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The origin of parent brine of the Badenian (Middle Miocene) primary gypsum deposits in the western part of the Carpathian Foredeep Basin: insights from strontium isotopes

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Middle Miocene crystals of sabre gypsum and subcrystal of giant gypsum intergrowth cropping out in southern Poland near Busko have been analysed for their Sr isotope composition. The new isotopic data revealed fluctuations in $^{87}\text{Sr}/^{86}\text{Sr}$ values within the primary gypsum crystals providing new insight into paleohydrological conditions during the Badenian salinity crisis in the Polish part of the Carpathian Foredeep Basin. The isotopic composition of a glassy gypsum subcrystal decreased progressively with the subcrystal growth, ranging from 0.70892 to 0.70884 near the crystal apex. The $^{87}\text{Sr}/^{86}\text{Sr}$ ratios of the sabre gypsum crystals are in the range of 0.70887–0.70934 and there are significant fluctuations within each gypsum layer tested. Similar intra-layer fluctuation patterns observed in various sections provide a strong argument for the synchronous origin of the investigated portions of the sulphate successions.

The studied primary gypsum has a more radiogenic composition than the Badenian seawater. Its isotope signatures reflect spatial and temporal changes in the supply of continental derived radiogenic Sr to the Carpathian Foredeep Basin. Contrary to previous studies, the Palaeozoic clastic rocks of the Holy Cross Mountains are suggested as potential sources of radiogenic strontium. The new Sr isotope data support a salina model for the evaporitic basin of the Carpathian Foredeep.

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