PHYS 384: ST: Space Physics

**Space Physics Term Research Paper**

# Objective

The objective of this project is to give you experience writing and presenting a quality academic research paper while learning about important topics in the field of Space Physics Research. You will have an opportunity to use professional tools and resources in the process of writing your paper.

# Key Dates

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| --- | --- |
| April 19, 2021 | Research Advisor Meeting Report 1 |
| April 28, 2021 | Paper Draft  Research Advisor Meeting Report 2 |
| May 3, 2021 | Paper Due |
| May 10, 12, 14, 2021 | Oral Presentations |

# Bonnie W. Oldham Library Research Prize

This project will qualify for the University-wide Bonnie W. Oldham Library Research Prize Contest. Students are encouraged, but not required to submit to the contest. The due date of this course paper is the same as the due date for the contest. More information about the contest can be found at <http://www.scranton.edu/libraryresearchprize>.

# Topic

You may choose any research topic relevant to Space Physics or Space Weather with approval from Dr. Frissell. If you are not sure what to pick, I recommend looking at the ionospheric response to a geomagnetic storm. This is because we have already shown you how to identify geomagnetic storm signatures in the Sym-H index in class, as well as how to access and plot the data. No two students should look at the same geomagnetic storm. You can find a list of the top 50 geomagnetic storms of the last solar cycle here: <https://www.spaceweatherlive.com/en/auroral-activity/top-50-geomagnetic-storms/solar-cycle/24.html>

# Research Advisor Meetings

Each student must select a research advisor for this project and meet with them at least twice before the final paper is due. At each meeting, you should discuss what you have done so far for the project, where you are now, and what you plan to do next. After the meeting, you will write up a one-page summary of what happened at the meeting and submit the summary to the appropriate dropbox on D2L by the listed due date.

Dr. Frissell, Dr. Joshi, and Dr. West will all serve as research advisors for this project. There are six students registered for this course, so each advisor should work with two students.

# Paper Requirements

Each paper must include original figures of either data or model output generated by the student using the python plotting and analysis ecosystem. You should have between 3 to 5 figures and/or tables in your paper.

The paper must be written in LaTeX and use the BibTex referencing system. You should use the simple\_article.zip template provided in class. Each paper must have at least 5 properly cited references. One reference may be the textbook, and the four others must be scholarly journal articles.

There is no explicit page count requirement, but each of the component sections should be well developed. The text body (includes abstract, introduction, methodology, results, discussion, summary, and acknowledgments) should be at least 5 pages.

Your paper should have the following components:

* **Title**
* **Author List:** You will work with your advisor to determine the author list.
* **Abstract:** One paragraph (250 words or less) summarizing your entire paper.
* **Introduction:** Give a brief history of what you are studying, what question you are trying to answer, why it is important, and what you are doing to answer it. Make sure you include references here.
* **Methodology:** This explains where you got your data and/or models, and what you did with them. If you are using both a dataset and a model, you might break this up into two subsections. One would explain your data source(s), and the other explains your model. Include references to your data/model sources.
* **Results:** Present and describe your results. The best thing to do here is to put your figures and/or tables in this section, and then describe them in words. **You must describe your figures in words. It is not enough to only have figures in this section. Also, your figures must have descriptive captions.**
* **Discussion:** Explain what your results mean in the context of the other research papers you have read. This is also the section where you can answer the additional questions in the project description.
* **Summary and Future Work:** Summarize your paper and include your ideas on future work.
* **Acknowledgements:** In this section, you should: (1) Acknowledge funding sources (which you don’t have for this paper), (2) List the organizations and websites that provided you data and model code/outputs, (3) Thank people who are not co-authors but gave important and helpful discussions.
* **References:** You must use the BibTex referencing system. The default format in the provided template is acceptable.

# Oral Presentation Requirements

Each student will present a 15 to 20 minute oral presentation of their paper. A presentation template is provided with this assignment.

# Grading

This final paper and oral presentation constitute 20% of your total course grade. 15% will be based on the final paper, and 5% will be based on the oral presentation. Grading rubrics for both the paper and oral presentation are attached to this assignment.

Checkpoints such as research advisor meeting reports and paper drafts will be counted as homework assignments.

Dr. Frissell will make the final grade determination for all projects, but he may be advised by and consult with Dr. West and Dr. Joshi in making his decision.

# Extra Credit – Montclair State Astronomy Club Presentation

All students in this class are invited to give a 10 minute presentation at the North Jersey Astronomical Group (NGAJ) meeting via Zoom on Wednesday, May 12, 2021, at 8 PM. You can list this as an invited talk on your CV! If you are not able to make this time, you can still earn the extra credit by giving an equivalent talk to some other equivalent group. Talk to Dr. Frissell for details. This is worth 5 points added to your project presentation score.