

The Decade of North American Geology 1983 Geologic Time Scale

Compiled by

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Preparation of the 27 synthesis volumes of *The Geology of North America* for the Decade of North American Geology (DNAG) is now in progress. In order to encourage uniformity among DNAG authors in the citation of numerical ages for chronostratigraphic units of the geologic time scale, an ad hoc Time Scale Advisory Committee was established by the DNAG Steering Committee in 1982. This advisory committee, consisting of Z. E. Peterman (Chairman) and J. E. Harrison, U.S. Geological Survey; R. L. Armstrong, University of British Columbia; and W. A. Berggren, Woods Hole Oceanographic Institution, was asked to evaluate numerical dating schemes that were either recently published or in press and to provide recommendations for the best numbers to use in preparation of a DNAG time scale. The chart on the opposite side of this page was developed from the recommendations of the Time Scale Advisory Committee.

Geochronometric ages (Ma, Ga) assigned to chronostratigraphic boundaries are subject to several uncertainties in addition to those introduced by the numerical dating methods themselves; boundary stratotypes for many units are not yet chosen, so disagreement exists about exact biostratigraphic placement and correlation of a boundary; and many materials that can be numerically dated are not known in good context with biostratigraphic data, so extrapolation to a chronostratigraphic boundary is commonly required. Furthermore, with respect to the late Mesozoic and the Cenozoic, differing numerical age calibrations of the magnetic polarity-reversal scale based on differing choices of scattered isotopically dated tie points, differing interpretations of the positions of biostratigraphic boundaries with respect to the polarity-reversal scale, and uncertainties in the meaning of isotopic ages derived from glauconites lead to disagreement about ages assigned to some chronostratigraphic boundaries.

With these caveats, the numerical ages given in this chart represent interpretations acceptable to the DNAG Time Scale Advisory Committee. The uncertainty bars for Paleozoic and Mesozoic ages are from data in Harland and others (1982). Uncertainty bars for the Cenozoic are not available.

Sources for the numerical ages and for the chronostratigraphic nomenclature are given below.

CENOZOIC

Berggren, W. A., Kent, D. V., and Van Couvering, J. A., 1984, Neogene geochronology and chronostratigraphy; in *Geochronology and the geologic record*: Geological Society of London (in press).

Berggren, W. A., Kent, D. V., and Flynn, J. J., 1984, Paleogene geochronology and chronostratigraphy, in *Geochronology and the geologic record*: Geological Society of London (in press).

MESOZOIC

Base of Campanian to end of Cretaceous

Berggren, W. A., Kent, D. V., and Flynn, J. J., 1984, Appendix, in *Geochronology and the geologic record*: Geological Society of London (in press).

Base of Aptian to base of Santonian

Harland, W. B., Cox, A. V., Llewellyn, P. G., Picton, C.A.G., Smith, A. G., and Walters, R., 1982, *A geological time scale*: Cambridge, Cambridge University Press, 128 p.

Base of Hettangian to base of Barremian (dating and chronostratigraphic correlation of the "M" series)

Kent, D. V., and Gradstein, F. M., 1984, A Jurassic to Recent chronology, in Tucholke, B. E., and Vogt, P. R., eds., *The Western Atlantic region*, Volume M of *The geology of North America*: Boulder, Colorado, Geological Society of America (in press).

Note: Rhaetian has been eliminated from the Late Triassic chronostratigraphic scale following Tozer, E. T., 1979, Latest Triassic ammonoid faunas and biochronology, western Canada: Geological Survey of Canada Paper 79-1B, p. 127-135.

Base of Ladinian to base of Norian

Armstrong, R. L., 1982, Late Triassic-Early Jurassic time scale calibration in British Columbia, Canada, in Odin, G. S., ed., *Numerical dating in stratigraphy*: New York, John Wiley & Sons, p. 509-513.

Base of Scythian to base of Anisian

Webb, J. A., 1982, Triassic radiometric dates from eastern Australia: in Odin, G. S., ed., *Numerical dating in stratigraphy*: New York, John Wiley & Sons, p. 515-521.

PALEOZOIC

All numerical ages except those for the upper and lower boundaries of the Paleozoic are derived from Harland and others (see above, 1982, p. 52-55). Late Carboniferous numbers are for continentally based ages (N = "Namurian"; W = Westphalian; S = Stephanian). The marine-based ages are from Harland and others (1982, Fig. 5.6). The earlier estimate for the base of the Cambrian at 570 Ma is retained.

PRECAMBRIAN

Harrison, J. E., and Peterman, Z. E., 1982, North American Commission on Stratigraphic Nomenclature, Report 9, Adoption of geochronometric units for divisions of Precambrian time: *American Association of Petroleum Geologists Bulletin*, v. 66, p. 801-802.



DECADE OF NORTH AMERICAN GEOLOGY 1983 GEOLOGIC TIME SCALE



CENOZOIC					MESOZOIC					PALEOZOIC					PRECAMBRIAN								
AGE (Ma)	MAGNETIC POLARITY	PERIOD	EPOCH	AGE (Ma)	PICKS (Ma)	AGE (Ma)	MAGNETIC POLARITY	PERIOD	EPOCH	AGE (Ma)	PICKS (Ma)	UNCERT. (m.y.)	AGE (Ma)	PERIOD	EPOCH	AGE (Ma)	PICKS (Ma)	UNCERT. (m.y.)	AGE (Ma)	EON	ERA	BDY. AGES (Ma)	
0.01	C1	QUATERNARY	HOLOCENE	CALABRIAN	0.01	66.4	C33	CRETACEOUS	LATE	MAASTRICHTIAN	66.4		245	PERMIAN	LATE	TATARIAN	245	±20	PROTEROZOIC	LATE		570	
1.6	C2	PLIOCENE	PLEISTOCENE	PIACENZIAN	1.6	74.5	C32		EARLY	CAMPANIAN	74.5	±4	253		KAZANIAN	253	±20						
3.4	C3		ZANCLEAN	3.4	84.0	±4.5	258				KUNGIURIAN	258	±24										
5.3	C4		MESSINIAN	5.3	87.5	±2.5	263				ARTINSKIAN	263	±22										
6.5	C5		TORTONIAN	6.5	88.5	±2.5	268				SAKMARIAN	268	±12										
11.2	C6	MIOCENE	SERRAVALLIAN	TORTONIAN	11.2	97.5	±2.5				286	ASSELIAN	286	±12									
15.1	C7			LANGHIAN	15.1	99.0			296	MOSCOVIAN	296	±10											
16.6	C8			BURDIGALIAN	16.6	113	±4		315	BASHKIRIAN	315	±20											
21.8	C9	OLIGOCENE	AQUITANIAN	AQUITANIAN	21.8	119	±9		320	SERPUKHOVIAN	320		333	VISEAN	333	±22							
23.7	C10			CHATTIAN	23.7	124	±9		352		TOURNAISIAN	352	±8										
30.0	C11			RUPELIAN	30.0	124	±9	360	FAMMENIAN	360		±10											
36.6	C12			Eocene	PRIABONIAN	PRIABONIAN	36.6	131	±8	367	FRASNIAN	367	±12	374	GIVETIAN	374	±18						
40.0	C13	BARTONIAN	40.0			138	±5	380	EIFELIAN	380	±18												
43.6	C14	LUTETIAN	43.6			144	±5	387	EMSIAN	387	±28												
52.0	C15	Paleocene	Ypresian	Ypresian	52.0	152	±12	394	SIEGENIAN	394	±22	401	GEDINNIAN	401	±18								
57.8	C16			THANETIAN	57.8	156	±6	408	PRIDOLIAN	408	±12												
60.6	C17			UNNAMED	60.6	163	±6	421	LUDLOVIAN	421	±12												
63.6	C18	SELIANDIAN	DANIAN	DANIAN	63.6	169	±5	428	WENLOCKIAN	428	±8	438	LLANDOVERIAN	438	±12								
66.4	C19			66.4	176	±34	448	ASHGILLIAN	448	±12													
						183	±34	458	CARADOCIAN	458	±16	468	LLANDEILAN	468	±16								
						187	±34	468	LLANVIRNIAN	468	±16	478	ARENIGIAN	478	±16								
						193	±28	488	TREMADOCIAN	488	±20	505	TREMPEALEUAN	505	±32								
						198	±32	523	FRANCONIAN	523	±36	523	DRESBACHIAN	523	±36								
						204	±18	540		540	±28												
						208	±18																
						225	±8																
						230	±22																
						235	±10																
						240	±22																
						245	±20																