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Numerical simulation of cosmic noise absorption in the SAMA region: Its response to electron flux and energy spectrum

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Energetic particle precipitation strongly affects the lower ionosphere, since these particles play an important role in the production of ionic pairs. We show numerical simulations of ionospheric cosmic noise absorption at 30 MHz, for the South Atlantic Magnetic Anomaly (SAMA) region. Simulations were carried out for aeronomic conditions of Cachoeira Paulista (22,50o S; 45,00o W, Btotal) Simulation analysis were done for nighttime hours and moderate solar activity conditions. Our simulations include precipitation processes of electrons and galactic cosmic rays, photo-ionization processes, and processes of ionospheric absorption of cosmic noise. Also, simulations take into account chemical equilibrium conditions for 25 positive ions and 10 negative ions described by 175 chemical reactions. We studied height profiles of cosmic noise absorption and its response to different characteristic energy levels (energy spectrum) and to different ranges of energy of the precipitating electron flux. As expected, absorption increases with precipitating electron flux and characteristic energy. An interesting feature observed is the presence of two peaks of absorption at different heights. For a fixed value of characteristic energy, an increase in the precipitating electron flux rises the height of the lower peak, and lowers the height of the upper peak. Our results also show that for a fixed range of energy of precipitating electron flux, the heights of both absorption peaks decrease with the increase of the characteristic energy.