BOSTON UNIVERSITY

Boston University College of Arts & Sciences Center for Space Physics

2020—2021 SPACE PHYSICS SEMINAR SERIES

Ionospheric outflow at Jupiter and Saturn

The physical mechanisms which lead to the ionosphere outflowing into space were theorised before the ionospheric outflow was detected at Earth: it was argued that, since the magnetospheric tail has a lower pressure than the ionosphere, there should be a continuous escape of thermal plasma from the ionosphere into the tail. By analogy with the solar wind, it was suggested that this flow should be supersonic and was named the 'polar wind'.

Whereas at Earth it is only the Dungey cycle destabilising the equilibrium along the field line, triggering the outflow, at Saturn and Jupiter the Vasyliunas cycle, resulting from the rapid rotation of the planets coupled with plasma sources inside each magnetosphere, plays also a factor in the system.

Experimentally, at Saturn, ionospheric plasma was detected deep in the magnetotail and it was postulated that the outflow could have originated from regions other than the polar caps, which are, instead, the source regions at Earth. At Jupiter, ionospheric plasma was found equatorward of the auroral oval, on closed magnetic field lines, suggesting that at giant planets ionospheric plasma populates different regions of the magnetosphere compared to Earth.

Recent progress has been made to characterise the ionospheric outflow process at Saturn and Jupiter, with new models that include the effect of centrifugal forces and auroral field-aligned currents; this process, however, is still poorly characterised at these planets, and its parameterisation would be a critical step for the understanding the coupling between the planet and its surrounding magnetosphere.

Thursday, November 5th

4:00-5:00 p.m.

See website for Zoom information

Marianna Felici

Boston University