The PLATES 2009
Atlas of Plate Reconstructions
(750 Ma to Present Day)

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670 Ma
Cryogenian, Neoproterozoic

PLATES/UTIG
April 2009
640 Ma
Cryogenian, Neoproterozoic

PLATES/UTIG
April 2009
600 Ma
Ediacaran, Neoproterozoic
550 Ma
Ediacaran, Neoproterozoic

PLATES/UTIG
April 2009
530 Ma
Late Tommotian/Early Atdabanian (Early Cambrian)
460 Ma
Llandeilian (Middle Ordovician)
450 Ma
Caradocian (Late Ordovician)
410 Ma
Early Praghian (Early Devonian)

PLATES/UTIG
April 2009
390 Ma
Early Eifelian (Early Devonian)

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April 2009
380 Ma
Late Eifelian/Early Givetian (Middle Devonian)

PLATES/UTIG
April 2009
370 Ma
Late Givetian/Early Frasnian (Late Devonian)

PLATES/UTIG
April 2009
360 Ma
Famennian (Late Devonian)
310 Ma
Moscovian (Pennsylvanian)
290 Ma
Late Gzelian/Early Asselian (Pennsylvania/Permian)
260 Ma
Late Artinskian/Early Kungurian (Early Permian)

PLATES/UTIG
April 2009
240 Ma
Anisian (Middle Triassic)
230 Ma
Ladinian (Middle Triassic)

PLATES/UTIG
April 2009
220 Ma
Early Norian (Late Triassic)
170 Ma
Bajocian (Middle Jurassic)
130 Ma
Hauterivian (Early Cretaceous)

PLATES/UTIG
April 2009
080 Ma
Campanian (Late Cretaceous)

PLATES/UTIG
April 2009
North Pole
660 Ma
Cryogenian, Neoproterozoic

PLATES/UTIG
April 2009
North Pole
570-450 Ma
Ediacaran, Neoproterozoic

PLATES/UTIG
April 2009
North Pole
330 Ma
Visean (Mississipian)

PLATES/UTIG
April 2009
North Pole

180 Ma

Aalenian (Middle Jurassic)

PLATES/UTIG

April 2009
North Pole
150 Ma
Volgian (Late Jurassic)
South Pole
330 Ma
Visean (Mississipian)
South Pole
150 Ma
Volgian (Late Jurassic)

PLATES/UTIG
April 2009
South Pole
120 Ma
Aptian (Early Cretaceous)

PLATES/UTIG
April 2009
South Pole
030 Ma
Early Oligocene

PLATES/UTIG
April 2009
References for Rotation File


Burke, K. and Rutherford, E., 1987, Sumba as a sideways slipping sliver, unpublished manuscript.


Giacobbi, 1978


Flinch, J.F., 2003, Structural evolution of the Sinu-Lower Magdalena area (northern Colombia), in The circum-Gulf of Mexico and the Caribbean: hydrocarbon habitats, basin formation, and plate tectonics. Bartolini, C., Buffler, R.T., and Blickwede, J. F. (editors), AAPG Memoir 79, pp. 776-796. (The Sinu-San Jacinto Province, located west of the Romeral fault, is a Paleocene to Oligocene accretionary wedge floored by Cretaceous oceanic crust.)


Hall, R., van Hattum, M.W.A., and Spakman, W., 2009, Impact of India-Asia collision on SE Asia: The record in Borneo, Tectonophysics, v. 451: 366-389. (In SW Borneo the Palaeozoic is represented mainly by metamorphic rocks of Carboniferous to Permian age, although Devonian limestones have been found as river boulders in East Kalimantan.)


Hanson, R.E., McCleery, D.A., Crowley, J.L., Bowring, S.A., Burkeholder, B.K., Finegan, S.A., Philips, C.M., and Pollard, J.B., 2009, Large-scale Cambrian Rhylolitic Volcanism in southern Oklahoma Related to Opening of Iapetus, presented at the Geological Society of America South-Central Section - 43rd Annual Meeting, 16-17 March 2009, Dallas, Texas, USA.


Liou, J.G. and Muruyama, S., 1986, Post-Permian evolution of Asia, and some implications for Taiwan, Acta Geologica Taiwanica, No. 24, pp. 5-49.


Pease, V. and Scott, R.A., submitted (2009), Crustal affinities in the Arctic Uralides, northern Russia: Significance of detrital zircon ages from Neoproterozoic and Paleozoic sediments in Novaya Zemlya and Taimyr, ???. Also, personal communication from V. Pease.


Rogers, R., 2003, Jurassic to Recent tectonic and stratigraphic history of the Chortis block of Honduras and Nicaragua (northern Central America), PhD dissertation, The University of Texas at Austin.


Smith, A.B., 1988, Late Palaeozoic biogeography of East Asia and palaeontological constraints on plate tectonic reconstructions, Phil. Trans. R. Soc. Lond., A326: 189-227.


radiolarians found on Sado Island. A part of the pre-Tertiary rocks of Sado Island should be correlated to the Permian.


Tohver, E., D’Agrella-Filho, M.S., and Trindade, R.I.F., 2006, Paleomagnetic record of Africa and South America for the 1200-500 Ma interval, and evaluation of Rodinia and Gondwana assemblies, Precambrian Research, vol. 147, p. 193-222. (Amazonia-NW Africa collide with central Gondwana 530-520 Ma; Arabian-Nubian shield was stable, coherent block ~600 Ma).


Veevers & Eittreim 1988


References for data


Tectonic map of Australia and New Guinea, 1971, scale 1:5,000,000, Geological Society of Australia, Sydney, Australia.

Total sedimentary isopach map, offshore east Asia, 1991, Working group on resource assessment, committee for co-ordination of joint prospecting for mineral resources in Asian offshore areas (CCOP), scale 1:4,000,000.


Bergh, H.W., pers. comm.


Bhattacharya, G.C., Chauhey, A.K., Murty, G.P.S., Srinivas, K., Sarma, K.V.L.N.S., Subrahmanyam, V.,
52, pp. 5-24, American Association of Petroleum Geologists, Tulsa, OK.
Bois, C., 1993, Initiation and Evolution of the Oligo-Miocene Rift Basins of Southwestern Europe -
ten years of research in central Nepal Himalaya and some other regions, in H.K. Gupta and F.M.
Delany (eds.), Zagros, Hindu Kush, Himalaya Geodynamic Evolution, 3, pp. 149-168, American
Geophysical Union, Washington, D.C.
Borrello, A.V., 1978, Mapa Geotectonico de la Republica Argentina, Servicio Geologico Nacional,
Buenos Aires, sheets 1 and 2 [Gastre Fault]; scale 1:2,500,000.
Bowland, C.L. and Rosencrantz, E., 1988, Upper crustal structure of the western Colombian Basin,
Bradshaw, J.D., 1997, Terrane Dynamics 1997 Guidebook for Field Excursions A, B, & C, University of
Canterbury, Christchurch, New Zealand. Figure 1, page III.
British Antarctic Survey, 1985, Tectonic Map of the Scotia Arc, Scale 1:3,000,000. BAS (Misc.) 3.
Cambridge, British Antarctic Survey.
British Oceanographic Data Centre (Proudman Oceanographic Laboratory), 1997, General Bathymetric
Chart of the Oceans (GEBCO) Digital Atlas, Bidston Observatory, Merseyside L43 7RA, UK
cdrom).
study of the Eurasia Basin, Supplement to Eos, Transactions, 1999 Fall Meeting American
Geophysical Union, v. 80, n. 46, p. F992-993.
Eurasian Basin based on aerogeophysical data.
Basin, International Conference on Arctic Margins, Celle, Germany, 11-16 October, 1998, Abstract
Volume, 36-37.
Burkart, B., 1978, Offset across the Polochic fault of Guatemala and Chiapas, Mexico, Geology, 6:328-
332.
Calais, E., and Mercier de Lepinay, B., 1991, From transtension to transpression along the northern
Caribbean plate boundary off Cuba: Implications for the Recent motion of the Caribbean plate,
Calais, E., and de Lépinay, B.M., 1995, Strike-slip tectonic processes in the northern Caribbean between
Cuba and Hispaniola (Windward Passage), Marine Geophysical Researches, 17:63-95.
Camp, V.E. and Ross, M.E., 2004. Mantle dynamics and genesis of mafic magmatism in the intermontane
Canadian Hydrographic Service, 1981, General Bathymetric Map of the Oceans (GEBCO), scale
1:10,000,000, International Hydrographic Organization/Intergovernmental Oceanic
Commission/Canadian Hydrographic Service, Ottawa, Ontario.


Case, J. and Holcombe, T., 1980, Geologic-tectonic map of the Caribbean region, scale 1:2,500,000.


Coffin, M.F. and Eldholm, O., in prep., Chapman paper.


Cuban Gulf Oil Co., 1956, Regional Geologic Map of Cuba; air photographic base; scale approximately 1:100,000; sheets B6, C6, and C7.


Defense Mapping Agency Hydrographic/Topographic Center, 1980, Shetland Islands: Deception Island to King George Island, map, mercator projection, scale: 1:200,000 at latitude 65°.


Dickinson, W.R. and Lawton, T.F., 2001, Carboniferous to Cretaceous assembly and fragmentation of Mexico, Geological Society of America Bulletin, vol. 113(9), p. 1142-1160 (Fig. 1). Digitized Del Sur terrane. Southeastern portion of the terrane was modified using reference 2106, Weber et al., 2009.


Dunbar, J. and Sawyer, D., 1986, Crust extension within the Gulf of Mexico: Implications for the breakup of Western Pangea, abs. from 1986 Geodynamics Symposium.


Exxon Production Research Company (World Mapping Project), 1985, Tectonic Map Series of the World, Exxon Production Research Company, Houston, TX.


Falconer, R.H.K. and Tharp, M., 1981, General Bathymetric Map of the Oceans (GEBCO), scale 1:10,000,000, sheet 5-14, Canadian Hydrographic Service.


Fisher, R.L., pers. comm.


Ghidella, M., 1999, personal communication. USAC data.


Hayes, D.E. and Vogel, M., 1981, General Bathymetric Map of the Oceans (GEBCO), scale 1:10,000,000, sheet 5+13, Canadian Hydrographic Service.


Instituto Geografico Nacional, 1970, Mapa Geologico de la Republica de Guatemala, scale 1:500,000.


Iwabuchi, Y., 1979, *General Bathymetric Map of the Oceans (GEBCO)*, scale 1:10,000,000, sheet 5-6, Canadian Hydrographic Service.

Jackson, Martin, 2009, Outline of salt basins from his salt basin database, personal communication.


Jennings, C.W., 1961, Geologic map of California: Kingman sheet, scale 1:250,000, California Division of Mines and Geology, Sacramento, CA.

Johnson, G.L., and Vanney, J.R., 1980, General Bathymetric Map of the Oceans (GEBCO), scale 1:10,000,000, sheet 5-18, Canadian Hydrographic Service.


Laughton, A.S., 1975, General Bathymetric Map of the Oceans (GEBCO), scale 1:10,000,000, sheet 5\(\times\)5, Canadian Hydrographic Service.


Lodolo, E. and Coren, F., 1997, A late Miocene plate boundary reorganization along the westernmost Pacific-Antarctic Ridge. Tectonophysics, 274(4): 295-305; Figure 3. Re-picked by Tip Meckel.


Mammerickx, J. and Cande, S., 1982, General Bathymetric Map of the Oceans (GEBCO), scale 1:10,000,000, sheet 5\(\times\)11, Canadian Hydrographic Service.


Mann, P., personal communication. NEHRP Proposal. Active tectonic lineaments in Mona Passage, between Hispaniola and Puerto Rico.


May, P.R., 1971, Pattern of Triassic-Jurassic diabase dikes around the North Atlantic in the context of predrift position of the continents, Geological Society of America Bulletin, 82:1285-1292.


Mejorada, P., 1976, Carta geologica del la Republica Mexicana, scale 1:2,000,000.


Miall, A.D., 1983, the Neves Strait problem: A re-evaluation of the geological evidence in terms of a diffuse oblique-slip plate boundary between Greenland and the Canadian Arctic Islands, *Tectonophysics*, 100:227-239.


Mobil Exploration and Producing Technical Center, 1994, Global Isopach Map and Digital Database, Dallas, TX.


Monahan, D., Falconer, R.H.K., and Tharp, M., 1982, General Bathymetric Map of the Oceans (GEBCO), scale 1:10,000,000, sheet 5-10, Canadian Hydrographic Service.


New Zealand Geological Survey, 1972, "Geological map of New Zealand 1:1,000,000", North and South Islands sheets (1st edition), Department of Scientific and Industrial Research, Wellington, New Zealand.


Pardo-Casas, F. and Molnar, P., 1987, Relative motion of the Nazca (Farallon) and South American plates since Late Cretaceous time, Tectonics, 6(3): 215-232.

Parfenov, L. & others, in press, "Comprehensive Geodynamic Chart," inset of northeastern Siberia from the "Geodynamic map of Okhotsk and surrounding territories."


Pease, V. and Scott, R.A., submitted (2009), Crustal affinities in the Arctic Uralides, northern Russia: Significance of detrital zircon ages from Neoproterozoic and Paleozoic sediments in Novaya Zemlya and Taimyr, ???. p. 52. Also, personal communication from V. Pease.


Peter et al.


Rankenburg, K., Lassiter, J.C., and Brey, G., 2004, Origin of megacrysts in volcanic rocks of the Cameroon volcanic chain – constraints on magma genesis and crustal contamination, Contributions to Mineral Petrology, 147: 129-144. Fig. 1.


Rogers, Rob, 2003, Jurassic to Recent Tectonic and Stratigraphic History of the Chortis Block of Honduras and Nicaragua (Northern Central America), PhD dissertation, University of Texas at Austin, pp. 264.


Rosencrantz, E. and Pardo, G., 1999. Investigations Into the Geology of Cuba, University of Texas at Austin Institute for Geophysics unpublished atlas, p. 47. Data digitized from Figure 1 of Section 1.1, "An Overview of the Cuban Orogen Geological Divisions."


Sutherland, R., 1999, Basement geology and tectonic development of the greater New Zealand region: an interpretation from regional magnetic data, Tectonophysics, v. 308(3), 341-362.


St. John, B., 1984, Sedimentary provinces of the world - hydrocarbon productive and nonproductive, Williams & Heinz Map Corporation, Capitol Heights, MD, 20743. Scale 1:31,368,000 or 500 miles to the inch at the equator. Van der Grinten projection.


Schlich, R., Wise, S.W., Jr., et al., 1989, Leg 120, Proceedings of the Ocean Drilling Program, Initial Reports, College Station, TX.


Storey, M., Mahoney, J.J., and Saunders, A.D., 1997, Cretaceous basalts in Madagascar and the transition between plume and continental lithosphere mantle sources, in J.J. Mahoney and M.F. Coffin (eds.),
Large Igneous Provinces: Continental, Oceanic, and Planetary Flood Volcanism, Geophysical Monograph, 100: 95-122, American Geophysical Union, Washington, D.C.


Theberge, A.E., Jr., 1971, Magnetic survey off southern California and Baja California: Rockwell, Maryland, National Oceanographic and Atmospheric Administration, National Ocean Survey, scale 1:1,000,000.


Vaughan, A.P.M. and Pankhurst, R.J., 2009, Tectonic overview of the West gondwana margin, Gondwana Research, vol. 13, pp. 150-162. Fig. 4.


World Data Bank #2 (CIA), Cartigraphic Database - Natural and manmade features of the world (digitized format), NTIS PB 271-874.

Young, U.D., Voight, B. and Orkan, N.I., 1987, The Iceland Prospective: Its role in the development of
plate tectonic theory, in 1987 Geodynamics Symposium, Silver Anniversary Celebration of Plate
Tectonics, Texas A&M Univ., April 1987, pp. 96-98, abs.
Ziegler, P.A., 1982, Geological atlas of Western and Central Europe, Shell Int. Petr. Maatschappij B.V.
130 p.
Zolotukhin, V.V. and Al'mukhamedov, A.I., 1988, Traps of the Siberian Platform, in Macdougall, J.D.
northeastern Asia in connection with the opening of the North Atlantic and Arctic Ocean Basins,