

UPDATED CENOZOIC NANNOFOSSIL MAGNETOBIOCHRONOLOGY

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The Cenozoic magnetobiochronology of Berggren et al. (1985a, b, c) has been essential in translating biostratigraphic information into numerical age information and widely used in studies of Cenozoic marine sediments. However, a significantly improved geomagnetic polarity time scale has recently been published (Cande and Kent, 1992) and the age differences between the new time scale and that of Berggren et al. (1985) are up to 2.9 m.y. It is thus necessary to convert the magnetobiochronologic ages of Berggren et al. (1985) to the new time scale. Here we recalculate the nannofossil datum ages given in table 4 of Berggren et al. (1985a) and table 7 of Berggren et al. (1985b) and graphically present them in the new time scale (Fig. 1).

Each new datum age is calculated based on:

$$(A_o - T_o)/(B_o - A_o) = (A_n - T_n)/(B_n - A_n) \text{ or:} \\ A_n = (T_n \cdot A_o - A_o \cdot B_n + T_o \cdot B_n - T_n \cdot B_o)/(T_o - B_o)$$

where A is the age of the datum, T and B are the ages for the top and bottom, respectively, of the magnetic subchron in which the datum is located, and the subscripts "o" and "n" indicate old and new time scales, respectively.

A few of the datum ages given in Berggren et al. (1985a, b) are inappropriate even in the old time scale. These problems are corrected and briefly outlined below:

The age for the first occurrence (FO) of *Catinaster calyculus* was given the same age as that of *Discoaster hamatus* (Berggren et al., 1985b) and thus subzone CN7a does not exist, although Berggren et al. (1985b, c) inferred its existence. The last occurrence (LO) of *Sphenolithus belemnoides*, the marker for the NN3/NN4 boundary, has an age of 17.4 Ma in Berggren et al. (1985b) based on DSDP Site 516, 18.8 Ma in Backman et al. (1990) based on ODP Site 710, and 18.7 Ma in Gartner (1992) based on DSDP Site 608. We adopt the age of 18.8 Ma, which translates to 18.5 Ma in the new time scale. The FO of *S. belemnoides* was assigned an age of 21.5 Ma in Berggren et al. (1985b), who cited Miller et al. (1985) as the data source. However, the latter study gave an age of about 20.8 Ma, which is virtually the same as that determined by Takayama and Sato (1987). We use the latter age, which translates to 20.5 Ma in the new time scale. The FO of *Isthmolithus recurvus* has an age of 37.8 Ma in Berggren et al. (1985a). This age was revised to about 39.0 Ma based on data from the Massignano section (Italy) and ODP Sites 744, 689, and 690 (Wei, 1992). The latter age translates to 36.2 Ma in the new time scale.

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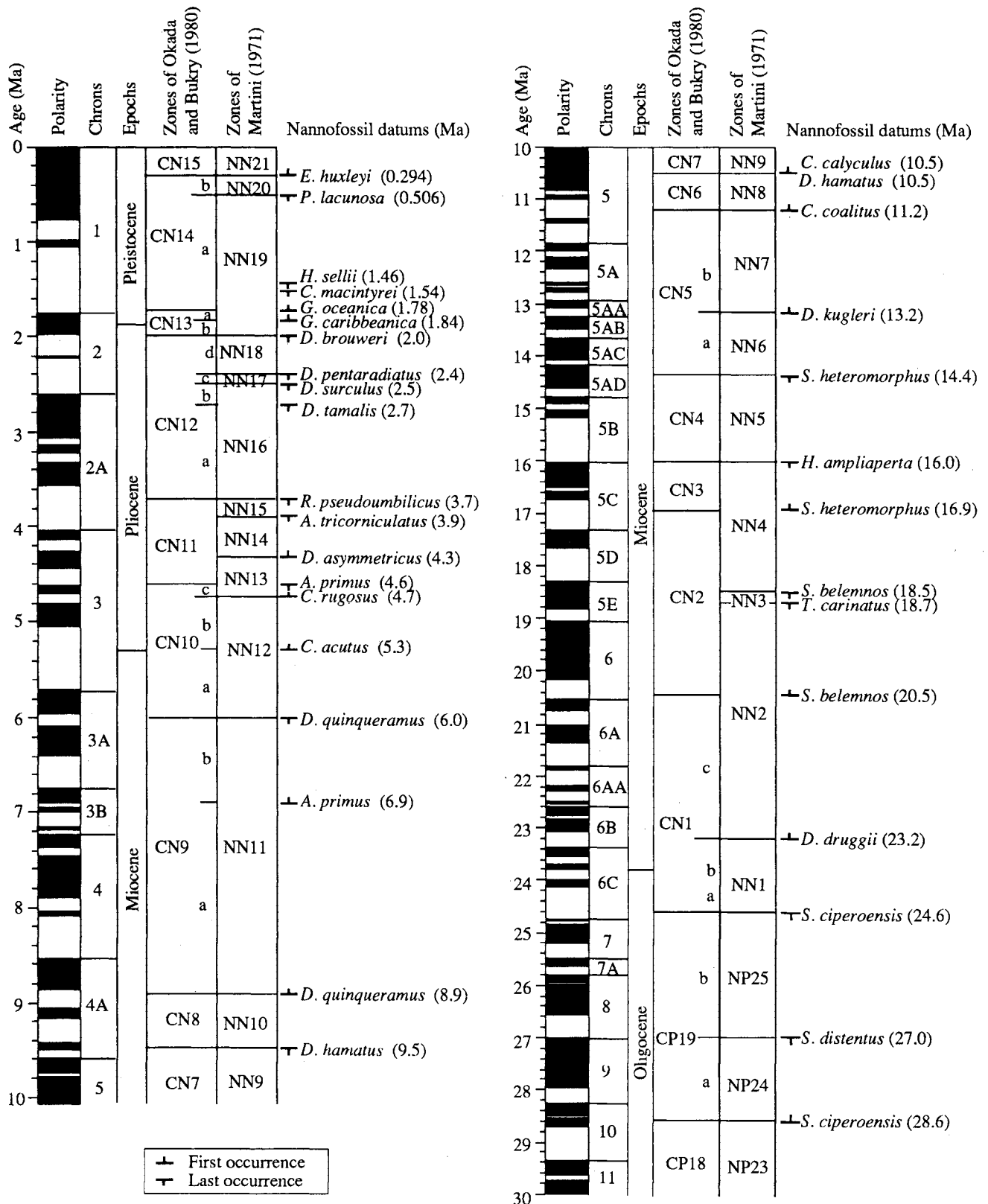


Fig. 1. Updated Cenozoic nannofossil magnetobiochronology. The magnetic polarity time scale is that of Cande and Kent (1992). The datum ages are converted from Berggren et al. (1985a,b) except for a few as discussed in the text.

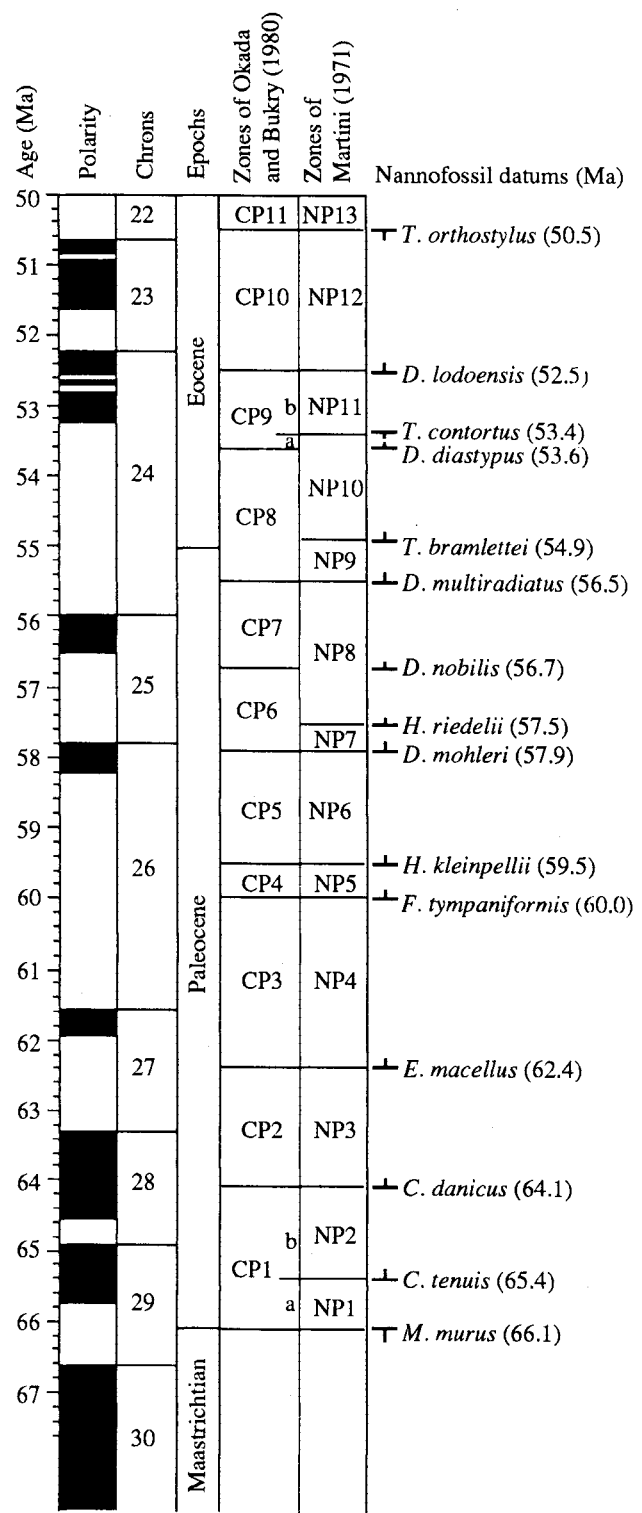
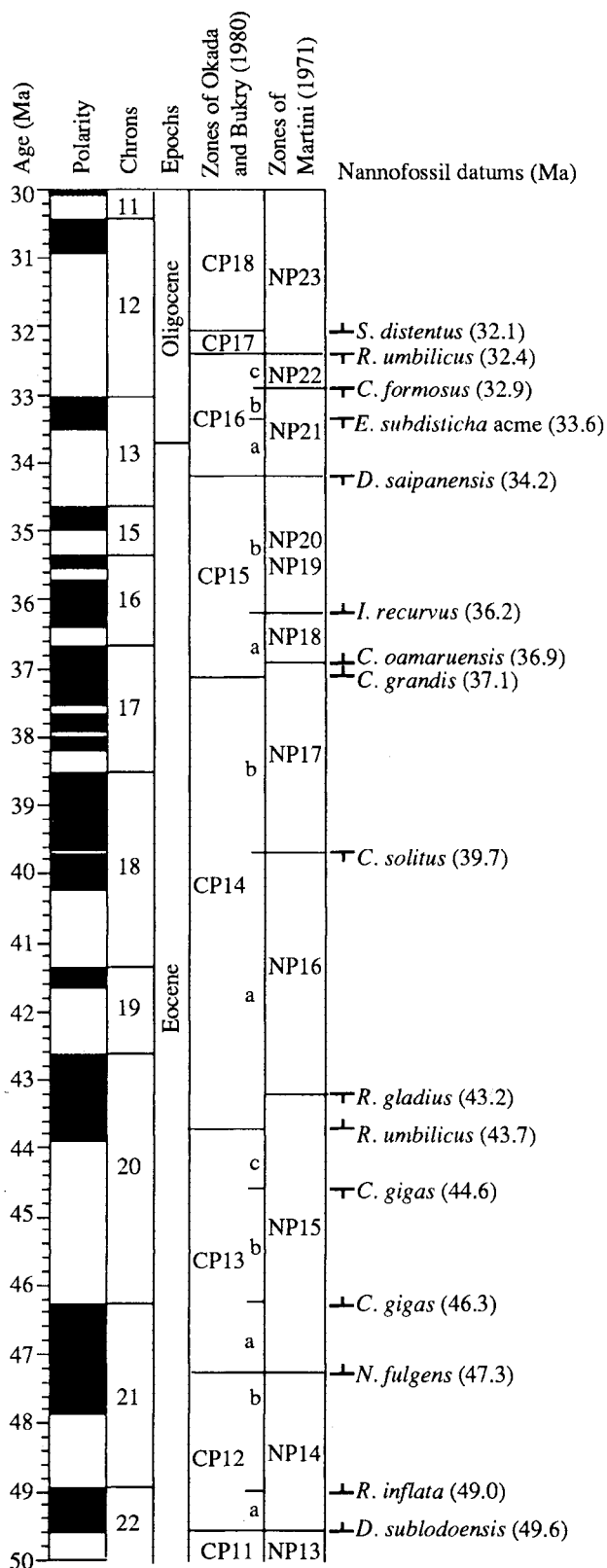


Fig. 1 (continued)