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Modern atmospheric monitoring using pollen analysis of ice cores: a case study from the Elbrus Western Plateau, Caucasus, Russia

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The report highlights the results of first ice-core palynology studies from the Elbrus Western Plateau. The title of the highest point in Europe and the geographical location of Elbrus determine the diversity of natural conditions and, as a result, palynological spectra, which act as markers of seasonal vegetation, climate dynamics, fires and anthropogenic activities in the Mediterranean, southern European Russia, the Middle East, and North Africa.

The 24-m ice core from the Elbrus Western Plateau collected in 2017 (5115 m a.s.l., 43°20'53,9'' N, 42°25'36'' E) covers the period 2012-2017. Pollen analysis revealed a significant number of biological markers contained in the ice core, including pollen and spores, fungi, algae, testate amoebae, feather barbules, microcharcoal, and black carbon.

The obtained results show that taxonomic diversity and concentration of biomarkers in the ice core were determined by the seasons of the year and their inherent convective flows. Pollen assemblages are characterized by predominance of native Caucasian plant species. Among them pollen values of Picea forming the high-altitude forest belt in the Western Caucasus significantly exceed pollen frequency of Pinus growing near the upper timber line on Elbrus Mt in the Central Caucasus that suggests a westerlies of air masses and transfer of microparticles. A high abundance of non-pollen palynomorphs in pollen assemblages demonstrates a high potential for studying of human impact on mountain ecosystems. The first pollen data from the ice core evidences a promising resource of the high-altitude temperate glaciers as a flexible tool for atmospheric monitoring of microparticle transfer and fixing its seasonality and biotic relationships.

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