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Influence of the pyroclastic component on the provenance and weathering indices assessment in shallow marine sediments – lessons from Upper Ordovician of the Baltic Basin

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Weathering plays a paramount role in controlling the Earth's atmosphere composition and climate that, among many, drives the bioevolution. Therefore, understanding the link between biodiversification events and global weathering patterns is essential.

Chemical weathering indices provide an objective tool for estimating weathering intensity, which can be linked to climate and atmospheric composition changes. The provenance of sediments (particularly of siliciclastics) is important for understanding the geodynamical context of sedimentary basins and evaluating the variations in weathering intensity. The Upper Ordovician sedimentary succession in the Baltic Basin contains numerous K-bentonites [1,2] that form series of distinct ash beds within siliciclastic or carbonate successions. A critical aspect of the pyroclastic component in these sediments is its potential effect on calculating weathering indices and assessing the provenance of terrigenous material flux. Geochemical mass balance mixing modelling shows that the volcanic material is not concentrated in discrete bentonite beds, but a significant amount of the volcanic tephra was dispersed or re-deposited into the host rock. The volcanic component in the host rock section between bentonite beds reaches up to 50%. Our results show that carbonate rock above and below the bentonite interval shows background values of K that are mineralogically expressed by pelagic clays and detrital K-feldspar. However, carbonate sections between discrete bentonite layers contain a high concentration of K, located in the authigenic K-feldspar and mixed-layer clay phase, besides detrital K-feldspar and pelagic clays. The values of weathering indices (CIA, CIW, WIP) between discrete bentonite beds differ from the carbonate rock above and below the bentonite interval, showing CIA values around 65, CIW 95-96 and WIP 15-25. However, bentonite interval with high content of dispersed ash shows CIW values of 96-99, highly variable (but generally low) CIA values from 55-70, and WIP values between 40-100. Therefore, the presence of volcanic material in the sedimentary record can significantly impact the weathering index and provenance estimates, making it necessary to consider the nature and significance of the volcanic component when interpreting geochemical-mineralogical signals as a paleoclimate proxy.

[1] Somelar *et al*. (2010), *Clays and Clay Minerals* **58**, 388-398.

[2] Huff (2016), *American Mineralogist* **101**, 43-70.