

## A revised calcareous nannofossil biostratigraphic framework for the Campanian-Maastrichtian interval recovered by ODP Leg 207 on Demerara Rise, western equatorial Atlantic

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Ocean Drilling Program (ODP) Leg 207 to Demerara Rise, a submarine plateau off Suriname, South America, recovered Cretaceous and Paleogene sediments to help elucidate the paleoceanography of the equatorial Atlantic (Erbacher *et al.*, 2004; Mosher *et al.*, 2007). In doing so, it recovered a Campanian-Maastrichtian sequence at all five of the sites drilled (1257-1261) that records the opening of the Equatorial Atlantic Gateway that accompanied the final separation of South America from Africa and the continuous deepening of the study area that followed.

Oxic conditions were well established by the late Campanian, when sedimentation on Demerara Rise changed from hemipelagic to pelagic, and clayey chalk was being deposited. In general, carbonate contents are initially about 35wt% and diagenetic calcite, carbonate debris, trace fossils, barite and pyrite crystals are abundant. Radiolarians are well preserved, indicating high surface-water productivity, although planktonic foraminifers are absent or poorly preserved. The lower Campanian-lower Maastrichtian zeolitic nannofossil claystone, however, gives way to Upper Maastrichtian greenish gray nannofossil chalk with foraminifers and clay.

The Campanian-Maastrichtian nannofossil chinks, clays and claystones show a reasonably diversified assemblage of calcareous nannofossils, although most holococcoliths are missing due to bathyal paleowater-depths. Well-preserved nannofossils are abundant in the section, and their distribution patterns provide a number of biostratigraphic nannofossil events that allow revision of the calcareous nannofossil zonation for equatorial regions such as this. The major biostratigraphic events illustrated in Figure 1 consist of the following first and last occurrences (FOs and LOs): *Micula prinsii*, *Lithraphidites quadratus*, *Reinhardtites levis-Tranolithus orionatus*, *Uniplanarius trifidus*, *Broinsonia parca constricta*, *Eiffellithus eximius*, and *B. parca parca*.

Equally important, however, secondary index species have been delineated via quantitative and qualitative nannofossil data from Holes 1258A, 1259A and 1260A, and these can be correlated throughout the study area. These events (Fig. 1) are: acmes of *Lithraphidites quadratus*, *Bukryaster hayi* and *Lithastrinus quadricuspis*; LO of acmes of *Kamptnerius magnificus*, *Gartnerago segmentatum*, *Ahmuellerella octoradiata* and *Zeughrabdotos bicrescenticus*; FO of acmes of *Pseudomicula quadrata*, *Prediscosphaera incohatus*, *Ahmuellerella regularis*, *Lithraphidites praequadratus*, *Micula praemurus* and *K. magnificus*; LO of *Quadrum gartneri* and *Zeughrabdotos diplogrammus*; FO of *Ceratolithoides amplexor*; and sig-

nificant increases in *C. amplexor* and *Staurolithites mielnicensis*. The study has shown that no previously developed stratigraphic schemes can be strictly applied to this sequence. Instead, this example shows that a mix of quantitative and qualitative approaches provides broader opportunities for the application of Cretaceous calcareous nannofossil biostratigraphies.

### References

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- Mosher, D.C., Erbacher, J. & Malone, M.J. (Eds). 2007. *Proc. ODP, Sci. Results*, **207**. College Station, TX (Ocean Drilling Program). doi:10.2973/odp.proc.sr.207.2007

General geochronology		Main Index species	Nannofossil interval, this study	
Stage	Nannofossil UC zonation, Burnett, 1999		Interval	Secondary Index Species
Maastrichtian	UC20	UC20d	Micula prinsii	L. quadratus acme K. magnificus, LO of acme
		UC20c	M. prinsii ↑ C. kampfneri ↑	P. quadrata, FO of acme C. amplector increase S. mielnicensis LO
		UC20a-b	C. kampfneri ↑	Lithraphidites quadratus
	UC19	L. quadratus/M. murus ↑	Gartnerago Segmentatum	P. incohatus, FO of acme A. regularis, FO of acme L. preaquadratus, FO of acme M. praemurus, FO of acme K. magnificus, FO of acme G. segmentatum persistent top C. amplector, FO Z. birescenticus, LO of acme A. octoradiata, LO of acme Z. diplogrammus LO
	UC18	R. levis ↓		
	Campanian-Maastrichtian	UC17	T. orionatus ↓ U. trifidus ↓	Uniplanarius trifidus
Campanian			UC16	B. parca constricta ↓
	UC14/15	E. eximius ↓ U. trifidus ↑	E. eximius	
		UC14a-15c	B. parca parca ↑	B. parca parca
	UC13	B. parca parca ↑ A. cymbiformis ↑	A. cymbiformis	

Figure 1: Campanian-Maastrichtian biostratigraphic framework for Demerara Rise based on ODP Leg 207 cores