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# Connection between sporadic E layers and geomagnetic field variations at the Antarctic Peninsula and Europe

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Sporadic E layers (Es) are the plasma formations characterized by increased electron concentration or intensive plasma irregularities located at the heights of E region. The occurrence, disappearance and variability of Es are irregular; their behavior is not repeated from day to day. The morphology of Es is extremely diverse. About a dozen of Es types is classified. Es can be as dense, completely screening the overlying layers, as transparent passing the reflections from the upper ionosphere. Earlier the connection of Es over the Europe with variations in the vertical component of the magnetic field was found [1]. It was shown that during quiet geomagnetic conditions (Kp = 0...2) the parameters Es depend on the magnitude of the magnetic index $\eta$, which introduced as a ratio of amplitudes of variations of the vertical and horizontal components of geomagnetic field. At the present paper we are analyzing the Es data accumulated at Antarctic Peninsula area. This region is characterized by extremely big difference of geographic and geomagnetic latitudes, low geomagnetic inclination caused by geomagnetic anomaly, extremely high cyclone activity in troposphere, ozone hole at the spring in middle atmosphere, etc. The combination of those features makes the Antarctic Peninsula a favorable place for studying the interaction between dynamics of neutral atmosphere and plasma environment. The results of more than 20 years of routine observations of Es at the Ukrainian Antarctic station *Akademik Vernadsky* (UAS) are considered. UAS is located near the west coast of Antarctic Peninsula (geographical coordinates: $65.25^0$ S, $64.27^0$ W; CGM: $-51^0$, $09^0$). Seasonal variation of Es repetition frequency has an absolute maximum in the summer and a local maximum in the winter (June) that provided by transparent Es. Diurnal variation has a peak at 10 LT every season. It was found that the maximum of all Es appearance is observed when the local K index is equal 2 (Fig. 1a). This result is true for Es that formed above the maximum of E region (Es of type "C", Fig 1d) and for all seasons except the winter (Fig 1 b, c). Maximum of lower Es (type "L") appearance is observed under the local K = 0 (Fig. 1e). At the winter time the maximum of all Es repetition frequency is shifted toward the smaller K indexes and observed under the local K = 0…1. It should be noted that the local K index at the UAS is correlated well with the total power of auroral precipitated particles in Southern hemisphere. Hence it can be used for estimating the energy released at the Polar Regions of Southern hemisphere.

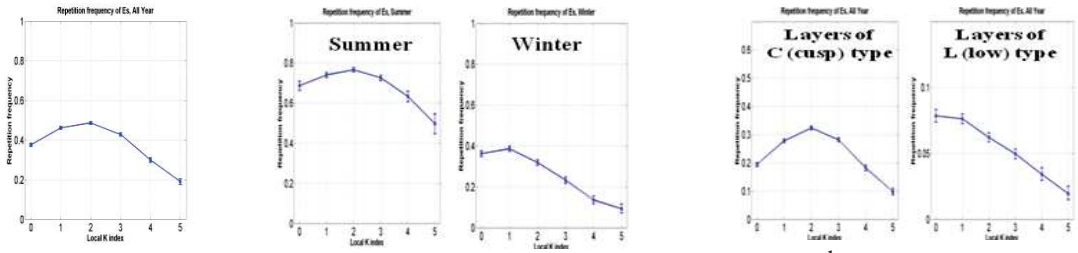


**Figure 1.** Dependencies of Es appearance frequency on the local K index at the UAS.

The found dependence could be explained by impact of auroral activity on thermospheric winds and as a result on their vertical shifts which are the main cause of Es formation at the middle latitudes. Another cause could be an impact of changed temperature and wind profiles on propagation conditions of atmospheric gravity waves, which also can excite the Es.

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1. B. Dziak-Jankowska, I. Stanislawska, T. Ernst, Ł Tomasik, Ionospheric reflection of the magnetic activity described by the index eta, *Advances in Space Research*, **48**, pp.850–856, 2011, doi:10.1016/j.asr.2011.04.029.