



GLOBE Investigation

Gozo College Sir Arturo Mercieca Rabat Primary School 2023-2024



Do seasonal differences really affect our soil temperature and soil moisture content?

Summary

Malta is a small island in the Mediterranean and its soil is the bread and butter of the island. Farmers/Crop Growers do everything to keep the soil rich and secure, but they do rely on the heavens to feed the soil with water. We are noticing that every year we are getting less and less water from our skies. "A 2022 NSO study by Prof. Charles Galdies show that Malta's average rainfall has decreased by 10.3mm every decade since 1952". (Ellul, 2024) It is important, if not essential, that we investigate our soil moisture content, soil temperature and when these are at their highest concentration. It is vital that we, in collaboration with other GLOBE students from all over the world, pass this information to NASA which updates the global soil moisture map (SMAP).

Research Questions

This year our investigation leads us to seasonal difference and how this affects our soil. Specially targeting our soil moisture and the soil temperature within our school grounds. The students came up with the following questions: "Could there really be a difference in soil moisture and soil temperature and in which month is the highest recorded?". While carrying out this investigation, our school entered the UN World Soil Day Poster Competition, highlighting and informing the importance our soil plays in our ecosystem and the crucial link to water.

Research Methods

We took part in the GLOBE Malta - Europe Direct Gozo Soil Project – Exploring the Hidden World with 6 other schools in Gozo and choose to investigate our soil moisture through gravimetric means. The observation period started in November 2023 till the end of January 2024. Since we wanted to explore if seasons affect the moisture content and soil temperature, it was decided that we needed to extend our research till the 9th of February 2024. Our GLOBE students, once a week, took soil samples from a depth of 5cm – removing rocks, large roots, worms and other insects/animals. Then weighing the soil at the time of packing to record the water content from fresh soil (Fig. 1). Next putting the soil sample outside on a ledge for a week to dry. Afterwards when the soil had been dried, it was weighed again. Documenting this on our form (Fig. 2), we can tell how much water was in the soil. Moreover, the students on a daily basis, measured the soil surface temperature using an infra-red thermometer (Fig. 3). By means of a datalogger (Fig. 4), the students measured also other weather parameters, including cloud types; air temperature; air pressure; humidity; rainfall; wind strength and soil surface temperature following the GLOBE protocols. This data was also documented on a data sheet and uploaded to the GLOBE database (Fig. 5).



Figure 1 GLOBE Students digging, measuring, weighing, documenting their soil sample

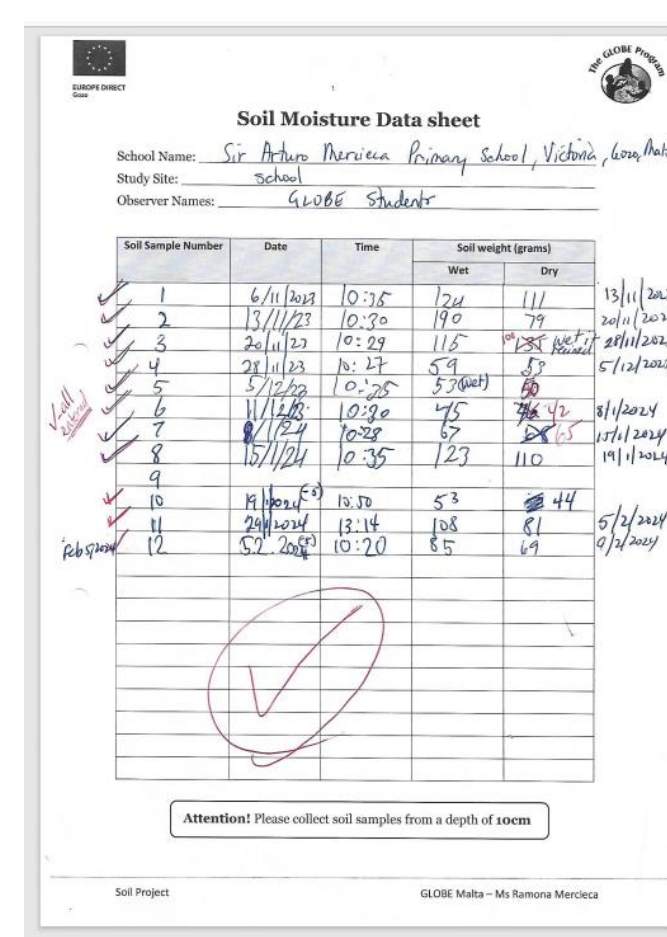


Figure 2 Soil Moisture Data Sheets

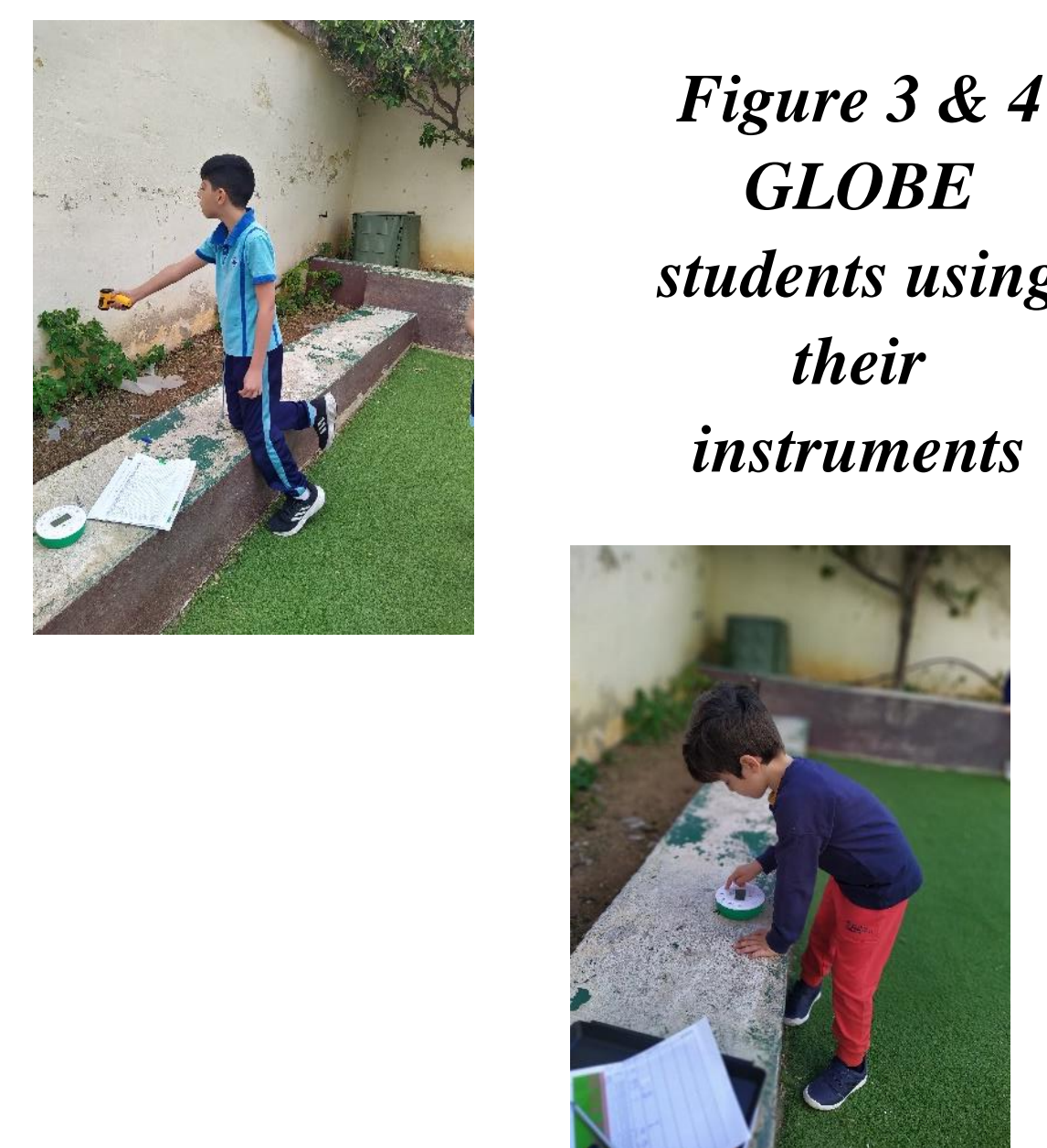


Figure 3 & 4 GLOBE students using their instruments

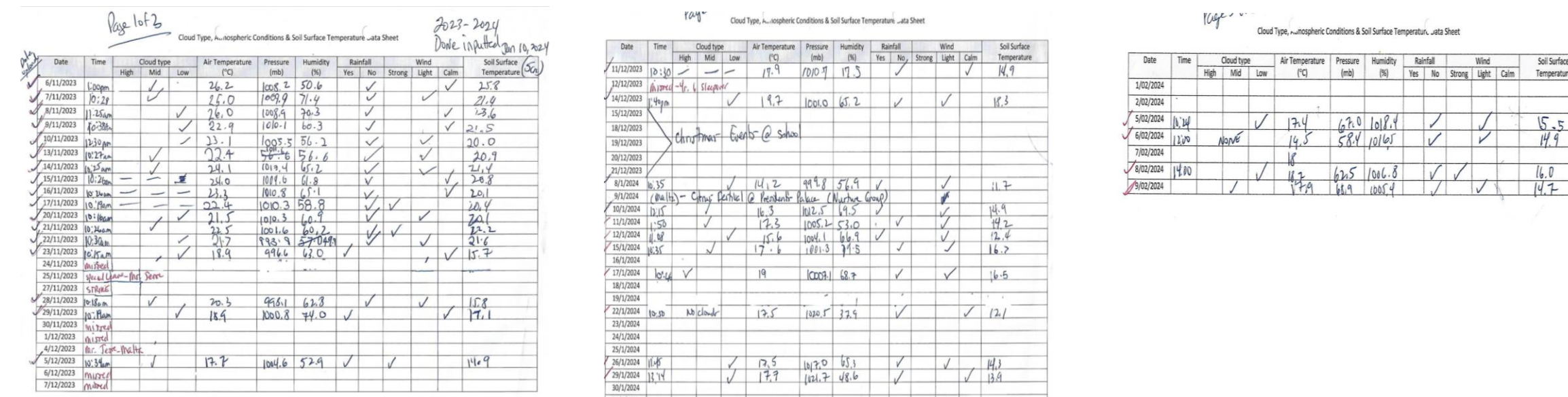


Figure 5 Weather Parameters Datasheets

Results

The screenshots below show data uploaded on the GLOBE website during the observation period between November 2023 and February 2024 (Figs. 6.7.8). (GLOBE, 2024) The students collected daily readings of soil /air temperatures and weekly soil moisture following GLOBE protocols.

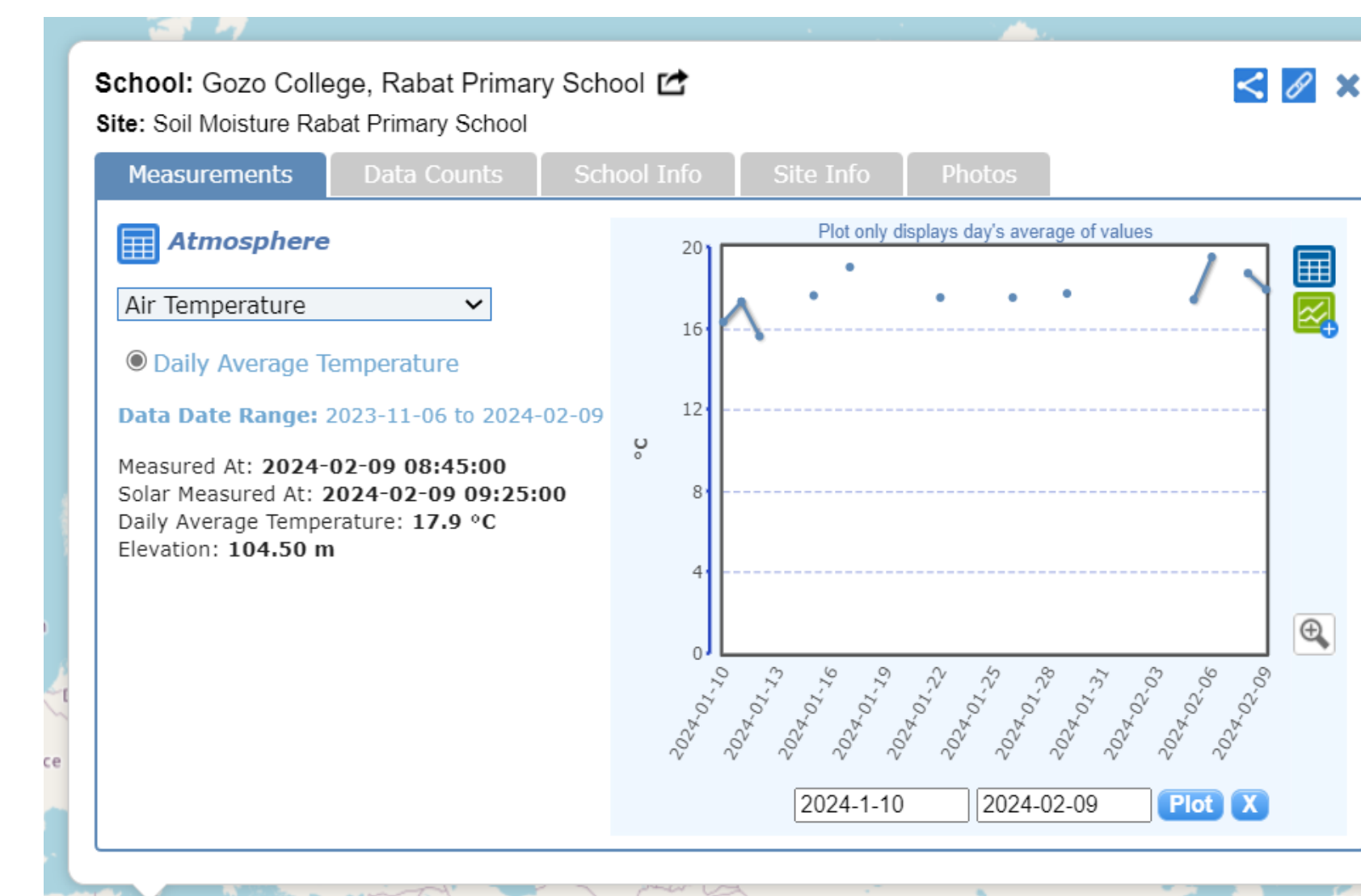


Figure 6 Air Temperature plot of VIZ GLOBE

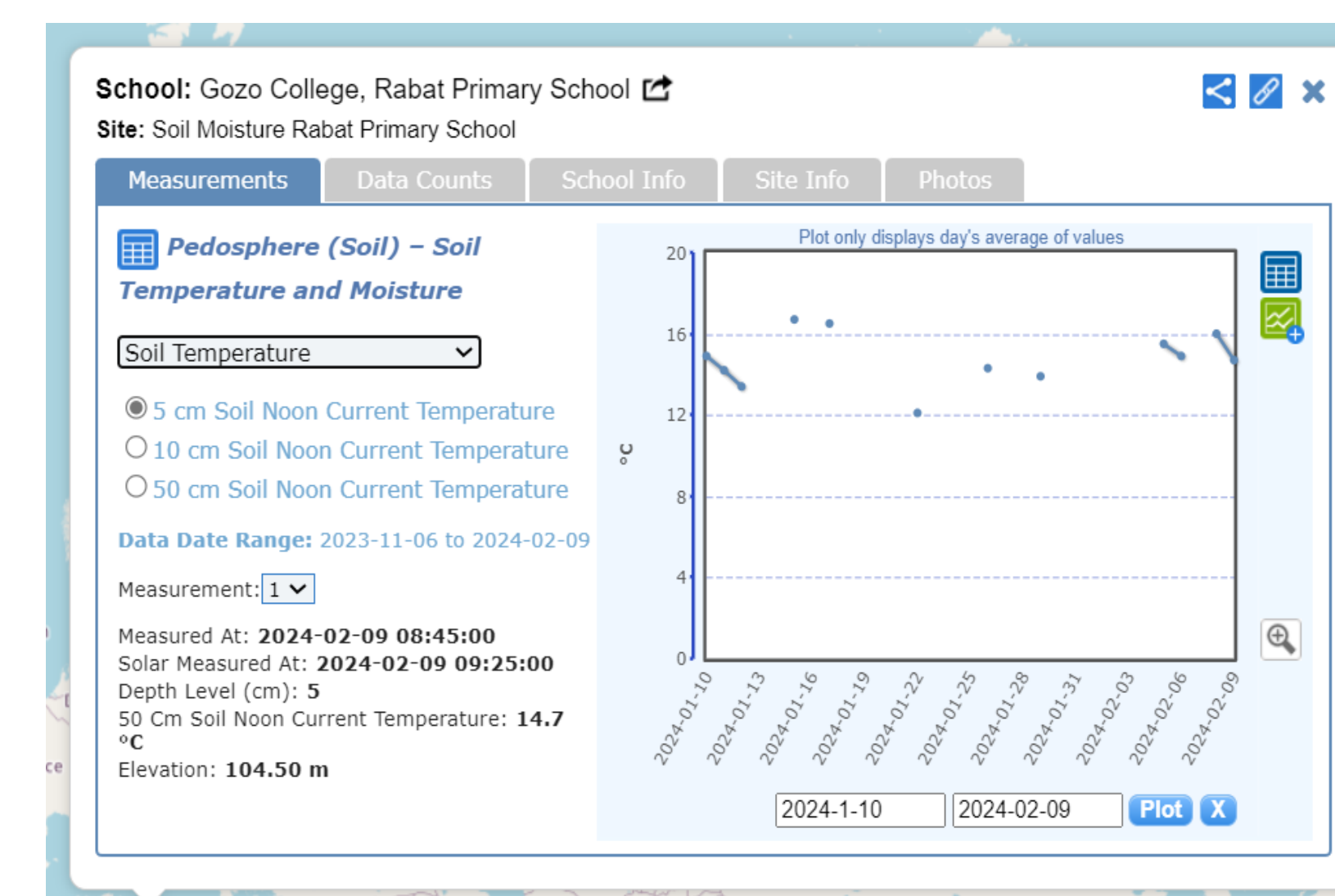


Figure 7 Soil Temperature plot of VIZ GLOBE

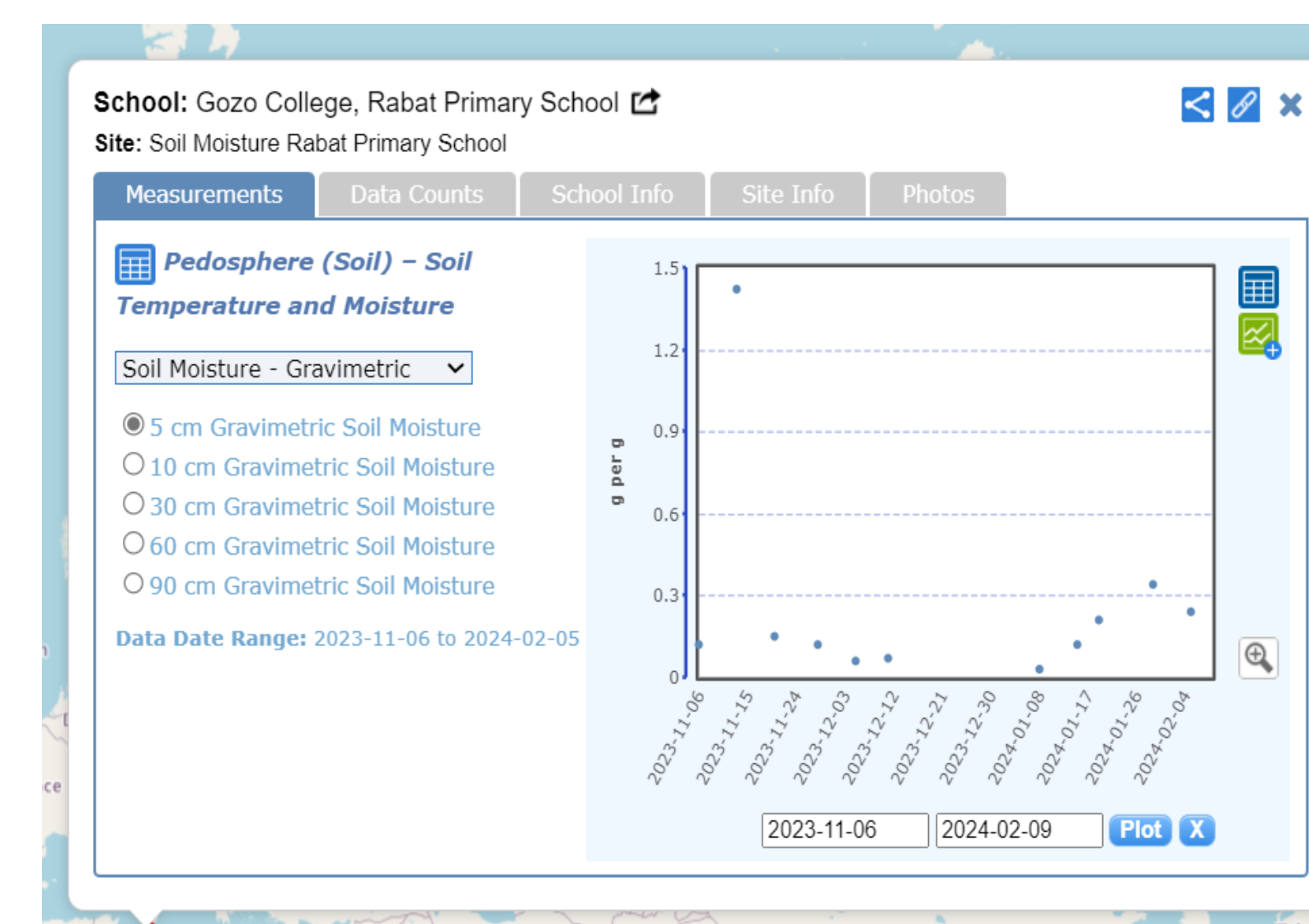


Figure 8 Soil Moisture plot of VIZ GLOBE

Conclusions

Getting back to our original question – "Do seasonal differences really affect our soil temperature and soil moisture content? Is there a relationship with the charts?" We have noticed that the lack of rainfall, is significantly affecting our soil moisture and temperature because there was very little difference between pre – post drying of soil. We notice when the air temperature is high, the soil gets warmer and eventually the moisture content decreases. The lack of moisture in the soil will affect the farmers in a big way. To make matters worse, CLIMATE CHANGE is, and continues, to affect our region with higher temperatures during the rainy season – less rainwater makes for drought conditions on our islands. Since the rainfall has become unreliable and not happening during our winter months, we suggest that we change our current pattern by doing more investigations during the Spring and Fall months in order to see if there is a difference.

With the limited data, we can conclude that we need to change our ways of conserving water and the types of crops grown. Especially for us in Malta it is worse – we do not have natural rivers that could supply us with water, instead, we need to learn how to use water wisely. For example, it is important to plant more trees that are adaptable to the climate of the Maltese Islands. Trees are very beneficial in that they provide shade which helps retain soil moisture. We also propose to put up rainwater barrels to collect natural rainwater for our school and reuse it to water our plants, etc.

CLIMATE CHANGE is affecting the link between soil and water – NO RAIN!!!



Posters on the outside of school informing everyone!

Bibliography

Ellul, D. (2024, February 10). Times of Malta. Retrieved from The Times of Malta: <https://timesofmalta.com/articles/view/desert-malta-course-see-driest-year-ever.1083015#:~:text=A%202022%20NSO%20study%20by,drought%20years%2C%20especially%20since%202000.>

GLOBE. (2024, February). GLOBE Data Viz System. Retrieved from GLOBE: <https://vis.globe.gov/GLOBE/>