CALIBRATION OF PALEOGENE PALYNOLOGICAL ZONES TO THE MARINE TIME SCALE

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Introduction

The most widely used palynological zonation scheme for the Paleogene of western Venezuela is that of Muller et al. (1987). This scheme presents no evidence for its calibration to the marine time scale but refers back to previous publications. The principal publication that relates the marine fossils to the pollen and spores of this period is Germeraad et al. (1968). This was written before the widespread application of nannofossils and dinoflagellates to biostratigraphic problems and is thus largely based on foraminiferal studies. In the present study we highlight some problems we have encountered in using the palynological zones as presently calibrated. This is very much a work in progress and presented here only for discussion as the authors are aware that other companies are making similar efforts.

Paleocene

Recent consultant reports of an outcrop and well section from Guasare and Marcelina Formations of the Perija have shown the co-occurrence of the dinoflagellate *Hystrichosphaeridium caiobensis* together with the pollen *Gemmastephanocolpites gemmatus* and *G.* aff. *G. gemmatus.* The dinoflagellate *H. caiobensis* is a junior synonym of *Apectodinium homomorphum* (according to the updated taxonomic revision of Lentin and Williams, 1983).

Germeraad et al. (1968) considered the species *G. gemmatus* restricted to the early to middle Paleocene. However, the reported range of *A. homomorphum* lies within late Paleocene to the middle Eocene (according to Haq et al., 1988).

Paleocene - Eocene

A recent analysis of samples from the outcrop section of the Paso Diablo Fm (equivalent to the Marcelina) has revealed the co-occurrence of the pollen species *Bombaciditites annae* (restricted to the Paleocene by Germeraad et al., 1968) and the dinoflagellate species *Adnatosphaeridium multispinosum* (ranging from the early to the middle Eocene according to Williams and Bujak, 1985 and Williams et al., 1993).

Eocene

The species *Rugutricolporites felix* has been used as a key species indicating the Early Eocene Zone 17 (Muller et al., 1987). A recent review of unpublished company reports of the Lake Maracaibo area has shown that this species was observed in middle Eocene sediments.

Another source of controversy involves the observed first appearance of the species *Bombacacidites* sp. B *(sensu* Muller et al., 1987) and *B. soleaformis.* Both species constitute key species for the palynological Zones 19 and 20 of the lower to middle part of the middle Eocene. Recent studies in the eastern Lake Maracaibo area have shown these species to occur below of the first appearances of the nannofossils *Discoaster saipanensis and Reticulofenestra reticulata* (middle Eocene NP16). Studies of the Barinas Basin report these species occurring above the first appearances of the same nannofossil species. Furthermore, the spore species *Cicatricosisporites dorogensis* (reported to have its first appearance in the upper part of the middle Eocene Zone 22) have been observed co-occurring with the species *B. soleaformis.* Problems with the correct identification of the species of the genus *Bombacacidites* are the probable source of these discrepancies.

Integration of data derived from nannofossils, foraminifera and palynomorphs (including dinoflagellates) in the eastern Lake Maracaibo area, indicates that Zones 21 and 22 of the middle Eocene can be calibrated with the uppermost part of the Middle Eocene, Zone NP17. This indicates an age younger than that previously considered correct for these zones.

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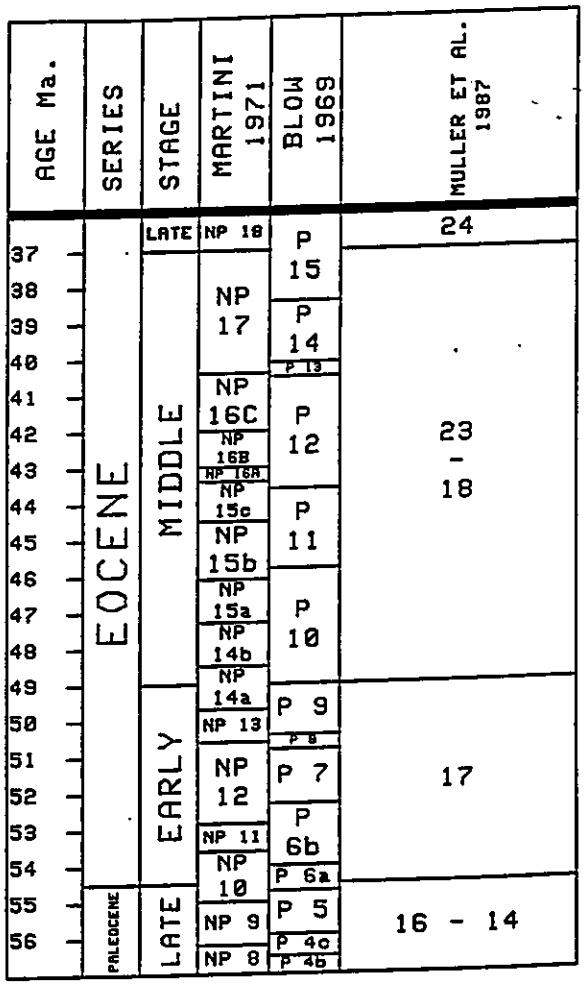
TIME SCALE


AGE Ma.
SERIES
STAGE
MARTINI 1971
BLOW 1969
MULLER ET AL. 1987
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EOCENE
PALEOCENE
LATE
MIDDLE
EARLY
LATE
NP 18
NP 17
NP 16C
NP 16B
NP 16A
NP 15c
NP 15b
NP 15a
NP 14b
NP 14a
NP 13
NP 12
NP 11
NP 10
NP 9
NP 8
P 15
P 14
P 13
P 12
P 11
P 10
P 9
P 8
P 7
P 6b
P 6a
P 5
P 4c
P 4b
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23 - 18
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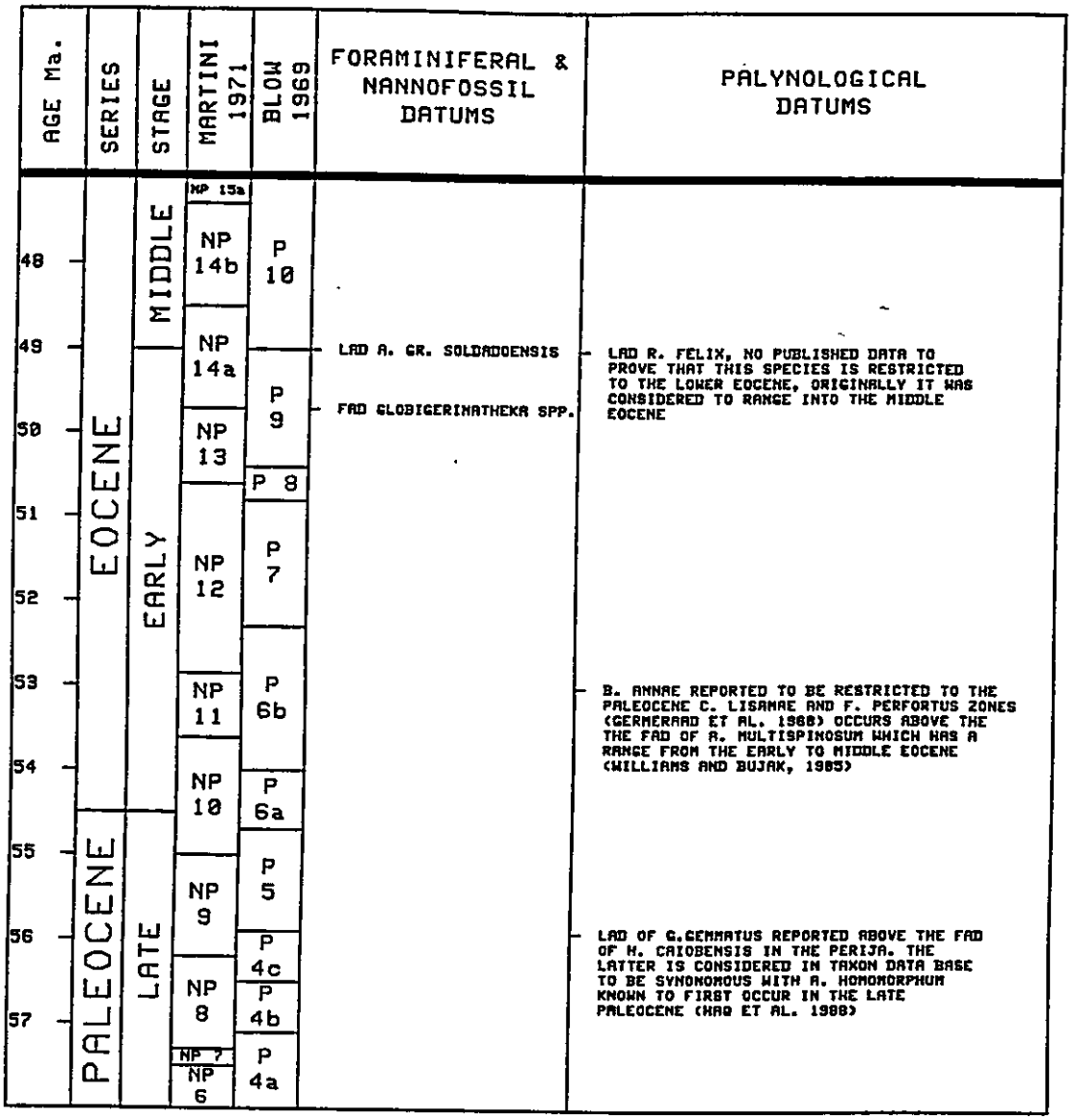
16 - 14

PALYNOLOGICAL CALIBRATION



PALYNOLOGICAL CALIBRATION