

Can Equatorial Spread-F (ESF) Occur on Other Planets?

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Observations of ionospheres on other planets started in the 1960s. In nearly 50 years of research on the topic, theoretical and modeling studies have concentrated on understanding the vertical structure of planetary electron density profiles, together with their diurnal, seasonal, latitudinal and solar cycle behavior. The data available from Venus and Mars are more abundant than from Jupiter and Saturn, and there are only a few observations from Uranus and Neptune. In the past several years, the more abundant data sets from Mars and Saturn have revealed two interesting trends: (1) at Mars, $N_e(h)$ profiles above the planet's crustal magnetic fields are far more structured than those above regions that are non-magnetized, and (2) virtually all $N_e(h)$ profiles at low latitudes at Saturn are highly structured. In this paper, we assess the impact that the gravitationally-driven Rayleigh-Taylor plasma instability may have as one possible source of plasma irregularities found above nearly-horizontal magnetic fields on Mars and Saturn.