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Heterogeneity of Holocene freshwater dolomites from central Hungary based on a statistical analysis of rock-forming component properties derived from CT data

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The Danube – Tisza interfluve area in the middle part of the Carpathian Basin harbors numerous mainly groundwater-fed hypersaline (alkaline) ponds which were characterized by carbonate precipitation under varying geochemical, climatic, environmental conditions during the Holocene. The formation of dolomite attributable to seasonal variations of the climate and concomitant volume, geochemical changes of the groundwater, and the waterbody in these lacustrine environments is a unique feature of the area. A general model of freshwater high magnesium calcite, proto-dolomite, and dolomite precipitation in these lakes has been constructed in the early-mid 1980s via the complex geological, geochemical isotope geochemical investigation of carbonate rocks of extant lacustrine sequences of the mentioned area complemented by geochemical analyses of the lake and groundwater. Seasonal and long-term climate variations are expressed in the form of macro and micro-cycles preserved in the rock record. These however have never been examined in detail. To unravel and understand the cyclicity present in the mentioned carbonate sequences we need quantitative information on the composition and physical properties of rock. CT analysis of rocks yields data on density differences observable between the building blocks or forming components in the material under study. Groups identified via statistical analysis of the data can be assigned to the various rock-forming components, and these groups can be described quantitatively via statistical parameters characterizing distribution. 3D visualization of the clustered data in the rock samples allows for cross-validation of interpretations. Via studying the vertical and spatial heterogeneity of the identified rock-forming components using their descriptive statistical properties the presence of micro-and macrocycles can be revealed, which serve as a starting point for further investigations to understand the nature and causes of these cycles. We are to present the results of such work done on some carbonate samples of the mentioned area. Research has been carried out within the framework of the University of Szeged, Interdisciplinary Excellence Centre, Institute of Geography and Earth Sciences, Long Environmental Changes Research Team. Support of the Ministry of Human Capacities, Hungary Grants 20391-3/2018/FEKUSTRAT and NKFIH 129265 are acknowledged.