EPI-GW2B: floods in the *Planesselve* cave

We are continuing our work on the water cycle in the Saint-Clement massif. Here we will find out how to measure the water levels using pressure probes installed in the underground river of Planesselve.

Objective: You must find the path of some of the rainwater that falls on the Saint-Clément massif (see activity GW2A).

Figure 1: The Planesselve underground river flows within the Saint-Clément limestone hill (A). The cave divers of the GAS and the CDS83 regularly come to collect the probes of the "Groundwater" project to transmit them to the university and then to the students (B).

Part 1: The measuring instruments of the "Groundwater" project.

The probes of the "Groundwater" device are autonomous sensors that record temperature and pressure. Before installing them in a cave, the scientists set the time between each measurement. The sampling step is the time between two measurements.

Figure 2 : Sensus Ultra probe (source: reefnet.ca).

→ Open the GW_DataSet2a file and its metadata file (complete the table at the reverse sheet to answer)

1. Identify the location and role of the 2 probes.
2. When does this time series begin and end?
3. What is the sampling step?
4. Find the formula to calculate the water level.

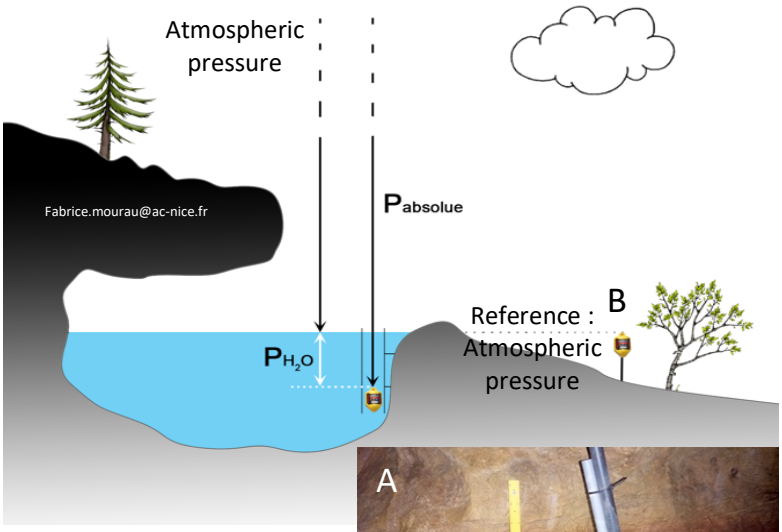

Figure 3: Two probes are used. The sensor recording absolute pressure is fixed inside tubes to the cave wall and immersed in water (A), the other records atmospheric pressure outside of the cave (B). They record temperature and pressure at the same preset sampling step. The absolute pressure recorded by the immersed probe is the sum of the atmospheric pressure and the pressure generated by the water level. To simplify the calculations, these pressures are expressed in meters of water in the files.

absolute Pressure = atmospheric Pressure + P_{H_2O}

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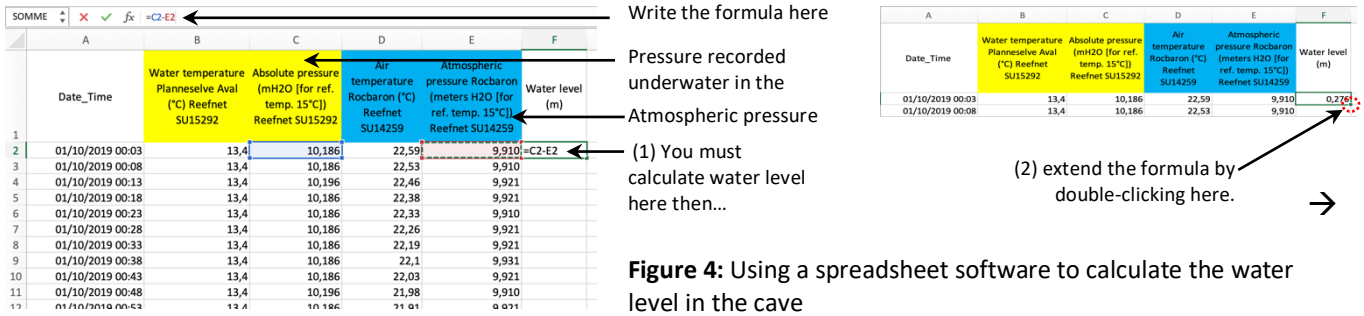
Part 2: Processing data – calculate water level and draw diagram

→ open the file "GW_DataSet2". (1) Write the formula to calculate water level in the F2 cell and (2) extend the formula to the entire column by double-click on the little square at the right bottom of the cell. (Figure 4)

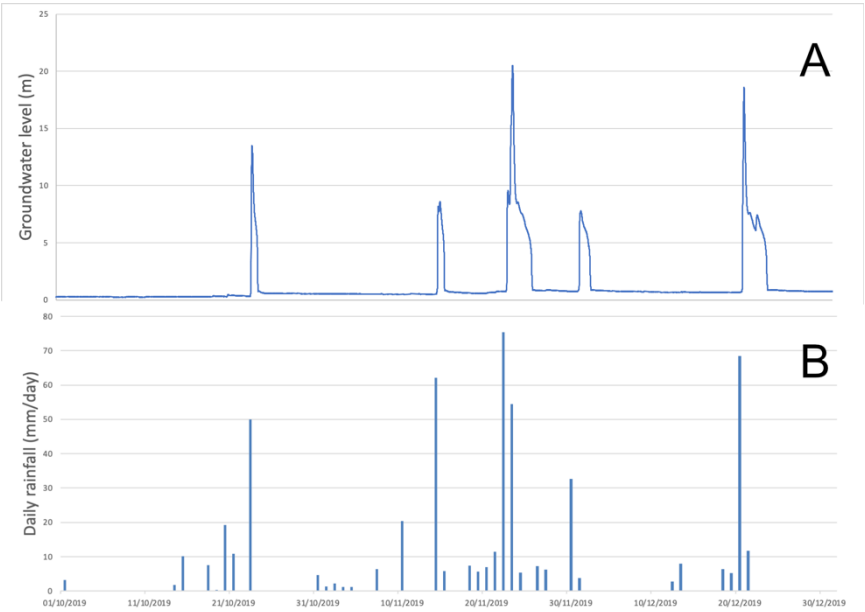


	A	B	C	D	E	F
1	Date_Time	Water temperature Planneselve Aval (°C) Reefnet SU15292	Absolute pressure (mH2O [for ref. temp. 15°C]) Reefnet SU15292	Air temperature Rocbaron (°C) Reefnet SU14259	Atmospheric pressure Rocbaron (meters H2O [for ref. temp. 15°C]) Reefnet SU14259	Water level (m)
2	01/10/2019 00:03	13,4	10,186	22,59	9,910	=C2-E2
3	01/10/2019 00:08	13,4	10,186	22,53	9,910	
4	01/10/2019 00:13	13,4	10,196	22,46	9,921	
5	01/10/2019 00:18	13,4	10,186	22,38	9,921	
6	01/10/2019 00:23	13,4	10,186	22,33	9,910	
7	01/10/2019 00:28	13,4	10,186	22,26	9,921	
8	01/10/2019 00:33	13,4	10,186	22,19	9,921	
9	01/10/2019 00:38	13,4	10,186	22,1	9,931	
10	01/10/2019 00:43	13,4	10,186	22,03	9,921	
11	01/10/2019 00:48	13,4	10,196	21,98	9,910	

Figure 4: Using a spreadsheet software to calculate the water level in the cave

Now draw a scatter graph, give it a title, name its axes and call your teacher.

Part 3: Propose a hypothesis



La figure 5 est un diagramme en bâton qui montre les variations de hauteur d'eau dans la rivière souterraine de Planesselve (A) et les précipitations journalières mesurées à la station météorologique de Rocbaron (B).

→ Propose a hypothesis that explains the path of some of the rainwater that falls on the *Saint Clément* Hillside.

Part 1 : Complete the chart

SVT 1.3	Je suis capable de lire et d'exploiter des données de différents types					
	ID	**Location**	**Role**		V+	10
1. Sensors	SU14259					9
	SU15292				V	8 / 7
2. start and end dates of the time series		Start:	End:		Vc	6 / 5
3. Sampling step					J	4 / 3
4. Water level Formula					O	2 / 1

Part 2: Processing data

SVT 2.3.2	Je suis capable d'utiliser des logiciels d'acquisition de données, de simulation et des bases de données.	D2	R	O	J	Vc	V	V+
Barème			0	1	2	3	4	5

Part 3: Propose a hypothesis

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SVT 4.2	Je suis capable de proposer une ou des hypothèses pour répondre à une question ou un problème.	R	O	J	Vc	V	V+
Barème		0	1	2	3	4	5

…./20

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