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A simple low-cost Arduino based LoRaWAN automatic weather station

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Why go for low-cost arduino solutions ?

- **Spatially** variable processes ->
Piezometer head, temperature, rain, etc.

Picture :

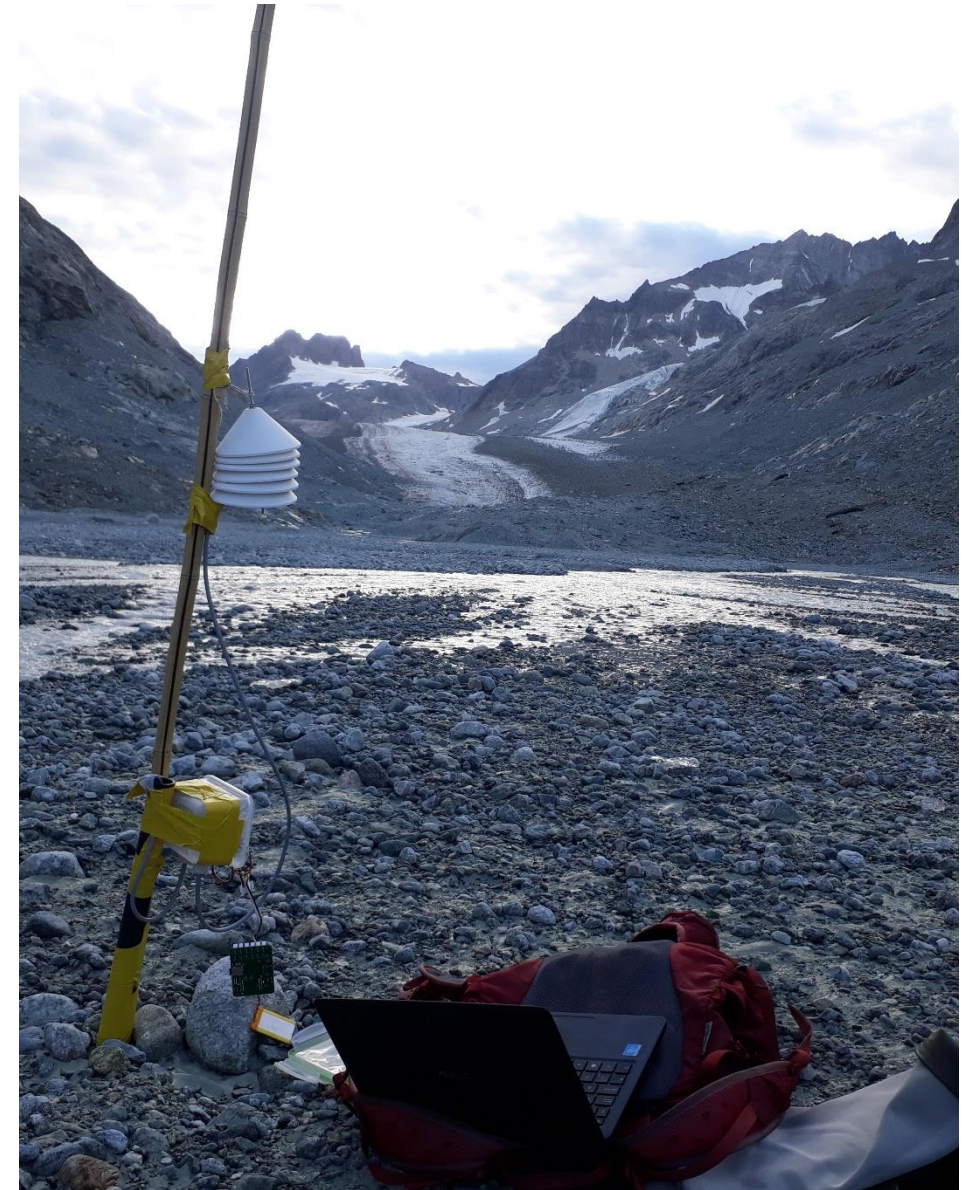
Low-cost standalone logger

- Data saved on SD card
- Last 2 months without solar panel

Data :

- Air temperature/humidity/pressure
- Groundwater head

Cost : ~100 €

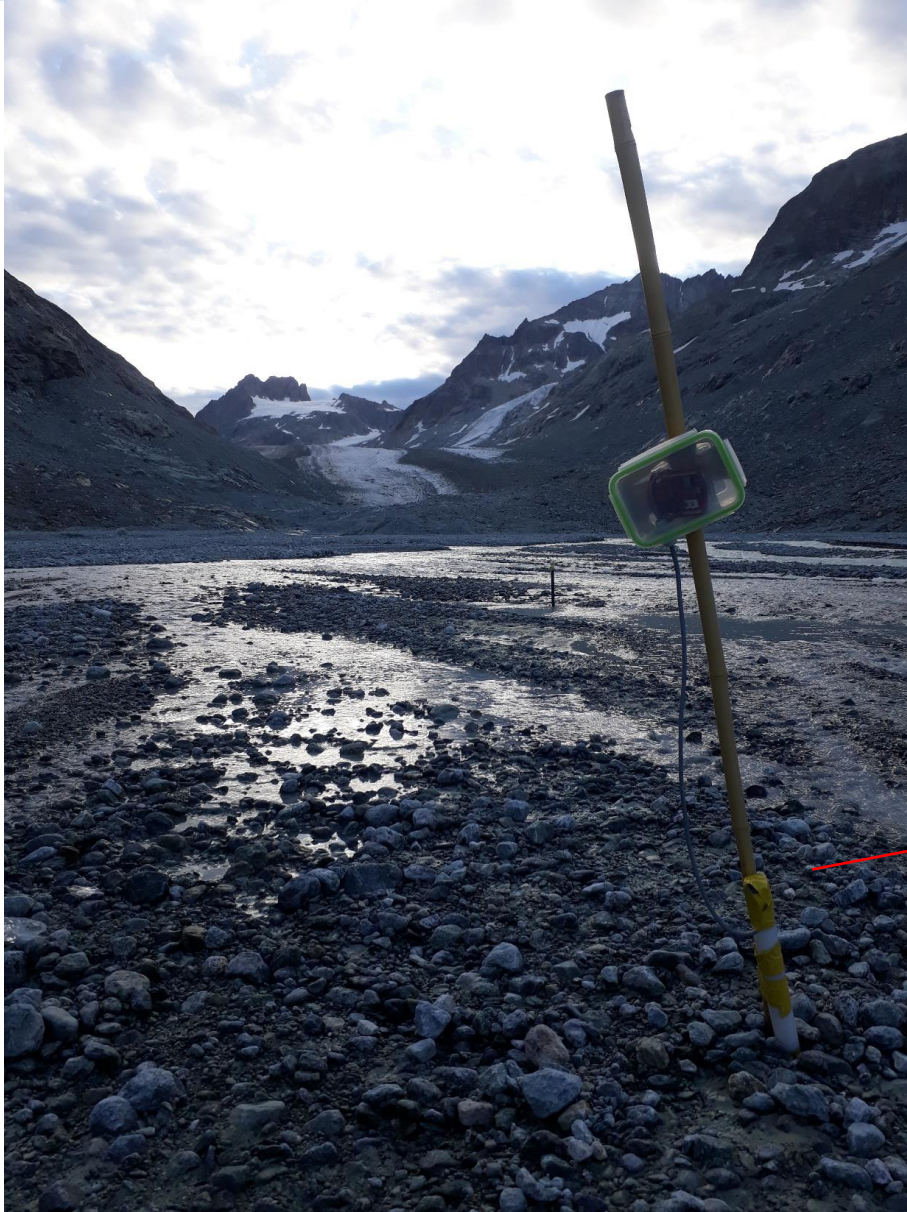


Why go for low-cost arduino solutions ?



- Spatially variable processes ->
Piezometer head, temperature, rain, etc.
- **Risky environment**

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Why go for low-cost arduino solutions ?

- Spatially variable processes -> Piezometer head, temperature, rain, etc.
- Risky environment
- **Low power** consumption
- Professional solutions not always more precise
- Large number of **sensors** with **high precision**
- Custom made solution flexible for any situation

Picture:

Water pressure sensor for narrow piezometers

Cost : ~50 €

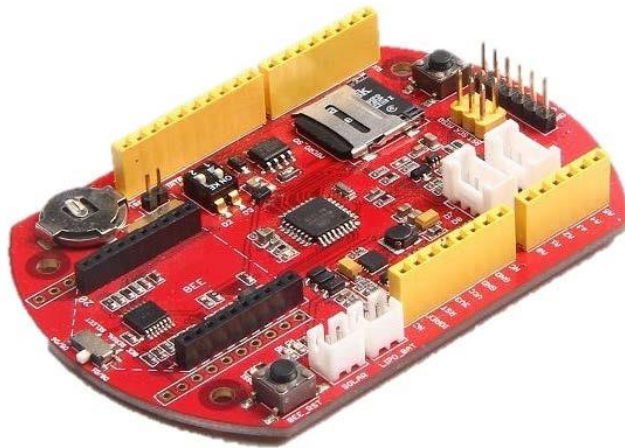
Size : 2.5 x 3 cm

Precision : 1 mm H₂O

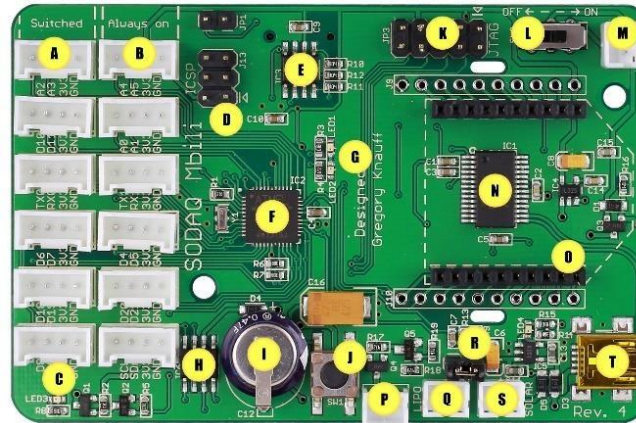


Low-cost datalogger hardware requirements

- The basic functions of an Arduino boards (Microcontroller, digital, analog and I2C pins);
- A **low-power** consumption;
- A **real-time clock** (RTC) clock to record time and to allow an RTC external interrupts to wake up the board from deep sleep;
- A built-in connector for a 3.7V **LiPo battery**;
- A built-in connector for a 5V **solar panel** with a charge controller;
- A built-in **LoRa module** or a socket to add a LoRa module with antenna;
- A **SD Card holder** to save data locally.



Seeeduino Stalker v3.1 : ~15 €



SODAQ Mbili : ~40 €

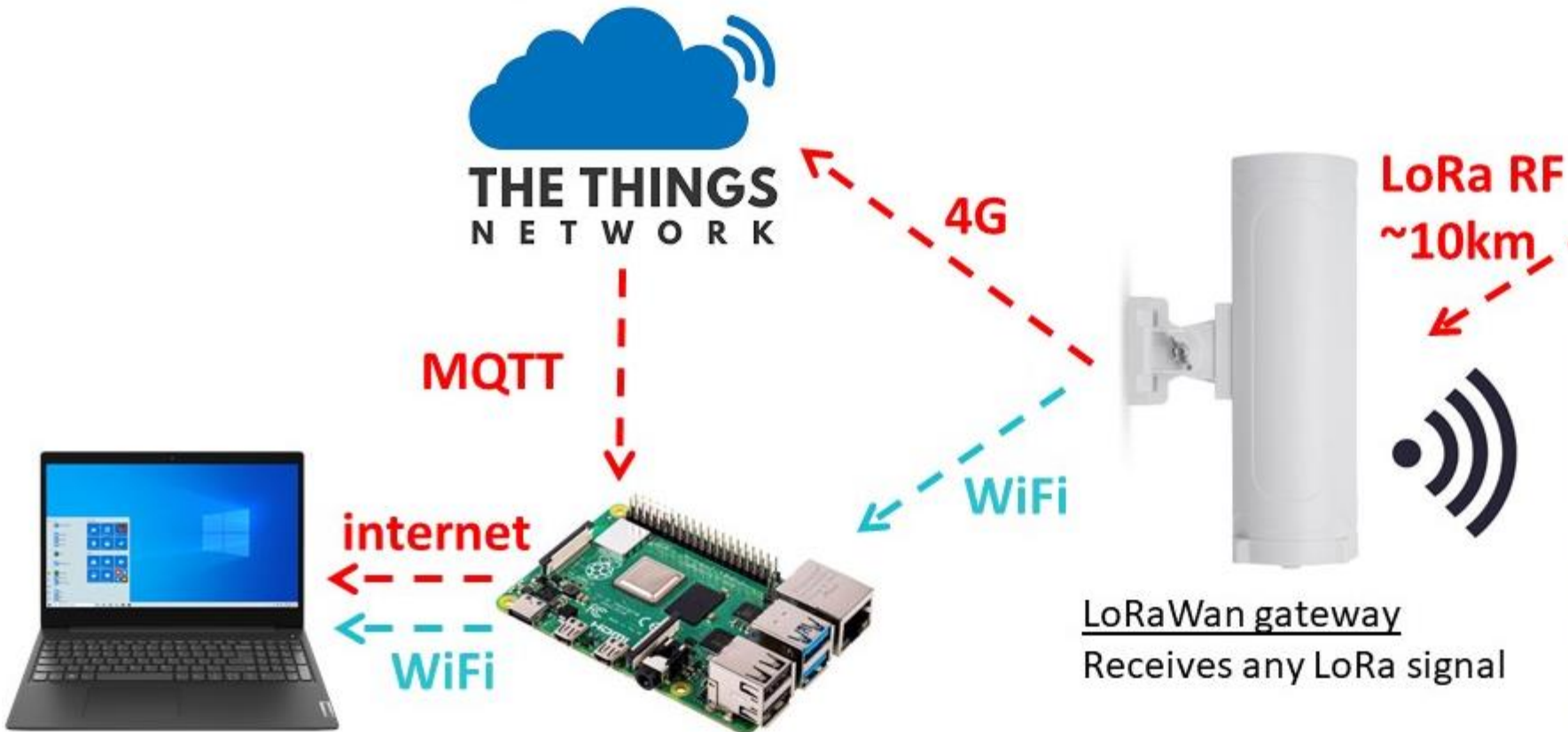


CubeCell dev. board (for LoRa) : ~15 €

LoRaWAN for the Internet of Things

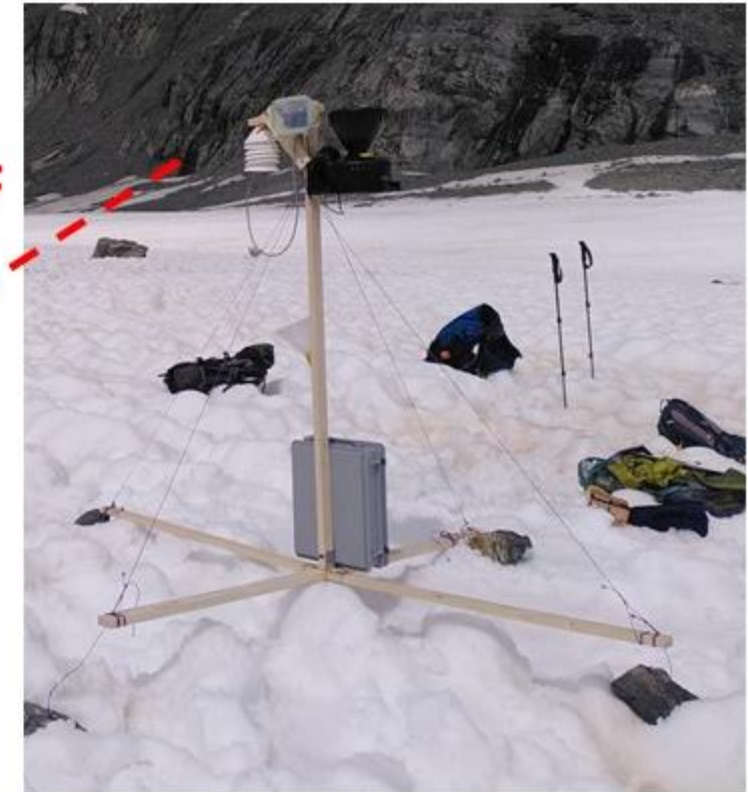
Network server

Receives /reads data from Gateway



Server (local or remote)

Database to save and visualize data



Automatic weather station (end-device)

Arduino based with LoRaWan antenna

LoRaWAN for the Internet of Things



Picture:

LoRaWAN end-device on the Otemma glacier in the Swiss Alps

Data: rain, air temperature, humidity

Cost: ~150€

LoRaWAN for the Internet of Things

For any context :

- Completely off-grid (no internet, solar powered)
- 4G connexion
- In urban areas : use other open source gateway !

Picture :

Portable LoRaWAN gateway with local server for remote locations

Cost : ~600 €



LoRaWAN for the Internet of Things



Thank you for your attention

Don't hesitate to contact me :
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<https://github.com/tomuelle/DIYweatherstation>

