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# Linking subaerial exposures to paleoenvironments and paleoclimates (Valdorria carbonate platform, northern Spain)

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The Valdorria carbonate platform is an isolated system found in the Cantabrian Mountains, Northern Spain. It is part of the Valdeteja Formation, which is stratigraphically overlying the Barcaliente Formation and underlying the San Emiliano Formation. The platform developed during the Bashkirian (Pennsylvanian) in the Variscan foreland basin and thrust belt, nowadays known as the Cantabrian Zone (Chesnel et al. 2016a).

Milankovitch cyclicity has recently been revealed throughout the carbonate platform exhibiting subaerial exposure features at the top of each cyclothem (Chesnel et al. 2016b). Subaerial exposures are of interest for a diagenetic interpretation of the history of platforms because they can display a complete paragenetic sequence of the lithification process. Features of interest observed range from marine deposition to vadose, phreatic and burial cementation along with tectonism and recent features that have developed after burying. At Valdorria, 13 different subaerial exposure surfaces have been identified, predominantly as subtle to deep immature dissolution surfaces and mature karstic and/or calcretic dissolution surfaces. Compacted immature dissolution surfaces are present but rare.

Transmitted light and optical cathodoluminescence petrographic studies show the presence of various cement generations. Furthermore, cathodoluminescence shows the presence of meteoric and burial cements within many samples. Vadose and upper phreatic cements can be confirmed due to a lack of luminescence indicating an oxidized environment where Mn and Fe are being incorporated into oxide minerals. Lower phreatic cements can also be confirmed where the brightest luminescence is found indicating reduced poor water because Mn is highly abundant in this environment. Burial cements can also be observed when cements are dimly luminescent indicating an enrichment in Fe, typical of the burial realm.

Furthermore, burial depths have been established using X-ray diffraction techniques to determine the smectite versus illite content of clay mineral assemblages found in karstic cavities and calcretic layers. The presence of calcrete along with its clay mineral assemblage has also been used to establish paleoenvironments of the platform.

Stable oxygen (δ18O) and carbon (δ13C) isotopes along with major and trace element geochemistry of Ca, Fe, Mg, Mn and Sr have been acquired to confirm the presence of cementation for the various diagenetic realms. Linking this information to the petrographic framework provides a paragenetic relationship related to the relative timing of diagenetic events.

## REFERENCES

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