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Studying Nitric oxide in the E and F regions of the Earth's ionosphere

Although the nitric oxide (NO) is a minority species in the earth's ionosphere (at altitude between 83 and 200 km) it exhibits a remarkable variation with altitude, latitude, season and magnetic activities. Therefore, it can be used as a tracer to depict such variations. We studied the impact of energetic electron, at high-latitude E and F Earth's ionosphere regions, on nitric oxide (NO) to find changes on density during nighttime and daytime. For that, we used a combined model based on Boltzmann equation solver and fluid equation for neutral and ionic species. In this model, only chemical reactions of known cross-section are considered. The solar activity, the transport effects, neutrals chemistry, ions chemistry, photo-absorption, energetic electrons acting on the neutral atmosphere, molecular diffusion, and turbulent diffusion transport are considered. The one-dimensional investigation showed that excited states of NO+ exhibit density peaks that have a varying altitude, which depends on ionospheric conditions. The peak altitudes are found to be in good agreement with observations. In addition, troughs are found to be sensitive to electron impact. In addition, nitric oxide vibrationally excited levels have a maximum density value near noon, when the solar zenith angle has the smallest value which corroborate data measurements pro-
provided by SABER (Sounding of the Atmosphere using Broadband Emission Radiometry)

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