

TimeScale Creator datasets (thematically ordered) GTS2012 age models			
46,000 datalines; in ca. 400 columns that are grouped into ca. 120 directories/subdirectories. Most text entries have pop-ups with calibrations, sources and comments. Selected references are at end of this table.			
Category			
Group and sub-group	Subsets	Age span	Sources (selected major ones)
Standard International Chronostratigraphy			10 columns
Eon, ... Period, ... Age/Stage, Substage		Present - Hadean	GSSP definitions and graphics are at http://stratigraphy.science.purdue.edu (Geologic TimeScale Foundation; mirrors to server at Purdue Univ. engineering). GSSPs are formalized by the International Commission on Stratigraphy (www.stratigraphy.org).
GSSPs (<i>boundary stratotypes</i>)		Present - Ediacaran	Mouse-Over option brings up windows with details on each ratified or potential boundary, plus direct URL links to GSSP documentation for each section (details, location map, stratigraphic section) at http://stratigraphy.science.purdue.edu (Geologic TimeScale Foundation)
Planetary		11 columns	Tanaka, K.L. and Hartman, W.K. (GTS 2012) Planetary time scale.
Moon	Periods / Epochs / Events	Present - 4.6 Ga	
Mars	Periods / Epochs / Events	Present - 4.6 Ga	
Venus	Periods / Events	Present - 4.6 Ga	
Mercury	Periods / Events	Present - 4.6 Ga	
Regional Stages		46 columns	From GTS2012 period-chapters, plus other selected regions. [See extensive pop-up windows explaining disagreements or uncertainties in calibrations.]
Jur-Cret boundary regional stages - British and Boreal	British regional Stages / Substages	Ryzanian-Kimm.	Jur-Cret boundary = GTS2012 Jurassic chapter (original was compiled by Sven Backstrom, via Felix Gradstein, ~1995), with revised calibrations aided by Mikail Rogov (2011)
	Boreal regional Stages / Substages		
North America regional units	Series / Stages	Cret - Precambrian	
	Type Mississippian Lithostratigraphy (USA) / Mid-continent conodont markers	Carb.	Generalized from Heckel et al., 2005; with additional correlations by Paul Brenckle, written commun., October 2006)
	California	Cenozoic	GeoWhen (compiled by R. Rohde; at www.stratigraphy.org)
Iberian-Morocco regional units (Cambrian)	Series / Stages	Cambrian	Geyer and Landing (2004)
Western European and British regional units	W. Europe-British Series	Cret - Cambrian	
	East Avalonian Series (Cambrian)	Cambrian	
	W. Europe Stages / Substages	Perm - Cambrian	Perm-Carb = Henderson (GTS2012) and Davydov (GTS2004/GTS2012) and German Stratigraphic Commission (2002); Ordovician = Webby et al (2004); Cambrian = Peng (GTS2008/2012)
	British Substages	e. Carb.	Menning et al (2006), plus advice of Peter Jones (Aust. Natl. Univ.). [See extensive pop-up windows explaining disagreements or uncertainties in calibrations.]

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German Basin Triassic Lithostratigraphy	Main Germanic Triassic Facies (generalized) / Folge divisions or Members		LithDesc (partly Feist-Burkhardt, S., et al., 2008. Triassic. In: The Geology of Central Europe. See also Triassic Fossils (with strat) at www.palaeo-online.de . Early Triassic Folge are considered to be 100kyr periodicity by Backman, Menning, Kozur, Szurilies and others
Baltoscandia regional units	Series / Subseries / Stages / Substages	Sil. - Ordov.	Silurian = partly based on Estonian conodont summary in Männik, 2007, Estonian J. Earth Sci., 56:35-46. Ordovician = Webby et al (2004)
Russian and Ural regional units			NOTE: See the extensive RUSSIAN BIOSTRAT DATAPACK for Russian regional zones and stages (part of PRO suite)
	Russia Platform regional units == Series / Stages / Substages or horizons / Permian horizons (pre-2005 and Carb sub-horizons	Jur-Cret, Perm-Carb, Cambrian	Jur-Cret boundary = GTS2012Jurassic chapter and Groupe Francais d'etude du Jurassique (1997); Permian = Kotlar and Pronina-Nestell (2005) with fusulinid-ages from Davydov/Henderson (GTS2008/2012), Permian "East-European Stratigraphic Scale 2005" is from Kotlyar and Pronina-Nestell (2005; Permophiles - This scale removed a system of horizons, which are indicated in the comments for each Stage.); Carboniferous = Menning et al. (DCP 2006); Cambrian = Peng and Babcock (GTS2012)
	Donets Basin sub-units -- Substages or horizons / Sub-horizons	Carboniferous	Partly from Menning et al. (DCP 2006) inter-calibrations to Russian stages
	N-E Siberia (Carboniferous)		Partly from Menning et al. (DCP 2006) inter-calibrations to Russian stages
	Kazakhstan	Cambrian-PreCambrian	Peng and Babcock (GTS2012)
Tethyan regional units (Permian)	Stages (Pamirs) / Stages (Salt Range)	Permian	Davydov (GTS2004) and Henderson (GTS2012)
East Asian regional units	South China -- Series / Stages	Jur-Camb.; Precamb.	Permian-Carb from from Henderson (GTS2012) and from Menning et al, 2006; except Late Carboniferous from Zhang and Zhou (2007; Carb-Perm Congress); Ordovician from Webby et al. (2004); Cambrian series from Shanchi Peng (2003) and Peng and Babcock (GTS2012)
	North China, E. Yunnan -- Epoch / Age-Stage	Cambrian	Shanchi Peng (2003) Chronostratigraphic subdivision of the Cambrian of China. <i>Geologica Acta</i> , 1: 135-144.
	Japan -- Stages	Neogene, Cret.	GeoWhen (compiled by R. Rohde; at www.stratigraphy.org)
Australia and New Zealand	Australia -- Stages	Cenozoic; Ordov.-Camb.	John Laurie (GeoScience Australia, to Jim Ogg, 2007 through 2012)
	New Zealand chronostratigraphy -- Series, stages, substages, abbreviations	Present - Camb.	NOTE: Suites are in "standard" NZ color scheme. [See extensive pop-up windows with stage definitions.]. Table 1.3 in Cooper et al (2004); with Cenozoic-Cretaceous updates and possible calibrations to magnetic chrons provided by Andrew Boyes (and Chris Hollis) at GNS (pers. commun. to J.Ogg; Nov'11 and Aug'12; and remarks incorporated into GTS2012 regional chart)
African	South Africa	PreCambrian	GeoWhen (compiled by R. Rohde; at www.stratigraphy.org)
Ordovician Time Intervals	Bergstrom et al (2009)	Ordov.	Bergstrom et al (Lethaia, 2009)
	Alternate (Berry et al., 2004)	Ordov.	Berry et al (2004)
Geomagnetic Polarity			
Composite polarity scale for Phanerozoic		Present - Cambrian	GTS2012 composites [Cenozoic-Late Jurassic from chapter on geomagnetic polarity time scale; Late Triassic provided by Dennis Kent in June 2005 (after Kent and Olsen, 1999), Early Triassic after Szurilies (2007) and Hounslow (2007), Late Permian after Steiner (2006); and other periods after compilations in associated GTS2004 chapter]. Early Permian-Devonian = modified slightly from compilations in GTS04 (see Concise GTS). Ordov-Late Camb = Pavlov and Gallet, 2005. Middle and Early Camb = Kirschvink and Rozanov, 1984; Kirschvink, 1978.

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Other Jurassic and Triassic oceanic and outcrop reference scales	Crussol and Poland Kimmeridgian	Lt. Jur.	Crussol outcrop and Polish composite from Przybylski, Ogg et al. (2010, with unpublished uppermost Kimm continuation at Crussol (Ogg-Atrops, unpublished except in Jur. Subcomm. Newsletter)
	Pre-M26 Deep-Tow Models -- At Seafloor model / Mid-Depth Projection model	M.-Lt. Jur.	Seafloor signal and Upward projection to sea-surface anomaly model. M27-M37n = Sager et al. (1998) with reinterpretation and M37r-M45 extension by Tominaga et al. (2008)
	Late Triassic outcrop magnetostratigraphy / Lowermost Newark	Lt. Tri.	Modified from Triassic composite of Hounslow and Muttoni (2010)
Main Mesozoic-Paleozoic Macrofossil Groups			
Ammonoids	18 columns		
Ammonoids (Mesozoic)	Tethyan Zones / Subzones	Cret - Tri.	CRETACEOUS = Thierry et al. (in Hardenbol et al., SEPM charts, 1998), with GTS2004 and Kilian Group (2004-2011) revisions; JURASSIC = Groupe Français d'étude du Jurassique (1997); TRIASSIC = Mietto and Manfrin (in Hardenbol et al., SEPM charts, 1998), with GTS2004 and Kozur (2003 and pers. commun., 2006, 2010) and Marco Balini (2010) revisions; Permian = Low-Latitude suite from Kozur (2003), but see Permian suite (under Paleozoic ammonoids) by Henderson (2012).
	North American Western Interior Zones / Close-spaced zones	Late Cret.	W.A. Cobban (in Hardenbol et al., SEPM charts, 1998), with GTS2008/2012 revisions. Intervals with close-spaced (less than 0.3 myr) zones have a separate column to avoid over-crowding.
	Sub-Boreal Zones / Subzones	Cret - Triassic	CRETACEOUS = J. Thierry et al. (in Hardenbol et al., SEPM charts, 1998), with GTS2004 revisions; JURASSIC = Groupe Français d'étude du Jurassique (1997) and Mikhail Rogov (pers. commun., etc., 2010-2011; TRIASSIC = P. Van Veen (in Hardenbol et al., SEPM charts, 1998) and Balini (2010).
	Boreal Zones / Subzones	e.Cret. - Trias.	GTS2004 Jurassic chapter (<i>original was compiled by Sven Backstrom, via Felix Gradstein, ~1995</i>), and Groupe Français d'Étude du Jurassique (1997)
Ammonoids (Paleozoic)	Ammonoid zone abbreviation / Zone name / Major Paleozoic ammonoid markers	Permian - Devon	NOTE: Paleozoic zonations are not as well-standardized as for the Jurassic. PERMIAN = Davydov et al., 2004, Kozur, 2003, and Henderson, 2005, 2012); CARBONIFEROUS = GTS2004 and GTS2012 diagrams (Davydov et al., 2004, 2012), DEVONIAN = Becker and House (2000) and Becker (GTS2012).
	Boreal zone (Perm-Carb Cis-Urals)	Perm-Carb	
	Carboniferous ammonoid zone (Work, 2008)	Carboniferous	Zonal calibrations are partly contributed by David Work (Jan'08 for Concise GTS)
	Devonian ammonoid Geno-zone / Geno-zone name / Subzone name	Devonian	Devonian zonations, taxa names and relative age-calibrations (relative to conodont "master" scale) are based on Thomas Becker's detailed chart (2010/2011; which was partly incorporated in GTS2012)
Conodonts	15 columns		TRIASSIC = Tethyan zones of Kozur'03 with Early Triassic modified after Orchard'07; PERMIAN-CARBONIFEROUS = GTS2012 diagrams of Henderson and of Davydov (zones used for Spline-fit of this age scale); DEVONIAN = Becker (GTS2012) suite used for spline-fit age model; SILURIAN = "Standard" of Mike Melchin in GTS2012; ORDOVICIAN = North Atlantic conodont zones (Figure 2.2 in Webby et al. (2004; The Great Ordovician Biodiversification Event); with ages (and some zones) modified by Roger Cooper (chart of Nov'2010 for GTS2012). Cooper's placement relative to Australia "Conop/spline-fit" zones is used here.); CAMBRIAN = South China zones by Chen et al (2010 pers. commun. to J.Ogg; during sessions at Nanjing Inst. Geol. Paleont.) as scaled by Peng and Babcock (GTS2012 graphics)
Conodont zones (general)	Conodont zonation (selected)	Tri.-Camb.	
	Conodont subzones (Devonian; Ordovician)	Triassic	Devonian conodont zonations, taxa names, and relative age-calibrations (relative to conodont "master" scale) are based on Thomas Becker's detailed chart (2010/2011; which was partly incorporated in GTS2012). ORDOVICIAN = North Atlantic conodont zones (Figure 2.2 in Webby et al. (2004; The Great Ordovician Biodiversification Event); with ages (and some zones) modified by Roger Cooper (chart of Nov'2010 for GTS2012). Cooper's placement relative to Australia "Conop/spline-fit" zones is used here.)
	Conodont major markers	Tri.-Camb.	TRIASSIC = mainly Orchard and Tozer (1997) and Kozur (2003); PERM-CARB = GTS2012 diagrams of Henderson and of Davydov; DEVONIAN = Thomas Becker (GTS2012)

Category			
Group and sub-group	Subsets	Age span	Sources (selected major ones)
Conodont zones (regional and alternate)	N.Amer. Triassic conodont zones	Triassic	Mainly Orchard and Tozer (1997)
	Permian-Carboniferous other conodont zonations -- Permian conodont zones (and number) of Davydov'04; Carboniferous of Lane'08 and Russian'06 / North American Mid-Continent conodont zones and datums (Carboniferous)	Perm-Carb	Lane and Brenckle (2005); Mississippian from Lane (2005); Pennsylvanian provided by Phil Heckel (pers. commun., Nov'07)
	Devonian other conodont zonations -- MN (Montagne Noire) set and regional Zones / Subzones; Conodont Index species	Devonian	Thomas Becker's detailed chart (2010/2011; which was partly incorporated in GTS2012).
	Ordovician North American Midcontinent Conodont Zones	Ordov.	Figure 2.2 in Webby et al. (2004; The Great Ordovician Biodiversification Event); with ages (and some zones) modified by Roger Cooper (chart of Nov'2010 for GTS2012). Cooper's placement relative to Australia "Conop/spline-fit" zones is used here.
	Cambrian Australian Zones / Datums	Camb.	From Australian time-scale diagrams (Laurie et al.; calibrated to their regional stages, in turn calibrated to scaled China stratigraphy by Peng and Babcock, GTS2012)
Graptolites	11 columns		Numerical age standards = Cooper & Sadler, 2005
Graptolite Zones (composite)	Graptolite Zones (general)	e. Devon. - Ordov.	This hybrid Ordovician Australian and "standard" Silurian suite was used to scale the Ordovician-Silurian (Cooper, Melchin, Sadler in GTS2012). Devonian zonations (relative to conodont "master" scale) are based on Thomas Becker's detailed chart (2010; delivered to Gradstein and Ogg, and partly used in GTS2012)
	Australian Ordovician Zone abbreviation and Subzones -- 3 columns	Ordov.	Numerical ages = Tied to Spline-CONOP12 table; about Base of Silurian assumed for top of Bo5 zone. Biostratigraphy; VandenBerg & Cooper 1992; Cooper and Lindholm 1990.
	Graptolite markers (Ordov., Dev.)	Dev., Ordov.	ORDOV Biostratigraphy from VandenBerg & Cooper 1992. Numerical ages = Cooper & Sadler, 2005, as interpreted by John Laurie, May 2007 (Pers. commun.); DEVON = Thomas Becker's detailed chart (2010/2011; which was partly incorporated in GTS2012).
Regional Graptolite zones			Figure 2.1 in Webby et al. (2004; The Great Ordovician Biodiversification Event)
	North American graptolite zones	Ordovician	
	Chinese graptolites -- Zones / Subzones	Ordovician	
	British graptolites -- Zones / Subzones	Ordovician	
	Baltoscandia graptolite zones	Ordovician	
Trilobites and pre-Trilobite biostratigraphy	13 columns		NOTE: Includes Small Shelly Fossils, and some Archaeocyaths
South China trilobites	Benthic trilobites (Polymerids); S.China	Cambrian	Zonal scheme from Peng (2003; Geol. Acta, 1:135-144 (www.geologica-acta.com:8080/geoacta/pdf/vol0101a14.pdf); but modified by Peng, 2007 to J.Ogg; and Peng, Jan2011 to G.Ogg); Ages based on Peng and Babcock (Concise GTS 2008; GTS 2012)
	Pelagic trilobites (Agnostids); S.China	Cambrian	
Siberia trilobites	Main Siberia set / Alternate Siberia set	Cambrian	Zonal schemes from Peng and Babcock (GTS2012) with ages based on placement relative to S.China trilobite zone "primary" (Jan2011 to G.Ogg)
Australia trilobites		Cambrian	Zonal schemes from Peng and Babcock (GTS2012) with ages based on placement relative to S.China trilobite zone "primary" (Jan2011 to G.Ogg)
Laurentia trilobites	Main Laurentia set / Alternate Laurentia set	Cambrian	Zonal schemes from Peng and Babcock (GTS2012) with ages based on placement relative to S.China trilobite zone "primary" (Jan2011 to G.Ogg)

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<i>Archaeocyaths, Acritarchs</i>	Archaeocyath Zones (Australia; middle Cambrian)		
	Acritarch zones (Australia)		
Early Paleozoic Biotic Events and Divisions	4 columns		
	Major Biotic Events (Silurian)	Silurian	Bioevents -- graptolite (G) and conodont (C) from Melchin (Aug'11) using (Jaeger, 1991; Jeppsson, 1998; Melchin et al. 1998, Jeppsson et al., 2006)
	Ordovician Time Slices (plus Alternate set (Berry et al., 2004))	Ordov.	Bergstrom et al (Lethaia, 2009); Berry et al (2004)
	Major Cambrian markers	Cambrian	Peng and Babcock (GTS2012) with ages based on placement relative to S.China trilobite zone "primary" (Jan2011 to G.Ogg)
Other Marine and Lacustrine Macrofossils			
Belemnites	5 columns		R. Combemorel (in Hardenbol et al., SEPM charts, 1998)
	NW Europe Zones / Subzones	Cret - Jur.	
	Balto-Scandia Belemnite Zone (Lt. Cret.); Tethyan (Oxf-Haut)	Cret - Jur.	
	Tethyan Belemnite subzone (Lt.Jur.)	Lt. Jur.	
	Russian platform zones	Lt. Cret.	
Bivalves (Inoceramids, Pelecypods, etc.)	23 columns		
Cretaceous Inoceramids	N.Amer. inoceramid Zones / Close-spaced Zones	Lt. Cret.	N.Amer. U.Cret. = Cobban et al., 2006, USGS report. Europe-Russia = A.V. Dhondt (Inoceramids) and Paul van Veen (Triassic pelecypods) (in Hardenbol et al., SEPM charts, 1998); Other columns from A.V. Dhondt (Inoceramids) and Paul van Veen (Triassic pelecypods) (in Hardenbol et al., SEPM charts, 1998)
	Western European Inoceramids	Lt. Cret.	
	Aquitaine Inoceramids	Lt. Cret.	
	Central European/ Russian Platform Inoceramids Zones / Markers	Lt. Cret.	
Triassic Bivalves	West Tethys bivalve zone	Triassic	Ranges are from Chris Roberts, pers. commun., Aug 2007; in-press for Triassic time scale special publication for 2009. Zones are McRoberts'10; but problem fitting zone names and ranges (many inconsistent usages?)
	North America bivalve zone	Triassic	
	Boreal bivalve zone	Triassic	
	Siberian Pelecypod Zone / Subzone	Lt. Tri.	Paul van Veen (Triassic pelecypods) (in Hardenbol et al., SEPM charts, 1998)
Conchostracans	Conchostracan Zones		Kozur and Weems (2010)
Brachiopods	Tethyan Brachiopod Zone / Subzone	m.-e. Jur.	B. Laurin (in Hardenbol et al., SEPM charts, 1998)
	Boreal Brachiopod Zone / Subzone	Lt.-m. Jur.	
Rudists	Western Europe datums	Cretaceous	J.-P. Masse and J. Philip (in Hardenbol et al., SEPM charts, 1998)
	Periadriatic datums	Cretaceous	

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Ostracodes and Dacryonarids	Boreal Ostracode datums	Present - Tri	J.-P., Colin et al. (in Hardenbol et al., SEPM charts, 1998)
	French Ostracode Zones / Subzones	Jurassic	J.-P., Colin et al. (in Hardenbol et al., SEPM charts, 1998)
	Tethyan Ostracode datums	Present - Jur.	
	Devonian Ostracode Zone / Subzone / Datum	Devonian	Devonian Pelagic ostracode zones are from Groos-Uffenorde et al (2000; Cour. Forsch.-Inst.Senckenberg 220:99-111; http://www.jstor.org/view/00223360/ap040327/04a00090/0). Relative calibration to conodont zones was revised by Thomas Becker (2010; diagram to J.Ogg) from Groos-Uffenorde summary figure (page 104).
	Dacryoconarid Zones	Devonian	Dacryoconarids are tentaculites -- an extinct genus of molluscs. The taxonomic classification is uncertain, but some group them with pteropods. Relative calibration to conodont zones was revised by Thomas Becker (2010; diagram to J.Ogg).
Microfossils			
Planktonic and Benthic Foraminifers	35 columns		
Planktonic Forams			NEOGENE = Berggren et al. (1995a,b), with revised age calibrations from Lourens et al. (GTS2004 appendix) and Erik Anthonissen (GTS2012 appendix; also for Paleogene). PALEOGENE = Berggren et al. (1995a,b) with age updates from Berggren and Pearson (2005) and Wade et al. (2010). CRETACEOUS = May 2011 meeting of Late Cretaceous microfossil working group (UCL) modifying ODP Leg 171 and other scales, plus communications from Brian Huber and others
	Sub-Tropical Zone / Subzone	Present - Cret.	Sub-Tropical Zones/Subzones from Wade et al., 2011
	N,P Zones (Cenozoic)	Cenozoic	Blow, 1979; Berggren & Miller, 1988; Berggren et al'1995
	Formal Foram Zone name / Subzone name	Cenozoic	
	Foram Zone Marker	Present - Cret.	
	Other Foram FAD/LAD	Present - Cret.	
	Additional Neogene and lesser Paleogene Foram FAD/LAD	Cenozoic	Mainly events not in Wade et al'11; but tabulated in Lourens et al'04 (esp. Medit.) or Berggren et al'95. Plus, events in Wade et al'11 that seemed relatively minor.
Benthic Foraminifers			
Larger Benthic Forams	Tethyan Shallow Benthic Zones (SBZ, etc.) / Markers	Cenozoic; Jur-Trias.	Various authors in Hardenbol et al (SEPM charts, 1998): [SBZ set of Oligocene-Miocene = B. Cahuzac and A. Poignant. plus detailed Paleocene-Eocene = J. Serra-Kiel and L. Hottinger -- Larger foram vs Planktonic zone diagram sent by R.Speijer, Feb'11 for GTS2012. Cenozoic zone details from Working Group on Larger Foraminifera (SBZ zones): http://cenozoicforaminifera.com/ . Upper Cretaceous = M. Bilotte. Lower Cretaceous = Annie Arnaud Vanneau. Jurassic & Triassic = B. Peybernes.]
	Other Larger Benthic Foram datums	Present - Cret.	
	Jurassic benthic foram datums (Bassoullet'97)	Jurassic	Jean-Paul Bassoullet -- chapter on "Les Grands Foraminiferes"; in Groupe Français d'Étude du Jurassique (1997)
Benthic Foram Letter stages (East Indies)	Letter-stage / Benthic Foram Stage Datum (Philippines) / Other datums	Cenozoic	Matsumaru, Kunitaru, 2011. A new definition of the Letter Stages in the Philippine Archipelago. Stratigraphy, 8 (no. 4): 237-252.
Fusulinids and Benthic Forams (Carb-Perm)	Benthic Foram zone Abbreviation / Name	Perm - Carb	Scheme of Davydov (GTS04)
	Standard Carboniferous fusulinid zone	Carboniferous	Zones are from Russian chart (2006) which referenced: Postanovlenia MSK ..., 2003
	Major Markers	Perm - Carb	Perm = Henderson, 2012; Carb = Davydov, 2004

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	Boreal Benthic Foram Zone	e. Perm - Carb	Davydov (1996, Carb-Perm chapters in GTS2004, unpublished zonation table to GTS2004, and unpublished Permian correlation chart)
	Tethyan Benthic Foram Zone		
	N.Amer. Mid-Continent Zone / Assemblage / Marker	Perm - Carb	MISS = Paul Brenckle (pers. commun., October 2006; and in Lane and Brenckle, 2005), PENN = unpublished ExxonMobil'01, PERMIAN = Davydov (1996; 2001)
	Other N.Amer. Mid-Continent	Perm - Carb	Ross and Ross (1988, 1995b)
	North American Cordilleran Zones / Assemblages	Carboniferous	Paul Brenckle (2006, written communication to Jim Ogg)
<i>Smaller Benthic Forams</i>	Boreal Cret Smaller Foram Markers / Datums	Cretaceous	F. Magniez-Jannin (in Hardenbol et al., SEPM charts, 1998)
	Tethyan Jurassic Zones / Subzones / Markers (Ruget&Nicollin'97)	Jurassic	Christiane Ruget and Jean-Pierre Nicollin -- chapter on "Les Petits Foraminifères Benthiques Degages"; in Groupe Français d'Étude du Jurassique (1997)
	Tethyan Jurassic Zones / Markers / Other Datums (SEPM'98)	Jurassic	F. Magniez-Jannin and C. Ruget (in Hardenbol et al., SEPM charts, 1998)
Calpionellids	2 columns		
	Zones / Datums	E.Cret. - Lt. Jur.	J. Remane (in Hardenbol et al., SEPM charts, 1998), with GTS2004 revisions.
Calcareous Nannofossils	16 columns		
<i>Tropical and Mid-latitude Calcareous Nannofossils</i>	NN,NP,CC,NJT,NT Zone / Subzone	Present - Lt. Trias.	NEOGENE = mainly Lourens et al. (GTS2004 tables); PALEOGENE = Composite of ODP studies, plus Berggren et al. (1995a, b) -- reviewed and enhanced by Paul Bown, June 2011. Late CRETACEOUS = mainly Late Cret. working group (London, June 2011), which modified Burnett (1999) and Erba et al (1995) as tabulated by ODP Leg 171B Init. Repts. (Table 2, p. 17-18). Middle and Early CRETACEOUS = compiled by Jim Bergen, based on publications by Tim Bralower et al (1995), J. Bergen (1994) and Eric de Kaenel. Tethyan Early-Middle Jur zones from Mattioli and Erba (1999); Late Jur zones from Casellato, 2011. See NannoTax links for individual taxa images, etc.
	CN,CP,NC Zone / Subzone	Present - Cret.	
	UC Zone / Subzone (Lt. Cret.)	Lt. Cret.	
	Tethyan Nanno Zone Marker	Present - Lt. Trias.	
	UC Tethyan Subzone Marker (if not NC-CC)	Lt. Cret.	
	Other Tethyan Nanno FAD/LAD	Present - Jur.	High-resolution (<i>need expanded vertical scale</i>); mainly Lourens et al. (GTS2004/GTS2012 tables)
	Additional Plio-Pleist datums	Present - Pliocene	
<i>Boreal Nannofossils</i>	Boreal UC,BC,NJ,NT Nanno Zone / Subzone	mid-Cret - Lt. Trias.	NEOGENE = mainly Lourens et al. (GTS2004 tables); PALEOGENE = Composite of ODP studies, plus Berggren et al. (1995a, b) -- reviewed and enhanced by Paul Bown, June 2011. Late CRETACEOUS = mainly Burnett (1998); Early CRETACEOUS = mainly Bown et al. (1998); JURASSIC = Bown and Cooper (1998); TRIASSIC = Bown (1998).
	Boreal NK Zones / KN Zones	Late Cretaceous	
	Boreal Nanno Zone Marker	mid-Cret - Lt. Trias.	
	Boreal Nanno subzonal and other markers	mid-Cret - Jur.	
Dinoflagellate cysts, Acritarchs and Chitinozoans	16 columns		
Dinoflagellate cysts			
<i>Dinoflagellate Cysts (N.Atl./Boreal)</i>	N. Atl./Boreal Dinocyst Zone / Subzone	Present - Lt. Trias.	CENOZOIC = mainly J. Powell in GTS2004 (Neogene and Paleogene figures). CRETACEOUS = mainly J.-C. Foucher and E. Monteil (in Hardenbol et al., SEPM charts, 1998). JURASSIC = Poulsen and Riding (2003). TRIASSIC = P.A. Hochuli (in Hardenbol et al., SEPM charts). SEPM Boreal Dinoflagellate Cysts compiled in SEPM chart by J.-C. Foucher and E. Monteil (1998 publ. Date)

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	N. Atl./Boreal Dinocyst zonal and selected markers	Present - Cret.	
	Other Boreal, NW Europe Dinocyst datums	Present - Jur.	
	Additional DTS dinoflagellate taxa (Boreal Mesozoic)	Present - Jur.	Events not on SEPM'98 chart but tabulated in earlier compilations. Use with caution.
<i>Cenozoic dinocysts of NW Europe (SEPM'98)</i>	NW Europe dinocysts	Cenozoic	Williams et al. (Cenozoic charts in Hardenbol et al., SEPM 60, 1998)
<i>Dinoflagellate Cysts (Tethyan)</i>	Cenozoic Tethyan Dinocyst datums (high-res.)	Cenozoic	"W" = Low-lat, w. N.Atl., "I" = Italy; Williams et al. (Cenozoic chart in Hardenbol et al., SEPM charts, 1998); Neogene: Mediterranean and North Atlantic; Paleogene: Mediterranean
	E.Cret.-Jur. Zones	mid-Cret - Lt. Jur.	E. Montell (in Hardenbol et al., SEPM charts, 1998)
	Tethyan Mesozoic Dinocyst zonal and other major markers	mid-Cret - Trias	(Triassic is mainly <i>S.Hemis.</i>); E. Montell (in Hardenbol et al., SEPM charts, 1998)
	Other E.Cret. Tethyan Dinocyst markers	e. Cret.	E. Montell (in Hardenbol et al., SEPM charts, 1998)
Chitinozoa			ORDOV = Webby, 2004, Fig. 2 in The Great Ordovician Biodiversification Event; SILURIAN = Standard Chitinozoan Zone (from subcommission); DEVONIAN = from Becker (GTS2012 figures)
<i>Ordov-Silur-Devon Chitinozoan Zones</i>		Dev.-Ordov.	
<i>Other Ordovician Regional Chitinozoan zones</i>	Baltoscandia Chitinozoan Zone / Subzone	Ordovician	Figure 2.2 in Webby et al. (2004; The Great Ordovician Biodiversification Event); North America was in main zonal scale.
	North Gondwana Chitinozoan Zone	Ordovician	
Acritarchs -- FUTURE			
Siliceous Microfossils	15 columns		
Diatoms			NEOGENE = mainly Maruyama (2000; Table 3). PALEOGENE = partly from J. Barron (in Hardenbol et al., SEPM charts, 1998)
	North Pacific Diatom Zone / Datums	Cenozoic	
	Neogene/Paleogene Antarctica Diatoms	Neogene	
	Neogene; Equatorial Pacific Diatoms	Neogene	
Radiolarians			CENOZOIC = Chris Hollis (GTS2012) plus Sanfilippo and Nigrini (1998), Nigrini and Sanfilippo (2001). MESOZOIC = partly from P. de Wever (in Hardenbol et al., SEPM charts, 1998), but Triassic includes some of Kozur (2003).
<i>Cenozoic-Jurassic Radiolarians</i>	Radiolarians (Low Latitude) Zone / Marker / other Datums	Present - Cret.	
	Other Neogene Radiolarian datums (not used on PEAT table)	Neogene	
	Radiolarians (southern high latitude)	Present - Cret.	
<i>Triassic-Permian Radiolarians</i>	Tethyan Radiolarian Zone / Subzone	Tri. - Perm.	Triassic Radiolarian zones are from Kozur'03 tables. Kozur (Jan 2006) provided additional details, especially on zonal boundary datums. [GTS04 -- Triassic RADIOLARIAN events of general Europe were compiled by Patrick de Wever for the Triassic Chronostratigraphy chart of Hardenbol et al. (SEPM, in press, 1996).]
	N.Amer. Radiolarian Zone / Subzone	Triassic	Carter (1993), Kozur (2003)
	Major radiolarian events (Triassic)	Triassic	

Category			
Group and sub-group	Subsets	Age span	Sources (selected major ones)
	Cis-Ural Radiolarian zone (Permian)	Permian	Kozur (2003)
Charophytes and Calcareous Algae	4 columns		Charophytes from J. Riveline (in Hardenbol et al., SEPM charts, 1998), and Early Cretaceous Green Algae from J.-P. Masse (in Hardenbol et al., SEPM charts, 1998)
	Charophyte Zone / Markers	Present - Trias	
	W Europe Calc. Algae horizons	e. Cret.	
	W Periadriatic Calc. Algae horizons	e. Cret.	
Plants (spores, pollen, flora)		15 columns	
Triassic spores and pollen	Pollen / Spores (Germanic/Alpine) -- Zone / Subzone / Datum	Triassic	Kürschner, W.M., and Herngreen, G.F.W., 2010. Triassic palynology of central and northwestern Europe: a review of palynofloral diversity patterns and biostratigraphic subdivisions. In: Lucas, S.G. (editor), The Triassic Timescale. The Geological Society, London, Special Publication, 334: 263-283; and P.A. Hochuli (in Hardenbol et al., SEPM charts, 1998)
	Pollen / Spores (Arctic)	Triassic	From SEPM chart (1998; converted to GTS2012)
Carboniferous spores, pollen, flora	Flora Macro Zone (Carbon.)	Carboniferous	GTS2004 diagrams (Davydov et al., 2004)
	Flora Micro Zone (Carbon.)	Carboniferous	GTS2004 diagrams (Davydov et al., 2004)
Devonian spores, pollen, flora	Macroplants Zone	Devonian	Devonian zonations and relative age-calibrations (relative to conodont "master" scale) are based on Thomas Becker's detailed chart (2010; delivered to Gradstein and Ogg); partly used in GTS2012 Devonian chapter. See http://www.devoniantimes.org/who/pages/archaeopteris.html and other pages at Devonian Times
	Western Europe Miospore Zone name / Abbreviation	Devonian	
	Eastern Europe Miospore Abbreviation / EE zone	Devonian	
	Australian Spore Zones / Subzones / Southeast Standard	Devonian	Australian: relationships to conodonts scheme taken from Young (in Young & Laurie, 1996) Price et al. 1985; Young in Young & Laurie 1996. Southeast Standard: Partridge 2006 & Backhouse, assorted). NOTE: Needs revision. Use detailed versions in Australian Datapack (TSCreator website)
	Australian spore zones (Southeast Std.)	Devonian	Southeast Standard: Partridge 2006 & Backhouse, assorted)
Silurian spores	Spore Zone (Silurian)	Silurian	
Vertebrates (Land and Marine)			
Fish and Reptiles (Silurian-Triassic)	8 columns		
Devonian Fish			Devonian zonations and relative age-calibrations (relative to conodont "master" scale) are based on Thomas Becker's detailed chart (2010; delivered to Gradstein and Ogg); partly used in GTS2012 Devonian chapter.
	Shark Zones	Devonian	SEE ALSO: http://www.devoniantimes.org/who/pages/sharks.html and other pages on Sharks at Devonian Times
	Armored Fish (Placoderm) Zones	Devonian	SEE ALSO: http://www.devoniantimes.org/who/pages/placoderm.html and other pages on Fish (Ray-fin, Lobe-fin) at Devonian Times

Category			
Group and sub-group	Subsets	Age span	Sources (selected major ones)
	Acanthodian Zones	Devonian	Acanthodians were among the earliest known vertebrates with jaws. Their new adaptation allowed them to nibble flesh off prey instead of waiting for morsels of food to float by. [FROM: http://animal.discovery.com/prehistoric/acanthodian/]; SEE ALSO: http://www.devoniantimes.org/who/pages/acanthodians.html and other pages on Acanthodians at Devonian Times
	Australian Early Fish -- Phoebondont Assemblages / Turinid Assemblages	Devonian	
	Other Devonian Vertebrate Zones	Devonian	SEE ALSO: http://www.devoniantimes.org/who/pages/densignathus.html and other pages on Tetrapods at Devonian Times
Carboniferous-Triassic Reptiles	LVF Zones (land-vertebrate faunachrons)		Lucas, S.G., 2010d. The Triassic timescale based on nonmarine tetrapod biostratigraphy and biochronology. In: Lucas, S.G. (editor), The Triassic Timescale. The Geological Society, London, Special Publication, 334: 17-39.
	Vertebrate Datum		
Mammals	12 columns		Woodburne (2004); and J. Hooker (GTS2004 and GTS2012 diagrams)
North American Mammals	NALMA (Zones) / Subzones	Present - mid-Cret.	
	N.Amer. zonal and selected markers	Present - mid-Cret.	
	Plio-Pleist datums	Present - Pliocene	
	Other N.Amer. Events	Present - mid-Cret.	
Europe Mammals	ELMA zones	Cenozoic	
	MN-MP zones	Cenozoic	
	Other European mammal zones	Cenozoic	
	Europe Paleogene events	Paleogene	
Asian Mammals	ALMA zones / Subzones	Paleogene	
South America Mammals	SALMA zones	Cenozoic	
Humanoid Evolution		6 columns	Main sources = Primate Fossil Record (Cambridge Univ Press; 2002); Tattersall & Schwartz (Evolution of Genus Homo; Ann. Rev. Earth & Planet. Sci., 2009); Australian Museum website; NOVA Human evolution website; Smithsonian website. NOTE: Humanoid datapack at TSC download page has images and active links.
	Tool intervals -- Paleo-Neolithic / Tool cultures / Europe tool cultures	Quaternary	Tattersall & Schwartz (2009)
	Main Homo and Australopithecus species ranges	6 Ma	Tattersall & Schwartz (2009); Primate Fossil Record (Cambridge Univ Press; 2002); Australian Museum website; NOVA Human evolution website; Smithsonian website
	Primate species ranges	50 Ma	Primate Fossil Record (Cambridge Univ Press; 2002); Australian Museum website; NOVA Human evolution website; Smithsonian website
	Primate Evolution Major Events	80 Ma	Tattersall & Schwartz (2009); Primate Fossil Record (Cambridge Univ Press; 2002)
Sequences, Sea-Level and Stable Isotopes			
Sequences, Onlap and Sea Level Curves	30 columns		
Phanerozoic Composites			

Category			
Group and sub-group	Subsets	Age span	Sources (selected major ones)
Phanerozoic Sequence Synthesis	Sequences (SEPM Global or Tethyan; Haq and Schutter, 2008)	Present - Cambrian	Ceno-Mesozoic = Hardenbol, J., Jacquin, T., Vail, P.R., et al. (SEPM charts, 1998), Paleozoic = Haq and Schutter (Science, 2008) with Seq-stage-nomenclature by ExxonMobil group (Chengjie Liu et al., Jan'08, who also modified some of the previous SEPM nomenclature for Ceno-Mesozoic)
	Age-Name of Paleozoic Seq by Haq-Schutter'08	Perm.-Camb.	Haq and Schutter (Science, 2008)
	Phanerozoic T-R Cycles (SEPM98; GTS04)	Present - Cambrian	Hardenbol, J., Jacquin, T., Vail, P.R., et al. (SEPM charts, 1998); Haq and Schutter (Science, 2008)
	Major Mesozoic-Cenozoic T-R Trends (SEPM98)	present - Triassic	Hardenbol, J., Jacquin, T., Vail, P.R., et al. (SEPM charts, 1998) with Seq-stage-nomenclature by ExxonMobil group (Chengjie Liu et al., Jan'08, who also modified some of the previous SEPM nomenclature for Ceno-Mesozoic)
	Arabian Plate sequences (Simmons et al., 2007)	Present - Cambrian	Simmons et al. (GeoArabia, 2007); recalibrated by NEFTEx to GTS2012 (data set provided to J.Ogg, Feb 2013)
Schematic Coastal Onlap (Phanerozoic synthetic)	Coastal Onlap (synthetic)	Present - Cambrian	Coastal Onlap (SEPM-Haq'08 synthetic) – Ceno-Mesozoic = Hardenbol, J., Jacquin, T., Vail, P.R., et al. (SEPM charts, 1998) with Tethyan SBs, Paleozoic = Haq and Schutter (Science, 2008). SB Falls set as Minor SB = 20m, Medium = 45m, Major = 80m relative to long-term envelope (in turn, Ceno-Jur = SEPM'98; Tri = Haq'05 GeoArabia; Paleozoic = Haq and Schutter'08 Science)
	Coastal Onlap segmented (synthetic)	Present - Cambrian	
Phanerozoic Sea-level Synthesis (meters relative to present)	Short-Term Phanerozoic	Present - Cambrian	CENOZOIC-MESOZOIC = Hardenbol, J., et al. (SEPM charts, 1998); PALEOZOIC = Haq and Schutter (Science, 2008); amplitudes of SEPM'98 Triassic sequences are offset from long-term Triassic curve by Haq and Al-Qahtani (2005) following advice of Bilal Haq (pers. comm. to J.Ogg, April, 2006), and base of their Triassic (Haq and Al-Qahtani, 2005) was used to adjust the Paleozoic (Haq and Schutter, 2008).
	Mean Sea Level (intermediate term; SEPM-Haq'08 synthetic)	Present - Cambrian	Computed as mid-point of Coastal-onlaps. Ceno-Mesozoic = Hardenbol, J., Jacquin, T., Vail, P.R., et al. (SEPM charts, 1998), Paleozoic = Haq and Schutter (Science, 2008), with Minor = 20m, Medium = 45m, Major = 80m
	Long-Term Phanerozoic (SEPM98-Haq'08)	Present - Cambrian	CENOZOIC-MESOZOIC = Hardenbol, J., et al. (SEPM charts, 1998); PALEOZOIC = Haq and Schutter (Science, 2008); amplitudes of SEPM'98 Triassic sequences are offset from long-term Triassic curve by Haq and Al-Qahtani (2005) following advice of Bilal Haq (pers. comm. to J.Ogg, April, 2006), and base of their Triassic (Haq and Al-Qahtani, 2005) was used to adjust the Paleozoic (Haq and Schutter, 2008).
Period-level and alternate versions			
High-Res Plio-Pleist Sea Level		Plio-Pleist.	Miller et al. (Science, 2005) based on conversion of oxygen-isotope data. They have similar detail extending back to 9 Ma, and a generalized curve back to 170 Ma, but the time scales in their table are Berggren et al (1995) and Gradstein et al (1994), which significantly diverge from GTS2004 below 5.32 myr, therefore this older curve is omitted until conversions are available.
Boreal Jurassic sequences (SEPM98)	Sequences / Cycles	Jurassic	Hardenbol, J., Jacquin, T., Vail, P.R., et al. (SEPM charts, 1998)
Paleozoic Sloss Sequences	Mega-Sequence / Super-Sequence	Perm.-Camb.	Haq, B.U., and Schutter, S.R., 2008. A chronology of Paleozoic sea-level changes. Science (3 Oct 2008), 322: 64-68.
Long-Term Meso-Ceno (Tapscott SEPM98)		present - Triassic	Hardenbol, J., Jacquin, T., Vail, P.R., et al. (SEPM charts, 1998)
Major Paleozoic Sequences (Haq & Al-Qahtani 2005)		Perm.-Camb.	Haq & Al-Qahtani, GeoArabia, 2005
Permian-Carboniferous-Devonian (Legacy versions)	Medium-Resolution / High-Resolution	Perm-Carb	Permian = Ross-Ross'95; lowermost Permian = Wardlaw (unpubl.); Upper Carb = Heckel, 2006; Heckel et al., 2007; Lower-Middle Carb = Ross-Ross'87/88; Devonian = Johnson et al. (1985)

Category			
Group and sub-group	Subsets	Age span	Sources (selected major ones)
	T-R Cycles / Major T-R Trends	Perm-Carb	Permian = Ross-Ross'95; lowermost Permian = Wardlaw (unpubl.); Upper Carb = Heckel, 2006; Heckel et al., 2007; Lower-Middle Carb = Ross-Ross'87/88; Devonian = Johnson et al. (1985)
<i>Devonian (Becker, GTS2012)</i>	Schematic Devonian Sea-level Curve (Endpoint 0 to 3)	Devonian	Devonian curves and relative age-calibrations (relative to conodont "master" scale) are based on Thomas Becker's detailed GTS2012 charts
	T-R Event name (Devon)	Devonian	
<i>Silurian-Ordovician</i>	Silurian-Ordovician Sea Level	Silur.-Ordov.	Silurian = inter-regional (Johnson, 2006); Ordovician = Baltoscandia (Nielsen, 2004)
	Ordovician-Silurian Sea-Level Intervals -- Intervals / Oceanic Episodes / Sealevel Events (Baltoscandia) / Sea Level	Silur.-Ordov.	Johnson, M.E., 2006. Relationship of Silurian sea-level fluctuations to oceanic episodes and events. GFF (journal formerly called Geologiska Föreningens i Stockholm Förhandlingar), 128: 115-121. AND Nielsen, A.T., 2004. Ordovician sea level changes: A Baltoscandia perspective. In: The Great Ordovician Biodiversification Event (edited by Webby, B.D., Paris, F., Droser, M.L., and Percival, I.), Columbia University Press, N.Y., p. 84-93.
	Silurian schematic Sealevel (Loydell '98)	Silurian	Loydell (1998) as drawn and calibrated to graptolite zones by Mike Melchin (Aug'11 for GTS2012 charts)
	Late Ordovician Sequences (Central USA; Holland '08)	Lt. Ordov.	Steven Holland (3 Mar'08; stratum@uga.edu ; to J.Ogg). See www.uga.edu/strata/ordoss and www.uga.edu/strata/cincy/strata/strata.html for details and references
	Cambrian-Silurian -- Sequences / Short-term Sea Level / Long-term Sea Level	Silur.-Camb.	Haq & Al-Qahtani, GeoArabia, 2005
	Ordovician-Silurian T-R Cycles (GTS04)	Silur.-Ordov.	PALEOZOIC = GTS2004 diagrams
Stable Isotopes (O-18, C-13, Sr)	14 columns		
Oxygen-18 curves and events	per-mil PDF		
	Plio-Pleist Marine Oxygen-18 composite	Pleist - Pliocene	Lisiecki, L. E., and M. E. Raymo (2005). [scale = +2.5 to +5.2 per-mil PDB]
	Cenozoic Marine Oxygen-18 Composite	Present - latest Cret.	Derived from Cramer (2009) -- See Saltzman and Thomas (GTS2012 Carbon-isotope chapter); but only every 10th item from 9-point averaging of Benthic foraminifer compilation (29000 data points in original) is shown here; NOTE: Cramer had two sets -- original and "adjusted" (which removed many of the original)
	Marine Isotope Stages -- Warm MIS / Cold MIS	Pleist - Pliocene	(Needs 20 cm/myr !!). Numbering, including Pliocene extension, from Crowhurst (2002) -- see above curve for relatively placement to their O-18 curve. Warm MIS (odd numbers), and Cold MIS (even numbers) listed in seoparate columns to avoid over-crowding.
	Miocene-Paleocene Oxy-18 events	Miocene - Paleocene	Miocene-Oligocene event definitions by Miller et al. (1991) and additional calibrations by Pekar et al (2002); Eocene-Paleocene events after Zachos et al. (2008) and summary by Westerhold et al. (2008) and Westerhold and Rohl (2008, in press); click on events for more details and calibration references.
	Devonian Oxygen-18	Devonian	Conodont phosphate Oxygen-18 (composite by Becker, GTS2012)
Carbon-13 curves and events	per-mil PDF		[scale = +5 to -0.3 per-mil PDB]
	Cenozoic-Mesozoic Composite	Present - Permian	CENOZOIC (0-70 Ma) = Derived from Cramer (2009) -- See Saltzman and Thomas (GTS2012 Carbon-isotope chapter); but only every 10th item from 9-point averaging of Benthic foraminifer compilation (29000 data points in original) is shown here; NOTE: Cramer had two sets -- original and "adjusted" (which removed many of the original); LATE CRET (70-100 Ma) = Composite English Chalk by Jarvis et al. (2006) plus Camp-Maastr boundary from Voight et al. (2010); EARLY CRET (100-145 Ma) = Gale et al. (2011; Cret. Res.), Herrle et al. (2004, EPSL), Renard et al. (2005) and Folimi et al (2006, Paleoceanography); JURASSIC (145-200 Ma) = mainly Jenkyns et al. (2002) enhanced by Glowinski and Wierzbowski (2007) for mid-Oxf, Kemp et al. (2005) for early Toarcian, and Palfy et al (2001) for Tri-Jur boundary; TRIASSIC = latest Perm from Payne et al'04; early Triassic from Galfetti et al.'07 who used N.Amer. ammon. zones; mid-Triassic from Payne'04; then Korte et al'05 for Carnian-Rhaetian ("bad" points removed from Korte'05, but his entire point-set is not yet inserted here)

Category			
Group and sub-group	Subsets	Age span	Sources (selected major ones)
	Carboniferous Composite	Carboniferous	Saltzman and Young (2005, supplement table) [scale = -7 to -2 per-mil PDB]
	Devonian Composite	Devonian	From Becker (GTS2012) -- Minimum and Maximums of envelope
	Cambrian Composite	Cambrian	Zhu et al. (2006; provided by Loren Babcock, then rescaled by Peng-Babcock for Concise GTS in Dec07). Most names seem to relate to China, therefore tied to their China zones where possible. Cambrian had MAJOR excursions, hence an enlarged scale = -7 to +5 per-mil PDB
Carbon-13 and Anoxic Events	Named Carbon-13 Events (selected)	Cret-Jur; Devon.	LATE CRETACEOUS (69-100 Ma) = Composite English Chalk by Jarvis et al. (2006); DEVON = Becker (GTS2012)
	Cretaceous-Jurassic and Devonian Anoxic Events	Cret-Jur; Devon.	LATE CRETACEOUS (69-100 Ma) = Composite English Chalk by Jarvis et al. (2006); DEVON = Becker (GTS2012)
	Cambrian C-13 events	Cambrian	by Loren Babcock (originally derived from Zhu et al. (2006), then enhanced and rescaled by Peng-Babcock for GTS2012. Most names seem to relate to China, therefore tied to their China zones where possible.
Strontium 87/86 ratio	[scale = 0.7068 to 0.7093]	present-Cambrian	John McArthur (2004, Lowess version 4, supporting compilation for GTS2004) [NOTE: He rescaled graphics for GTS2012; but didn't provide a table, therefore, for now, used re-scaling of the GTS2004 curves based only on GTS2004-GTS2012 age conversions, with no new data]. HOWEVER: Devonian is from Becker (2012); and part of Silurian is from Cramer (2011; as indicated by Melchin in GTS2012).
Global Reconstructions (images)		1 column	
	Versions by Ron Blakey		Late Precambrian to Recent globes by Ron Blakey [http://jan.ucc.nau.edu/~rcb7/globaltext2.html] , based on Chris Scotese's reconstructions [at http://www.scotese.com]
Quaternary (high-resolution)		19 columns	
Quaternary Regional Stages			P. Gibbard (2004, and references therein; pers. commun. to J.Ogg, 2006; 2010)
	Italian marine Stages / Substages	Pleistocene	
	North America Stages / Substages	Pleistocene	
	NW Europe Stages / Substages	Pleistocene	
	British Stages / Substages	Pleistocene	
	Russian Plain Stages / Substages	Pleistocene	
	New Zealand stages	Pleistocene	
Chinese Loess			
	Loess Sequence	Pleistocene	An Zhisheng et al. (1990) [measured from their diagram]. "S" = soil levels onto loess; "L" = Loess pulses.
	Magnetic Susc.	Present - Pliocene	An Zhisheng et al. (1990) [measured from their diagram]. Magnetic susceptibility (SI units) = 0 to 230
Antarctic Ice Cores			
	delta-Deuterium	Present - mid-Pleist (740 kyr)	Jouzel et al. (2004). Accessed from NCDC Paleoclimatology Program. [scale = -450 to -360 per-mil]
	CO2	Present - mid-Pleist (650 kyr)	0-11 ka = Taylor Dome (Indermuhle et al, 1999a); 11-27 ka = Taylor Dome (Smith et al, 1999); 27-60 kyr = Taylor Dome (Indermuhle et al, 1999b). 64-417 kyr = Vostok (Barnola et al., 2003); 417-649 kyr = Dome C (Siegenthaler, 2005). Accessed from NCDC Paleoclimatology Program, and spliced together. [scale = 180 to 1300 ppmv]
Milankovitch curves		0 to 3 Ma	Analysieries 2.0 output using: Laskar et al (2004)
	Insolation 65N	Pleistocene	[W/m2] function of time and true longitude (season). From time = 0 to 2500 kyr BP. With starting season = 0 deg. from vernal point. With ending season = 180 degrees. With latitude = 65 degrees (north>0, south<0). using the Laskar 2004 solution. And with solar constant = 1365 W/m2. [scale = 335 to 410 Watts/m2]

Category			
Group and sub-group	Subsets	Age span	Sources (selected major ones)
	Eccentricity	Pleistocene	Laskar et al (2004) [scale = 0 to 0.06, where 0.0 = circular; Present = 0.17]
	Obliquity	Pleistocene	Laskar et al (2004) [scale = 21.5 to 25 degrees, Present = 23.45 degrees]
	Precession	Pleistocene	Laskar et al (2004) [scale = -0.06 to +0.06; Present = +0.01]
Impacts, Volcanism, Tectonics			
Carbonate Trends	5 columns	present-Cambrian	Markello, J.R.; Koepnick, R.B.; Waite, L.E.; and Collins, J.F., 2006, The Carbonate Analogs Through Time (CATT) Hypothesis and the Global Atlas of Carbonate Fields- A Systematic and Predictive look at Phanerozoic Carbonate Systems, in Lukasik, J. and Simo, T. eds., Controls on Carbonate Platform and Reef Development, SEPM Special Publication.
	Carb Platform Reefs		
	Carb Platform Organisms		
	Carb Platform - Platform Types		
	Carb Platform - Carbonate builders		
	Major Reef builders		
Hydrocarbon System overviews	6 columns	present-Cambrian	Mainly from Lowell Waite (author) and Roger Gilcrease (compiler), 2002. Phanerozoic Cycles and Events (NV PXD Global Stratigraphic Chart 02.DSF), March 27, 2002 (printed by Pioneer Natural Resources; permission provided by L. Waite); with additional items from Markello et al. (2006)
	Icehouse / Greenhouse		after Fisher, 1981 (from Waite, 2002)
	Anoxic Intervals		Markello et al. (2006)
	Major Source Rocks		Markello et al. (2006)
	Global Source Rocks		With % of world's total generated (Waite, 2002)
	Reservoir Intervals		With % of world's trapped reserves (Waite, 2002)
	Major Evaporite Seals		Major evaporite packages (seal facies) (Waite, 2002)
Impacts	14 main columns:		<i>Meteor Impacts [dashed => estimated; arrow UP => younger than this level; DOWN => older]. With URL links for details on every event. Includes a column for impact-icon (if downloaded)</i>
	Global effects (>50 km crater)	Past 2 billion years	Mainly from Earth Impact Database, 2008. [http://www.unb.ca/passc/ImpactDatabase/]; plus other publications
	Regional Impacts (<50 km crater) -- 6 pairs of columns by region	Past 2 billion years	Pairs of columns (5-50 km, and <5 km) for each region -- Europe, Russia-Asian, Australian, African, North American, South American
	Recent impacts	Past 1 Ma	
Large Igneous Provinces (LIPs)	9 columns		
	Super LIPs; Major LIPs	Past 3 billion years	Mainly from Large Igneous Provinces Commission (2008). All events have URL links to their maps and summaries; plus "LIP of the Month" as appropriate.
	Regional LIPs of smaller extent - 7 columns by continent	Past 3 billion years	Columns for each region -- Asia, Europe to Urals, Africa, N.America, S.America, India and Indian Ocean, Australia-Antarctica
Passive Margins	13 columns		
	Modern margins -- 6 columns, by ocean basin	present-Jurassic	Mainly from Bradley (2008) Passive margins through earth history. Earth-Science Reviews, 91: 1–26.
	Past margins - 7 columns, by continent	Past 3 billion years	

Selected partial references

Some of the main references (especially those cited under Sources on TS-Creator dataset description page)

NOTE: This listing is selected summary and review articles and books is not intended to include all primary sources. Additional documentation and comments are given for each individual datum in the databases; and in the relevant chapters in GTS2012.

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- Anthonissen, D.E., and Ogg, J.G., 2012. Cenozoic and Cretaceous Biochronology of Planktonic Foraminifera and calcareous nannofossils. In: *Geologic Time Scale* (Gradstein, Ogg, Schmitz, Ogg), Elsevier, pg. 1083-1128.
- Barnola, J.-M., D. Raynaud, C. Lorius, and N.I. Barkov. 2003. Historical CO₂ record from the Vostok ice core. In Trends: A Compendium of Data on Global Change. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A.
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