

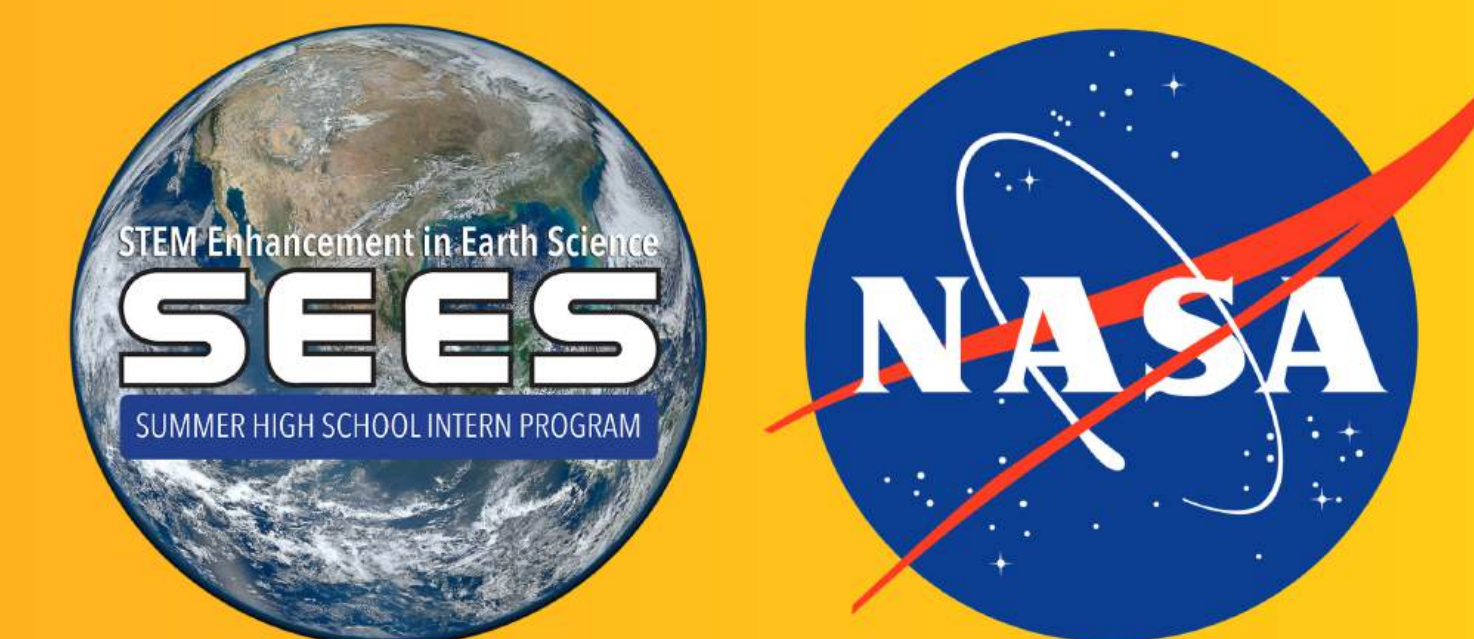


Analyzing the Impact of Artificial Turf & Grass Sports Fields in Differing Climates

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Introduction

The Urban Heat Island Effect (UHIE) is a phenomenon that causes significantly higher surface temperatures within urban areas compared to surrounding rural counterparts. Factors like population density, industrial activity, urban building materials, and a lack in vegetation are all determinants.

Specifically, artificial turf fields have been known to contribute to the UHIE more severely in comparison to grass fields. This is primarily due to the turf's plastic composition which renders it incapable of retaining moisture and absorbing sunlight like grass would.

Research Question

How do both grass and artificial turf fields contribute to the Urban Heat Island Effect within different climates (tropical and sub-tropical)?

Methodology

Locations: New York + Brazil

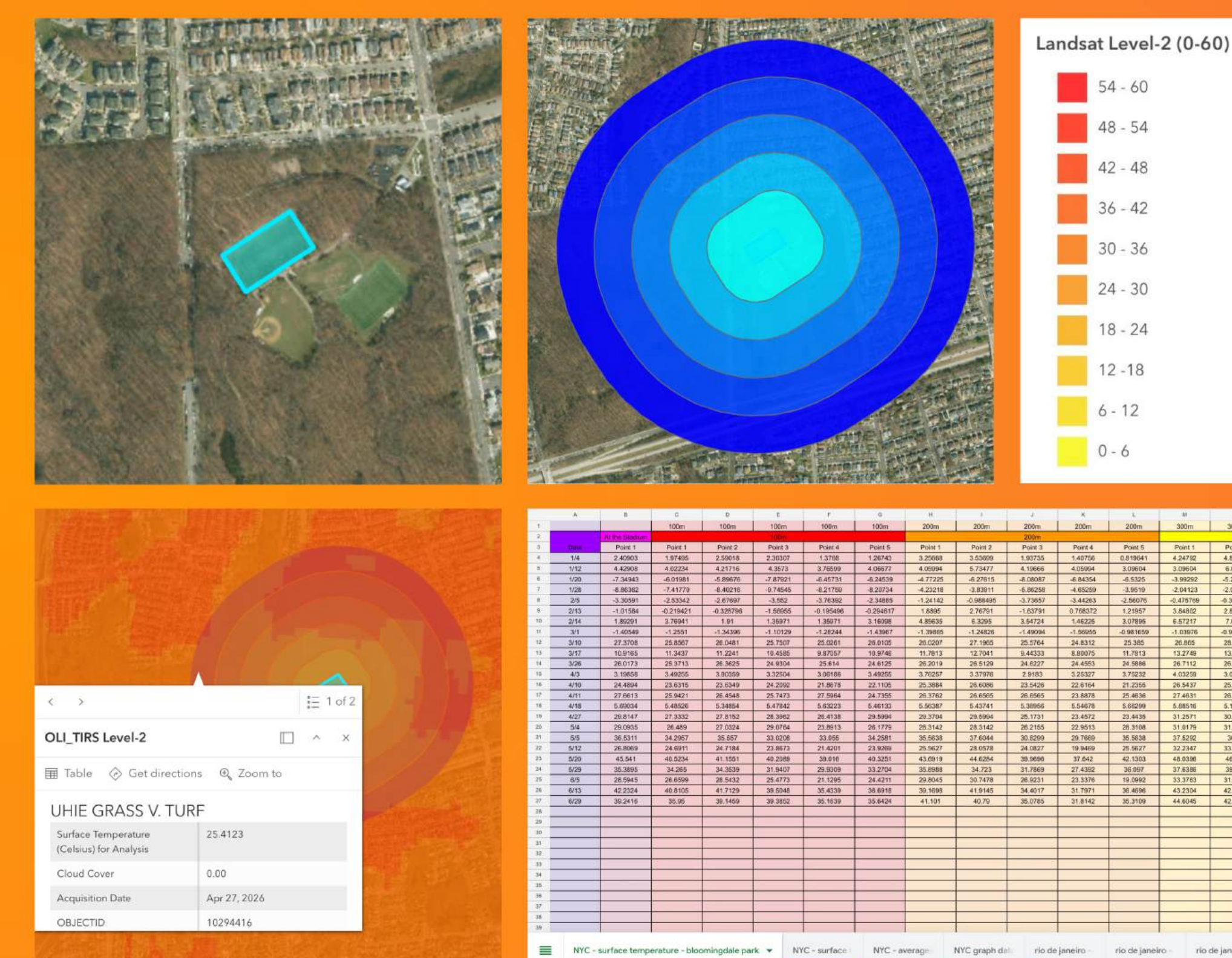
Timeframe: January-June; 6 months (to account for the opposite seasons in the different hemispheres)

Dataset: Landsat Level-2

- 30m spatial resolution
- Extracted the surface temperature data (°C)

Data Collection: ArcGIS, Google Sheets

1. Added the Landsat Level-2 layer to map
2. Used the polygon sketch feature and we each mapped out one grass and one turf field.
3. Added buffers around each field. Each one had 5 100m interval rings. The largest buffer had a 500m radius.
4. Extracted data from the center of each field as well as from 5 equidistant points per buffer ring.
5. Logged data in Google Sheets.



Conclusion & Future Implications

Both fields reinforce the idea that turf fields contribute more to the UHIE in comparison to grass fields. Brazil shows a higher maximum difference compared to NYC that had a more negligible value. We can conclude that the turf fields in Brazil contribute more severely to the UHIE compared to the turf fields in NYC.

Given the data, it is imperative to reflect on potential health complications turf fields can cause as studies show them to harbor carcinogens. Cloud cover and its impact on collecting data is also important to consider when beginning analysis as some days it can skew the data.

New York City

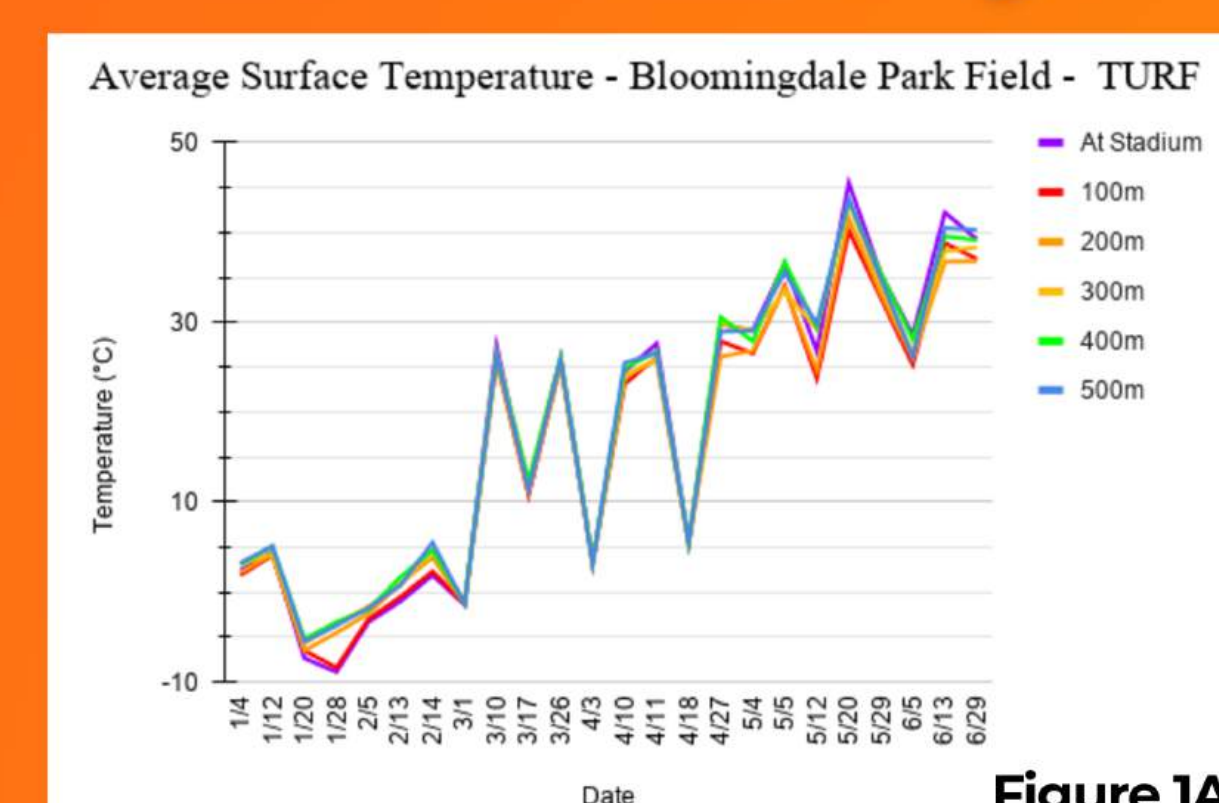


Figure 1A

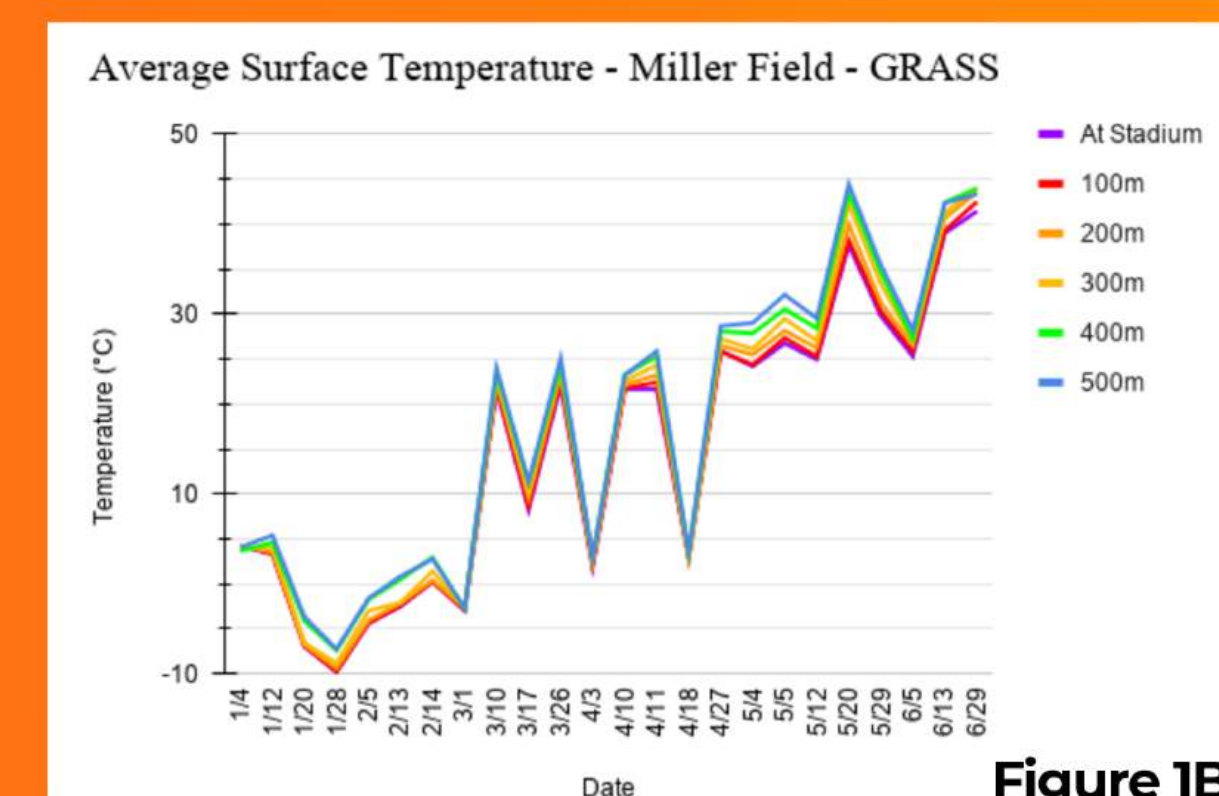


Figure 1B

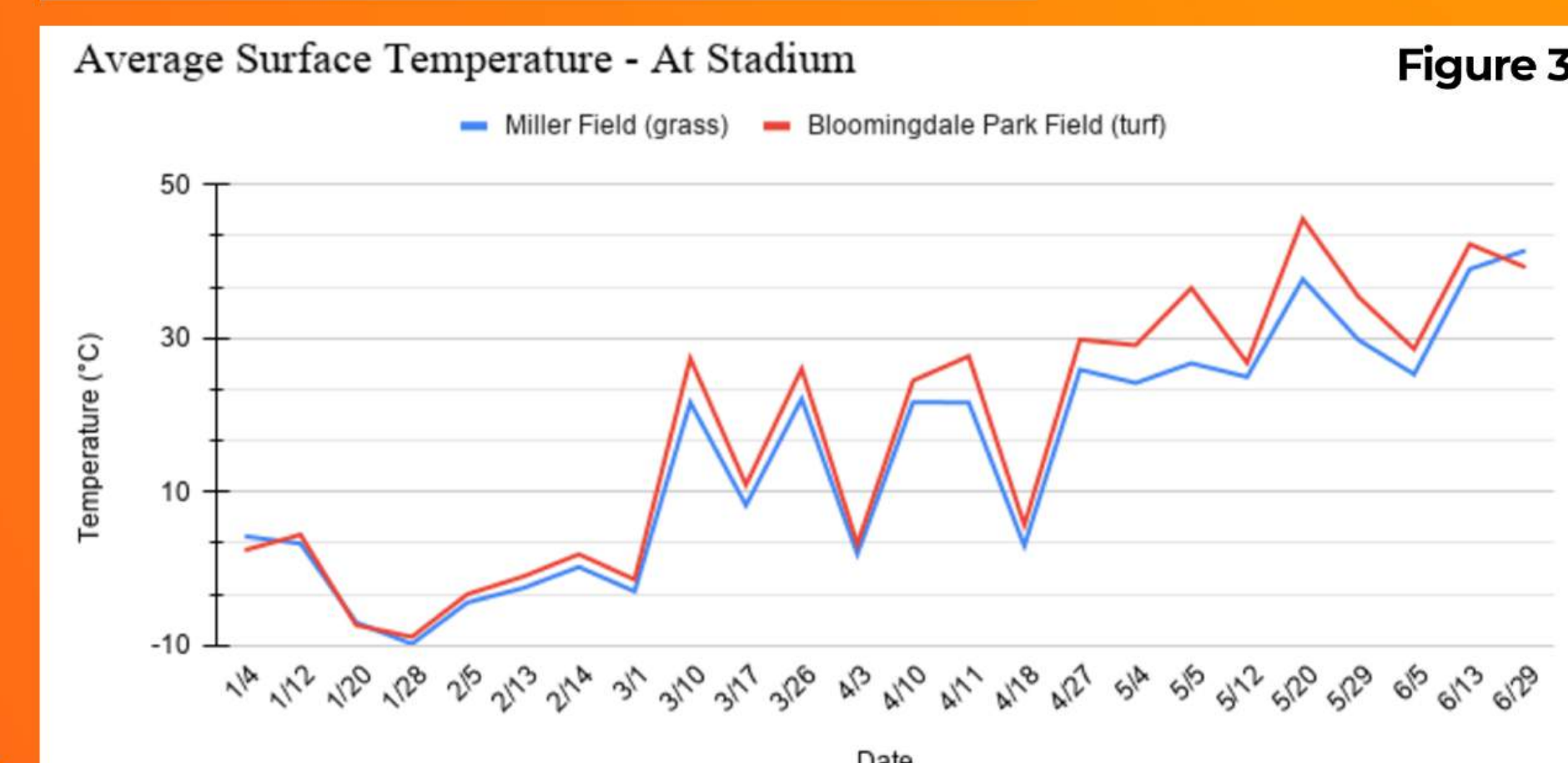


Figure 3

Results

The following graphs were created using the average surface temperature data that was calculated within Google Sheets, using the individual measurements we took prior (refer to images in methodology).

Our results show that both cities exhibited a trend where the turf fields were hotter than the surrounding environment whereas the grass fields were cooler. Additionally, the turf fields were significantly hotter than the grass fields when directly compared, shown in Figure 3 (NYC) and in Figure 4 (Brazil).

Furthermore, we calculated the difference between the surface temperatures of the turf and grass fields using the data collected over the six month sequence. Brazil had the highest difference of 23.7 C and a minimum of 1.4 C which is striking compared to New York's maximum of 9.8 C and minimum of 0.9 C.

Brazil

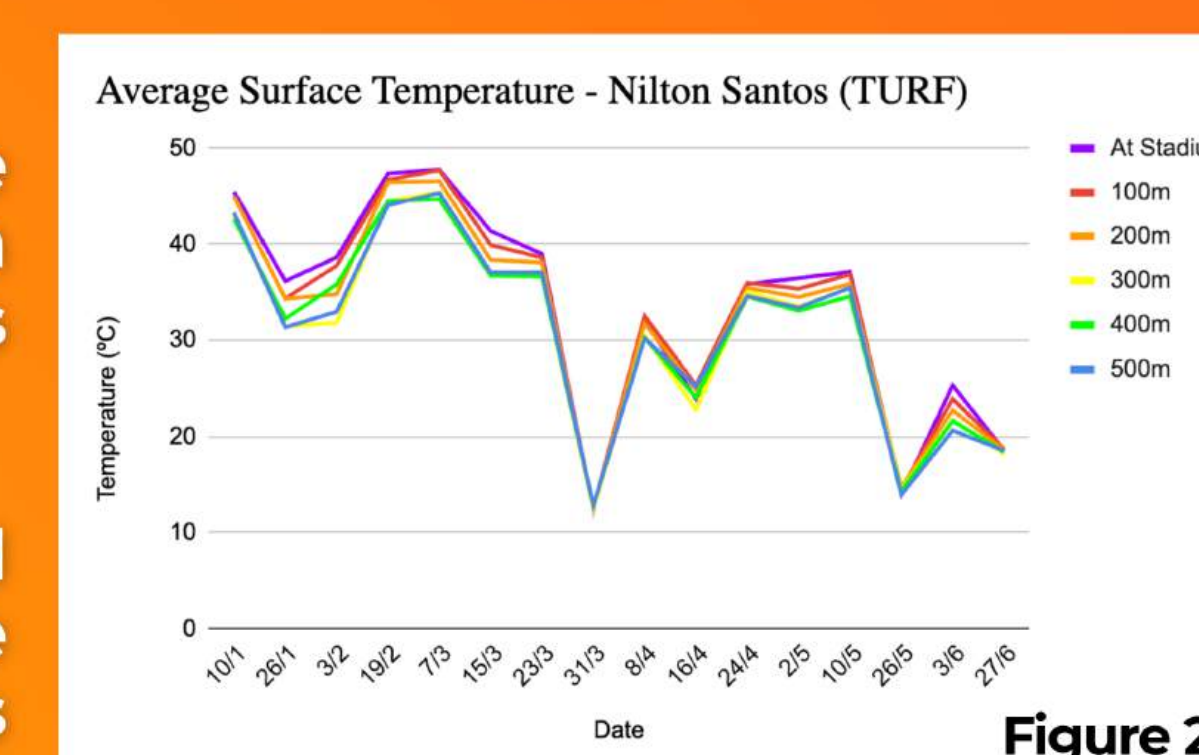


Figure 2A

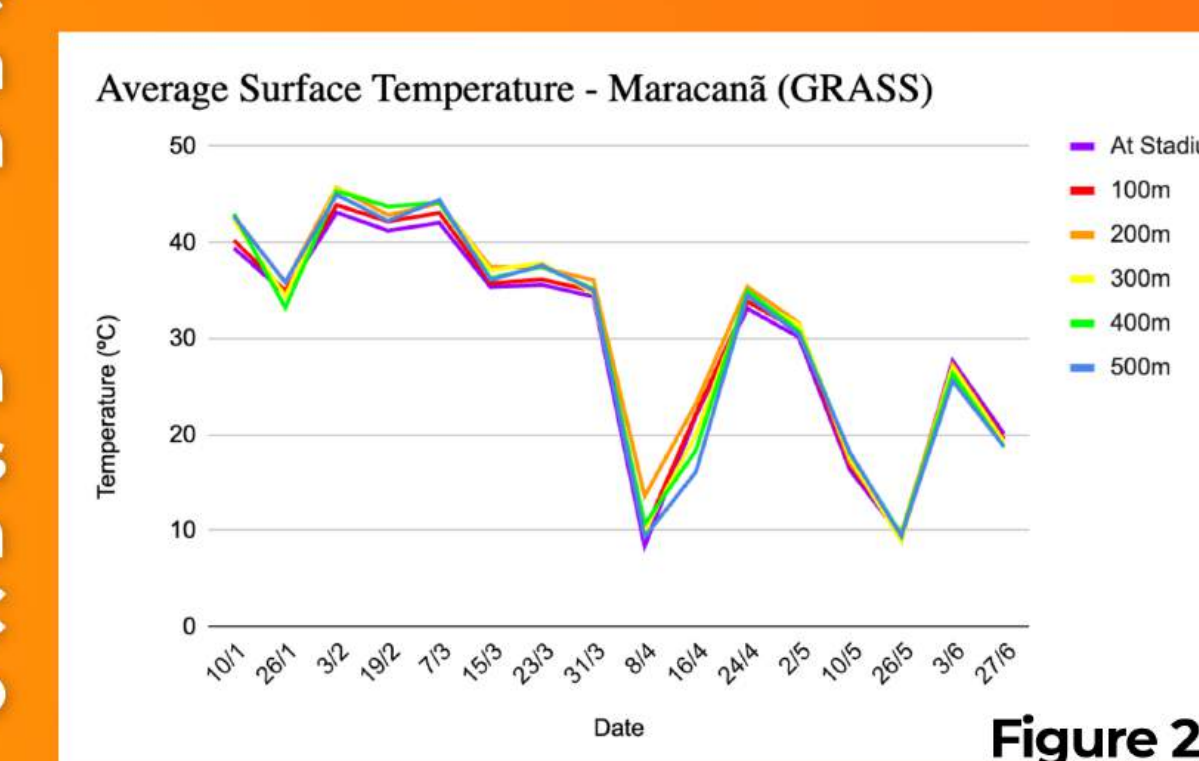


Figure 2B

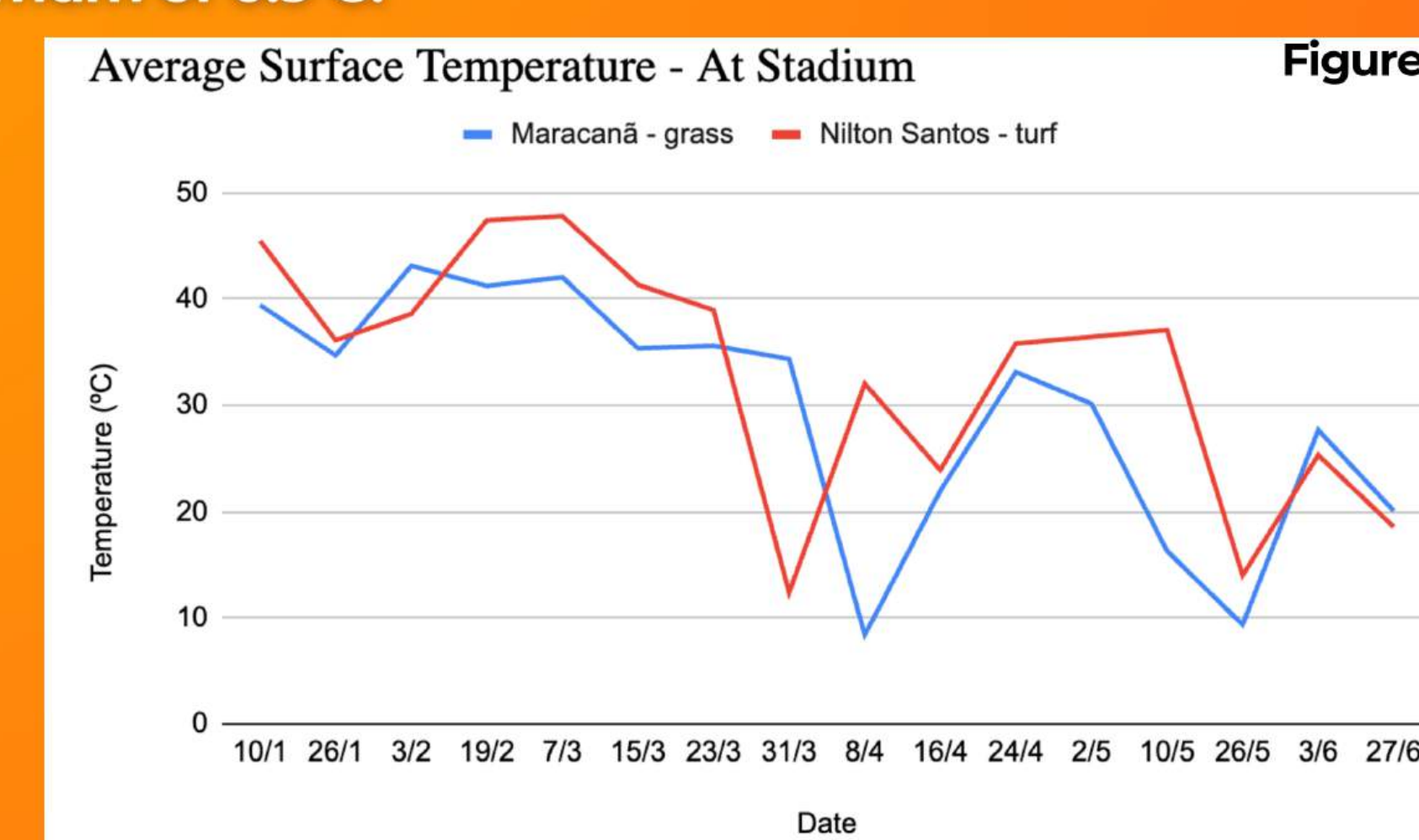
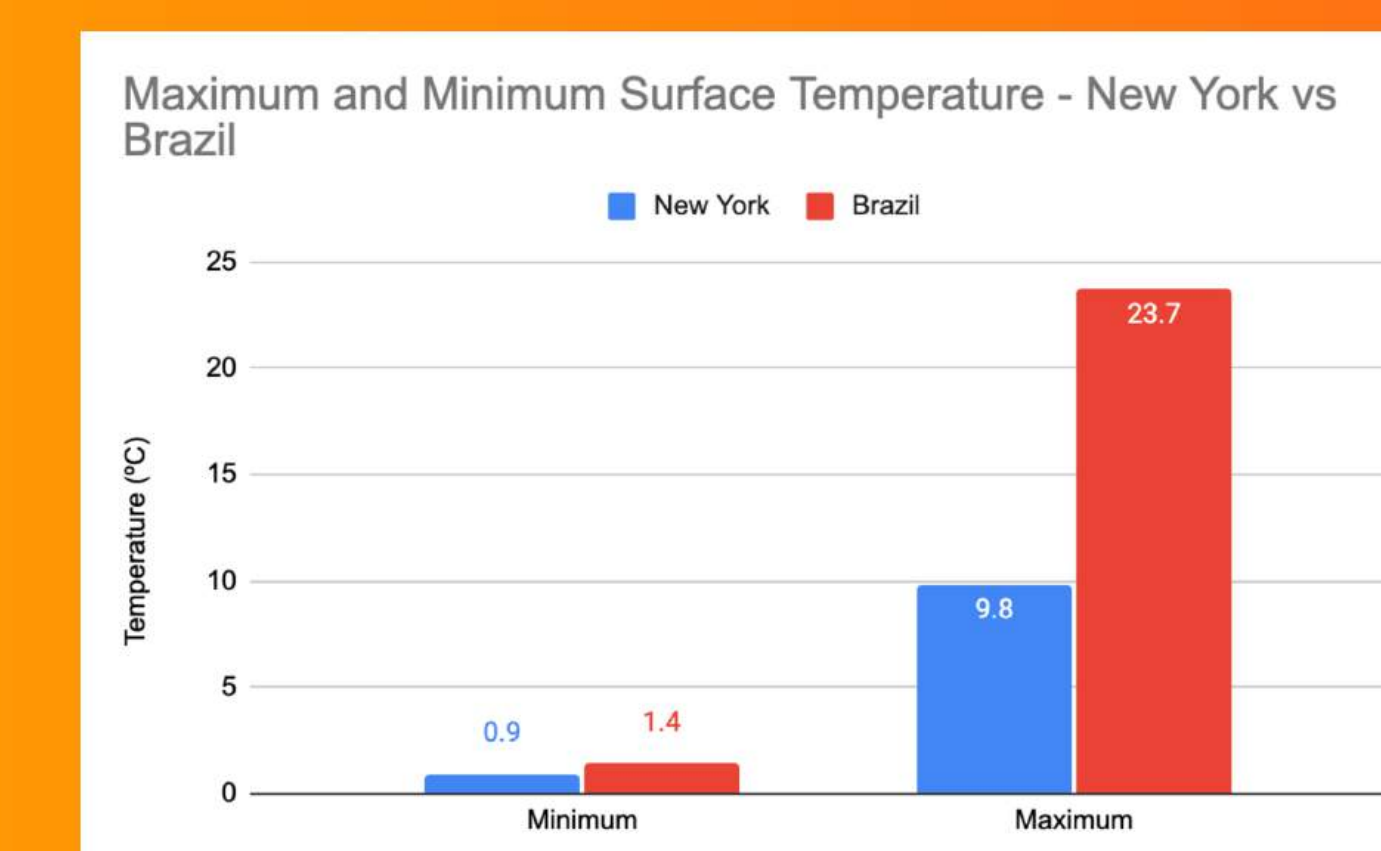


Figure 4



Acknowledgements

Demi: When I got that email saying I was a NASA intern, my dreams quite literally turned into a reality. For this project, I'd love to thank our esteemed mentors and the UHI team for their support and unending guidance. To my new friends, to my old friends, and to my family, thank you all for the support during the past 6 weeks!

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