

# Neural network model of Electron density in the Topside ionosphere (NET)

*Thursday 22 June 2023 14:30 (20 minutes)*

We present a new empirical model of electron density in the ionosphere, which is a crucial parameter impacting radio signal propagation and GNSS systems. Our model utilizes radio occultation profiles obtained from CHAMP, GRACE, and COSMIC missions. We assume a linear decrease in scale height with altitude and consider four parameters: F2-peak density and height (NmF2 and hmF2), as well as the slope and intercept of the linear scale height decay (dHs/dh and H0). Our model (NET) is based on feedforward neural networks and incorporates as inputs geographic and geomagnetic position, solar flux, and geomagnetic indices. Validation against over several million in-situ measurements from CHAMP, CNOFS, Swarm, and GRACE/KBR data, along with comparisons to the International Reference Ionosphere (IRI) model, demonstrate the NET model's excellent accuracy in reconstructing the topside ionosphere. The model produces unbiased predictions across various locations, seasons, and solar activity conditions.

**Primary author:** SMIRNOV, Artem (Helmholtz Centre Potsdam - GFZ German Research Centre for Geosciences)

**Presenter:** SMIRNOV, Artem (Helmholtz Centre Potsdam - GFZ German Research Centre for Geosciences)

**Session Classification:** Deep/Machine learning and data science

**Track Classification:** Deep/Machine learning and data science