

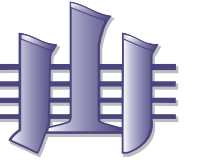


# INTERNATIONAL CHRONOSTRATIGRAPHIC CHART

www.stratigraphy.org

International Commission on Stratigraphy

v 2013/01



| Eonothem / Eon | Erathem / Era | System / Period | Series / Epoch | Stage / Age | GSSP    | numerical age (Ma) |
|----------------|---------------|-----------------|----------------|-------------|---------|--------------------|
| Phanerozoic    | Cenozoic      | Quaternary      | Holocene       |             |         | present            |
|                |               |                 |                | Upper       |         | 0.0117             |
|                |               |                 |                | Middle      |         | 0.126              |
|                |               |                 |                | Lower       |         | 0.781              |
|                |               | Pleistocene     | Calabrian      |             | 1.806   |                    |
|                |               |                 | Gelasian       |             | 2.588   |                    |
|                |               | Pliocene        | Piacenzian     |             | 3.600   |                    |
|                |               |                 | Zanclean       |             | 5.333   |                    |
|                |               | Neogene         | Miocene        | Messinian   |         | 7.246              |
|                |               |                 |                | Tortonian   |         | 11.62              |
|                | Serravallian  |                 |                |             | 13.82   |                    |
|                | Langhian      |                 | Burdigalian    |             | 15.97   |                    |
|                |               |                 | Aquitanian     |             | 20.44   |                    |
|                |               |                 | Chattian       |             | 23.03   |                    |
|                | Oligocene     |                 | Rupelian       |             | 28.1    |                    |
|                |               |                 |                |             | 33.9    |                    |
|                | Eocene        |                 | Priabonian     |             | 38.0    |                    |
|                |               |                 | Bartonian      |             | 41.3    |                    |
|                |               | Lutetian        |                | 47.8        |         |                    |
|                |               | Ypresian        |                | 56.0        |         |                    |
|                |               |                 |                | 59.2        |         |                    |
|                | Paleocene     | Thanetian       |                | 61.6        |         |                    |
|                |               | Selandian       |                | 66.0        |         |                    |
|                |               | Danian          |                | 72.1 ± 0.2  |         |                    |
|                |               |                 |                | 83.6 ± 0.2  |         |                    |
|                | Mesozoic      | Cretaceous      | Upper          | Campanian   |         | 86.3 ± 0.5         |
|                |               |                 |                | Santonian   |         | 89.8 ± 0.3         |
|                |               |                 |                | Coniacian   |         | 93.9               |
| Lower          |               |                 | Turonian       |             | 100.5   |                    |
|                |               |                 | Cenomanian     |             | ~ 113.0 |                    |
| Paleogene      |               | Eocene          | Aptian         |             | ~ 125.0 |                    |
|                |               |                 | Barremian      |             | ~ 129.4 |                    |
|                |               |                 | Hauterivian    |             | ~ 132.9 |                    |
|                |               | Paleocene       | Valanginian    |             | ~ 139.8 |                    |
|                |               |                 | Berriasian     |             | ~ 145.0 |                    |

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|----------------|---------------|-----------------|----------------|---------------|---------------|--------------------|--------------|
| Phanerozoic    | Mesozoic      | Jurassic        | Upper          | Tithonian     |               | ~ 145.0            |              |
|                |               |                 |                | Kimmeridgian  |               | 152.1 ± 0.9        |              |
|                |               |                 | Middle         | Oxfordian     |               | 157.3 ± 1.0        |              |
|                |               |                 |                | Callovian     |               | 163.5 ± 1.0        |              |
|                |               |                 |                | Bathonian     |               | 166.1 ± 1.2        |              |
|                |               | Lower           | Bajocian       |               | 168.3 ± 1.3   |                    |              |
|                |               |                 | Aalenian       |               | 170.3 ± 1.4   |                    |              |
|                |               | Triassic        | Upper          | Toarcian      |               | 174.1 ± 1.0        |              |
|                |               |                 |                | Pliensbachian |               | 182.7 ± 0.7        |              |
|                |               |                 |                | Sinemurian    |               | 190.8 ± 1.0        |              |
|                |               |                 | Middle         | Hettangian    |               | 199.3 ± 0.3        |              |
|                |               |                 |                | Rhaetian      |               | 201.3 ± 0.2        |              |
|                |               | Paleozoic       | Permian        | Upper         | Norian        |                    | ~ 208.5      |
|                |               |                 |                |               | Carnian       |                    | ~ 227        |
|                |               |                 |                |               | Ladinian      |                    | ~ 237        |
|                | Middle        |                 |                | Anisian       |               | ~ 242              |              |
|                |               |                 |                | Olnekian      |               | 247.2              |              |
|                | Lower         |                 | Induan         |               | 251.2         |                    |              |
|                |               |                 | Changhsingian  |               | 252.17 ± 0.06 |                    |              |
|                |               |                 | Wuchiapingian  |               | 254.14 ± 0.07 |                    |              |
|                | Carboniferous |                 | Pennsylvanian  | Lopingian     |               | 259.8 ± 0.4        |              |
|                |               |                 |                | Guadalupian   |               | 265.1 ± 0.4        |              |
|                |               |                 |                | Wordian       |               | 268.8 ± 0.5        |              |
|                |               |                 | Mississippian  | Roadian       |               | 272.3 ± 0.5        |              |
|                |               |                 |                | Kungurian     |               | 283.5 ± 0.6        |              |
|                | Paleozoic     |                 | Carboniferous  | Cisuralian    | Artinskian    |                    | 290.1 ± 0.26 |
|                |               |                 |                |               | Sakmarian     |                    | 295.0 ± 0.18 |
|                |               | Asselian        |                |               |               | 298.9 ± 0.15       |              |
|                |               | Upper           |                | Gzhelian      |               | 303.7 ± 0.1        |              |
|                |               |                 |                | Kasimovian    |               | 307.0 ± 0.1        |              |
| Paleozoic      | Carboniferous | Middle          | Moscovian      |               | 315.2 ± 0.2   |                    |              |
|                |               |                 | Bashkirian     |               | 323.2 ± 0.4   |                    |              |
|                |               | Lower           | Serpukhovian   |               | 330.9 ± 0.2   |                    |              |
|                |               |                 | Visean         |               | 346.7 ± 0.4   |                    |              |
|                |               |                 | Tournaisian    |               | 358.9 ± 0.4   |                    |              |

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| Phanerozoic    | Paleozoic     | Devonian        | Upper          | Famennian    |             | 372.2 ± 1.6        |
|                |               |                 |                | Frasnian     |             | 382.7 ± 1.6        |
|                |               |                 | Middle         | Givetian     |             | 387.7 ± 0.8        |
|                |               |                 |                | Eifelian     |             | 393.3 ± 1.2        |
|                |               |                 |                | Emsian       |             | 407.6 ± 2.6        |
|                |               | Lower           | Pragian        |              | 410.8 ± 2.8 |                    |
|                |               |                 | Lochkovian     |              | 419.2 ± 3.2 |                    |
|                |               | Silurian        | Upper          | Pridoli      |             | 423.0 ± 2.3        |
|                |               |                 |                | Ludlow       |             | 425.6 ± 0.9        |
|                |               |                 | Lower          | Gorstian     |             | 427.4 ± 0.5        |
|                |               |                 |                | Homerian     |             | 430.5 ± 0.7        |
|                |               |                 |                | Sheinwoodian |             | 433.4 ± 0.8        |
|                |               | Ordovician      | Upper          | Llandovery   |             | 438.5 ± 1.1        |
|                |               |                 |                | Aeronian     |             | 440.8 ± 1.2        |
|                |               |                 |                | Rhuddanian   |             | 443.4 ± 1.5        |
|                | Middle        |                 | Hirnantian     |              | 445.2 ± 1.4 |                    |
|                |               |                 | Katian         |              | 453.0 ± 0.7 |                    |
|                | Cambrian      | Lower           | Sandbian       |              | 458.4 ± 0.9 |                    |
|                |               |                 | Darriwilian    |              | 467.3 ± 1.1 |                    |
|                |               |                 | Dapingian      |              | 470.0 ± 1.4 |                    |
|                |               | Upper           | Floian         |              | 477.7 ± 1.4 |                    |
|                |               |                 | Tremadocian    |              | 485.4 ± 1.9 |                    |
|                | Cambrian      | Series 3        | Furongian      |              | ~ 489.5     |                    |
|                |               |                 | Jiangshanian   |              | ~ 494       |                    |
|                |               | Series 2        | Paibian        |              | ~ 497       |                    |
|                |               |                 | Guzhangian     |              | ~ 500.5     |                    |
|                |               |                 | Drumian        |              | ~ 504.5     |                    |
|                | Cambrian      | Series 1        | Stage 5        |              | ~ 509       |                    |
|                |               |                 | Stage 4        |              | ~ 514       |                    |
|                |               |                 | Stage 3        |              | ~ 521       |                    |
| Terreneuvian   |               | Stage 2         |                | ~ 529        |             |                    |
|                |               | Fortunian       |                | 541.0 ± 1.0  |             |                    |

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|----------------|---------------|-------------------|-------------|--------|--------------------|
| Precambrian    | Proterozoic   | Neo-proterozoic   | Ediacaran   |        | ~ 541.0 ± 1.0      |
|                |               |                   | Cryogenian  |        | ~ 635              |
|                |               |                   | Tonian      |        | 850                |
|                |               | Meso-proterozoic  | Stenian     |        | 1000               |
|                |               |                   | Ectasian    |        | 1200               |
|                | Archean       | Paleo-proterozoic | Calymmian   |        | 1400               |
|                |               |                   | Statherian  |        | 1600               |
|                |               |                   | Orosirian   |        | 1800               |
|                |               | Neo-archean       | Rhyacian    |        | 2050               |
|                |               |                   | Siderian    |        | 2300               |
|                | Archean       | Meso-archean      |             |        | 2500               |
|                |               |                   |             |        | 2800               |
|                |               |                   |             |        | 3200               |
|                |               | Paleo-archean     |             |        | 3600               |
|                |               |                   |             |        | 4000               |
| Hadean         |               |                   |             | ~ 4600 |                    |

Units of all ranks are in the process of being defined by Global Boundary Stratotype Section and Points (GSSP) for their lower boundaries, including those of the Archean and Proterozoic, long defined by Global Standard Stratigraphic Ages (GSSA). Charts and detailed information on ratified GSSPs are available at the website <http://www.stratigraphy.org>. The URL to this chart is found below.

Numerical ages are subject to revision and do not define units in the Phanerozoic and the Ediacaran; only GSSPs do. For boundaries in the Phanerozoic without ratified GSSPs or without constrained numerical ages, an approximate numerical age (~) is provided.

Numerical ages for all systems except Permian, Triassic, Cretaceous and Precambrian are taken from 'A Geologic Time Scale 2012' by Gradstein et al. (2012); those for the Permian, Triassic and Cretaceous were provided by the relevant ICS subcommissions.

Coloring follows the Commission for the Geological Map of the World. <http://www.ccgw.org>



Chart drafted by K.M. Cohen, S. Finney, P.L. Gibbard (c) International Commission on Stratigraphy, January 2013

<http://www.stratigraphy.org/ICSchart/ChronostratChart2013-01.pdf>