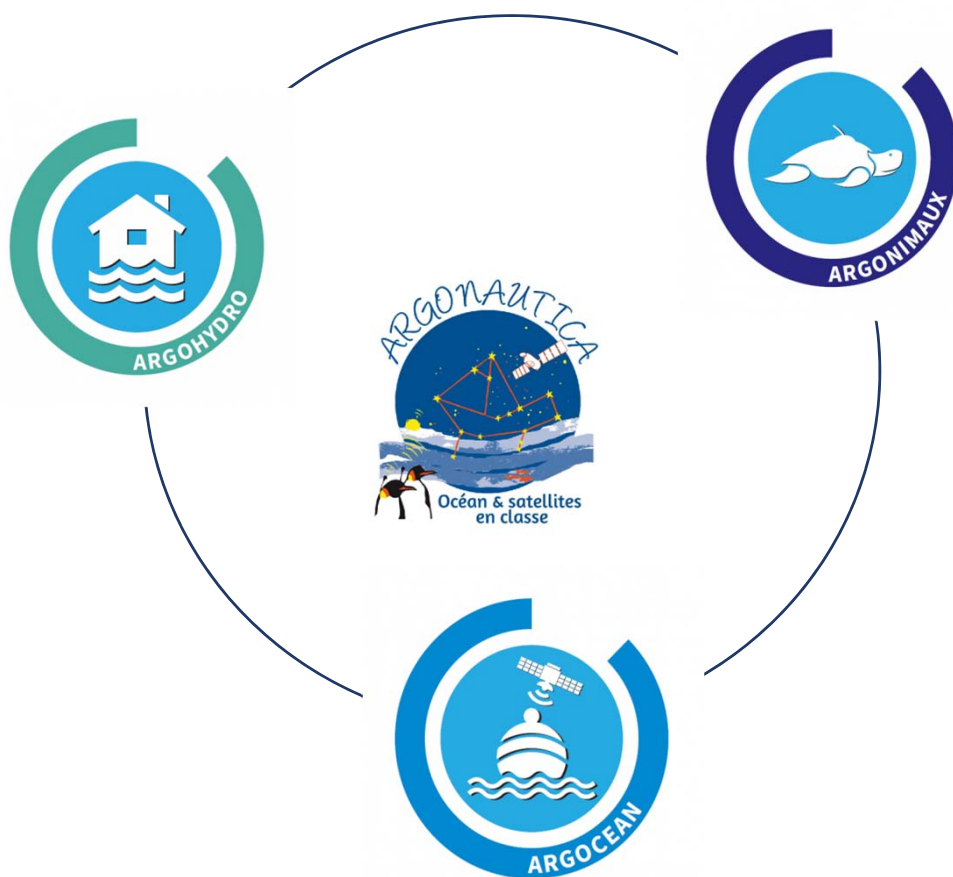




ARGONAUTICA

ARGONAUTICA



Educational Project to study Ocean with satellite data

For student from elementary to secondary schools

Started at CNES in 2000

279 classes registered in 2019

ARGONAUTICA



Argonautica, an educational project to study ocean using satellite data (ARGOS, JASON...)

ARGONIMAUX : Study environmental and climatic impact on marine animals routes (cooperation with scientists, biologists...)
156 classes from Elementary to Middle schools



ARGOHYDRO/ARGOTECHNO : Monitoring lakes and river including technical projects (buoys building, sensors...)
71 classes from Middle to High schools



ARGOCEAN/ARGOTECHO : Understand the links between ocean & climate (cooperation with skippers, explorers, building buoys, sensors...)
52 classes from Elementary to High schools



ARGONAUTICA



Argonautica is designed to help students get hands on experience both in and out of the classroom to build material and discover the world around them.



Students from E. Deroche Middle School test their water quality buoy in the Garonne



Students from Monteil High School in Rodez deploy their buoy in the Mediterranean Sea with support from l'Observatoire Océanologique de Banyuls





ARGOHYDRO



Argohydro?

OBJECTIVES

- To allow students to understand the consequences of climate and environment changes on water cycle, water quality ...

OPPORTUNITIES

- **SWOT satellite**
- **GLOBE Program**

SWOT

- Oceanographic and hydrological satellite
- Will be launched in 2021
- Will allow global measurements of water level variations

GLOBE

- International scientific and educational Program
- Students collect environmental data and enter them in the GLOBE data base.

Argohydro, Why ?

INTERESTS

- Monitor the water level variations to evaluate flooding and drought risks
- Evaluate the water quality of the nearby lakes and rivers (water temperature, pH, turbidity, dissolved Oxygen, nitrate...)
- Evaluate the impact on environment of plastic pollution, pesticide concentration...



La Garonne



Une vue aérienne du Doubs le 12 octobre 2018 à Villers-le-Lac

Argohydro, How ?

In situ measurements

- **Students collect data**
- **Using:**
 - GLOBE protocols for water quality, soil moisture, rain rate...
 - Students can also build a platform for permanent data acquisition (using a dedicated card, MANGO card, or a Arduino card...)
- **New protocols and sensors are under study:**
 - To measure water level variation, rate of flow...
 - To evaluate the level of water pollution

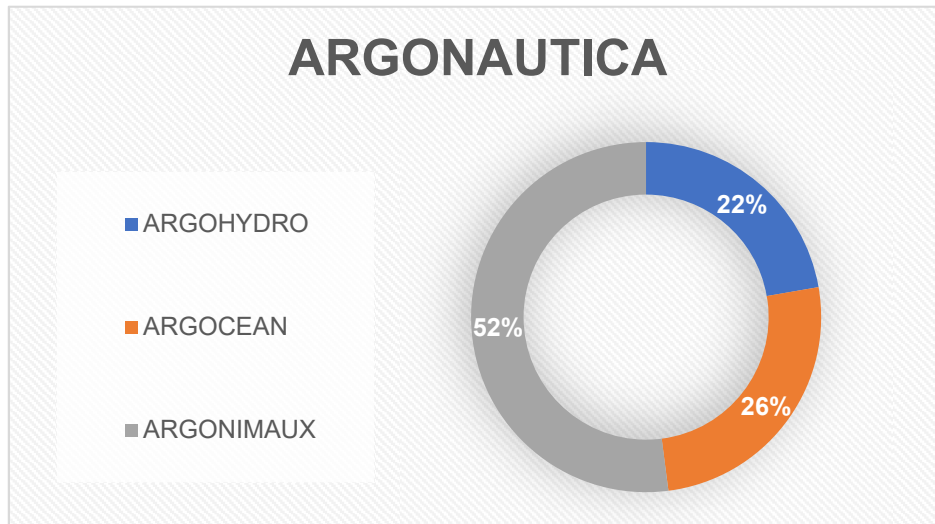
Argohydro, How ?

Correlation of in situ measurements and satellite data

- **Several satellites : SMOS, Sentinel, Jason...and soon SWOT**
- **Hydrology from Space:**
 - Water level variation (Jason 3, Sentinel 3)
 - Soil moisture (SMOS, SMAP)
 - Rain (GPM)
- **Release of data**
 - Visualization of Jason and Sentinel data via **Hydroweb** portal



Argohydro, Who ?



279
projet ARGONAUTICA

71
ARGOHYDRO

8
Pilot Projects

Collège Saint Paul (Soissons)

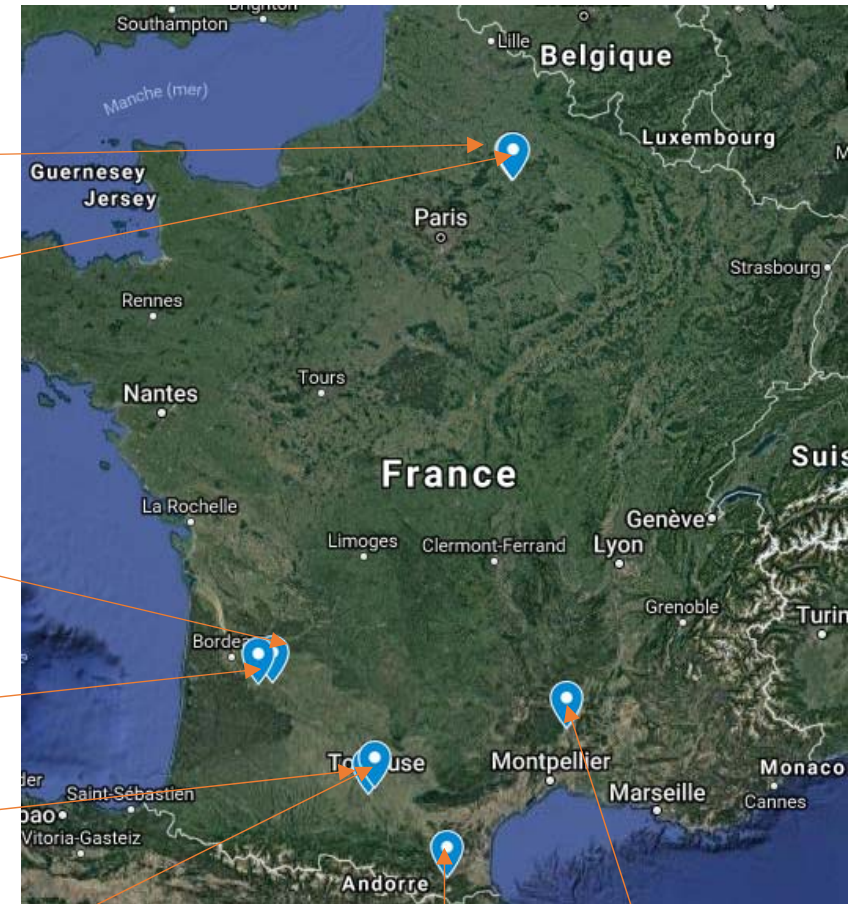
Collège Saint Vincent De Paul (Soissons)

Collège Paul Esquinance (La Réole)

Collège Elise Deroche (Pian-sur-Garonne)

Lycée Charles de Gaulle (Muret)

Collège Jules Valles (Portet-sur-Garonne)



Lycée Charles Renouvier (Prades)

Collège Jean Moulin (Alès)



SATELLITE EVENT
TOULOUSE
EUROPEAN CITY OF SCIENCE
— ESOF 2018 —

Maison pour la
science
AU SERVICE DES PROFESSEURS



**Garonne, a river,
under surveillance**

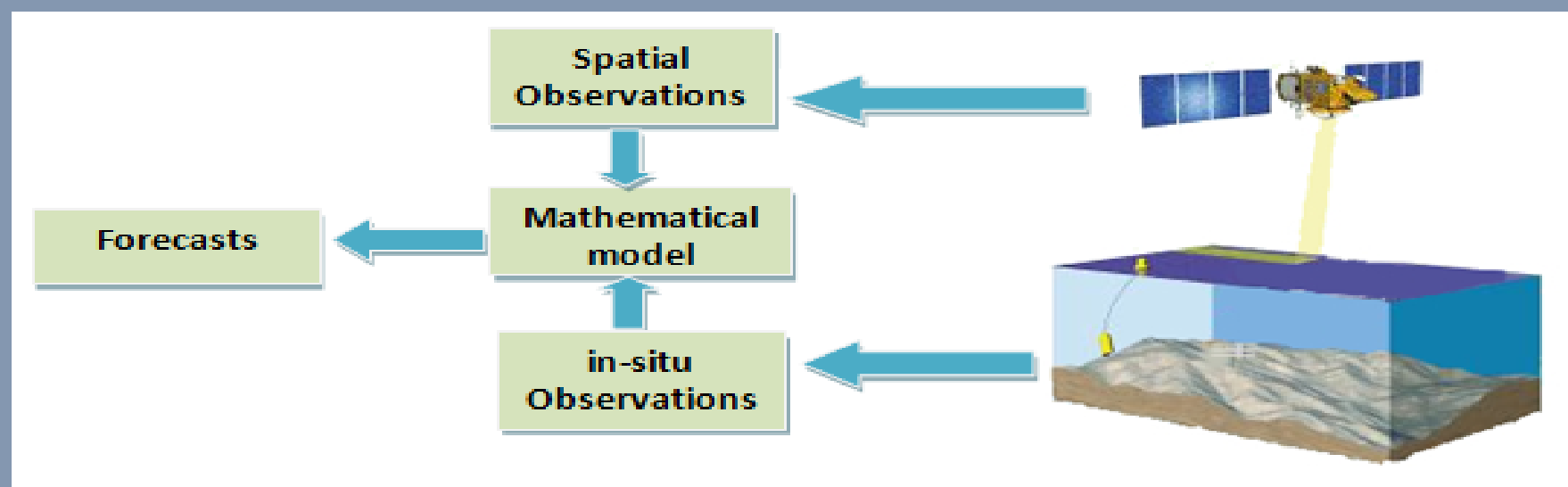


THE EARTH PROGRAM



Institut de Recherche
en Informatique de Toulouse

How to monitor the water level of the River Garonne ?



HOW TO MEASURE THE WATER LEVEL OF A RIVER

MEASURE
WATER LEVEL
A RIVER OR A
RIVER

INFORMATION
PROCESSING

- CARTE
ARDUINO UNO



ACQUIRE THE WATER
LEVEL

DATE OF INFORMATION
RECORDING

DISPLAY REAL-TIME
INFORMATION

SAVE THE
INFORMATION

SUPPLY THE SYSTEM
ITSELF

WATERPROOF SYSTEM

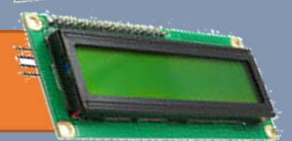
- WATERPROOF SENSOR ULTRASON JSN-SR04T
- PRESSURE SENSOR MPX5010DP



- CLOCK RTC DS 1307 I2C



- ECRAN LCD 2X16 I2C



- CARD SLOT
- SD CARD



- BATTERY 18650 LI-ION 3000mA



- WATERPROOF CASE



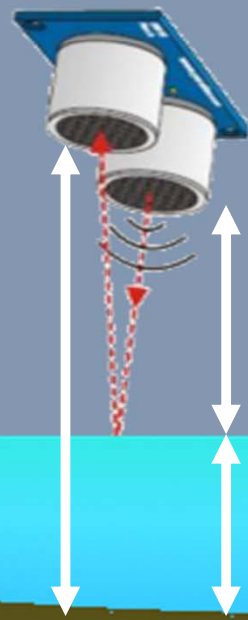
How to measure the water level using an ultrasonic sensor ?

$$H_e = H - H_m$$

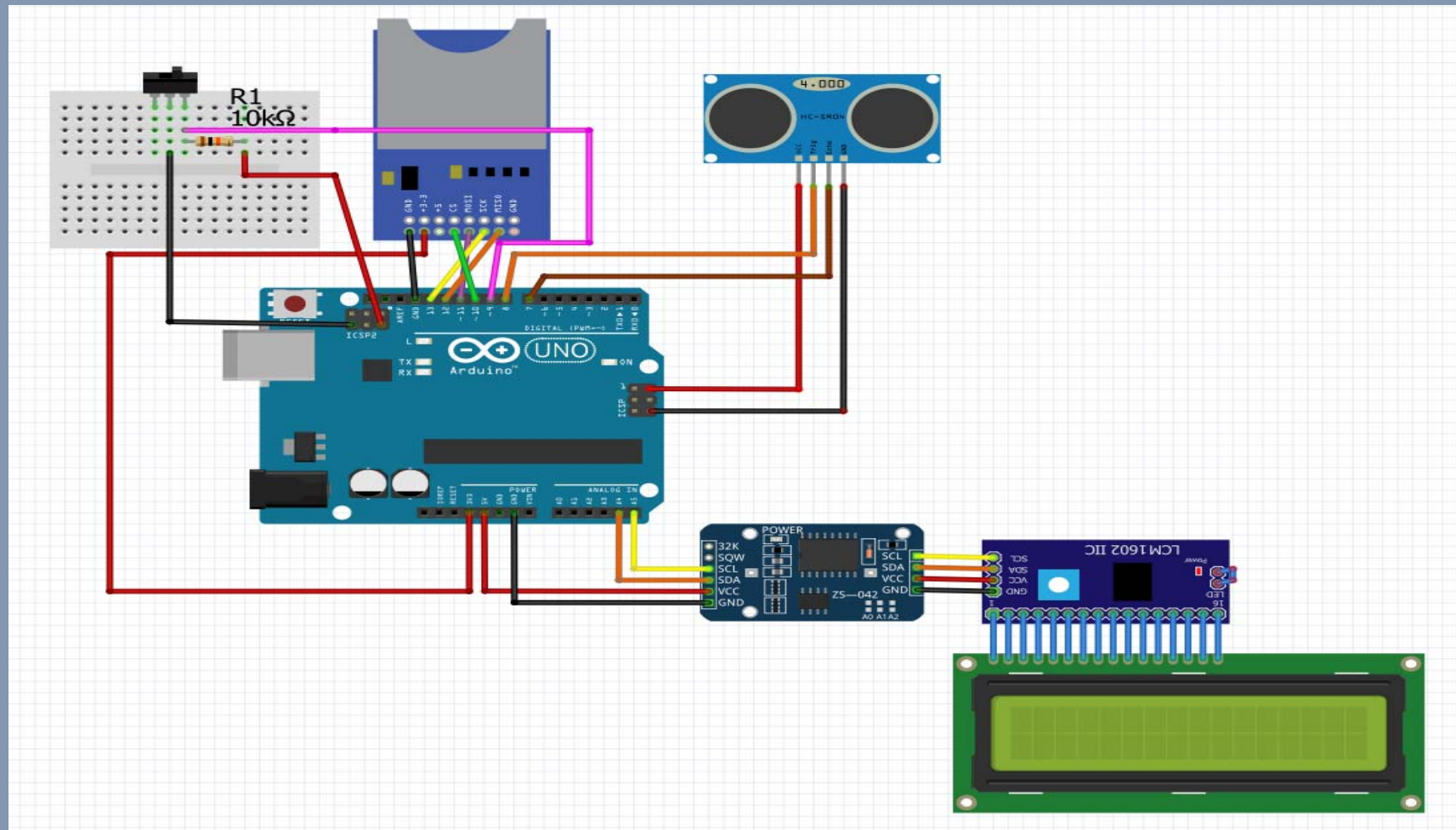
H = Height of
the sensor

H_m = Height measured by
sensor

H_e = Water depth

A diagram illustrating the measurement of water level using an ultrasonic sensor. The sensor is mounted on a bridge structure. It emits ultrasonic waves (represented by red dashed lines) which reflect off the water surface. The diagram shows the total height of the sensor from the water surface (H), the distance the wave travels to the surface and back (Hm), and the resulting water depth (He). The sensor is shown as a blue and white unit with two cylindrical transducers. Red dashed lines with arrows indicate the path of the ultrasonic waves. The water is represented by a light blue area, and the ground/bottom is a brown area.

Assembly drawing



The sensor in the field



CONCLUSION

- **ArgoHydro is very popular with schools: measurements in the vicinity of schools (river, lake...), connection with local problems (flooding risks, drought...)**
- **Last year we only had 8 pilot Projects, this year 71 schools registered**
- **We get comments from schools to improve the project : we already know that we will have to adapt for younger students (ages 6 to 8)**
- **Next step**
- **Wait for SWOT**