SPORADIC-E (Es) LAYER TYPES DEVELOPMENT OVER THE AMERICAN SECTOR DURING THE AUGUST 2018 GEOMAGNETIC STORM

J. Moro[1,2], J. Xu[1], C. M. Denardini[3], L. C. A. Resende[1,3], L. A. Da Silva[1,3], S. S. Chen[3], A. J. Carrasco[3,4], G. Stefani[5], R. P. Silva[3], G. A. S. Picanço[3], C. S. Carmo[3], P. F. Barbosa Neto[3], Z. Liu[1], C. Wang[1], N. J. Schuch[2]

[1]State Key Laboratory of Space Weather – NSSC/CAS, China, [2]Southern Space Coordination – COESU/INPE - MCTI, Brazil, [3]National Institute for Space Research – INPE/MCTI, Brazil, [4]Physics Department, Universidad de Los Andes, Venezuela, [5]Federal University of Santa Maria – UFSM, Brazil.

Abstract: Sporadic-E (Es) layers are investigated over five Digisonde stations located inside (Santa Maria and Cachoeira Paulista), boundary (São Luís), and outside (Millstone Hill and Port Stanley) the South American Magnetic Anomaly (SAMA) during the 25 August 2018 intense geomagnetic storm. It is shown the development of different Es types (flat: Es_f; low: Es_l; high: Es_h; cusp: Es_c; equatorial: Es_q; and auroral: Es_a), meaning the action of distinct formation mechanisms over the American sector. The blanketing (*fb*Es) and maximum (*ft*Es) frequency parameters are analyzed to search the roles of winds, electric fields, and particle precipitation in forming the Es layers considering the geomagnetic storm phases. It is observed, for the first time, a type of Es over Santa Maria, Brazil, central region of the SAMA, that resembles the Es_a detected in the auroral region. The characterization of such signatures in ionograms and the investigations of its formation mechanisms during the geomagnetic storm are the main focus of this study. It is also used a numerical model of the *E*-region known as MIRE to provide evidence that the particle precipitation was the source of such an increase in the electron densities at nighttime during the recovery phase of the geomagnetic storm. An attempt is also made to explain the presence of Es_q over São Luís in terms of the disturbing magnetospheric electric fields. Finally, the results highlight a new observational and modeling indication of a concomitant action of multiple formation mechanisms in the Es layers in the American sector during the geomagnetic storm.

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