DR2004152

FIGURE DR1

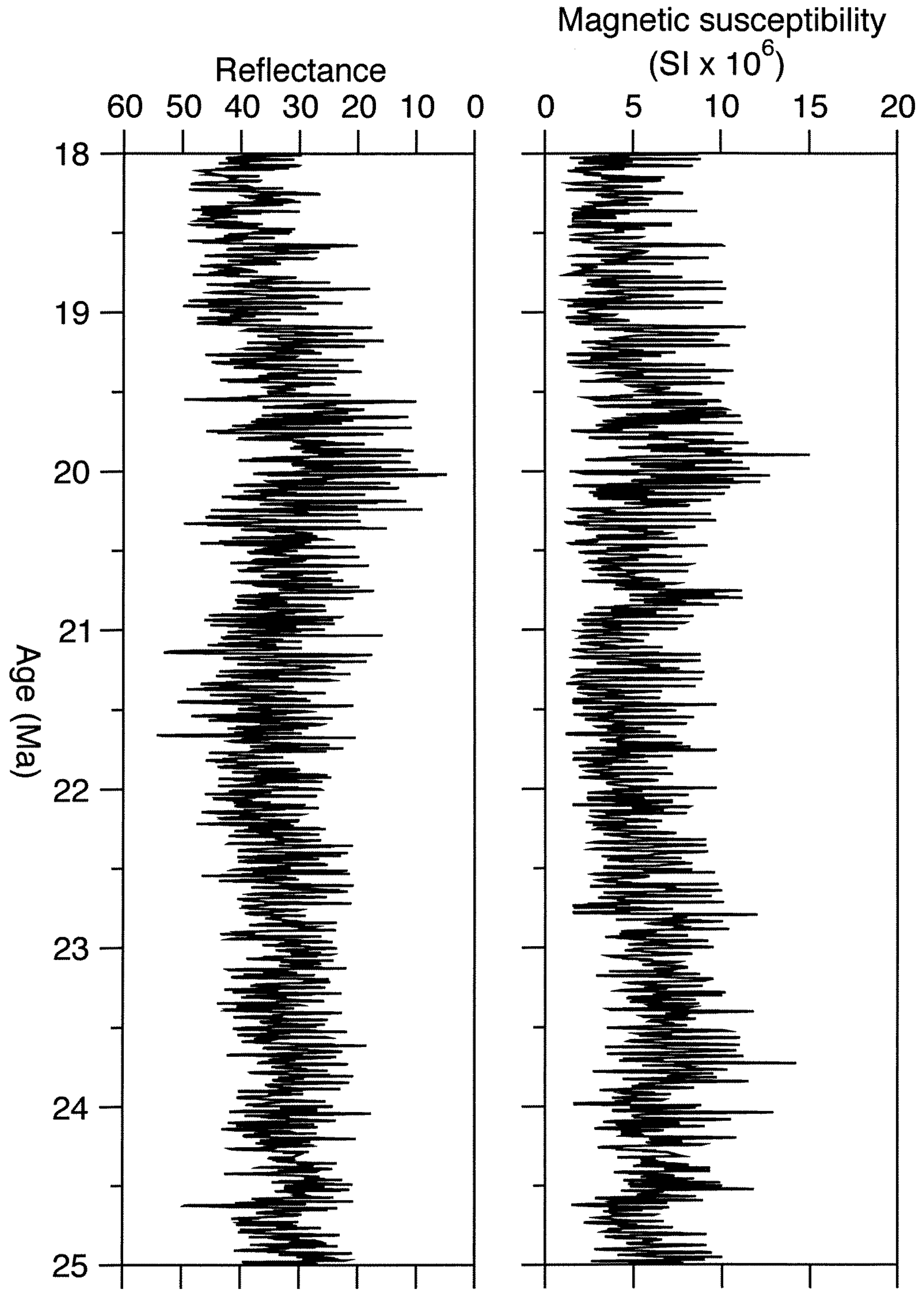

Figure DR1. ODP Leg 154 data (color reflectance and magnetic susceptibility splices) from 18 to 25 Ma, tuned to La_{2004}.

FIGURE DR2

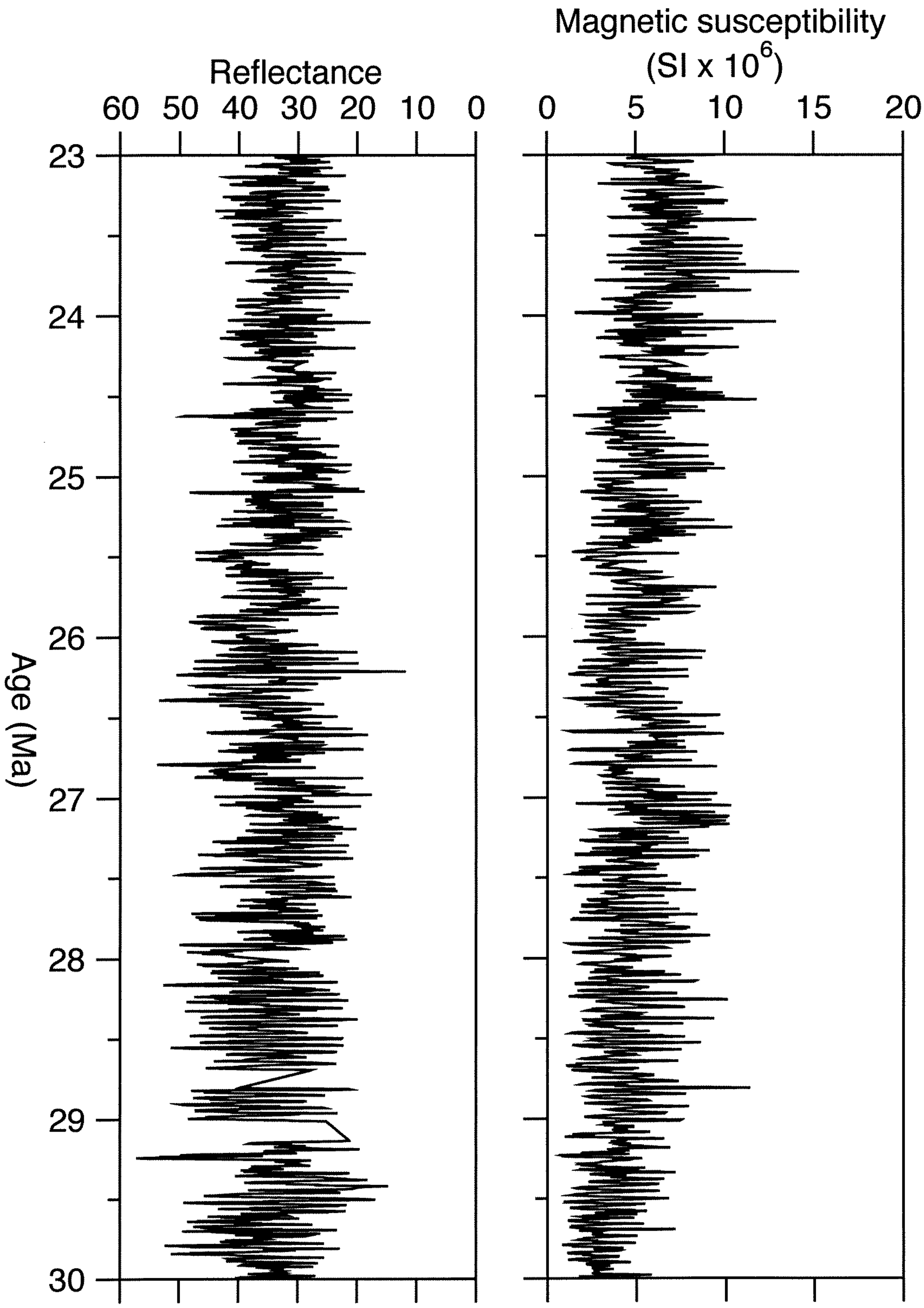

Figure DR2. ODP Leg 154 data (color reflectance and magnetic susceptibility splice) from 23 to 30 Ma, tuned to La_{2004}.

FIGURE DR3

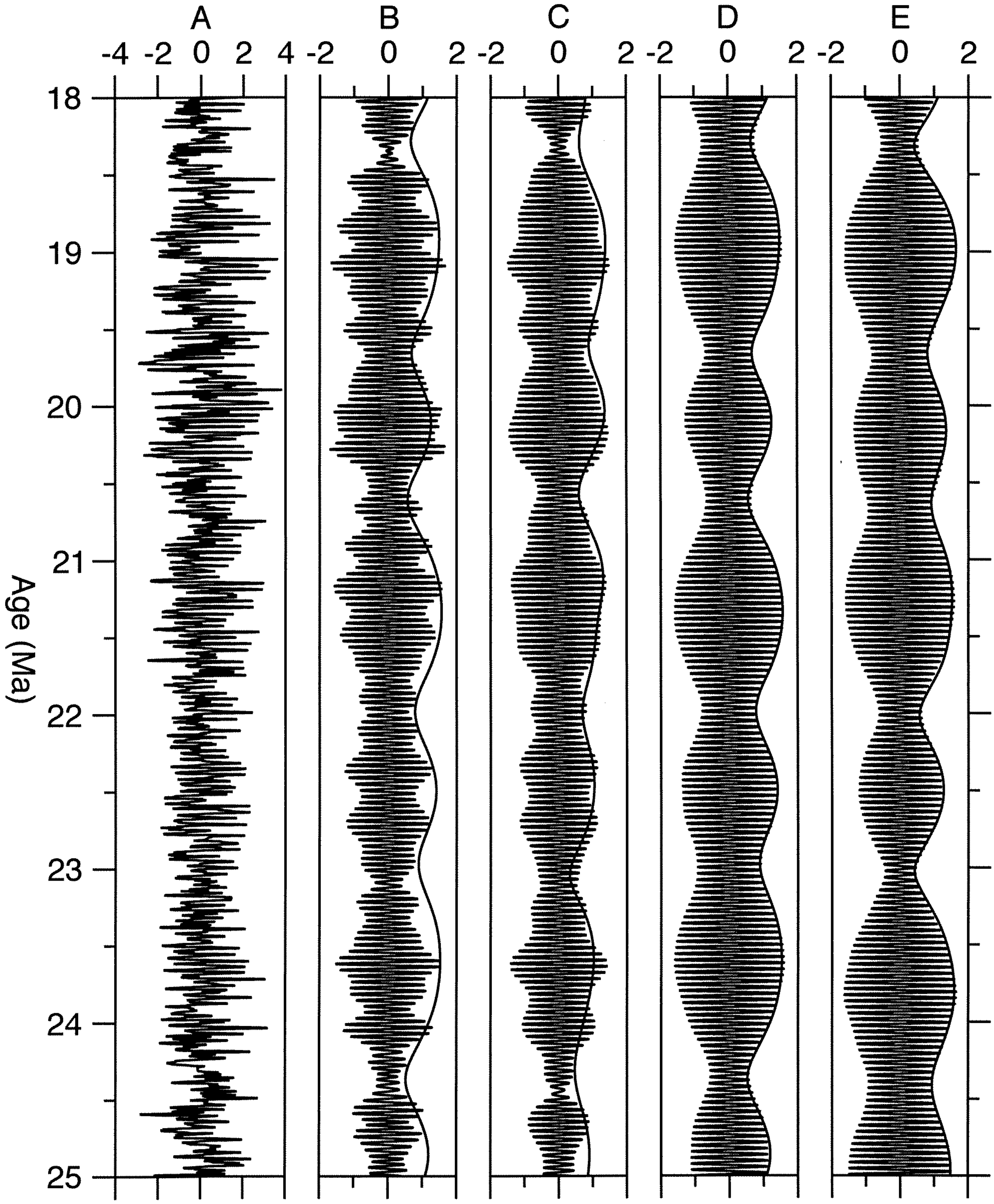

Figure DR3. A: ODP Leg 154 data (combined color reflectance and magnetic susceptibility splices, detrended, standardized to zero mean and standard deviation) from 18 to 25 Ma, tuned to La_{2004}. Obliquity filters and demodulations of A tuned to La_{2004} (B) and La_{1993} (C). Obliquity filters and demodulations of astronomical obliquity calculations for La_{2004} (D) and La_{1993} (E). Filters were calculated between frequencies of 22 and 28 m.y.$^{-1}$

FIGURE DR4

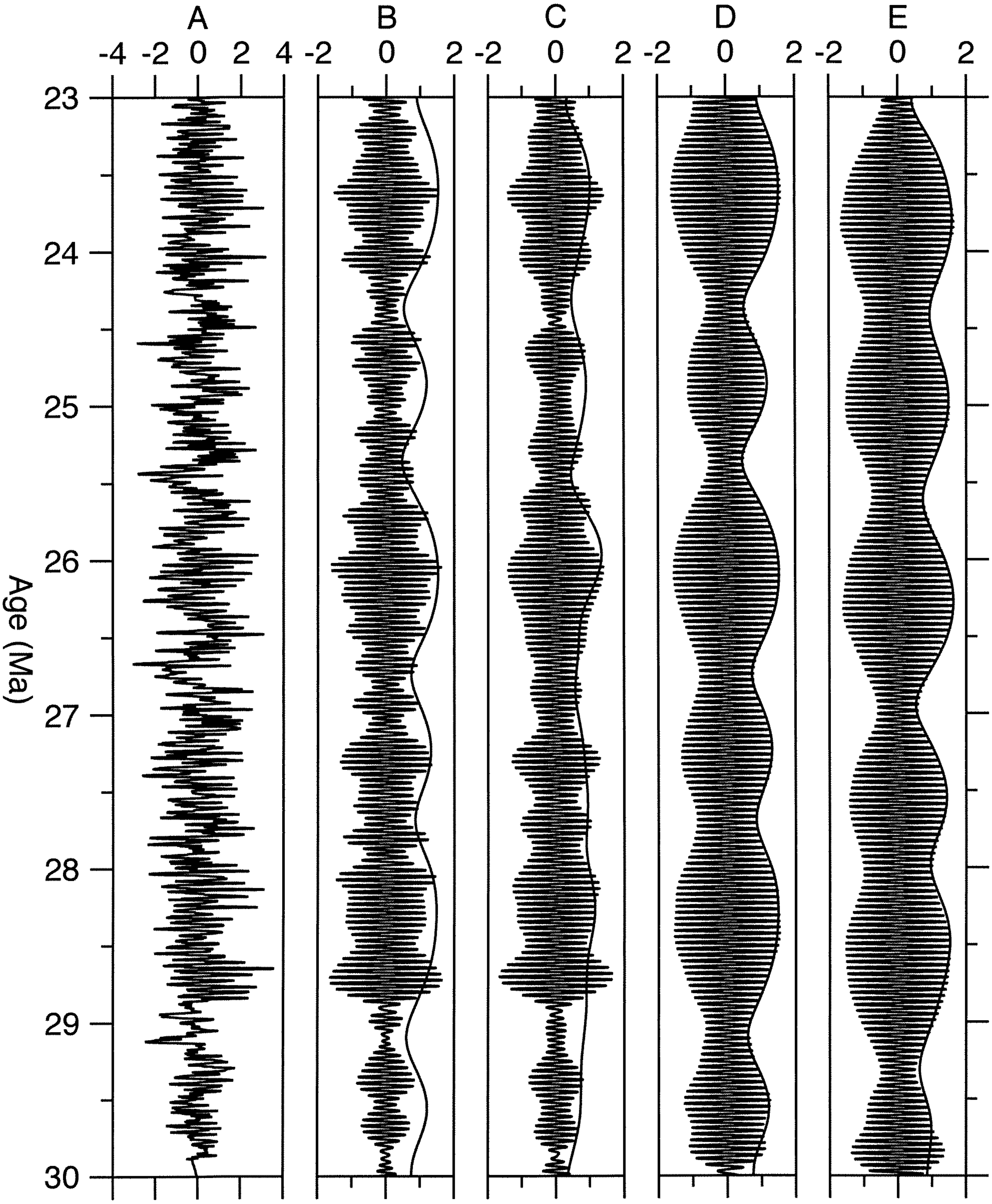

Figure DR4. A: ODP Leg 154 data (combined color reflectance and magnetic susceptibility splices, detrended, standardized to zero mean and standard deviation) from 23 to 30 Ma, tuned to La_{2004}. Obliquity filters and demodulations of A tuned to La_{2004} (B) and La_{1993} (C). Obliquity filters and demodulations of astronomical obliquity calculations for La_{2004} (D) and La_{1993} (E). Filters were calculated between frequencies of 22 and 28 m.y.$^{-1}$

FIGURE DR5

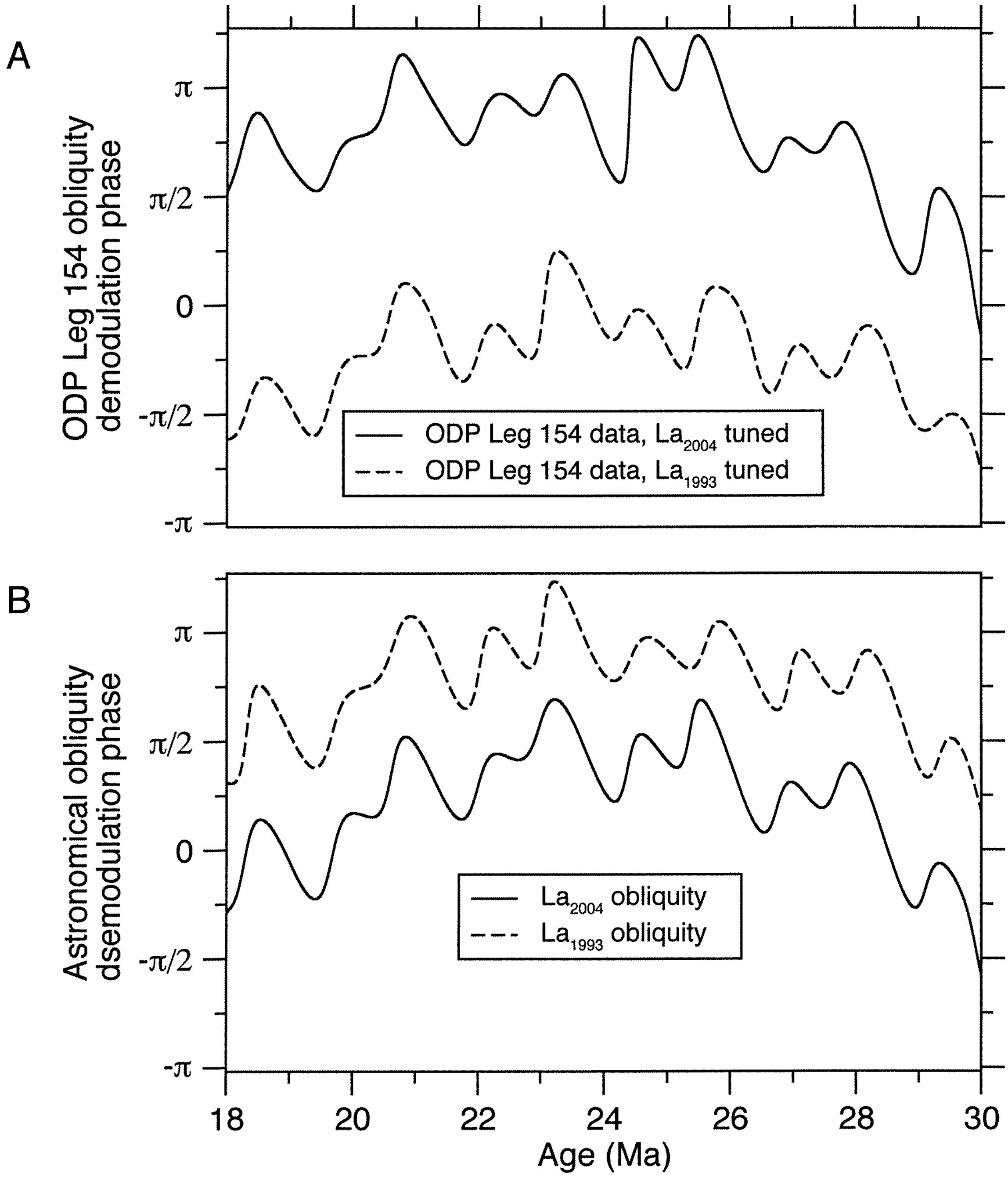

Figure DR5. A: Phase output (in radians) from obliquity demodulations for ODP Leg 154 data tuned to La_{2004} and La_{1993}. The concave shape arises from demodulating at a fixed frequency for an obliquity signal that changes due to tidal dissipation. B: Phase output from obliquity amplitude demodulations for La_{2004} and La_{1993}. The absolute phase angles depend on the exact demodulation frequencies. The results show that the obliquity cycles were well adjusted between the geological data and the astronomical calculations.

FIGURE DR6

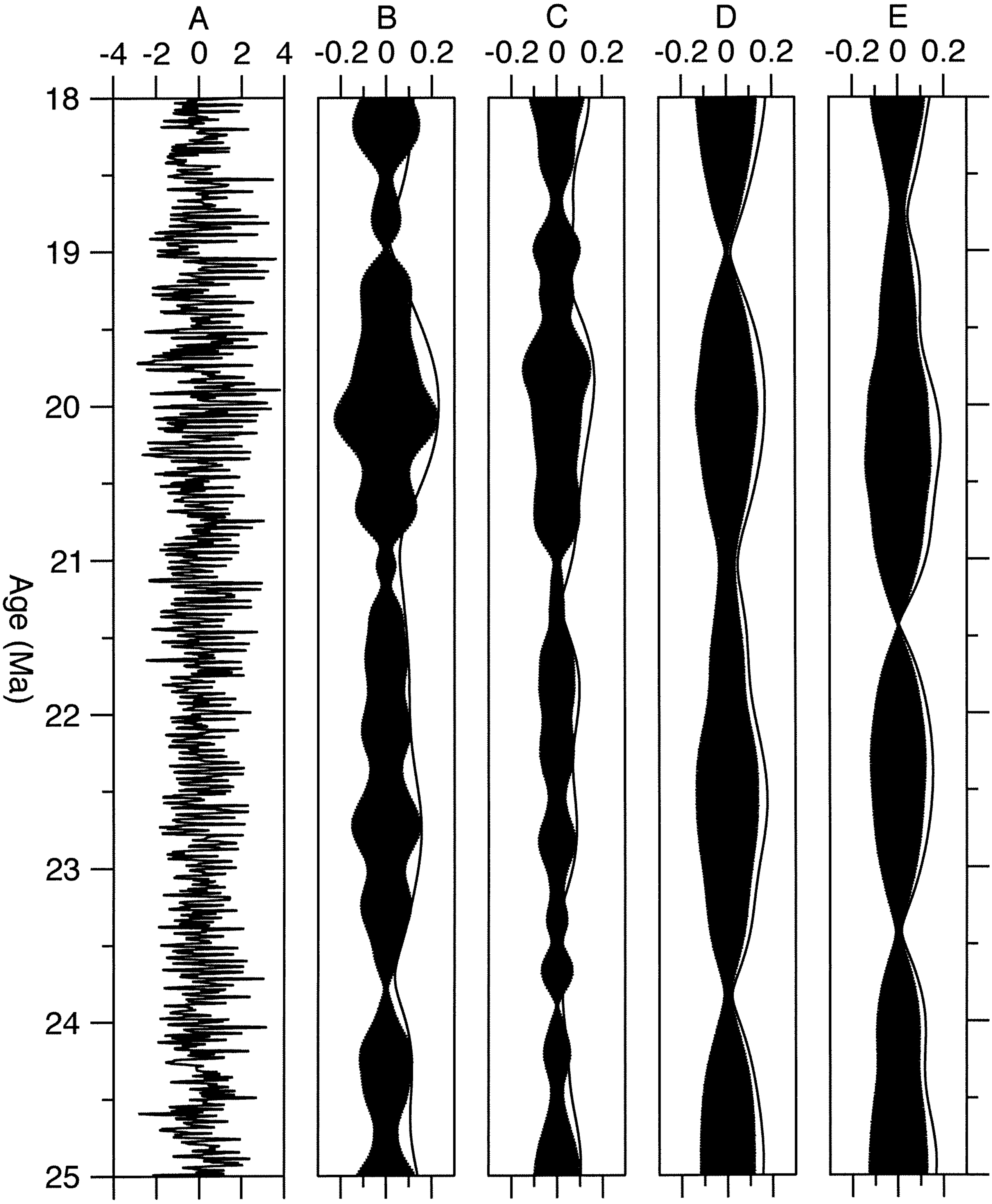

Figure DR6. A: ODP Leg 154 data (combined color reflectance and magnetic susceptibility splices, detrended, standardized to zero mean and standard deviation) from 18 to 25 Ma, tuned to La_{2004}. 19 k.y. precession filters and demodulations of A tuned to La_{2004} (B) and La_{1993} (C). 19 k.y. precession filters and demodulations of astronomical obliquity calculations for La_{2004} (D) and La_{1993} (E). Filters were calculated between frequencies of 51 and 55 m.y.$^{-1}$

FIGURE DR7

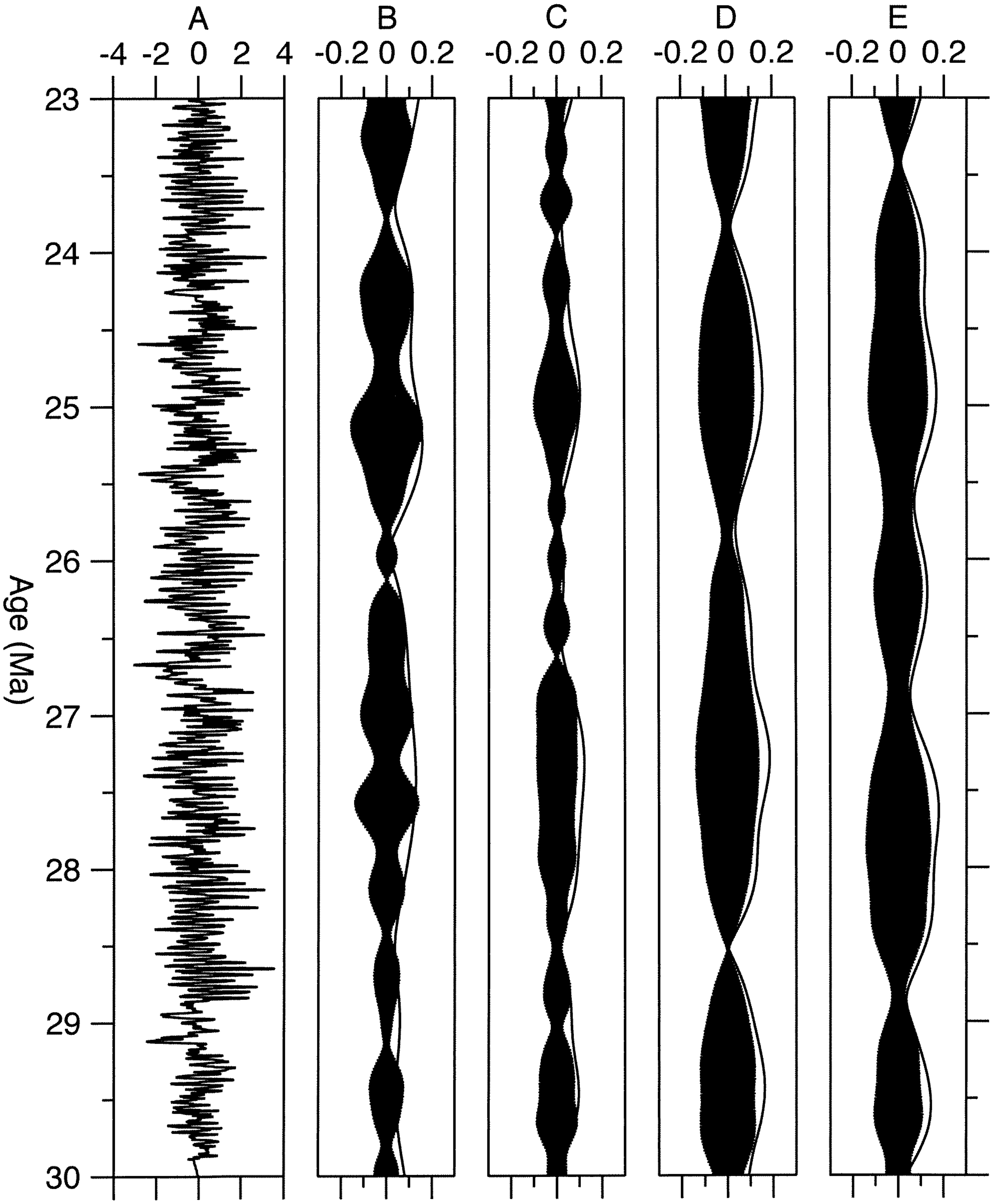

Figure DR7. A: ODP Leg 154 data (combined color reflectance and magnetic susceptibility splices, detrended, standardized to zero mean and standard deviation) from 23 to 30 Ma, tuned to La_{2004}. 19 k.y. precession filters and demodulations of A tuned to La_{2004} (B) and La_{1993} (C). 19 k.y. precession filters and demodulations of astronomical obliquity calculations for La_{2004} (D) and La_{1993} (E). Filters were calculated between frequencies of 51 and 55 $m.y.^{-1}$

FIGURE DR8

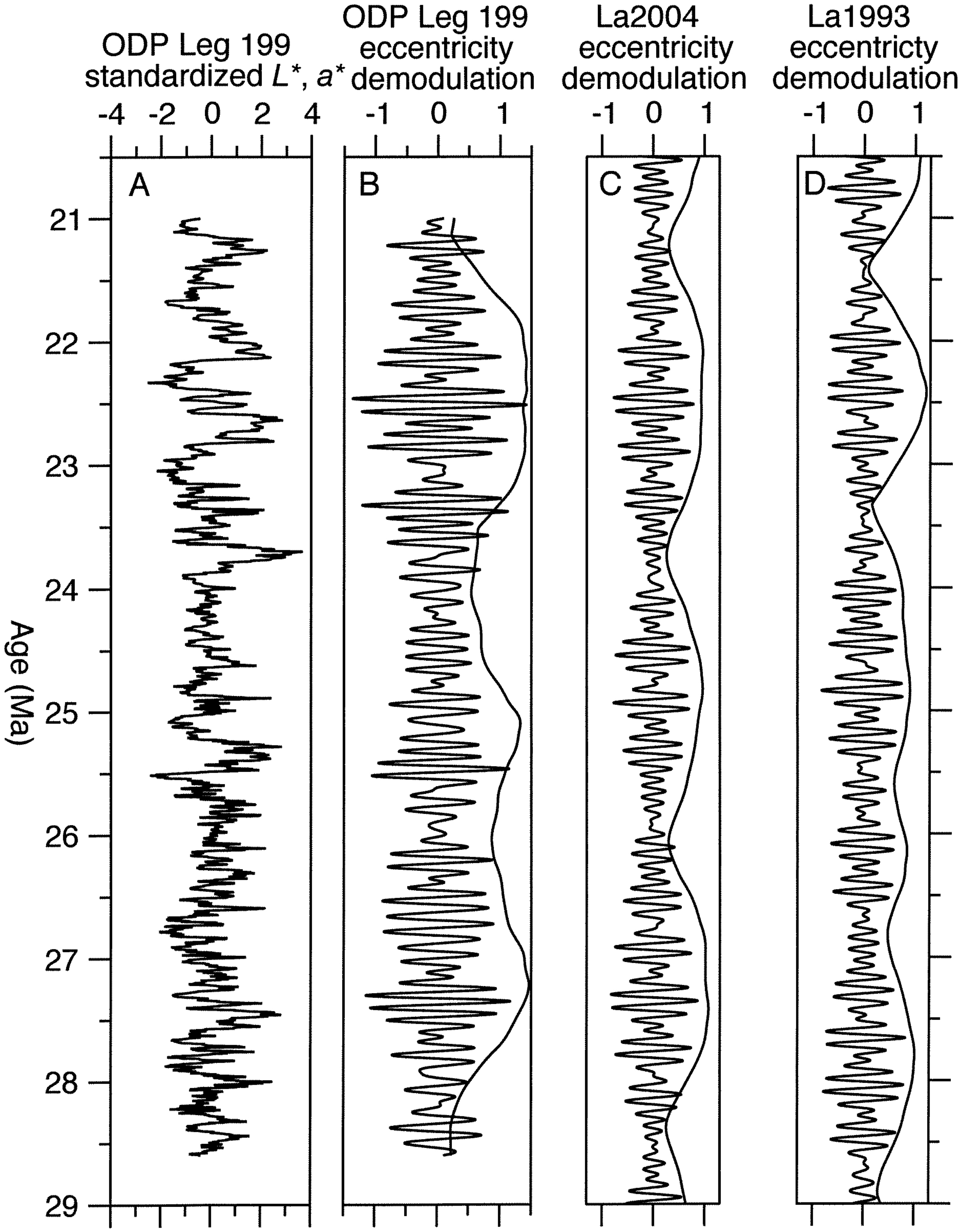

Figure DR8. A: ODP Leg 199 data (combined color reflectance *L** and *a**, detrended, standardized to zero mean and standard deviation) from 21 to 28.5 Ma, tuned to La_{2004}. B: Ca. 100 k.y. eccentricity filters and demodulations of A tuned to La_{2004}. C and D: Ca. 100 k.y. eccentricity filters and demodulations of astronomical calculations for La_{2004} (C) and La_{1993} (D). Filters were calculated between frequencies of 6 and 12 $m.y.^{-1}$

TABLE DR1. ORIGIN OF AMPLITUDE MODULATION TERMS

Interfering terms		"Beat" term		Period
Short eccentricity amplitude modulation terms				
$(g_4 - g_5) - (g_4 - g_2)$ $(g_3 - g_5) - (g_3 - g_2)$	=	$(g_2 - g_5)$	≈	400 k.y.
...		...		...
Short and long eccentricity amplitude modulation terms				
$(g_4 - g_5) - (g_3 - g_5)$ $(g_4 - g_2) - (g_3 - g_2)$	=	$(g_4 - g_3)$	≈	2.4 m.y.
...		...		...
Climatic precession amplitude modulation terms				
Identical to eccentricity frequencies and amplitude modulation terms				
Obliquity amplitude modulation terms				
$(p + s_3) - (p + s_4)$	=	$(s_3 - s_4)$	≈	1.2 m.y.
$(p + s_3 + g_4 - g_3) - (p + s_3 - g_4 + g_3)$	=	$(2g_4 - 2g_3)$	≈	1.2 m.y.
$(p + s_3) - (p + s_3 + g_4 - g_3)$ $(p + s_3) - (p + s_3 - g_4 + g_3)$	=	$(g_4 - g_3)$	≈	2.4 m.y.
$(p + s_3) - (p + s_6)$	=	$(s_3 - s_6)$	≈	173 k.y.
...		...		...

Table DR1. Origin of amplitude modulation terms that affect the Earth's eccentricity, obliquity and climatic precession. Individual g_k and s_k terms refer to those given by Laskar (1990, 2004b). The ~100-k.y.-period (short) eccentricity cycles are modulated with a period of ~405 k.y. by the long eccentricity cycle. Both short and long eccentricity cycles are modulated with a period of ~2.4 m.y., but with a phase difference of 180°, i.e. an amplitude maximum of the ~100 k.y. eccentricity coincides with an amplitude minimum of the ~405 k.y. eccentricity. Since eccentricity directly modulates the climatic precession, all eccentricity amplitude modulation terms are also present in the climatic precession signal. The obliquity signal is weakly amplitude modulated with a period of ~173 k.y., and more strongly with a period of 1.2 m.y. This amplitude modulation cycle is dynamically linked to the ~2.4 m.y. cycle present in the eccentricity modulation.