The spatial and temporal evolution of mineral discoveries and their impact on mineral rarity

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Abstract

This paper presents the proceedings of the data analysis of the year and country of mineral discoveries with their Nickel-Strunz classes and rarity to enrich our knowledge of the evolution of mineral discoveries and their spatial distribution during different periods. Based on the dynamic of mineral discovery, three principal periods were identified: (1) Ancient period (up to 1800) of irregular mineral records; (2) Sustainable development period (1800–1949) with regular records and a moderate increase in the total number of minerals; and (3) Modern period (1950–present) of rapid development. It is pointed out that the timeline of mineral discoveries exhibits local anomalies. The positive anomalies were linked to the publications of mineralogical encyclopedias and classifications, while the negative ones were caused mainly by historical events, suppressing scientific activity. The majority of rock-forming and widespread minerals were discovered before the 1980s, while the discovery rate of rare and endemic species still progresses due to the study of hard-to-reach locations and the introduction of high-resolution analytical methods. A comparison of Nickel-Strunz class counts throughout mineral history revealed that the fraction of carbonates, oxides, and elements have drastically decreased during the Sustainable development period and the Modern period with a minor increase of elements during the last period. However, opposite behavior is observed for the phosphates, sulfates, and sulfides, with a sudden decrease in sulfates during the Modern period. On the other hand, the fraction of borates, halides, and silicates remained unchanged during all periods. Spatial analysis of the data showed that the distribution of mineral discoveries on the world map depends not only on the country's geology but also on the area, population, economic development, and general interest in science.

Keywords: Minerals distribution, history of mineralogy, minerals discovery, data science, statistics