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Early-diagenetic processes in marine mangrove sediments from Guadeloupe, French West Indies

Antoine Crémière (1,2), Mathieu Sebilo (1), Harald Strauss (3), Olivier Gros (4), and Anniet M. Laverman (5)

(1) Université Pierre et Marie Curie, BIOMECO UMR 7618, Paris, France, (2) Geological Survey of Norway, Trondheim, Norway (antoine.cremiere@ngu.no), (3) University of Münster, Institut für Geologie und Paläontologie, Münster, Germany, (4) Université des Antilles et de la Guyane, SAE UMR 7138, Point-à-Pitre, Guadeloupe, France, (5) Université Pierre et Marie Curie, SISYPHE UMR 7619, Paris, France

Sediment and pore-water geochemistry were investigated in two short sediment cores from the Manche-à-eau lagoon (Guadeloupe, French Caribbean island) surrounded by mangroves trees. These sediments present high total organic carbon content, ranging between 10 to 18 % wt, mainly originating from mangrove litter fall. Oxygen is depleted in the first few millimetres of the sediment indicating active organic carbon degradation. Seawater sulphate is entirely consumed within the first 20 cm of the sediments and total organic carbon content decreases with depth pointing out that early-diagenetic degradation of organic matter occurs with sulphate reduction. Sulphide produced as the results of sulphate reduction partly reacts with detrital iron-bearing minerals and precipitates as pyrite which is consistent with high amounts of sulphur in the sediments (4-5 % wt). The sulphur isotopic composition (δ^{34}S) of both dissolved sulphate and sulphide in pore-water increases with depth displaying a large apparent isotopic fractionation (Δ^{34}S) between both species of 65-80‰ as a result of bacterial sulphate reduction. Scanning electron microscopy investigation reveals that a part of the carbonate alkalinity produced either by organic matter oxidation or anaerobic methane oxidation leads to authigenic carbonates precipitation. These results provide straightforward evidence that carbon and sulphur biogeochemical cycles are intimately governed by sedimentary microbial activity.