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Integrated stratigraphy of the carbonate platforms in the Guadeloupe archipelago (Lesser Antilles)

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In the Lesser Antilles, the Plio-Pleistocene carbonate platforms have developped in a fore-arc setting on the top of a ancient (Oligo ?-Miocene) abandonned arc (Bouysse et al., 1990). These platforms are cut by normal faults and provide index beds or units that are usefull for studying the arc-parallel extension (Feuillet et al., 2001 ; 2002 ;2004). They were considered to be composed of two main units (Garrabé, 1983) : a lower unit, up to 100 m thick, made of Plio-Pleistocene rhodolithic limestones with an interstratified volcanodetritic index bed and an upper unit, 20–30 m thick, made of lower Pleistocene reef corals. This biostratigraphic frame was mainly established from the study of the Simonière drill (Andreieff et al., 1987). Contradictively, Feuillet et al. (2004) suggested that the upper unit should rather be upper Pleistocene in age based on U/Th datings of corals. Léticée et al. (2005) showed that the upper unit has to be divided into two distinct reef units separated by an erosive and aerial surface and that at least two other main erosive surfaces can be recognized within the rhodolitic unit. Here, we conduct an integrated calcareous plankton magnetobiostratigraphy of the carbonate platforms in order to precise the timing of the arc-parallel extension in the Guadeloupe archipelago. This integrated study is also based on Argon dating.

The base of the carbonate platforms unconformably rests upon upper Tortonian to upper Messinian (8.44-5.77 Ma) volcanodetritic sediments outcropping in Marie-Galante. Our results show that the lowermost deposits are upper Zanclean to Piacenzian in age (Zones Pl2-Pl3 and NN13/15-NN17, basal part of Chron C2An) in Grande-Terre. However, the base of the series cannot be observed on Grande-Terre to the contrary of Marie-Galante and La Désirade. In La Désirade, the sedimentation started much earlier since the uppermost part of the carbonate platform yielded Zanclean to Piacenzian ages (Zones Pl2-Pl3 and uppermost NN13/15 to NN16). Unfortunately, the lower part has not yielded any biostratigraphic marker, yet. In Grande-Terre, the volcanodetritic index-bed, that is bounded by two erosional surfaces, is Piacenzian in age (Zone Pl5) and falls within the Gauss Subchron (C2An.1n). Overlying deposits are upper Gelasian to Calabrian in age (Pl5-Pt1 Zones) and pyroclastic materials from the lowermost part of these deposits yielded an 40Ar/39Ar age of 1.94 $\pm$ 0.06 Ma. The two reefal units that cap the series did not yield any biostratigraphic marker and both exhibit a normal magnetic polarity. From biostratigraphic constraints and magnetostratigraphy of the underlying deposits, we propose to correlate this normal polarity to the Olduvai Subchron (C2n). However, we cannot ensure precisely the age of the last reefal unit as it overlyies an erosional surface (S1 in Léticée et al., 2005). We have also found this erosional surface on Marie-Galante, then suggesting a similar evolution of both islands during Plio-Pleistocene times. We believe that the age of the youngest carbonate platform deposits should be Early Pleistocene (Gelasian) rather than Late pleistocene (Ionian). In La Désirade, we have also evidenced Gelasian deposits (Zones Pl6 and NN18) but 270 m down from the top of the Island where Late Zanclean to Early Piacenzian deposits occur. This indicates that La Désirade experienced a major uplift phase during the Late Piacenzian prior to the uplift that occurred during the Calabrian in Grande-Terre and Marie-Galante. The three main islands of the Guadeloupe archipelago have thus experienced different tectonic histories and the present-day morphology of these islands does not solely result from a single, Late Pleistocene uplift/tilt event.