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The response of the ionosphere and upper atmosphere to the energetic particles precipitation.

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The Earth's magnetosphere is a complex structure that is determined by both internal and external processes (mainly in the Sun), and the influence of which can be traced on the Earth's surface. The upper atmosphere and ionosphere continuously interact with each other, especially in the polar regions. Energetic particles are influenced by the Earth's magnetosphere, reaching the dense layers of the atmosphere, they spill out. This process is known as energetic particle precipitation (EPP). These particles are an additional source of atmospheric ionization (in addition to direct exposure to solar radiation), which is essential during periods, for example, the polar night, since EPP is the only source of atmospheric ionization. Such additional ionization triggers chains of chemical reactions that can lead to strong changes both in the chemical composition of the atmosphere and in the electron concentration in the ionosphere (layers D and E).

In this study, using a one-dimensional radiative-convective photochemical model with interactive neutral and ion chemistry, we followed the effects of EPP on the polar atmosphere during some of the most intense events. We have obtained the results not only of changes in the chemical composition of the atmosphere, including ozone, but also the electronic concentration in the D and E layers.