Airglow Emissions Observed From Above and Below

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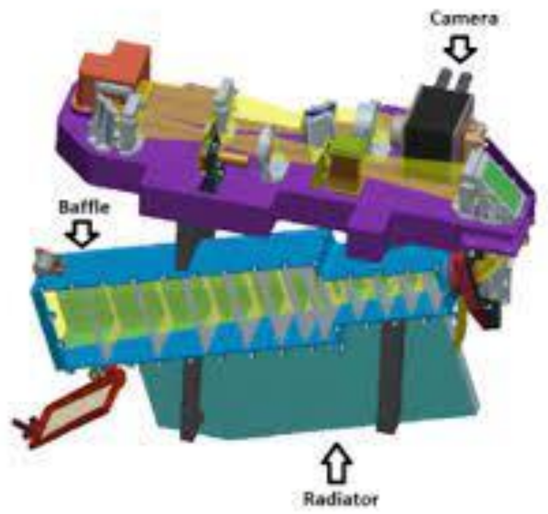
Background

The Ionospheric Connection Explorer (ICON), in conjunction with Michelson Interferometer for Global High-resolution Thermospheric Imaging (MIGHTI) work together to help us understand Earth's ionosphere.

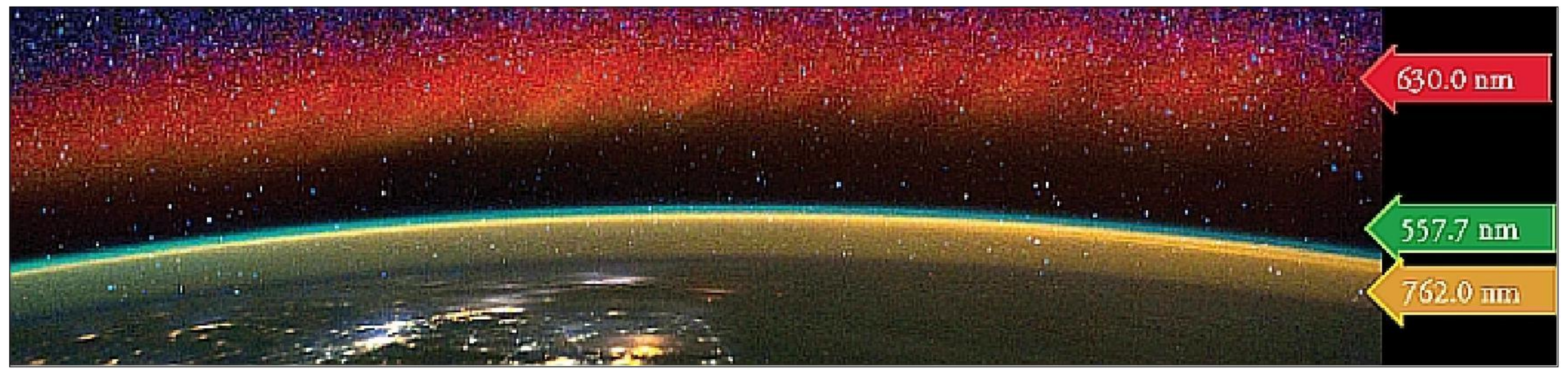
ICON was launched to spend more focus on changes of the ionosphere while MIGHTI's objective is to find the profile of the atmospheric wind and temperature in the neutral atmosphere. Finally, a prime objective is to understand the inexplicable relationship between Earth and space weather.[1]



The focal point of this project is to realize that ground-based sensor and space-based sensors can lead to cross-calibration issues.[2] To avoid this, we turn to "combining these sampling strategies [which] could be advantageous for quantifying the spatiotemporal variability of the thermosphere".[2]

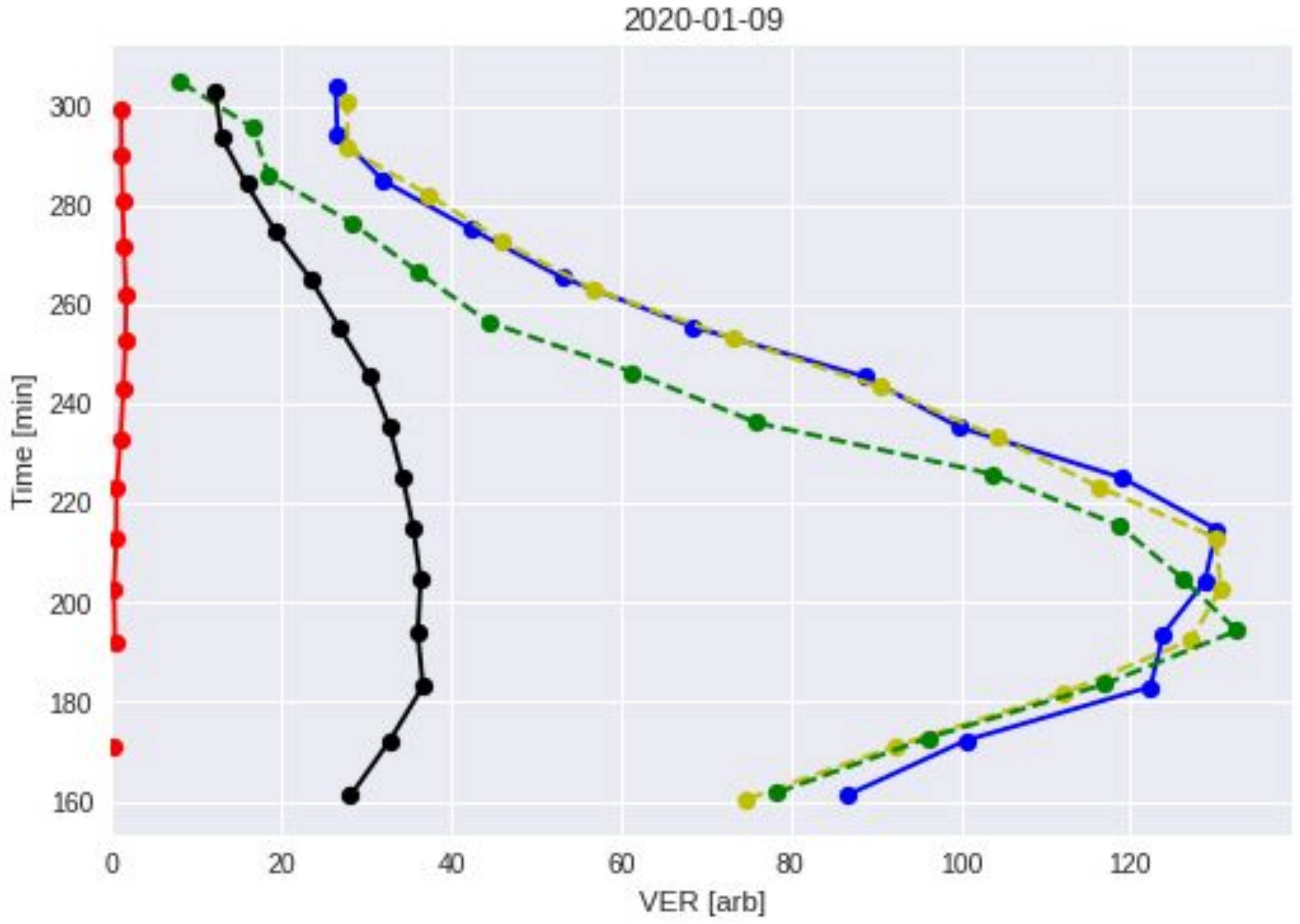
Methodology

This project used data from ground-based sensors' observations of several emissions in Earth's ionosphere and thermosphere (e.g., 630.0 nm red, 557.7 nm green).



Using Jupyter Notebook and Python, along with several packages necessary for code written in Jupyter Notebook to run correctly (e.g., Xarray, Numpy, Pandas), a few plots were created. These plots focused on the project's primary variable–"ICON_L21_Relative_VER" which is a proxy for the brightness of the red airglow emission.

This plot shows the volume emission rate, which is the brightness of the red emission vs. time. The graph utilizies five different timestamps, taken from data in Urbana, IL (UAO; geographic coordinates: 40.17°N, 88.16°W) according to VER vs time.



Conclusion

Successfully analyzing and plotting the volume emission rate has led to being able to find the major differences between timestamps when measuring the brightness of the red emission. Using this, it is possible to begin data analysis on the space-based sensors to search for cross-calibration issues.

Furthering research on Earth's upper atmosphere leads to better understanding of disturbances to GPS and communications signals.[3]

References

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3. Exploring Where Earth's Weather Meets Space Weather. (n.d.). ICON. Retrieved August 11, 2021, from https://icon.ssl.berkeley.edu/category/mighti

Acknowledgments

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