

**Space Grant 2023 Summer Fellowship**  
**Final Report**  
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The primary goal of this summer's research was to compare ion temperature maps derived from the MENA instrument from the IMAGE satellite mission to auroral images from the FUV instrument on the same mission. Prior to the summer, we had just finished revising previously written IDL codes designed to create ion temperature maps and were optimistic about utilizing them to start work on the primary goal.

During this summer's research, we discovered our revised codes accessing and plotting skymaps of IMAGE MENA data were faulty. The issue presented itself as data being incorrectly mapped to the coordinate space in the final map and an example is shown in figure 1. This changed the scope of our immediate attention to determining what the cause was and how best to remedy the problem. We presented our research at a poster session at the Geospace Environment Modeling (GEM) workshop. The newfound issue was discussed in a floating figure as the issue was an active point of interest at the time.

The issue was finally determined to be caused by the initial data files being read in and manipulated incorrectly and is likely attributable to differences between today's IDL version 8.9 and the original version 5.5 used to write the base codes the current project is based on. Similar issues have plagued development during our research, with this last issue prompting a decision to move our codes from the IDL language to Python.

The remainder of the summer following the GEM workshop was devoted to testing the viability of rewriting the algorithms using Python instead of IDL and with the new semester beginning we look forward to creating a working version in the new language. As a first step in this process, we intend to first access .cdf files stored on CDAWeb and create flux maps derived from the MENA instrument. We also intend to utilize the CDAWeb plotting tool provided for the IMAGE mission to continue with our comparison of the MENA and FUV datasets in the interim. An example figure is shown in figure 2. For this purpose, we plan to investigate ion flux maps in place of the ion temperature maps as a first step which will allow for comparison between our new Python scripts and the CDAWeb tool to ensure our plotting suite is satisfactory.

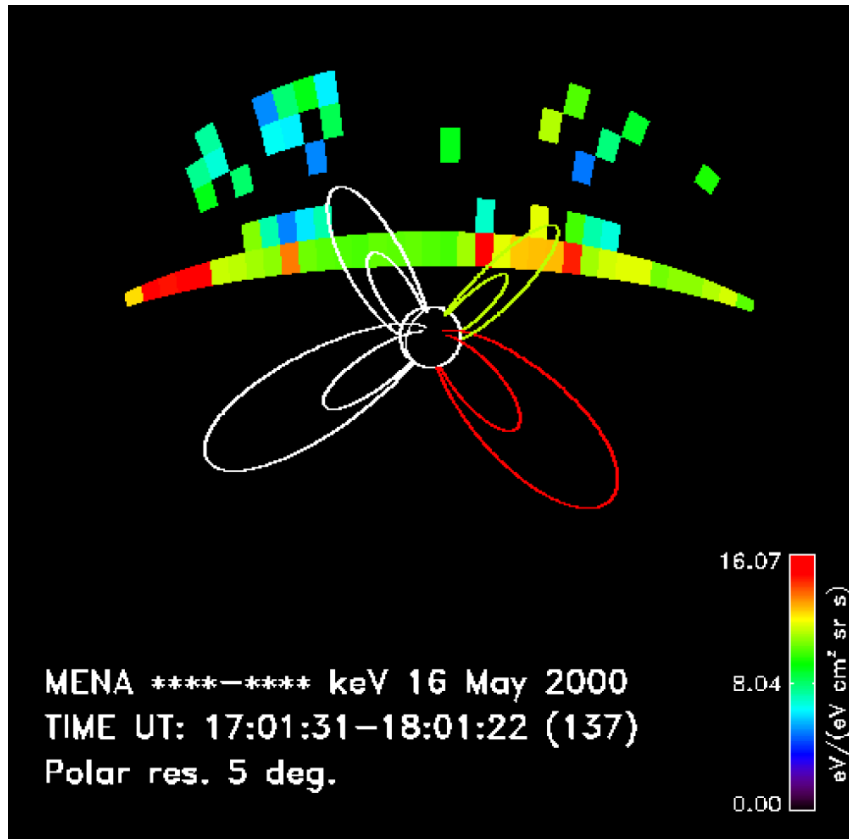


Figure 1: Example image of ion maps during known substorm time.

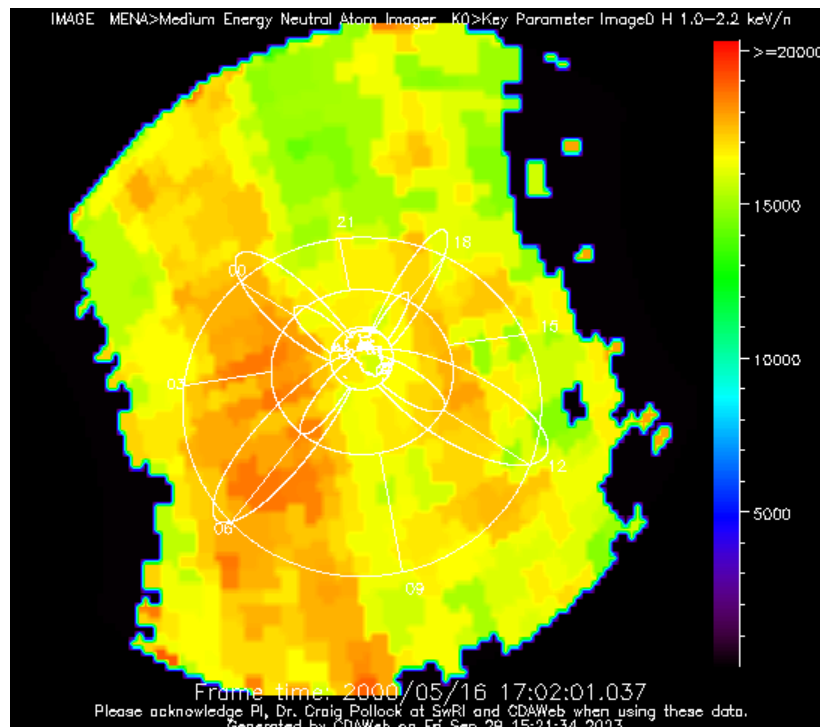


Figure 2: Example flux map