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Comparison of various geochemical weathering indices and mineralogy of Pennsylvanian paleosols from the Upper Silesia Coal Basin (Poland)

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In recent years significant efforts were made to develop weathering indices based on a wide suite of elements. An example of such approach is the geochemical model proposed by [1], in which the geochemical composition of a rock is described in a two-dimensional space defined by weathering () and igneous () evolution vectors. Furthermore, the correct interpretation of geochemical data requires understanding of partition of elements between mineral in a rock [2].

In the present work, elemental compositions and mineralogical data obtained with the powder X-ray diffraction analysis were combined to asses the weathering intensity and possible evolution of the source rock areas for paleosol samples from the Upper Silesia Coal Basin (USCB, Poland). USCB encompasses a continental succession of Pennsylvanian age, spanning approximately 8 km in thickness, characterized by numerous coal seams and clastic paleosol horizons.

Our results showed linear relationships between , , and depth in the profile for the samples coming from one of the youngest coal-bearing members of the succession, the Mudstone series. This indicates a gradual shift from granitic to mafic sources up the profile, accompanied by an increasing degree of weathering. These geochemical trends are reflected by the increase of chlorite content with the increase of the value of the metric i.e., with the shift towards the mafic field. The increase in weathering degree was not easily discernible when analyzing results of other weathering indicators such as chemical index of alteration minus potassium (CIA-K) or base loss.

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References

[1] Lipp, Shorttle, Syvret, & Roberts (2020), Geochemistry, Geophysics, Geosystems 21, e2019GC008758

[2] Jewuła, Środoń, Kuligiewicz, Mikołajczak, & Liivamägi (2022), Geochimica et Cosmochimica Acta 322, 1-23.