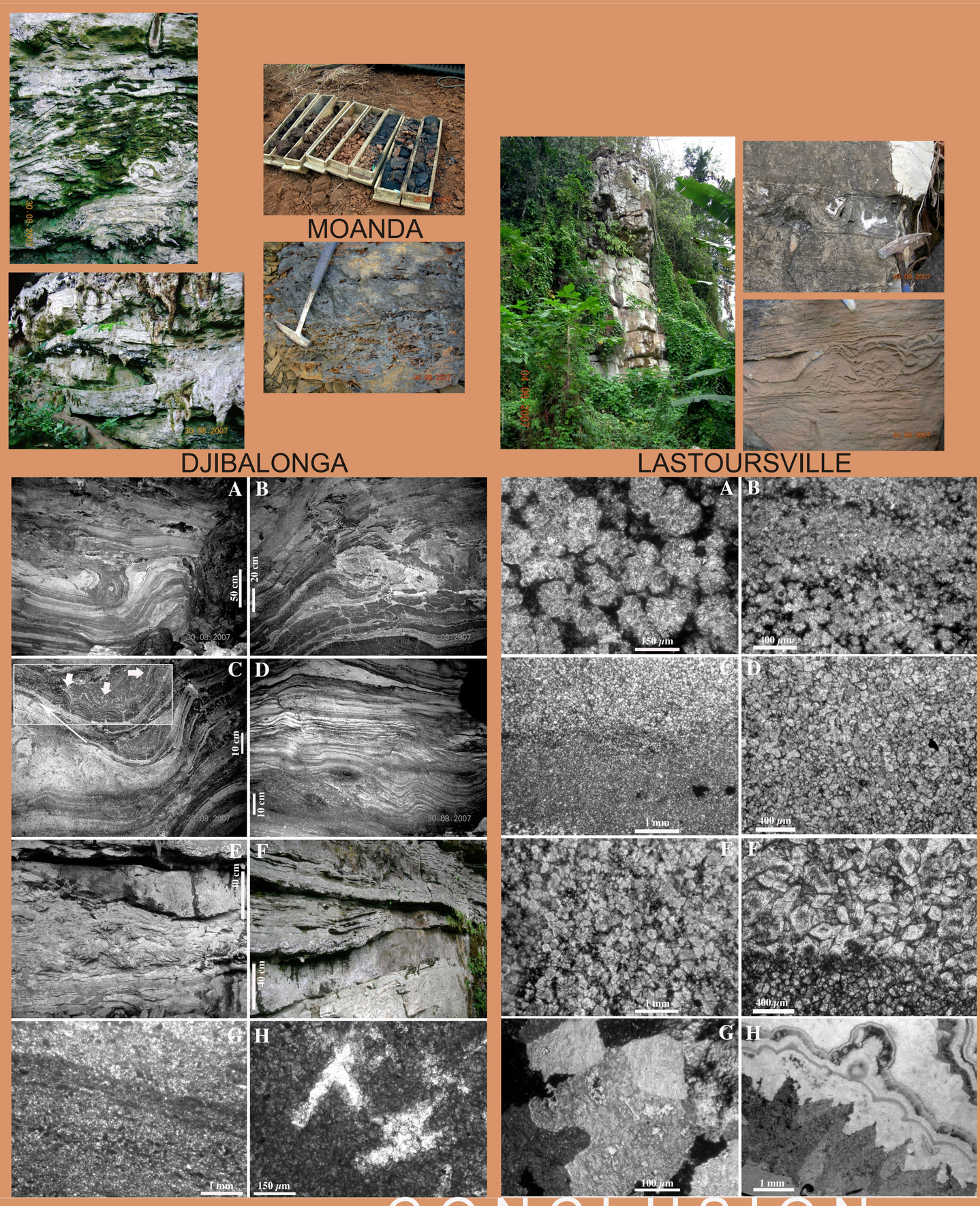
PALEOPROTEROZOIC HIGH ^{13}C DOLOMITES FROM THE LASTOURSVILLE AND FRANCEVILLE BASINS (SE GABON) STRATIGRAPHIC AND SYNSEDIMENTARY SUBISDENCE IMPLICATIONS

PREAT[1] Alain, BOUTON[2] Pascal, THIEBLEMONT[3] Denis, PRIAN[3] Jean-Pierre, NDOUNZE[4] Serge Simo, DELPOMDOR[1] Franck

[1] Earth Sciences and Environment, University of Brussels [2]Calligée, Nantes, France, [3]Bureau Recherches Géologiques et Minières, Orléans, France, [4]Ministère Mines et Géologie, Libreville, Gabon

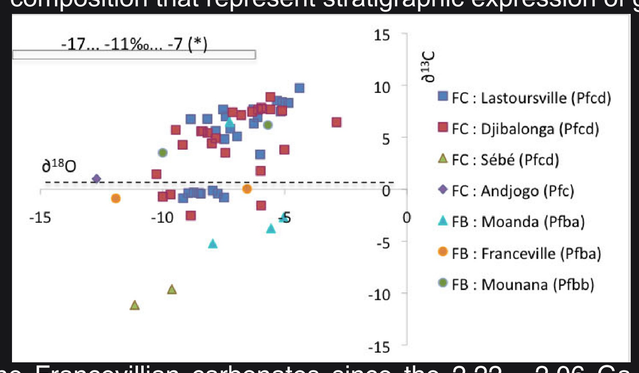
The most interesting and complete sections are those of Lastoursville (Moukouma) and Djibalonga. In Djibalonga, the lower part consists of <10 m of slumped, deformed, distorted, folded greyish-blackish dolomite and white former sulphate (mainly anhydrite) decimetric-thick layers displaying plastic-stretching (1A-1F). The series displays an intense soft deformation and the folds are metric and associated with small-sized tepees. In situ angular flake breccias or sligthly transported reworked centimetre-decimetre blocks (or rip-up intraclasts) resulting of these displacive growth structures are incorporated in the sediment. No structures indicative of wave and current activity have been observed in Djibalonga. Small-sized (5 up to 8 cm) and well-preserved hemispherical stromatolites were associated with the deformative processes and follow perfectly the curvature of the folding suggesting a progressive deformation (1C). Dolomite layers are homogeneous or strongly brecciated as a result of the penetration of thin (millimeter- and centimeter-thick) fractures filled by coarse-crystalline white sparry dolomite containing sulphate relicts seen under the microscope (1B). The middle part of Djibalonga section is composed over 5 meters (of decimetric and metric laminated or homogeneous dolomites intensively deformed by larger tepees (1E). The thick beds have been broken, slided, form large lenses and cannot be laterally correlated (1F-1E). The resulting succession is chaotic with unconformities and 'synsedimentary' normal faults and fractures. Microscopic analysis showed that sulphates have been nearly totally replaced by white sparry dolomite with development of collapse structures, resulting in the thick observed collapse breccia layer. The upper part of the section is regularly bedded with laminar dolomites, LLH-stromatolites (Logan et al., 1964), and silicified layers which are dominant at the top of the section. Manganese is present at the top of the section.

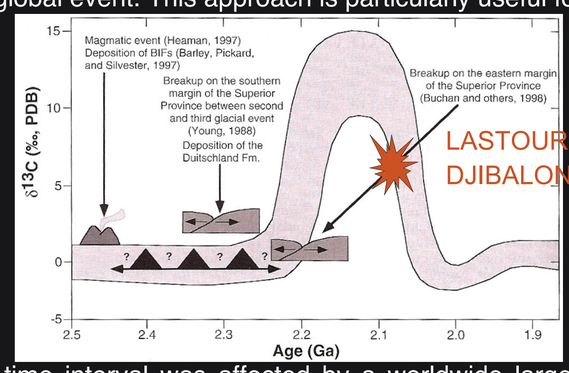


CONCLUSION

The extreme reported ^{13}C enrichments in Lastoursville and Djibalonga sections are probably related to an abnormally high rate of organic carbon deposition as suggested by TOC contents between 5 and 20% in the coeval ampelites or black shales (Cortial et al., 1990). These ^{13}C enrichments are comparable with those found in 2.2 - 2.1 Ga carbonates of the Fenno-scandian Shield (Karhu, 1993) and in many places around the world (averaging between 7 ‰ and 12 ‰, Karhu and Holland, 1996), including the Francevillan Series with carbonates characterized by ^{13}C values averaging 4.3 ±1.6 (N = 4) at 2.07 ± 0.05 Ga (Bros et al., 1992). These ^{13}C -enriched carbonates are therefore widespread. This isotopic excursion lasting < 200 m.y. can be obscured easily by data insufficiently well dated (Karhu and Holland, 1996) and needs detailed sampling to be revealed. The carbon isotope excursion ended with a sharp drop of almost 10 ‰ in the ^{13}C values of the dolomites located in the upper parts of our studied sections. The large positive ^{13}C excursion is probably linked to the enhanced proportional burial of organic matter in sediments deposited around 2.1 - 2.0 Ga, as suggested by the age of the studied series (Bros et al., 1992; Thiéblemont et al., 2010). Of the factors believed to result in the enhanced burial of organic carbon in the basins and extreme ^{13}C enrichment of surficial seawater, those that appear to be the most important are high sedimentation rates, bottom water anoxia and high biological productivity (Bekker et al., 2001).

Correlation of Proterozoic sedimentary successions being still hindered by poor age constraints, event and chemostratigraphy could overcome this limitation by utilization of marker beds and changes in chemical composition that represent stratigraphic expression of global event. This approach is particularly useful for





the Francevillian carbonates since the 2.22 - 2.06 Ga time interval was affected by a worldwide large positive excursion of the value of ^{13}C. Our observed ^{13}C values in the carbonates of the FB and FC (Pfcd) formations and their interstratification with a thick black shale series with high rates of organic carbon deposition (Cortial et al., 1990) point to closed basins where 13C level had been substantially increased as a result of a preferential removal (within sedimentary organics) of the light carbon. This has been possible since the basins were extensional (Thiéblemont et al., 2010) and have been assumed to be related to the synorogenic flexuring of a subducted and stretched crust (Pambo et al., 2006).