Preliminary Results for Experiment at the Wisconsin Plasma Physics Laboratory (WIPPL)

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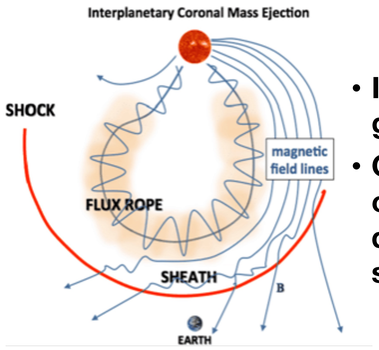
What did we learn from our scaled ICME experiments at WIPPL?

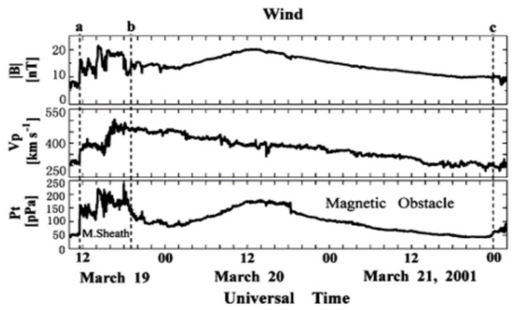
Background

What is an ICME and why are they important?



- ICMEs are the source of geomagnetic storms
- Geomagnetic storms caused by the sun can damage human electrical systems

ICMEs have distinct regions that are identifiable in satellite data

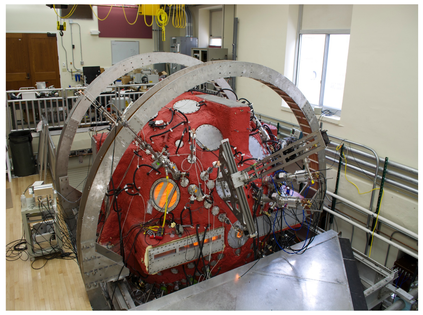


- Shock: Sudden increase in magnetic field, pressure, and particle velocity
- Sheath: Region of increased pressure, temperature and erratic magnetic field
- Ejecta: Region with smooth magnetic field and decreasing temperature and particle velocity

Experiment

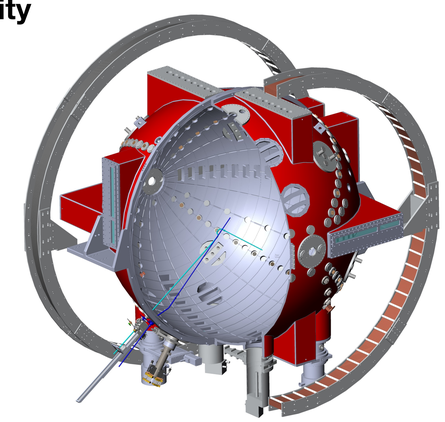
scaled ICME through a background plasma to act as the interplanetary medium

- A Compact Torus (CT) of plasma is sent through a perpendicularly magnetized plasma
- We control the background plasma parameters to scale the experiment appropriately



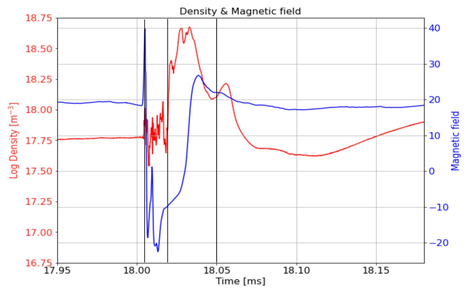
We used magnetic and temperature probes to diagnose our experiment

- Hook Probe: B-dot probe array with 90° bend
- Speed Probe: B-dot probe array that points radially inward
- Te Probe: Langmuir probe to measure temperature and density

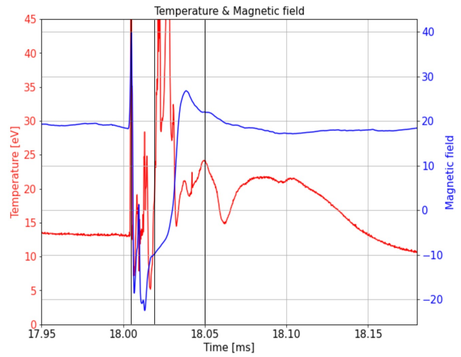


Results

Time resolved data indicates recreation of zones consistent with ICME



- In data received from the Te probe and the Hook probe, there are distinct regions.



Conclusion

ICME events are important to study in controlled environments. To study them, we injected a compact torus into a background plasma. We diagnosed the experiment with the hook probe, speed probe, and Te probe . The data collected from the probes contain sections consistent with a well scaled experiment relevant to an ICME.

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