformatics analyses of the data generated with our NGS (Next Generation Sequencing) equipment (MiSeq, HiSeq Illumina) and to provide a self-service access to different state-of-the-art equipment. The core facility also develops applications of high throughput digital PCRs. The core facility benefits from a scientific working environment combining both ecological and medical fields of research.

The platform has a ISO9001 quality management certification and has a national label 'IBISA'. The platform also works hand in hand with the GenOuest bioinformatics core facility (www.genouest.org/) to develop automatized workflows of sequence data analyses using Galaxy.

6.9 PEARL PLATFORM


PEARL, *Aquatic experimental platform*, is devoted to animal breeding experimentation. It includes 800 m^2 halls for fisheries, 205 m^2 of greenhouses for amphibians growth experiments, a mesocosm plateau including 100 basins 0.5 to 30 m^3 and 30 ponds 100 to 1000 m^2 allowing aquatic ecosystem and agro-ecology investigations.

6.10 LERES ANALYTIC PLATFORM

LERES offers a wide range of analysis of quality parameters of environmental media (water, air, solid media including dust). Specifically, there are more than 900 analyzes or measurements that the laboratory is able to perform on water, effluents, air, sludge, sediments, dust ... to meet needs of particular, industrial, design office, local authority or public body.

In 2017, the LERES produced more than 350,000 analytical results, corresponding to nearly 18,000 samples. LERES is located on the EHESP site north-west of Rennes. On a surface of more than 1000 m², it has state-of-the-art equipment (UHPLC / QTOF, GC / MS / MS, UPLC / MS / MS /, ICP / MS / MS, RTPCR, etc.) and implements procedures which guarantee a quality of measurement results. It has been accredited COFRAC since 2000, and approved by the ministries in charge of health and the environment.

The LERES benefits from a highly qualified staff to supervise and carry out the analytical services (65 doctors, engineers, technicians analysts and samplers), carried out in one of the 3 units (Micropollutants, Test and Field Measurements, Microbiology).

6.11 ISCR ANALYTIC PLATFORM

The analytic platform at ISCR-CIP performs qualitative and quantitative analysis of organic micropollutants (pesticides, endocrine disruptors, pharmaceuticals, volatile organic compounds … and their residues) down to and below the ng.L^{-1} level in water resources, waste waters, contaminated soils and for air pollution control (indoor, outdoor). Various equipment for sample preparation, extraction, purification, concentration... are provided. (Analytical facilities). Analysis are carried out through gas chromatography (6 Gas chromatographic systems equipped with various detectors (FID, NPD, TCD...), Mass spectrometry (GC-MS) coupled with multiple injection systems (liquid injector, Headspace sampler, Thermal desorber injector)) and liquid chromatography (6 High Pressure Liquid Systems (HPLC and UPLC) and two UPLC's coupled with mass spectrometry : on-line SPE-UPLC-MS/MS (triple quadrupole), and for high resolution non targeted screening an IMS-QTof detector coupled with 2D chromatography or on-line SPE.