

Long-term analysis of the sporadic E layer at African-European midlatitudes

Project level: MSc

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Description

Sporadic E (Es) layer is a thin layer consisting of metallic ions, such as Ca⁺, Fe⁺, Mg⁺, NA⁺, that appears in the lower ionosphere around 100 – 140 km. It is thought that this layer is formed from vertical shears of horizontal winds of the diurnal and/or semi-diurnal atmospheric tides [Haldoupis et al., 2007; and references therein]. Neutral wind plays a crucial role in producing these thin layers from long lived metallic ions from meteoric debris depositions through collisional and electromagnetic processes [Zhou et al., 2017; and references therein]. There is a lot of scientific interest in understanding the formation and distribution of the Es layer because it produces anomalous propagation of radio waves used for high-frequency (HF) communications and it affects air-navigation applications that uses HF radio waves. The Es layers also play an important role in the generation of nighttime medium-scale traveling ionospheric disturbances, through seeding the Perkins instability [e.g., Narayanan et al., 2018; Katamzi-Joseph et al., 2022; Perkins, 1973]. This proposed study aims to investigate the occurrence, frequency and height distributions of the Es layer using ionosondes in South African and central Europe. This is to better understand the dependency of these properties of the Es layer on local time, season, solar and geomagnetic activities.

Requirements:

- Background knowledge in ionospheric physics
- Programming skills

References

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