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Cretaceous coastal lake carbonate geochemistry of La Pedrera de Meià fossil site (southern Pyrenees)

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La Pedrera de Meià (LPM) fossil site, discovered in the 19th century, is an important Barremian Konservat-Lagerstätte located at the southern slope of the Montsec range (Lleida province, Spain). LPM is comparable in fossil preservation with other European lithographic limestones lagerstätten sites such as Solnhofen (Germany), Cerin (France) or Las Hoyas (Spain). The LPM site stands out by the conservation of soft tissues of different groups of plants and animals such as arthropods, osteichthyes, frogs or feathered dinosaurs. The high biodiversity recorded in fossil pieces there are up to 50 holotypes and paratypes described, including the first flowered plants or social insects in the history of life. Such a unique fossil record is widespread throughout the most significant collections all over Europe.

Geologically, the outcrop records the deepest part of a coastal lake after a succession of 50 m of laminated mudstones, with restricted lateral continuity. These mudstones produce slabs from metric to millimetric thickness and appear very monotonous. Overall, no conspicuous vertical textural changes can be recognized in outcrop

The main objective of this study is to gain insights on the paleoenvironmental and paleoclimatic conditions concurring to lake formation where the LPM outcrop is located. For this purpose, a detailed stratigraphic study has been performed together with petrographical and geochemical analyses on rock samples collected across a 50m-thick sedimentary log to precisely locate all the samples of a multiproxy study. Our analysis includes X-Ray fluorescence (XRF), throughout all the stratigraphic log. Other analytical measurements have been carried out in a shorter control interval to obtain more accurate data that can be extrapolated to the whole column by using the XRF results. These include X-Ray diffraction (XRD), C and O stable isotopes, loss on ignition of organic matter, pyrite framboid petrography, and laminae counting. Comparison of the complete XRF record with the results of laminae counting suggests that cycles could be orbitally forced. It is concluded that the multiproxy dataset along the shorter interval allows one to characterize the

paleoenvironmental evolution of this exceptional site.

The present LPM geochemical data is also being used to test whether lithographic limestone localities have distinctive compositional fingerprint. Worldwide lithographic limestone's localities are thus compared. The goal is to attain a pattern that may enable one to identify the original site of any specimen in a museum which may have no associated information. In other words, our objective is to assess whether a fossil belongs to the LPM and/or even to determine the specific stratigraphic interval from which it was obtained.