



# Lake Guerlédan

An hydrographic and robotic educational project

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MOQESM'16

# Future of marine robotics & hydrography?

- Industrial needs



Infrastructures  
monitoring



Mineral resources  
Oil & Gas



Defense

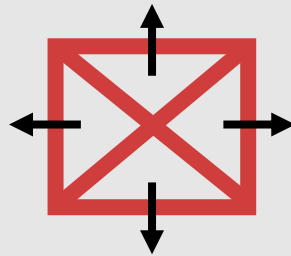


Fishery resources  
Scientific studies

- Hypothesis: challenges of sea economy
  - Improve the knowledge of marine environment
  - Allow a sustainable exploitation of available resources

# Future of marine robotics & hydrography?

- Outlook for sea surveyors



Large Areas



Hazard



Accuracy



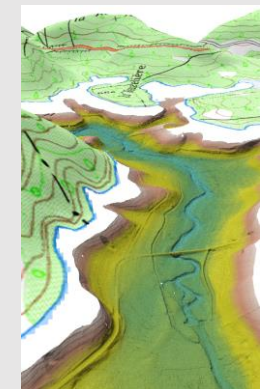
Quickness

24h/7

Persistence

- New tools & new methods

- Extensive use of robots when possible
- Close collaboration between Hyo & Rob
- New operational plan, robots, sensors



# Lake Guerlédan 2016 project

- An **intensive field tests project** for Roboticists & Hydrographers  
ENSTA Bretagne engineering students

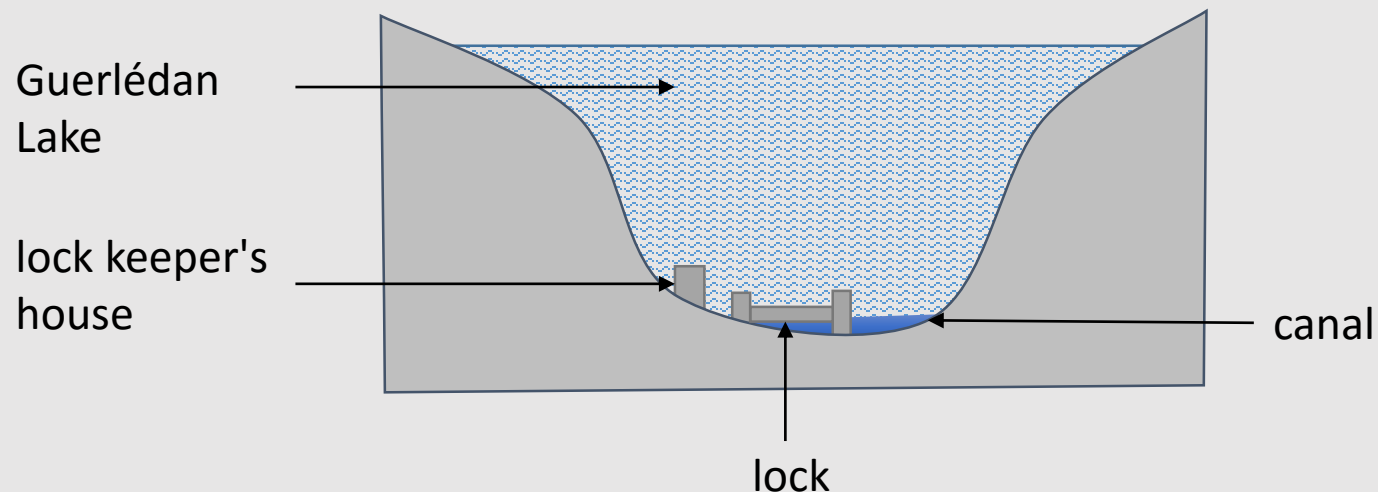


- Objectives
  - Interdisciplinary projects
  - Learning through experimentation
  - Test of innovative approaches



# Guerlédan Lake

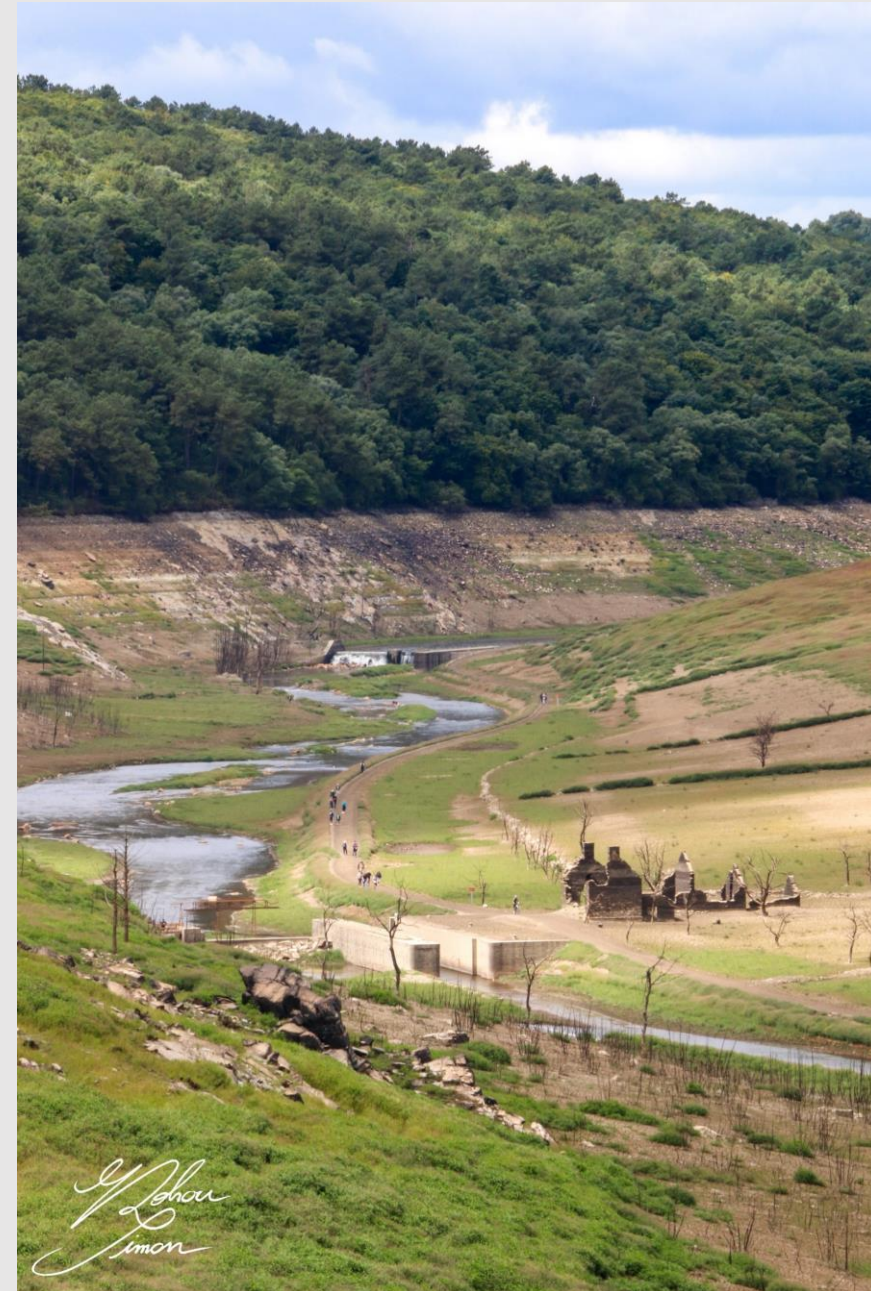
- 3 km<sup>2</sup> playground, center of Brittany
- Artificial lake, operated by EDF (1930)
  - 45m depth in front of the dam
- Build on the *Nantes-Brest canal*





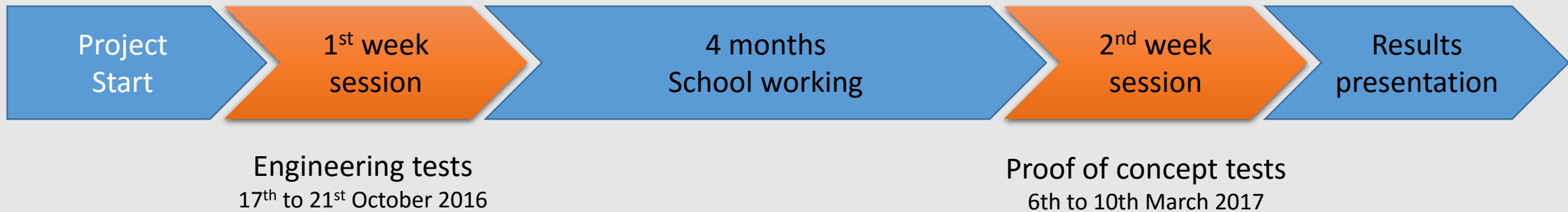
# Guerlédan Lake

- An outstanding site
  - Field's reality
  - Lake emptying (2015, 1985, ...)



# Project Scheduling

- A two sessions scheduling



- +50 students involved
- +10 teachers
- +14 subjects in partnership with *EDF* and several sponsors



# Equipment deployed

- Automated boats (USV)
- Underwater vehicles (AUV & ROV)
- Hydrographic boats and Zodiac
- Amphibious vehicle (Argo)
- ...





# Examples of student subjects (1)

- **Autonomous Survey with a Catamaran USV**

- Settling pond after the lake
- Depth  $\ll 7\text{m}$
- Constant monitoring of the sediment quantity



- Objectives

- Autonomous bathymetry
- Live QC & trajectory rescheduling

# Examples of student subjects (2)

- **Autonomous Inspection of the Dam**

- Detection of cracks
- Inspection of the dam wall

- Objectives

- Tests of several sensors (Sonars, Lidar, ...)
- Definition of robots strategy
- Localization of robots
- ...



# Next steps



- Erasmus project



- Involvement of new scientific communities around sea survey
- Exploration of the *Rance Tidal Power Station*



# How to participate?

- Come to visiting us at Guerlédan Lake
  - 17<sup>th</sup> to 21<sup>st</sup> October 2016
  - 6<sup>th</sup> to 10<sup>th</sup> March 2017
- Go to <http://hydrob.ensta-bretagne.fr> to get News



# Our sponsors



# Questions?





# Bibliography & Credits

- Photo credits
  - <http://www.lacdeguerledan.com>
  - DGA TN Brest
  - ENSTA Bretagne
  - Simon Rohou
  - <http://www.yannarthusbertrand2.org>
  - Marine Nationale

# PhD subject

- Localize & control a swarm of AUV carried by currents
  - Is there a cycle that can be follow?

