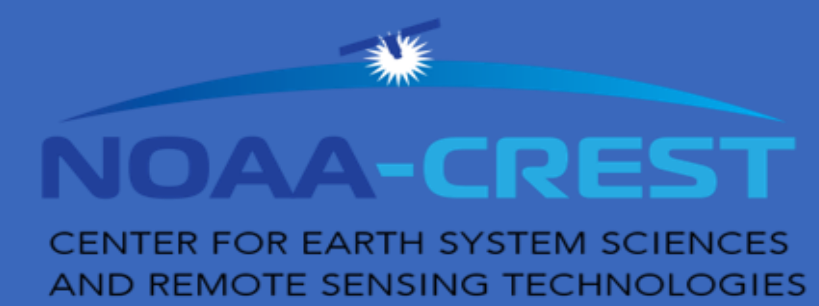




# Establishment of In-situ Soil Moisture and Temperature Observation Network in Western Puerto Rico



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## Background

As students with an interest in environmental studies, we understand the impact soil moisture and temperature has in our atmosphere.

### Soil Moisture

The amount of water contained in the unsaturated zone of the soil. It is a source of water for the atmosphere through processes like evapotranspiration (exposed soil evaporation and plant transpiration) from a region.

### Soil Temperature

The internal energy of the soil or its heat. Influences the physical, chemical, and microbiological processes that take place in the soil. Therefore, it may be affected by climate and meteorological changes.

Currently, the Natural Resources Conservation Service (NRCS) operates a network of around 12 stations across the island. This work expands the in-situ data collection of soil moisture and the soil temperature in western Puerto Rico. It will establish 10 in one municipality.

## Motivation for the Study

- **Creation of a Soil Moisture Map in Western Puerto Rico.**
- **Validation and Calibration of Satellite-based soil moisture products.**
- **Drought Forecasting Model:** Long-term soil moisture data over large regions can be used to predict and characterize harmful droughts.
- **Landslide studies detection and agriculture.**

## Methods

This research project collected data through the use of the following:

- **Hydra Probe Soil Sensor:** This sensor was installed 5 cm below the ground to measure the soil moisture and temperature.
- **CR 206X Data logger:** The data logger was used to collect and save the data of the soil moisture and temperature.
- **PC 200W:** This software was used to export the data of soil moisture and temperature collected from the soil sensor.

To create the map for the location of the stations on the Western area of Puerto Rico was used the ArcMap GIS.



Figure 1: Hydra Probe Soil Sensor at 5 cm below the ground.



Figure 2: Setup of the Station

### Location of the Stations

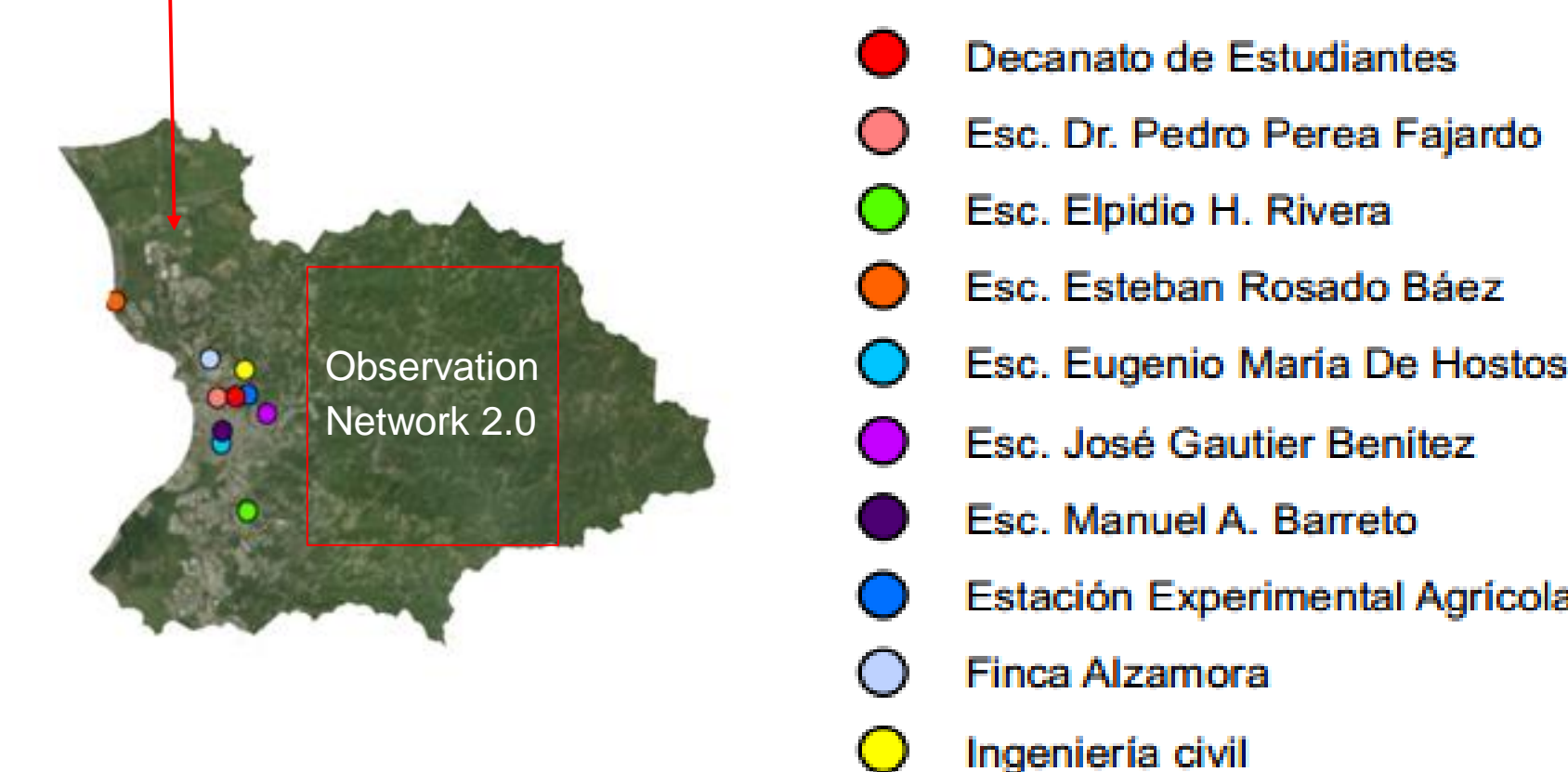


Figure 3: Western Puerto Rico Location of the Stations Map

## Results and Discussion

Two stations (Figure 2) with the Hydra Probe Soil Sensor at the “Decanato de Estudiantes” (DE) and “Ingeniería Civil” (IC) building at the University of Puerto Rico at Mayagüez were installed. These sensors collect data of soil moisture and temperature. The data that were analyzed are summarized in two graphs.

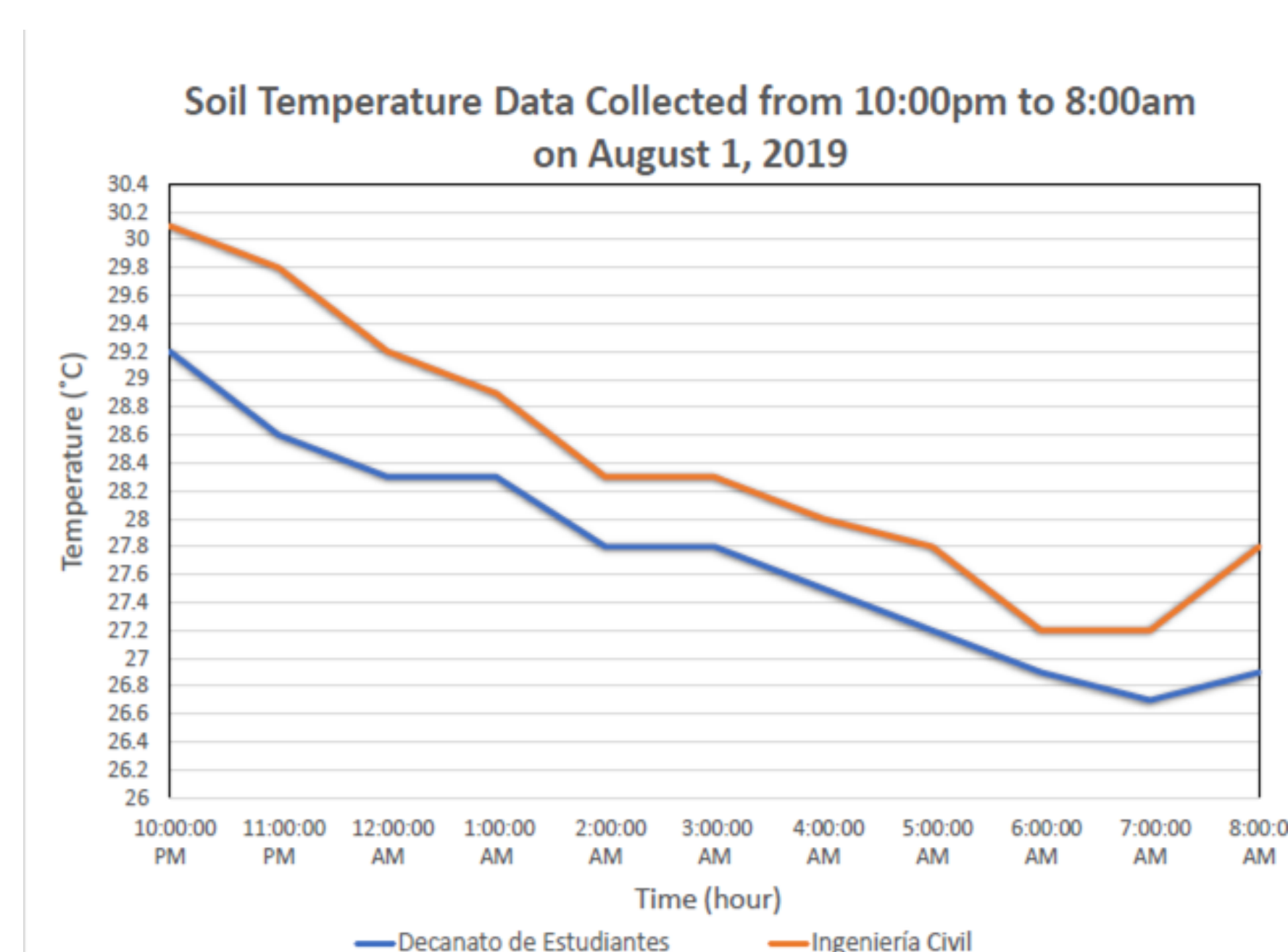


Figure 4: Decrease of the soil temperature during night hours.

Soil temperature dropped from 10:00 pm to 7:00 am (Figure 4). Also, at 7:00 am temperature started rising in both stations. The difference between temperatures in both stations may be due to sunlight exposure.

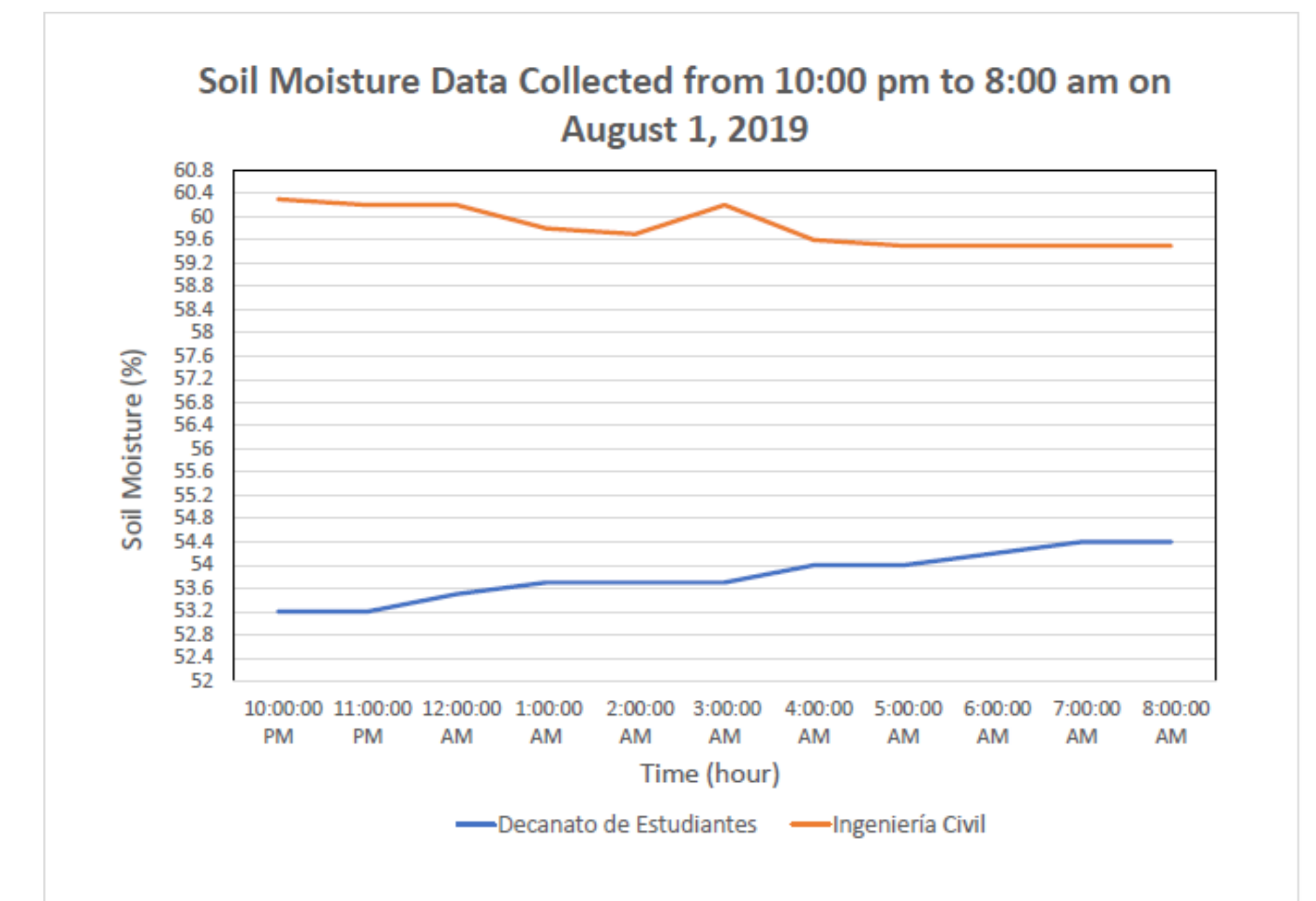


Figure 5: Difference in percentages of soil moisture according the location of the station.

Soil moisture fluctuated during the ten-hour window (Figure 5). The IC station showed a higher percentage of soil moisture than the DE station. This difference in percentage may be due to the difference in the environment surrounding the sensors.

## Future Work

- Establishment of 8 more stations in Western Puerto Rico.
- Create a Soil Moisture Mapping at the Western Puerto Rico
- Establishment of Observation Network 2.0

## References

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