EPI-GW2A: Rainwater measurements

Objective: you must calculate the volume of rainwater that has fallen on the Saint-Clément hillside using data from the meteorological station of the "Eaux souterraines" project in Rocbaron.

Part 1: Define the surface area of the impluvium

The impluvium is the surface on which rainwater falls. First, you need to calculate the area of the field on which it rains.

→ Start the *Google Earth©* application and search for the commune of *Néoules* in France. We are going to work on the "*Saint-Clément*" (figure 1), a limestone hill located south of the village.

Figure 1: The *Saint-Clément* massif is located in southern France south of the village of *Néoules* (A). It is made up of karstified limestones of Jurassic age. It drains essentially 2 rivers: the Issole river in the North which flows towards the East then the North and the Gapeau river in the West which flows towards the South and the sea. First of all, you have to define the surface of the massif (B)

1. Locate the Saint-Clément massif on the application.
2. Draw the outline of the massif with the "add polygon" tool
3. In the "Get infos" tab, ask for the area of the massif expressed in km^2 and complete the reverse side of this sheet.

Part2: How to measure rainfall?

The most common rain detector used in electronic weather stations is the "tipping bucket" type of rain sensor. This interesting technology uses two small "buckets" mounted on a fulcrum (balanced like a see-saw). The tiny buckets are manufactured with tight tolerances to ensure that they hold an exact amount of precipitation, typically .01 inch. The tipping bucket assembly is located underneath the rain collector, which funnels the precipitation to the buckets. As rainfall fills the tiny bucket, it becomes overbalanced and tips down, emptying itself as the other bucket pivots into place for the next reading. The action of each tipping event triggers a small switch that activates the electronic circuitry to transmit the count to the indoor console, recording the event as 0.01 inch of rainfall. (from WeatherShack website)

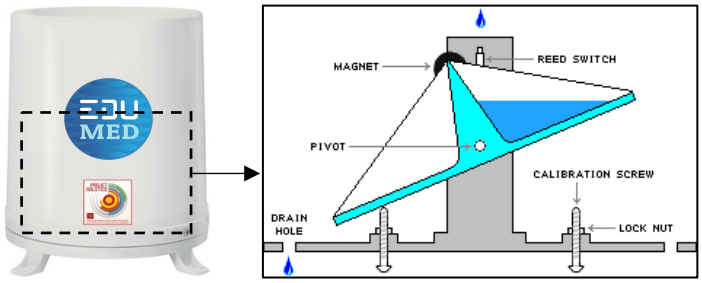

Figure 2: A tipping bucket rain gauge. Buckets tip over when 0.01 inch of rain has fallen (=0,254mm)

→ Open the GW2_DataSet1.zip archive

1. Using the metadata:
   a. determine the city where the station is located, its brand and type
   b. To how many mm of rainfall does a bucket tipping correspond?
2. Using the data, calculate the cumulative annual rainfall in 2015

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Part3: Calculating cumulative rainfall

Rainfall is measured in mm. 1 mm of rainfall corresponds to a deposit of 1 mm of water spread over 1 m^2 (figure 3), i.e. a volume of 1 X 1 X 0.001 = 0.001 m^3 = 1 litre of rainwater per square metre.

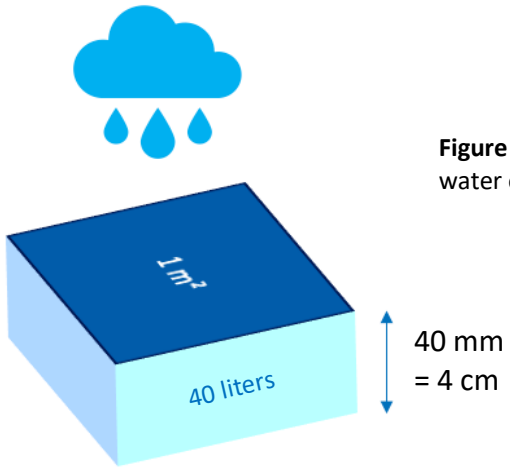

Figure 3: In this example, 40mm of rain fell, which corresponds to a rise of 4cm of water on a surface of 1m^2, i.e. a volume of 0.04 X 1 X 1 = 0.04 m^3 or 40 liters.

→ Using the above information, the surface area of the impluvium (part 1) and the cumulative annual rainfall (part 2) :

1. calculate the total volume of rainwater that fell on the Saint Clément hillside during the year 2015. (1km^2 = 1 millions m^2)
2. Propose a hypothesis to explain where all this water has gone?

Part 1: Impluvium area

1. Impluvium area : …….
2. Call the teacher when you have finished this part (don't close the *Google Earth* window on the screen)

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 2 : Complete the chart

SVT1.3	Je suis capable de lire et d'exploiter des données de différents types		V+	5
City where the weather station is located				
Brand of the weather station			V	4
Type of the weather station			Vc	3
Rainfall value for 1 tipping (mm)			J	2
Cumulative annual rainfall (2015)			O	1

Part 3: Total volume of rainwater

1. Total volume of rainwater fell on the hillside during the 2015 year (Write your calculations and your answer):

……

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2. Propose a hypothesis:

……

……

SVT 4.4	Je suis capable d'interpréter des résultats et d'en tirer des conclusions.	D4	R	O	J	Vc	V	V+
SVT 4.2	Je suis capable de proposer une ou des hypothèses pour répondre à une question ou un problème.	D4	R	O	J	Vc	V	V+
Barème			0	1	2	3	4	5

….. /20

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