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オーロラジェット電流指数の極値統計解析
Extreme value statistics analysis of the auroral electrojet indices

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The worst space environment phenomena have a possibility of damaging electric transmission grids due to large induced currents on the earth and causing satellite anomalies due to increased high energy plasma on satellite orbits. Therefore a statistical study of the worst substorm events is important. For the study, we utilize extreme value statistics, which focus on the statistical behavior in the tail of a distribution. We analyze the one-minute values of the auroral indices (AE, AU, AL) in 1996-2012. These indices are derived from geomagnetic variations in the horizontal component observed at twelve observatories along the auroral zone in the northern hemisphere. The AU and AL indices are the uppermost and lowermost envelopes of the superposed horizontal component perturbations, and are thought to represent the maximum eastward and westward electrojet currents over the auroral zone, respectively. The AE index is defined by the separation between the upper and lower envelopes (AE=AU-AL) and commonly used as an index of the aurora activity. As a result of the analysis, we can estimate the upper limit of AU and the lower limit of AL, which suggests the maximum strengths of the eastward and westward electrojet currents. However, it is found that the AE index is not suitable for the extreme value statistics analysis, because it is a combined index. The largest values of AE are not generated by a single process and do not show a simple extreme value distribution.

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