



Abstract Volume 14th Swiss Geoscience Meeting

Geneva, 18th – 19th November 2016

**Time in Geosciences:
Knowledge for a new beginning**

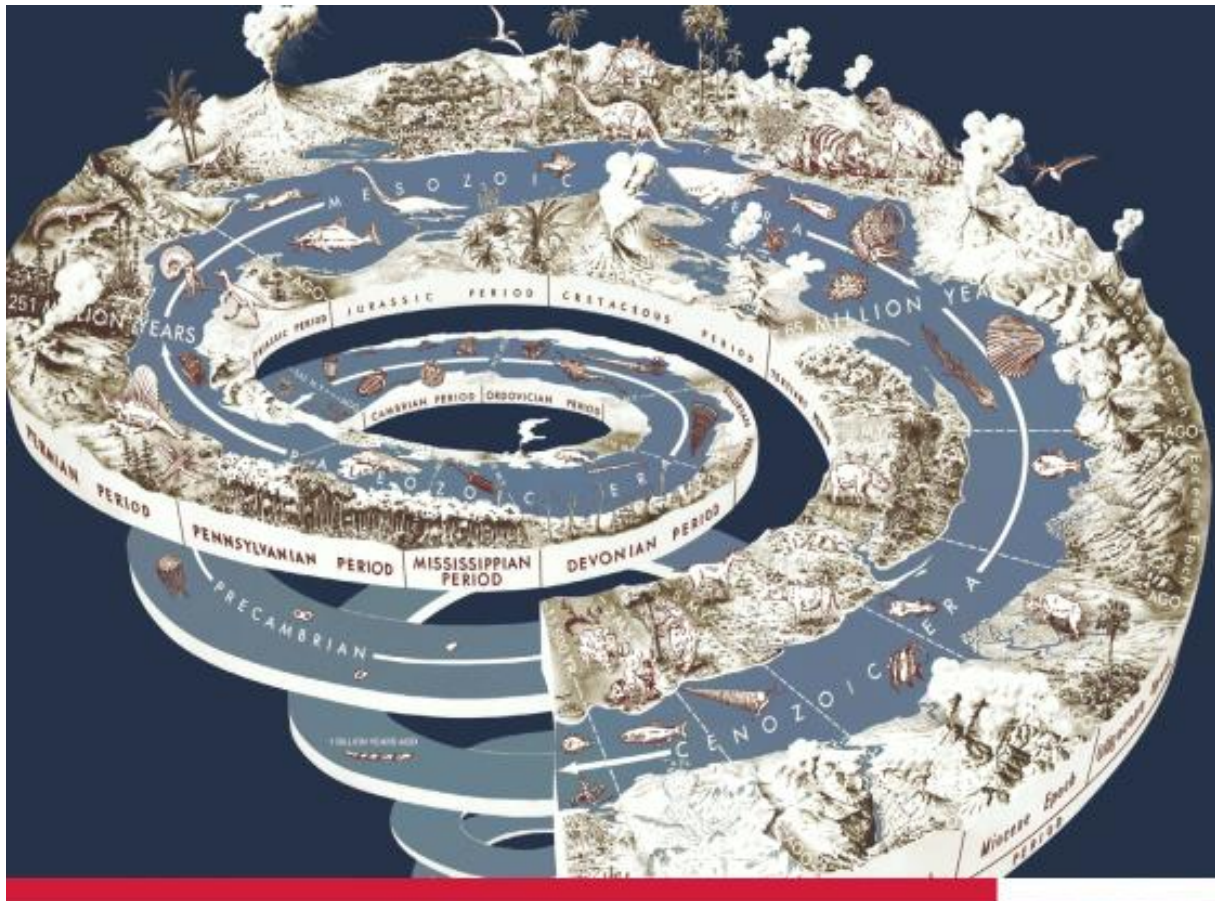
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Académie des sciences naturelles



**UNIVERSITÉ
DE GENÈVE**

FACULTÉ DES SCIENCES
Section des sciences de la Terre
et de l'environnement



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2. Mineralogy, Petrology, Geochemistry

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Size Dependant Physico-Chemical and Geochemical Characteristics of Two Distinct Carbonate-Rich Marine Sediments (Adriatic Sea)

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Micron- and submicron-sized mineral particles, omnipresent in natural environments, comprise most of the potentially reactive surfaces responsible for transfer and removal of organic and inorganic contaminants [1]. On account of the size-related changes in surface reactivity, mineral particles occurring in the nanosized range (1-100 nm) are of considerable interest in investigations of fate of contaminants. In marine environment, micron- and submicron-sized mineral particles mostly consist of clay minerals, metal oxides and oxyhydroxides and sulphides while carbonate minerals more often occur as larger lithogenic and biogenic fragments. Even though investigations of their occurrence in the nanosized range are rare (Morse, 2007), authigenic precipitation can produce carbonate minerals in the submicron size (Sondi & Juračić, 2010).

This research investigates occurrence of carbonate minerals in different size fractions of two distinct sedimentological environments characterized by high carbonate content in sediment (Figure 1). One is a highly stratified karstic estuary (Krka River Estuary), supersaturated in calcite, with calc tufa barriers formed at the uppermost part of the estuary. The second is an enclosed marine lake (Mijet Lakes) with limited water exchange, where whiting events (drifting milky clouds of water) and the formation of aragonite-rich lake sediments have been the focus of previous investigations (Sondi and Juračić, 2010).

Recent marine sediments were retrieved using Uwitec gravity corer during different sampling campaigns. The upper 5 cm of sediment was treated with NaOCl for organic matter removal after which micron- and submicron-sized fractions were collected by gravitational settling. The size of each fraction was confirmed by laser-based granulometry and separated fractions were freeze-dried. Samples were mineralogically (XRD) and morphologically (FE-SEM) characterized, their physico-chemical properties (specific surface area, SSA and cation exchange capacity, CEC) and trace element concentrations (HR ICPMS) determined.

The results obtained showed that carbonate minerals resulting from weathering of carbonate rocks and disintegration of biomineral structures (i.e. Krka River samples) do not produce significant share of carbonates in the submicron and, especially, nanosized range. This is reflected in a very significant increase in concentrations of lithogenic trace elements (Al, Li) already in the fraction containing particles <5 µm, suggesting significant removal of carbonate minerals by settling. Their absence was accompanied by a sharp increase in SSA and CEC, as a result of higher concentration of clay minerals and Fe and Mn oxides/oxyhydroxides. Contrarily, in environment where carbonates (mostly aragonite) are produced as a result of authigenic processes (i.e. Mijet), their share is significant even in finest fractions. Incorporation of Sr in the aragonite crystal structure allows it to be used as a tracer of aragonite content. High levels of Sr were measured in all fractions collected from this sample, with a maximum of 4461 µg g⁻¹ determined in fraction containing particles <4 µm. Its concentration lowered only in the finest fraction (<0.45 µm: 1793 µg g⁻¹), where 90 % of particles were <200 nm. The sharp decrease in Sr concentration was accompanied by a 56 % increase in concentrations of Al. The prevalence of carbonate minerals in all size fractions collected from this sample is reflected in continuously low SSA and CEC values.



The study investigated influence of origin of carbonate mineral phases on their occurrence in various size-fractions. Carbonates were shown to be present in larger quantities in sub-micron sizes in environments where their authigenic formation occurs. Low surface reactivity of carbonate mineral phases of different origin was established.

Figure 1. Map showing sampling locations.