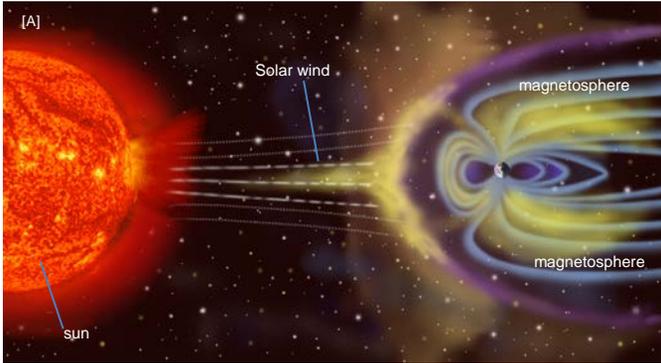


1. Introduction



- Sun has a stream of plasma released from its surface, called solar wind
- It consists mainly of proton and electron travelling outward at $\sim 400 \text{ km s}^{-1}$
- These particles interact with the Earth's magnetic field and cause time-varying conditions known as space weather
- Space weather influences our modern, technologically complex systems

2. Samples of space weather effects

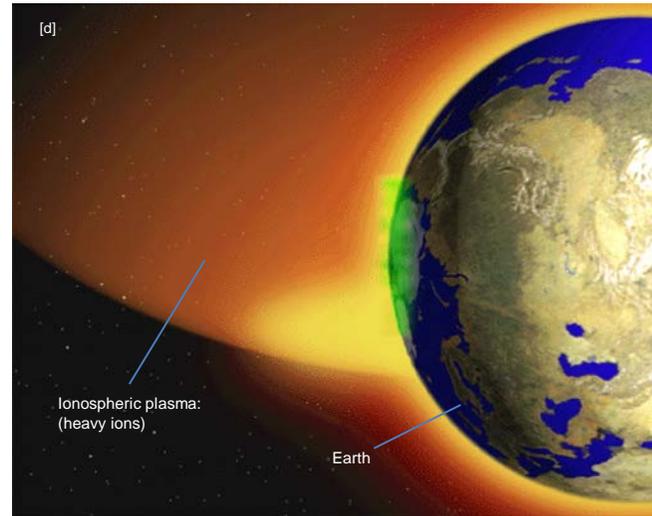
Space weather influence could be viewed as:

[a] **the good:** aurora (northern lights) [b] **the bad:** technological disruption and [c] **the ugly:** blackout



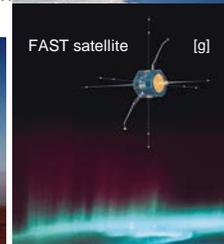
3. Why are heavy ions of interest ?

- The earth has a magnetosphere that acts as radiation shield
- Despite the shielding, a fractional part of the plasma sneaks into the earth
- The earth also has its own plasma in the ionosphere, but heavier
- These heavy ions contribute to the overall convection of the magnetospheric plasma (solar and ionospheric in nature)
- The heavy nature of the ionospheric plasma thus moderates the space weather effects

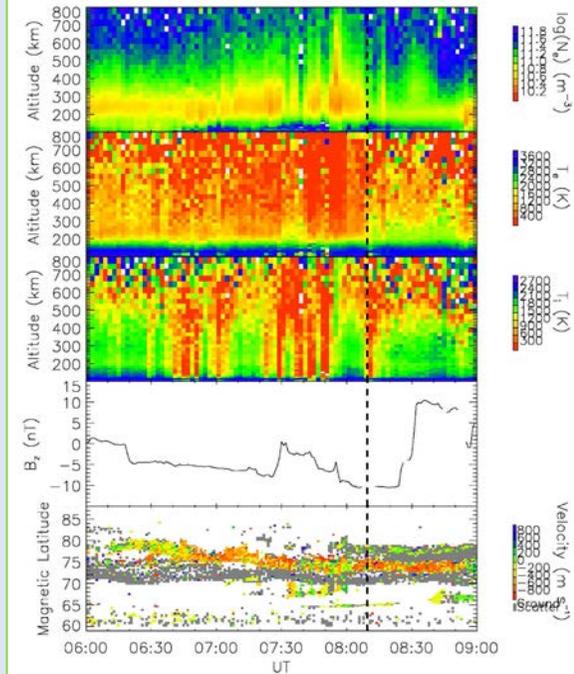


4. Data and Instrumentation

- The data for this work was sourced from the EISCAT and CUTLASS radars, and OMNIweb
- Seven events of heavy ion outflows from the ionosphere were identified by the FAST satellite in conjunction with EISCAT Svalbard Radar (ESR)



5. Results



The study shows that heavy ion outflows occur when there is:

- an ambipolar electric field due to electron precipitation
- an enhancement in electron and/or ion temperature(s)
- an increase in ion scale height

The striking events are clearly associated with high coupling function, geomagnetic storm and nightside auroral substorms.

6. Conclusion

- The study noted an interplay between heavy ion outflows and space weather. The results further help to broaden our understanding of magnetospheric dynamics and could be incorporated in magnetospheric models
- An appropriate next step would be the collection of a large dataset of satellite and ground based radar at conjunction, in order to have statistical generalization and better models to predict disruptive effects.