

GSA Meeting
Denver, 2013

Ancient Earth app, Google Earth
paleoglobes, Paleoatlas for ArcGIS

C. Dreher
Focus Research

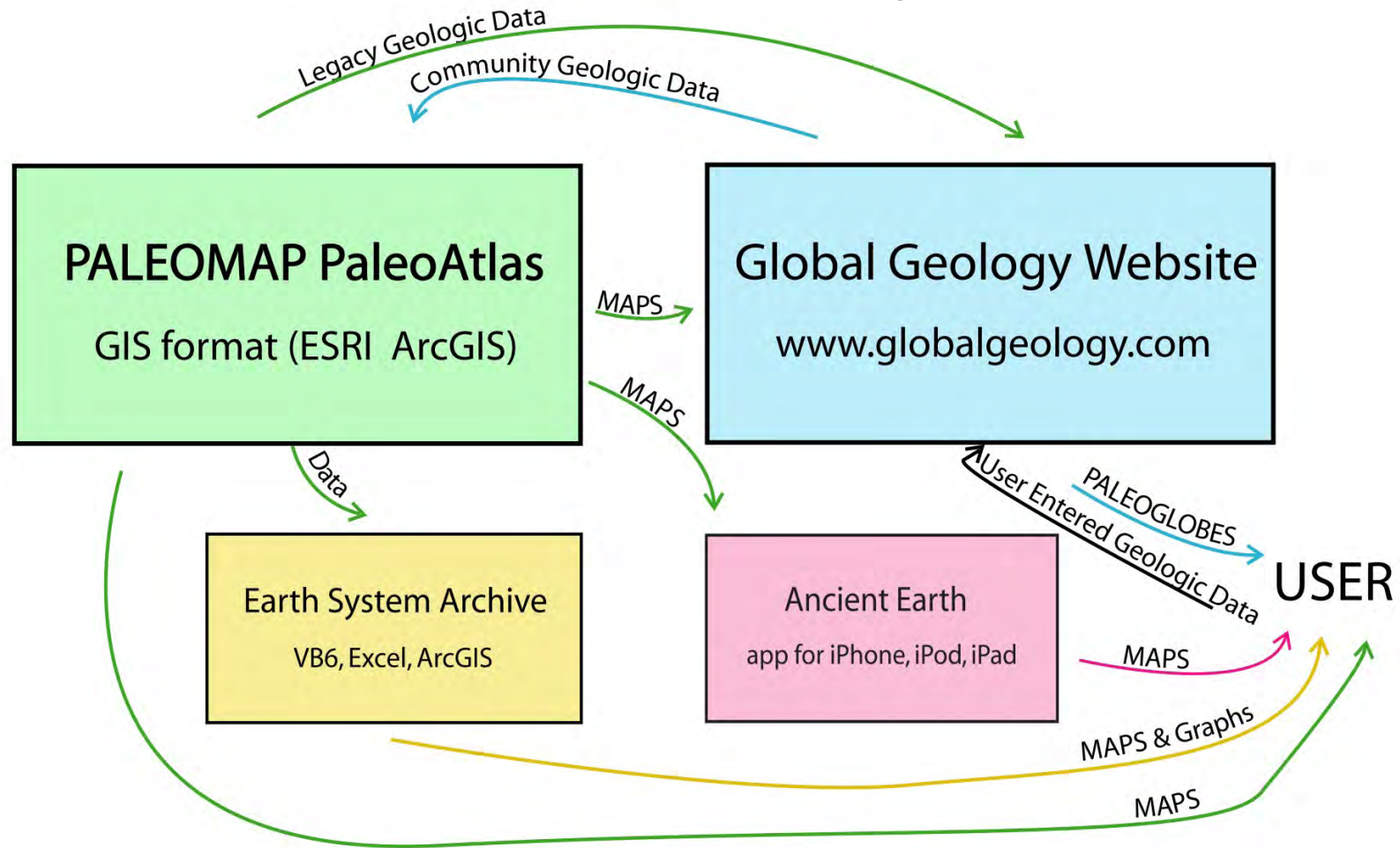
T.L. Moore, PaleoTerra
by C. R. Scotese, PALEOMAP Project

www.scotese.com

NSF Workshop Mandate

- Produce a interactive, user-friendly, internet-accessible tool that:
 - Produces Plate Tectonic reconstructions for any instant in time (0 – 4.5 by)
 - Provides basemaps that show paleogeographic, paleoclimatic, lithologic, tectonic, & paleoenvironmental information
 - Allows users to load geologic/stratigraphic information from across the internet (e.g. PBDB, COSUNA, etc.)
 - Allows users to add their own geologic/paleontologic /stratigraphic locality data

PALEOMAP Project



How to Get This Stuff

“Ancient Earth” app from iTunes

“Google Earth” paleoglobes from
www.globalgeology.com

“PALEOMAP PaleoAtlas for ArcGIS” send
me an email at cscotese@gmail.com or visit
www.scotese.com

PALEOMAP PaleoAtlas

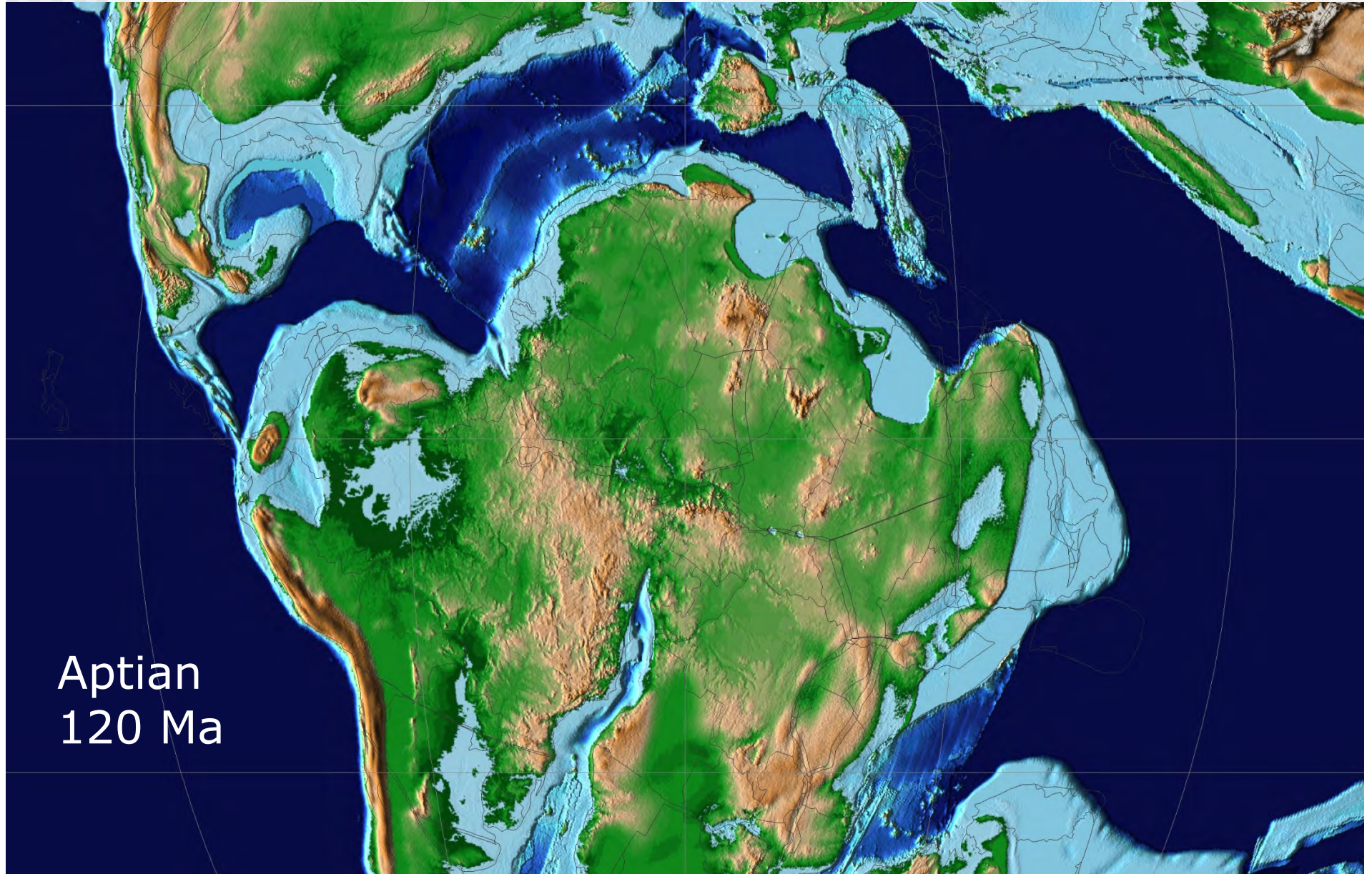
GIS format (ESRI ArcGIS)

PALEOMAP PaleoAtlas

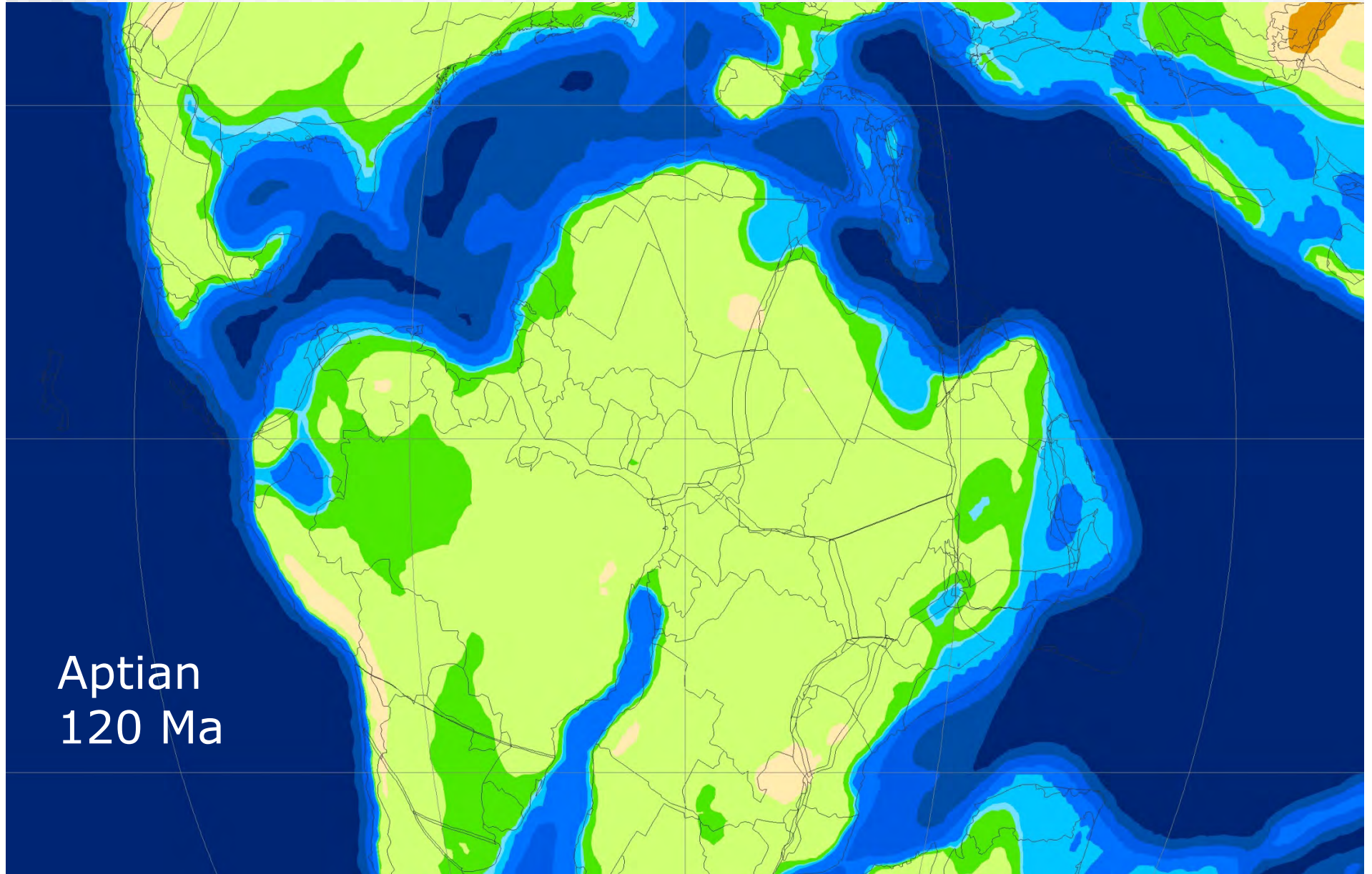
GIS format (ESRI ArcGIS)

- ArcMap Project (mxd) with ~ 140 paleomaps
 - one for each geologic stage
 - one for each major sequence strat boundary
- 15 different “feature types” for each time interval
 - including paleogeography, plate tectonics, paleolithology & paleoclimate

High Resolution Paleogeography



Simplified Paleogeography



Paleo-Rivers & Drainage on Simple Paleogeography

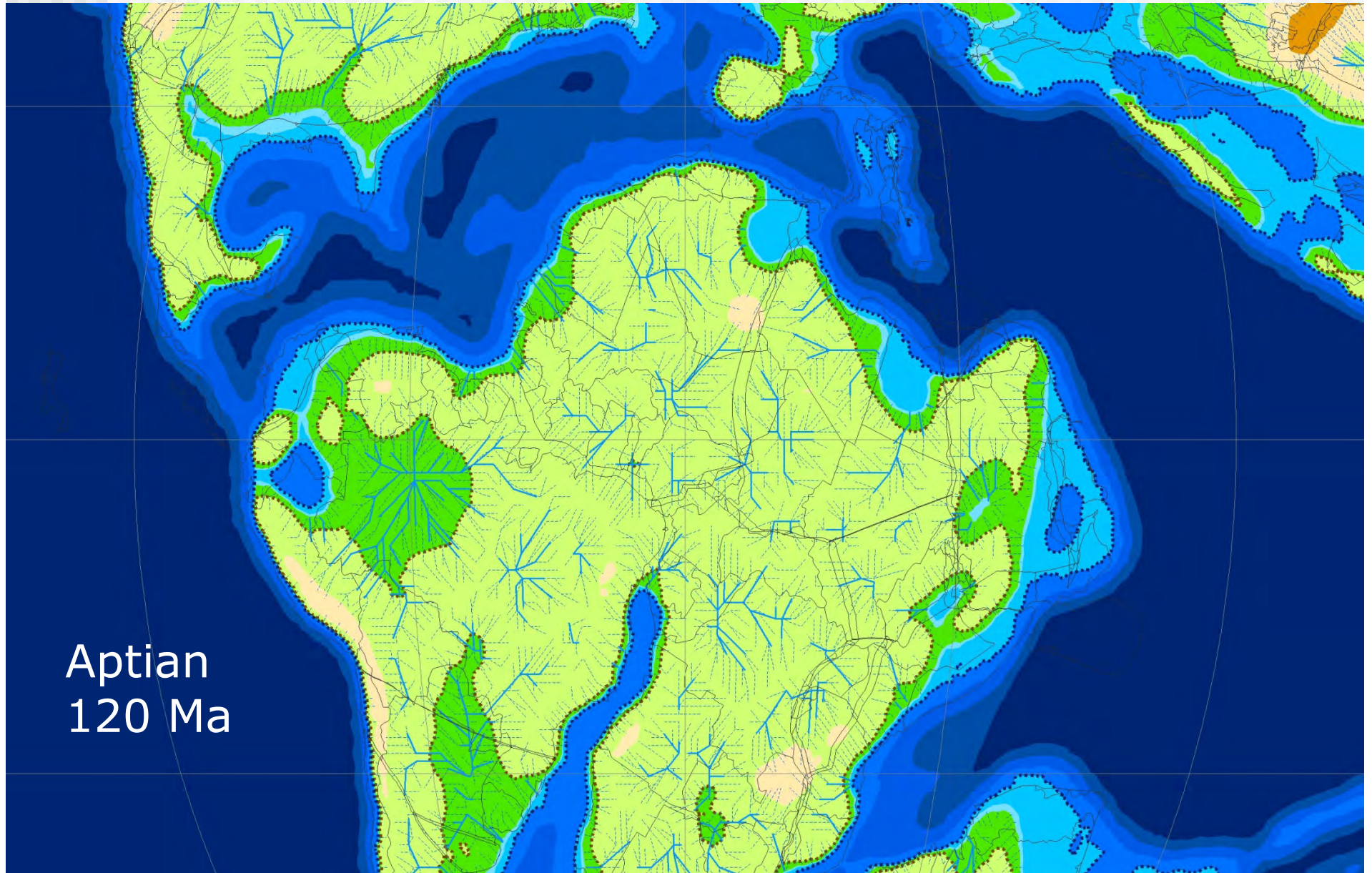
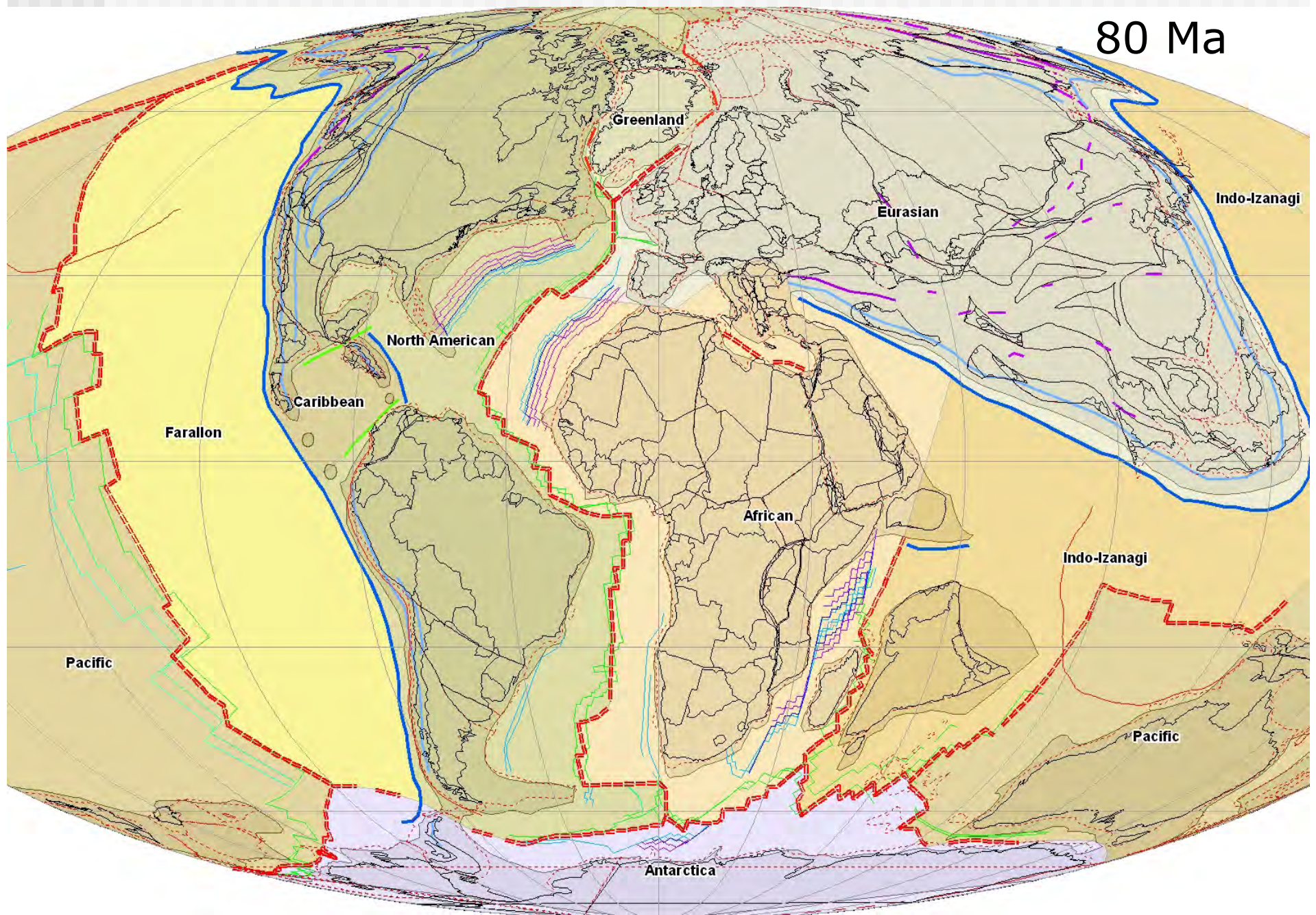
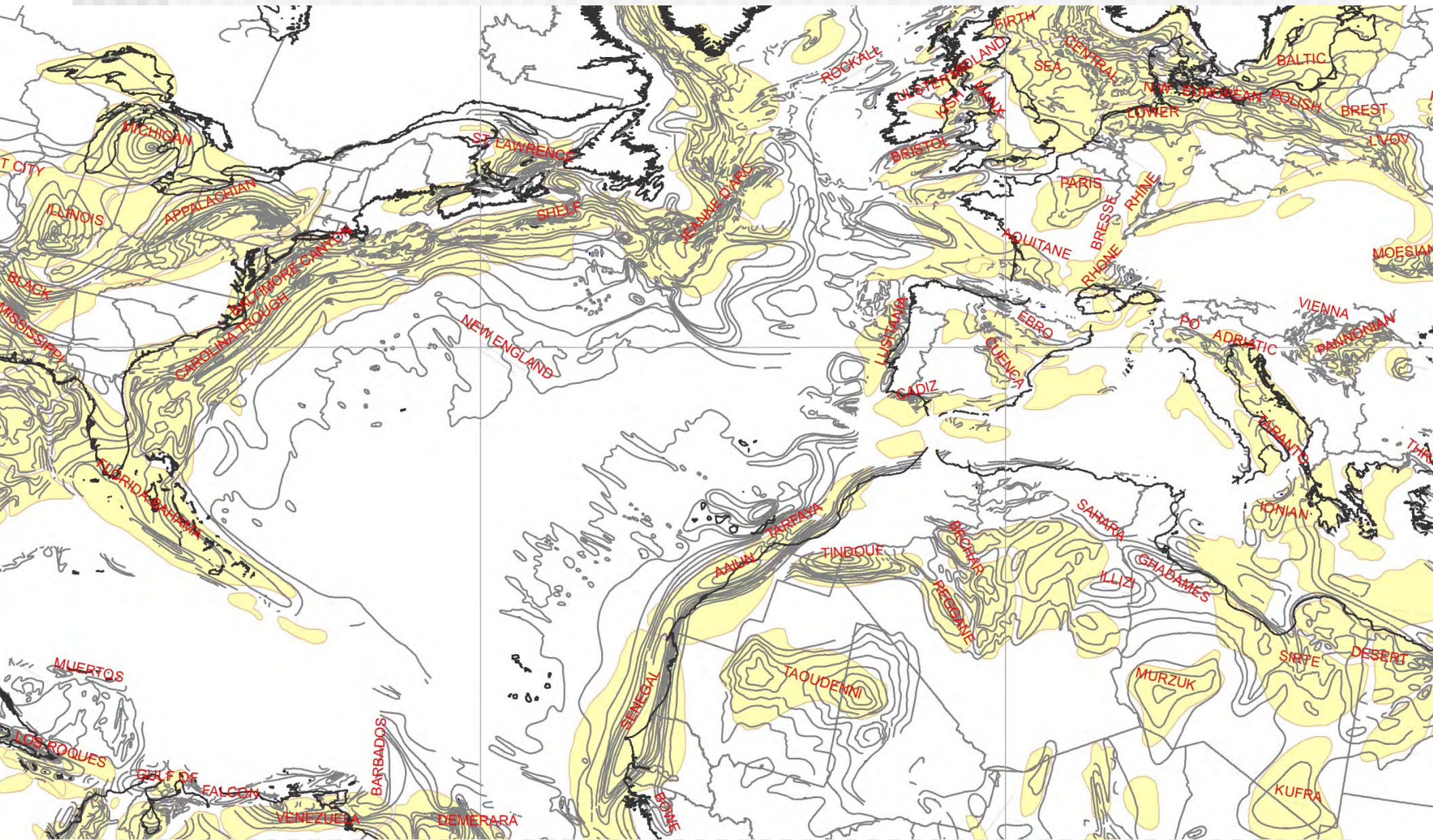


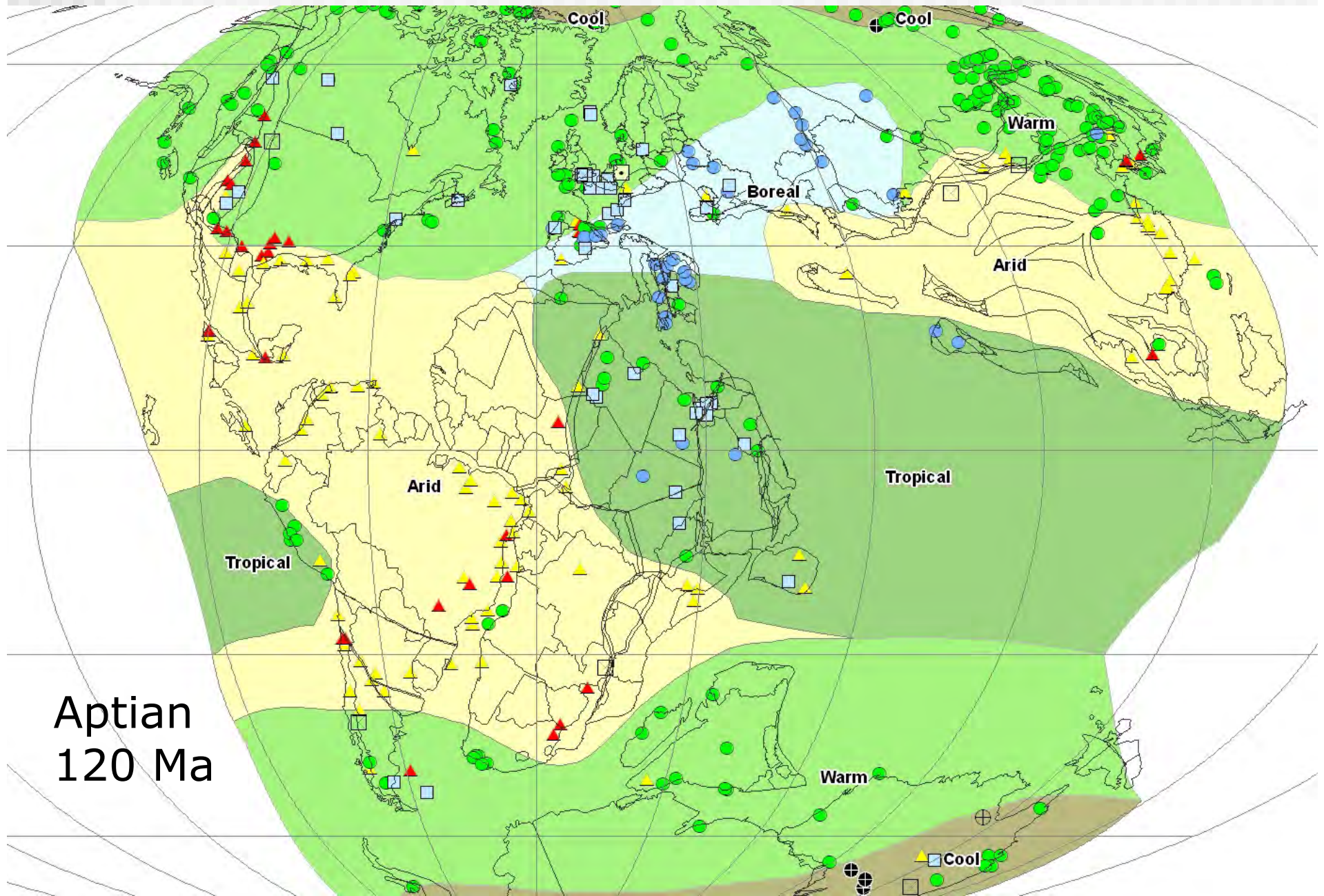
Plate Tectonic Reconstruction



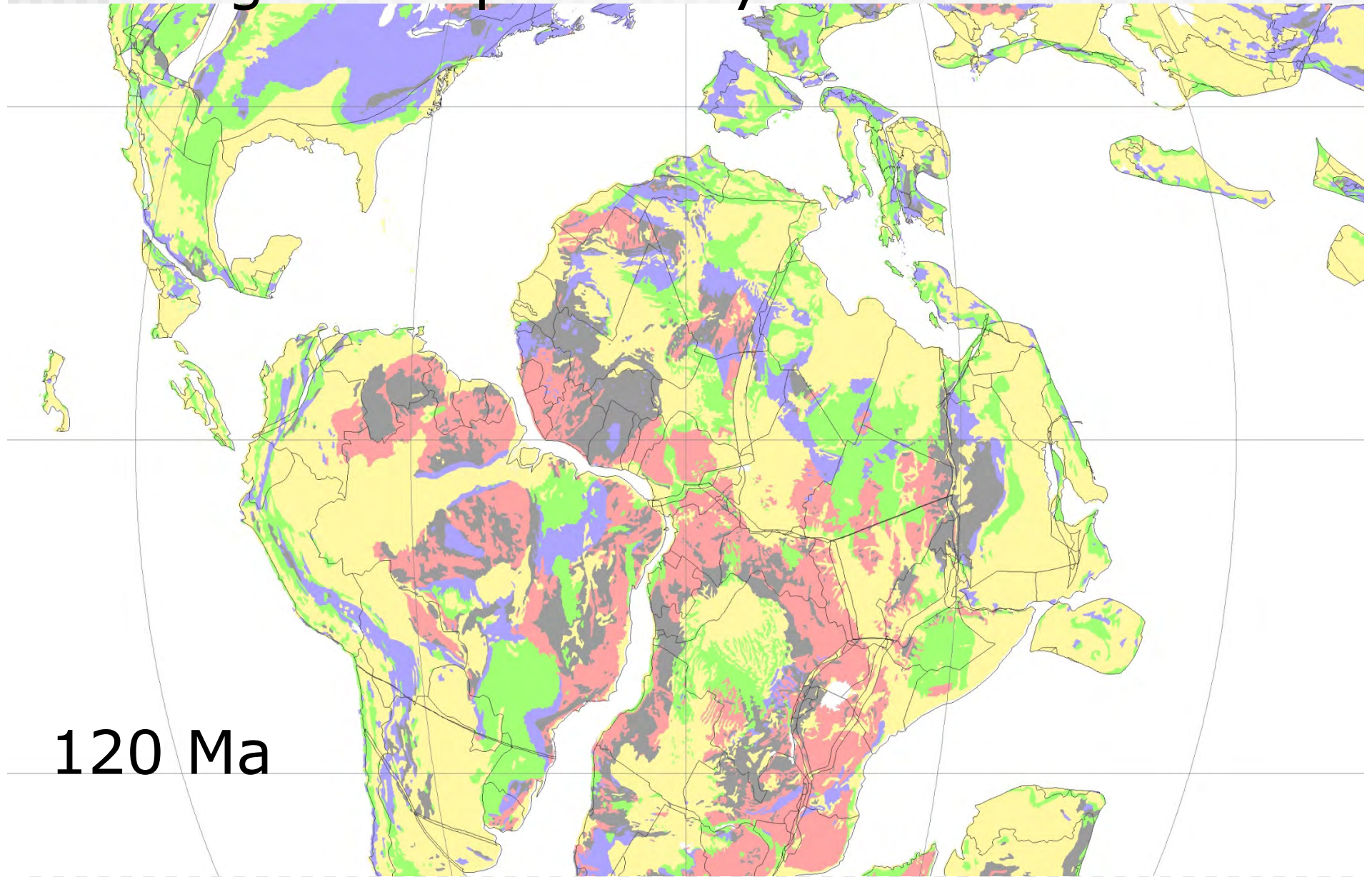
Sedimentary Basins from XOM Tectonic Map



Climatic Zones derived from Lithologies



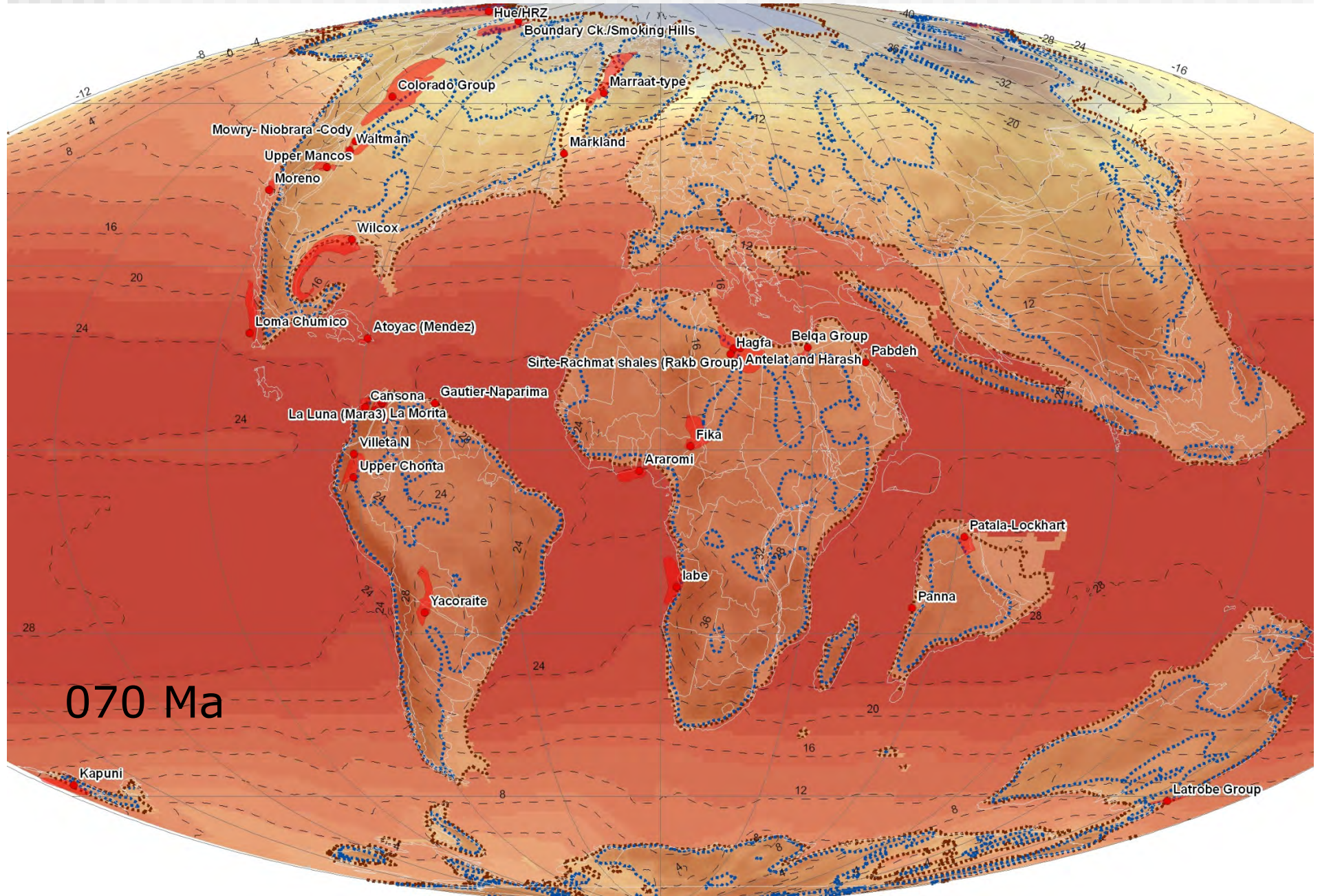
Paleoreconstruction with Global Geological Map Overlay



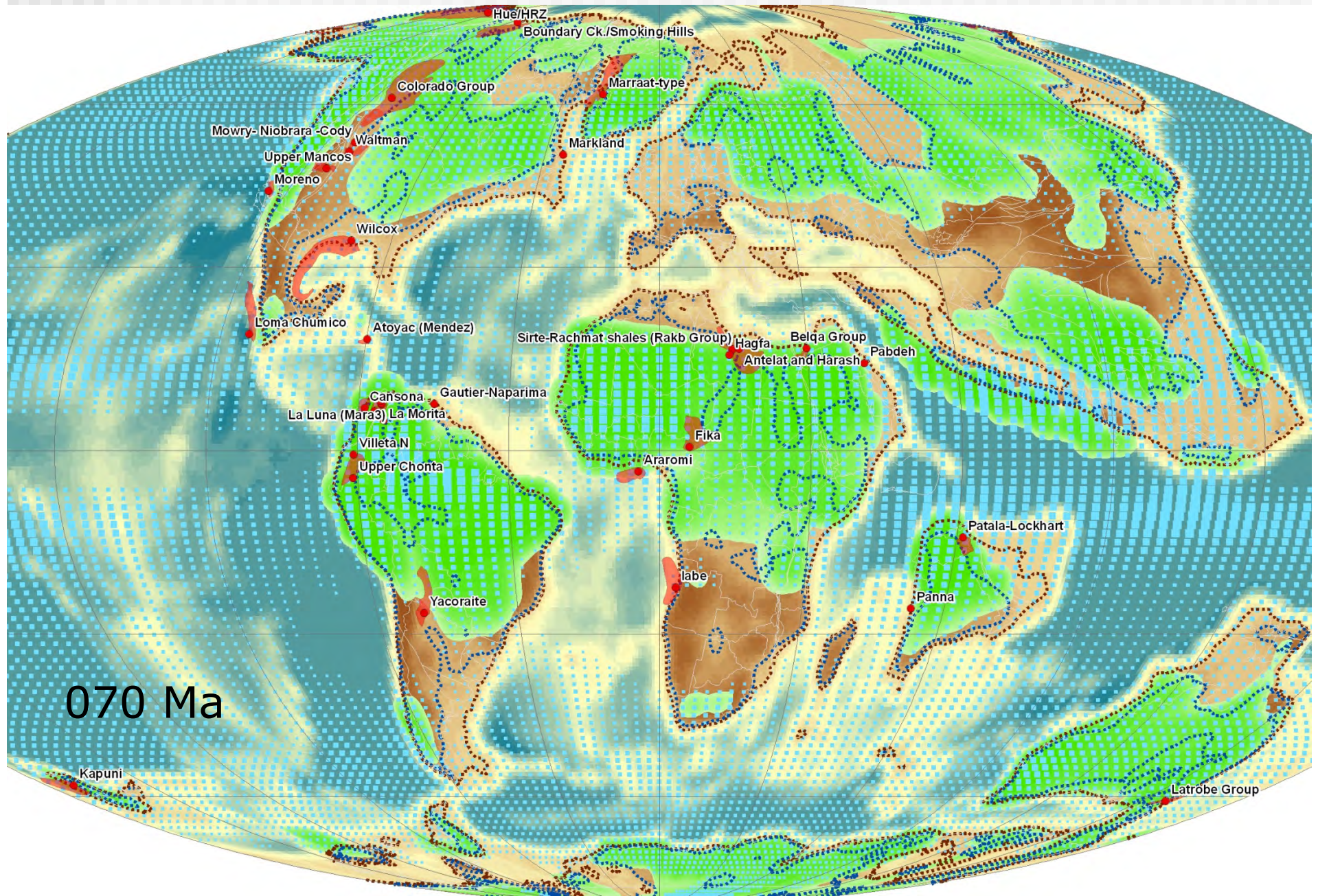
Time Intervals with Paleoclimate Simulations

EON	ERA	PERIOD	EPOCH	Ma	INTERVAL	GANDOLPH TIME SLICES
Phanerozoic	Cenozoic	Quaternary	Holocene	0.01	YEAR ↓	
			Pleistocene	Late 0.8		
				Early 1.8		
		Tertiary	Pliocene	Late 3.6		
				Early 5.3		
			Miocene	Late 11.6		
				Middle 16.0		15 - Miocene
				Early 23.0		
			Oligocene	Late 28.4		30 - Oligocene
				Early 33.9		
			Eocene	Late 37.2		
				Middle 48.6		45 - Middle Eocene (Thanetian)
				Early 55.8		
		Paleogene	Paleocene	Late 61.7		
				Early 65.5		70 - Tertiary/Cretaceous Boundary
	Mesozoic	Cretaceous	Late	100	1	90 - Late Cretaceous (Turonian-Cenomanian)
			Early	146	2	120 - Early Cretaceous (Albian-Aptian)
		Jurassic	Late	161	1	140 - Early Cretaceous (Barremian-Berriasian)
			Middle	176	3	160 - Late Jurassic (Tithonian-Oxfordian)
			Early	200		180 - Early Jurassic (Callovian-Hettangian)
		Triassic	Late	228	2	210 - Late Triassic (Rhaetian-Anisian)
			Middle	245		
			Early	251	4	250 - Permo-Triassic Boundary
		Permian	Late	271		
			Early	299	1	280 - Permo-Carboniferous
	Paleozoic	Carboniferous	Pennsylvanian	318		
			Mississippian	359	3	340 - Mississippian
			Late	385	1	360 - Late Devonian (Frasnian-Famennian)
		Devonian	Middle	398		
			Early	416	4	400 - Siluro-Devonian (Givetian-Wenlock)
		Silurian	Late	428		
			Early	444	2	440 - Late Ordovician - Early Silurian
		Ordovician	Late	461		
			Middle	472		
			Early	488	4	480 - Late Cambrian - Ordovician
		Cambrian	Late	501		
			Middle	513		
			Early	542	3	600 - Late Neoproterozoic (Ediacaran)
Precambrian	Proterozoic	Late		1000		
		Middle		1600		
		Early		2500		
	Archean	Late		3000		
		Middle		3400		
		Early				Age of FOAM Simulation

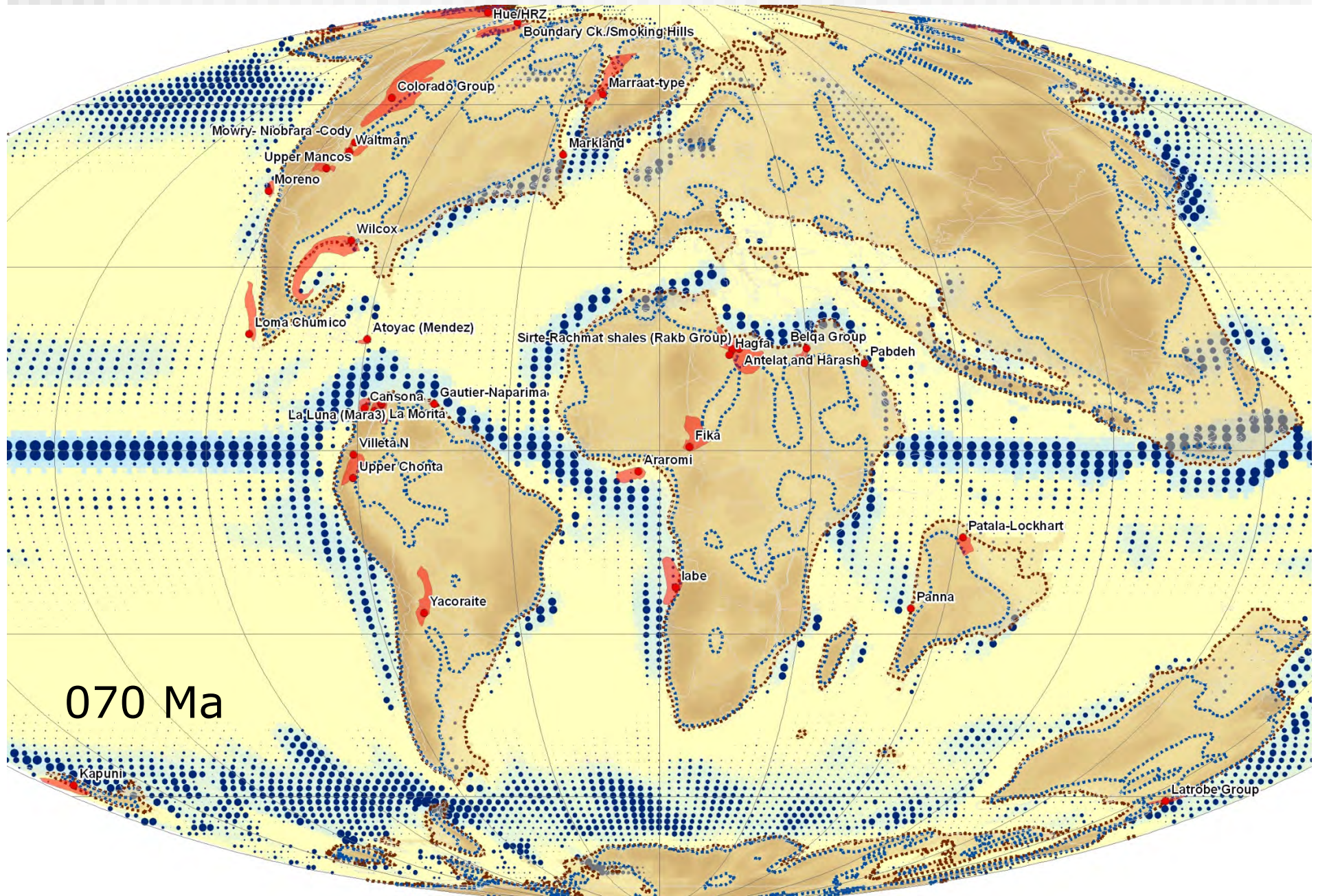
Winter Mean Annual Temperature with Isotherms

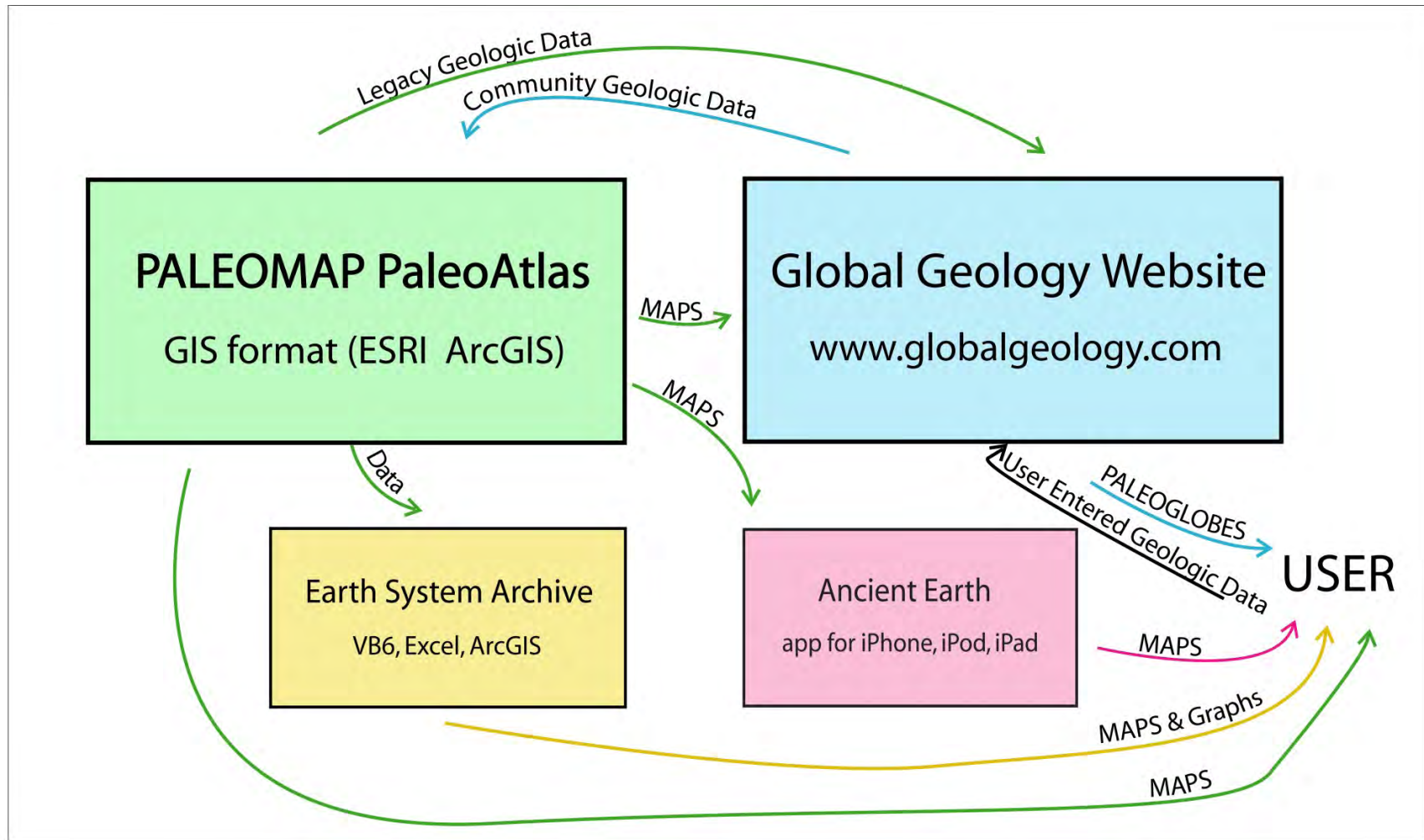


Mean Monthly Rainfall and Runoff



Upwelling Zones





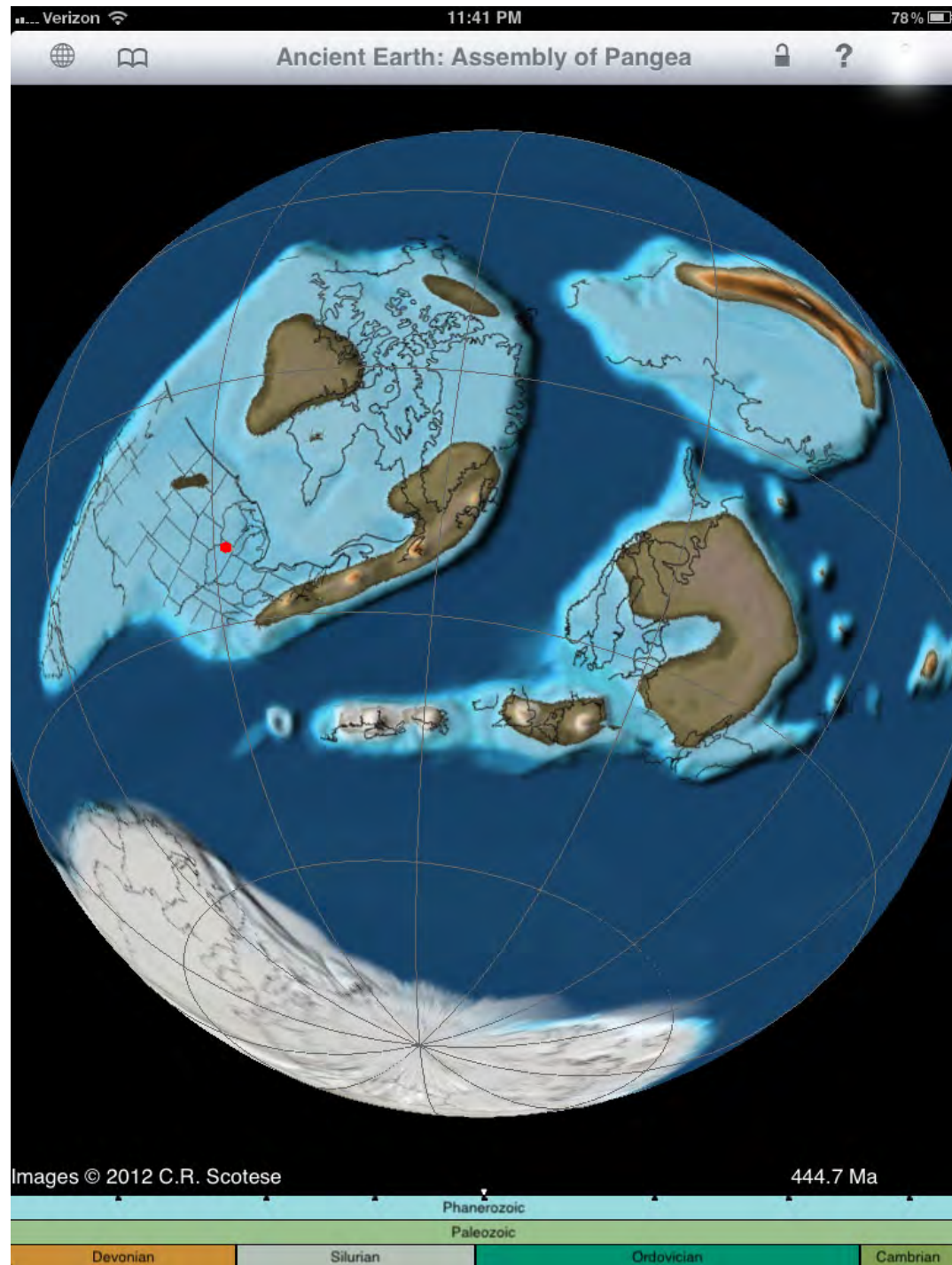
Ancient Earth

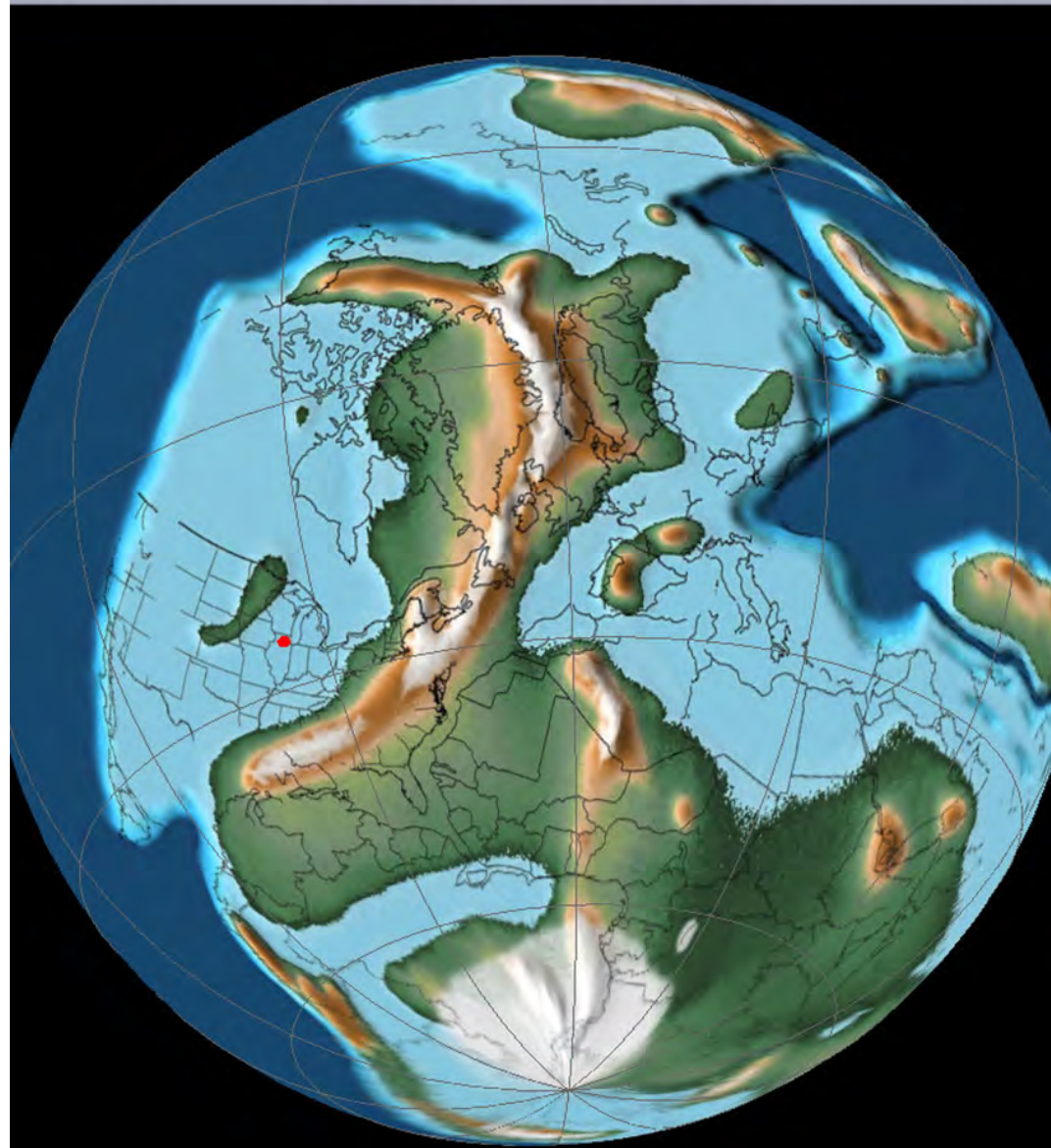
app for iPhone, iPod, iPad

Ancient Earth

app for iPhone, iPod, iPad

- AE: Breakup of Pangea (0-200 Ma) 1Q2012
- AE: Assembly of Pangea (200-540 Ma) 1Q2013
- AE: Future Pangea (0 - 250 Ma future) 4Q2013
- Google Earth-like interface
 - uses GPS to show user location through time
 - keep one continent "fixed"
 - add "bookmarks", labels, & geologic "info" points
 - add user-defined data





Images © 2012 C.R. Scotese

359.2 Ma

Paleozoic

Pennsylvanian

Carboniferous

Mississippian
Middle

Devonian

Early

Lato

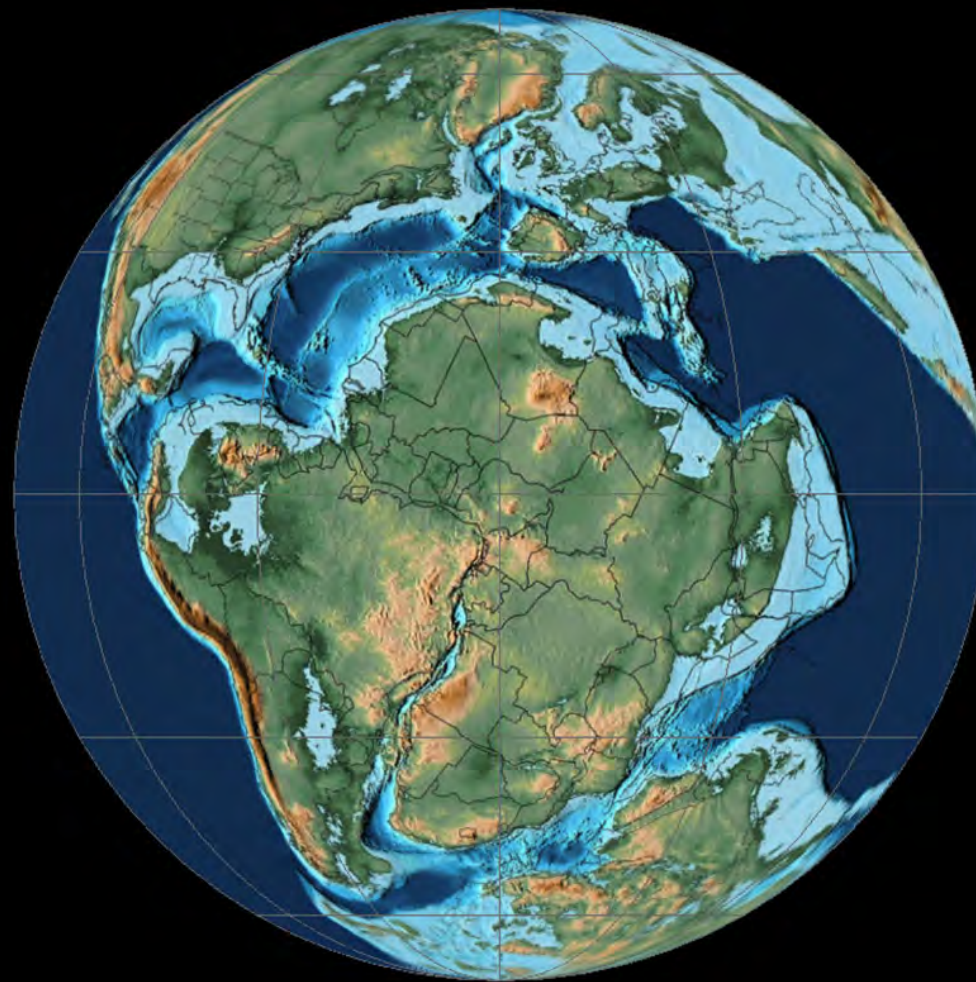
Middle

Early

Late

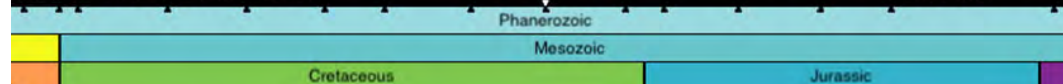
Middle

Early



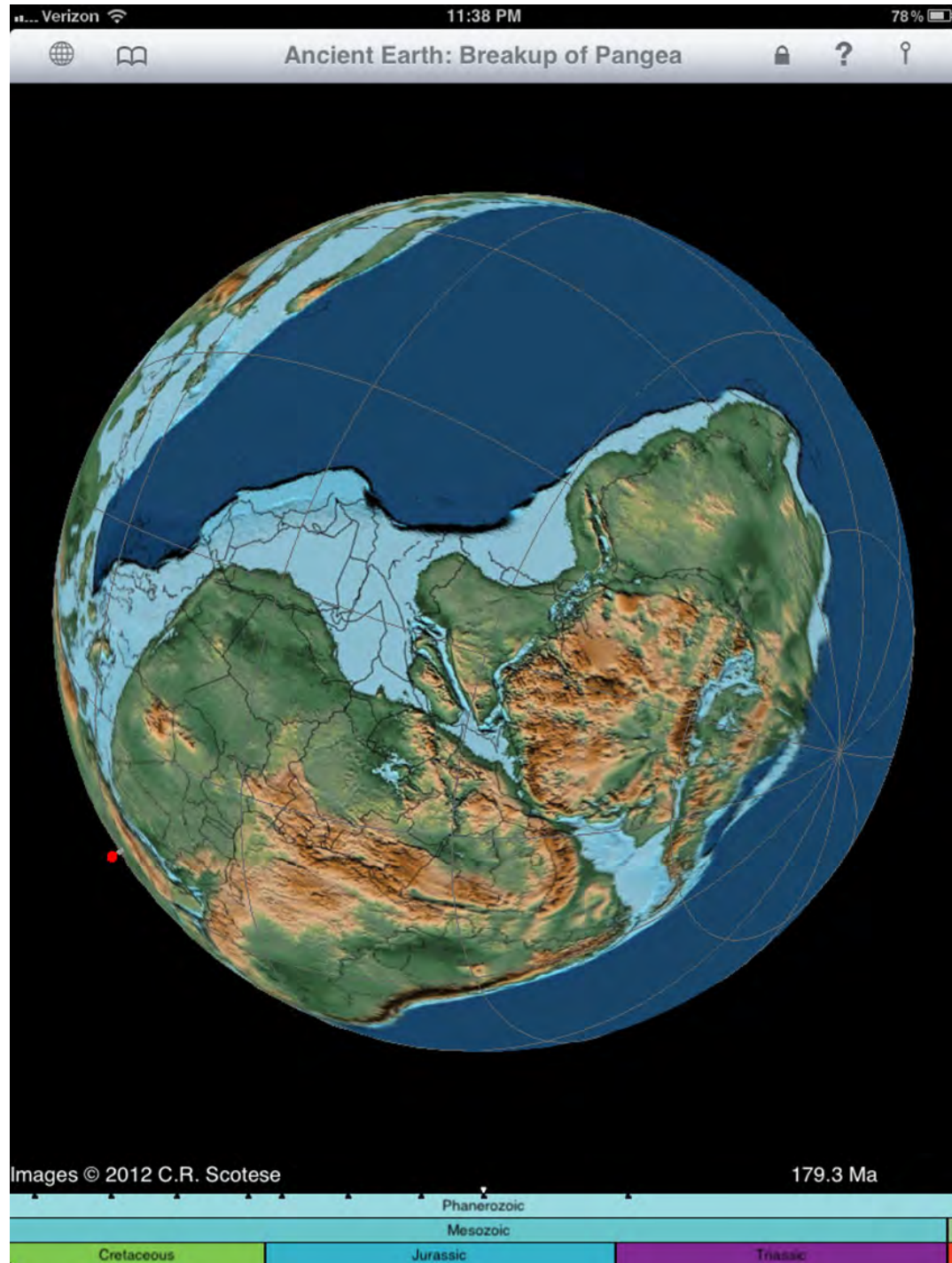
Images © 2012 C.R. Scotese

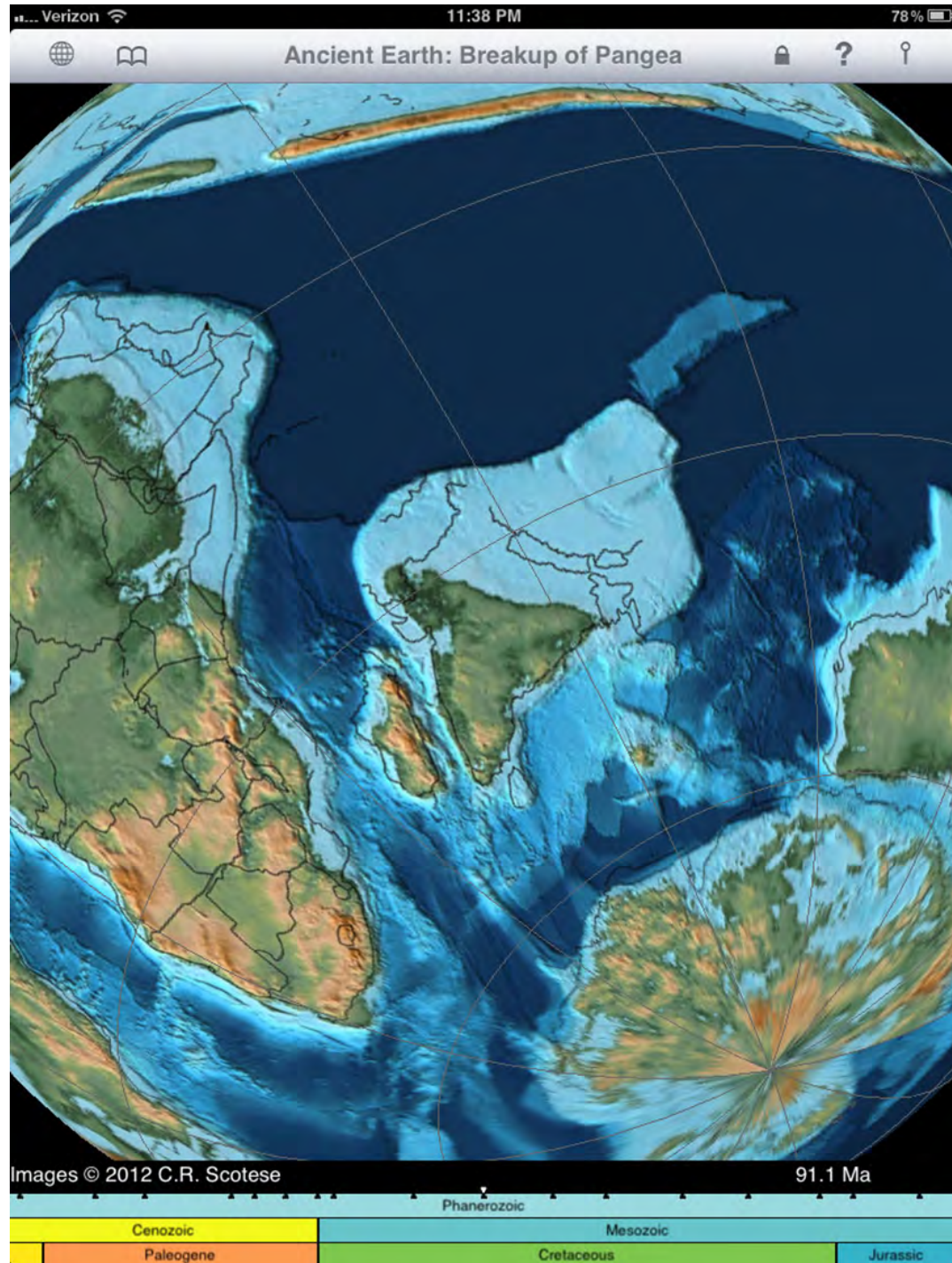
132.0 Ma

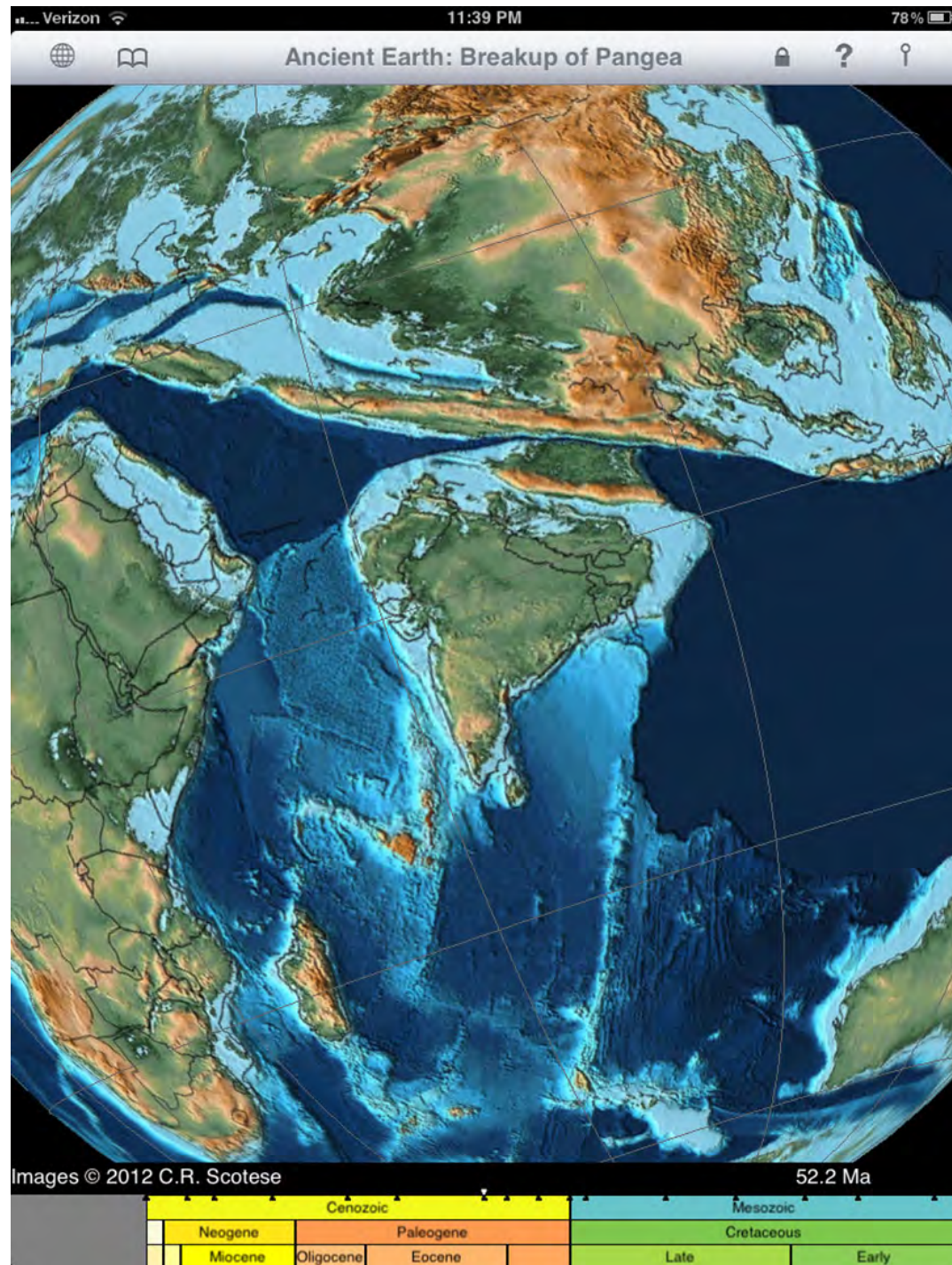


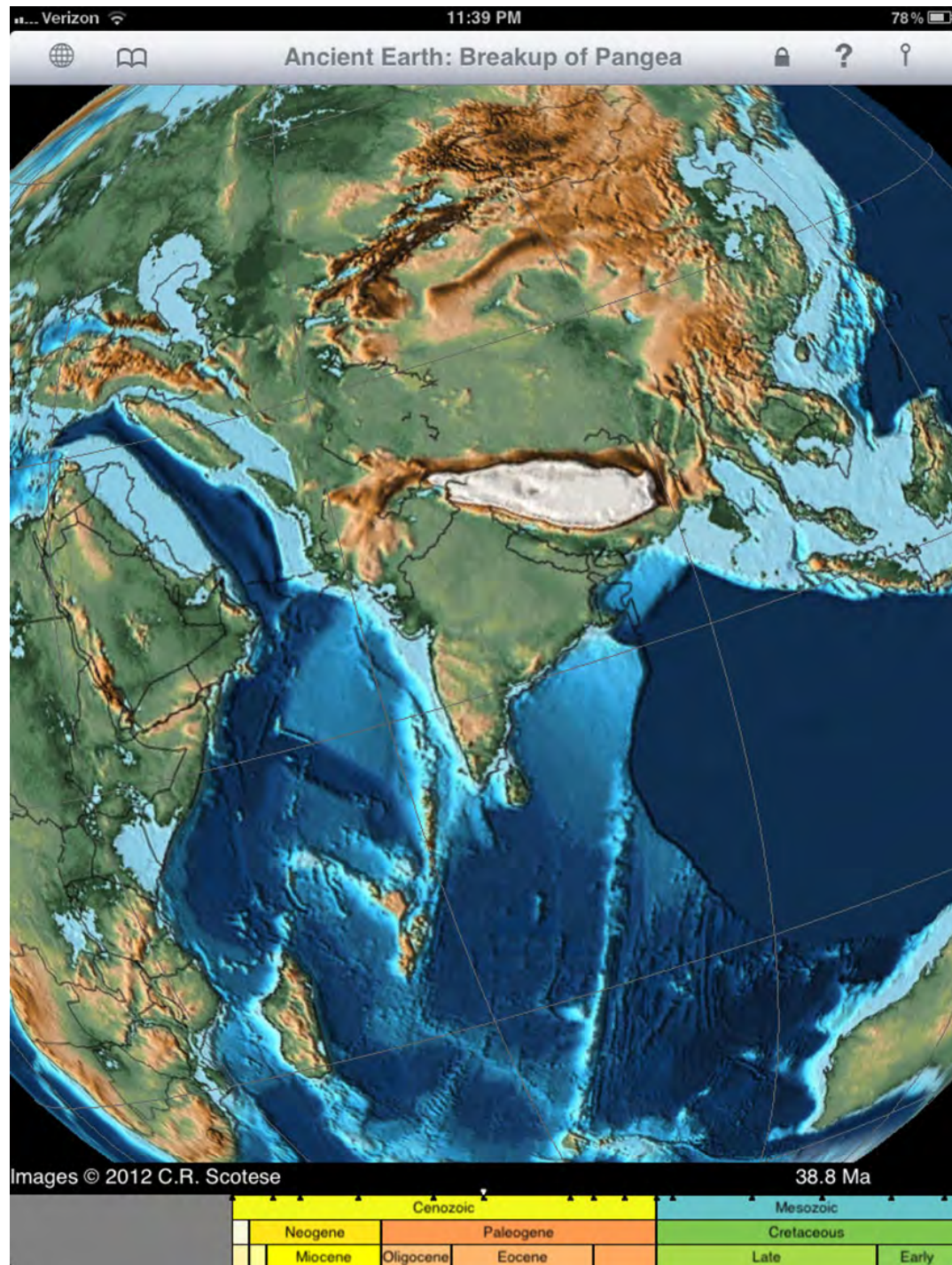


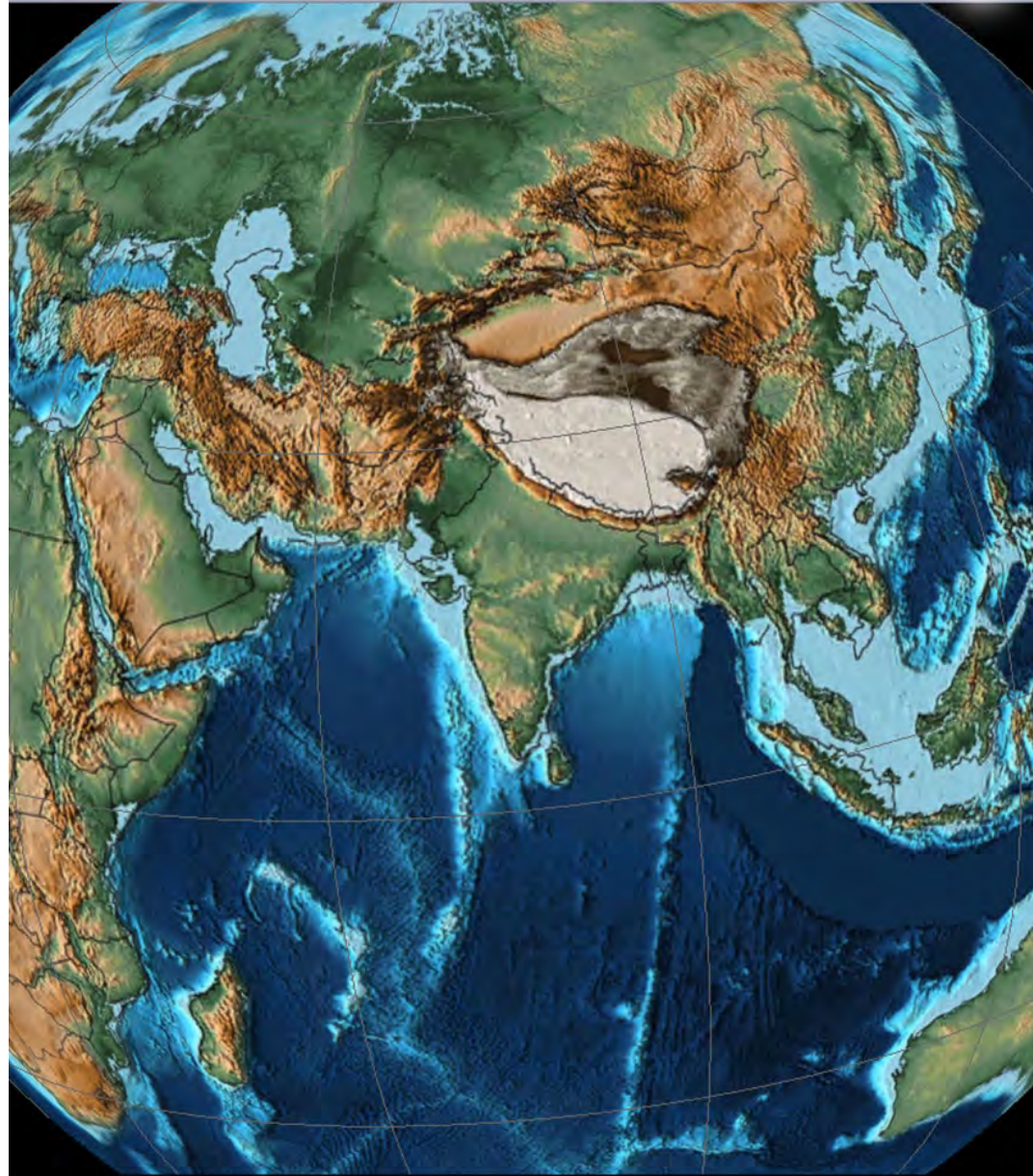






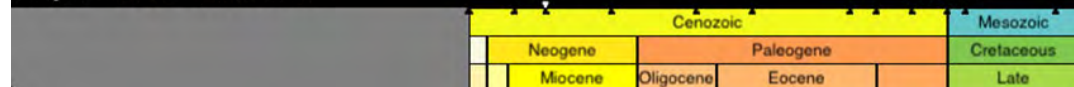






Images © 2012 C.R. Scotese

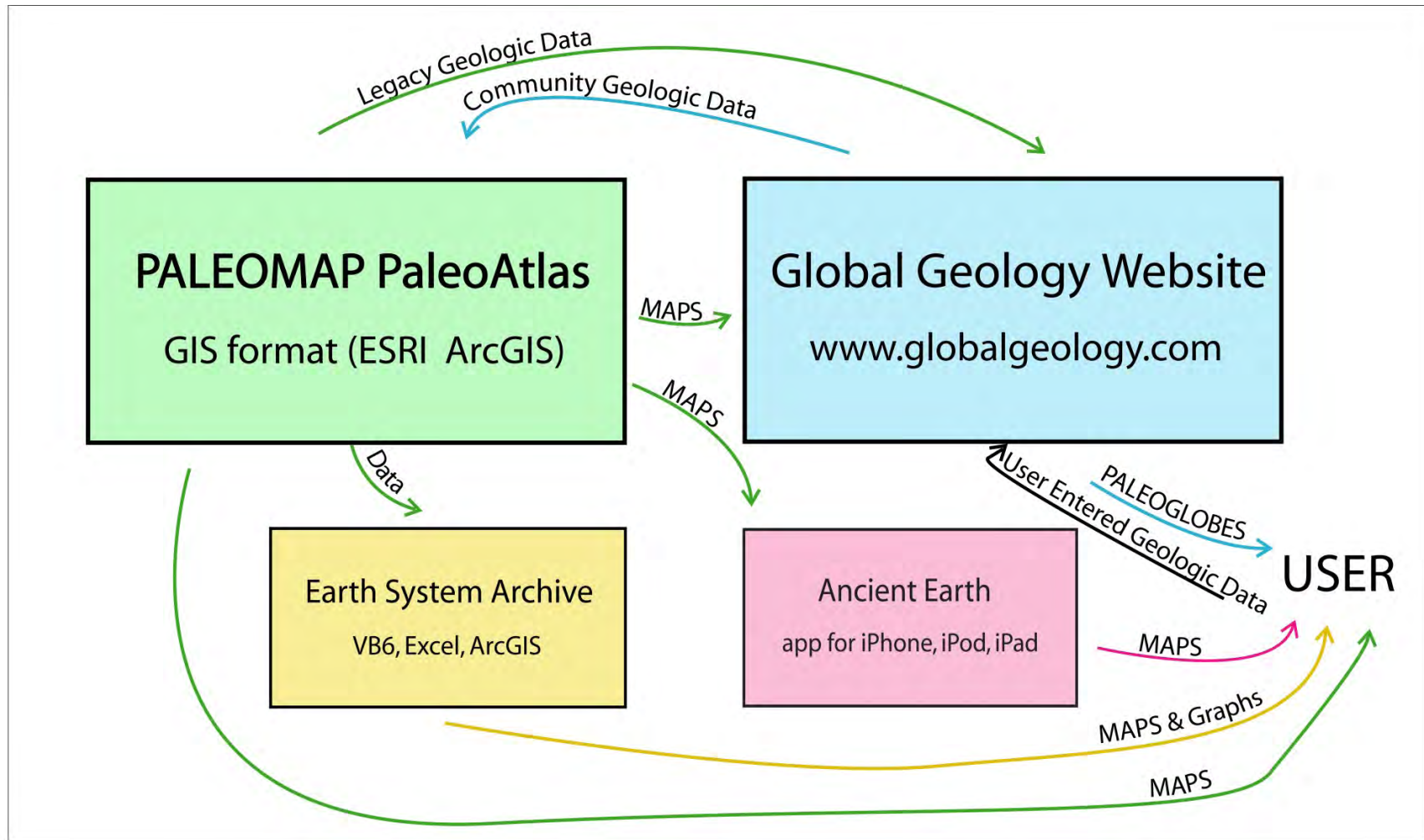
10.5 Ma





Ancient Earth app for iPad/iPhone

- Ancient Earth: Breakup of Pangea (200 Ma – 0 Ma) 03/12
- Ancient Earth: Assembly of Pangea (540Ma – 200Ma) 02/13
- Ancient Earth: Future Pangea (0Ma - +250Ma Future) 11/13
- Ancient Earth: Precambrian Pangeas (1100Ma – 540 Ma) 03/14
- Ancient Earth: Pro (all time intervals) 06/14



Global Geology Website

www.globalgeology.com

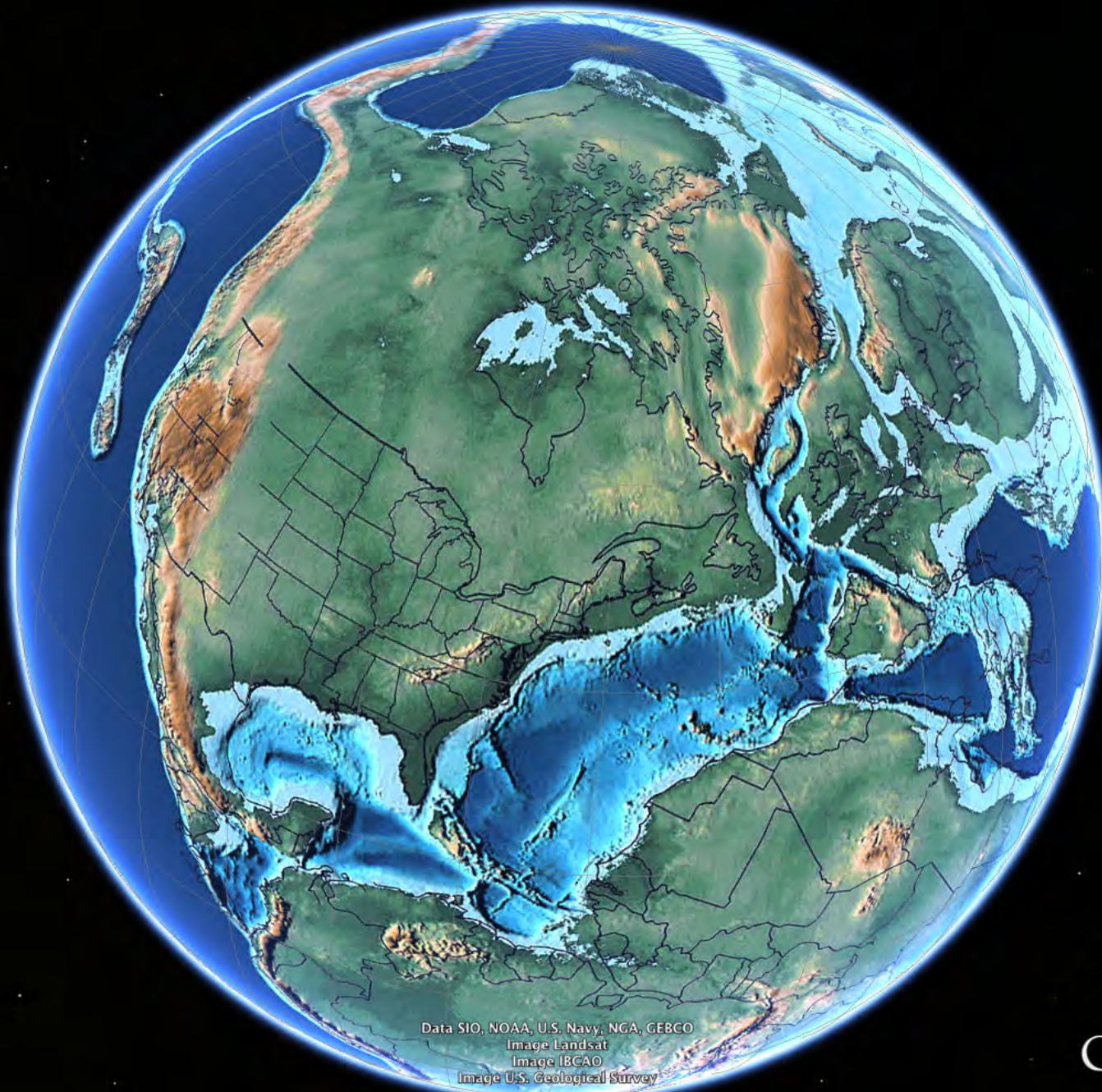
Global Geology Website

www.globalgeology.com

2 Parts:

- stratigraphic database -“Wikipedia for Geologists”
- exports “Google Earth” style Paleoglobes
 - with geologic localities from db as “pins”
 - with user-defined data localities

Earliest Cretaceous

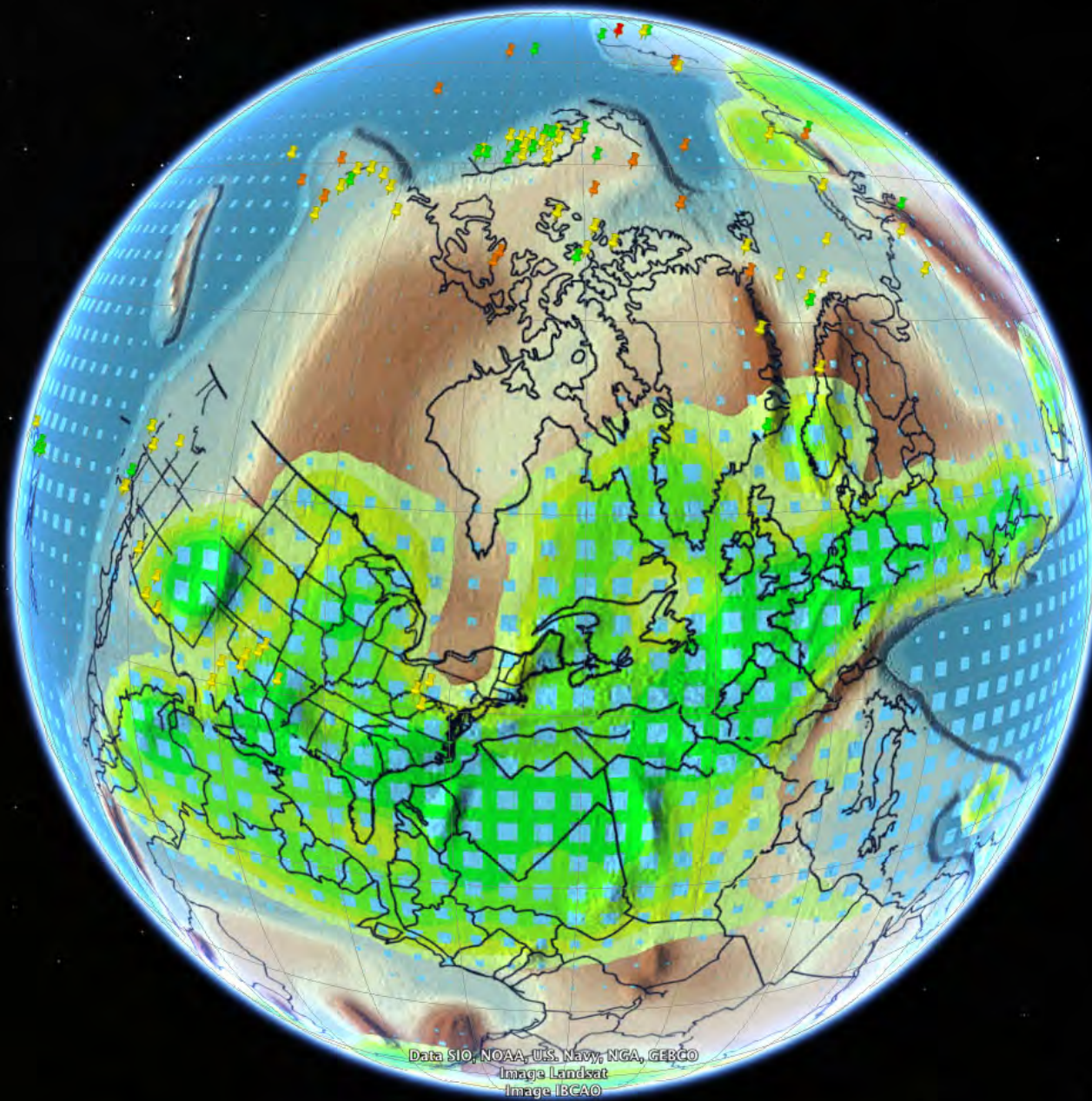


Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
Image IBCAO
Image U.S. Geological Survey

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Google earth

Late, Early Permian



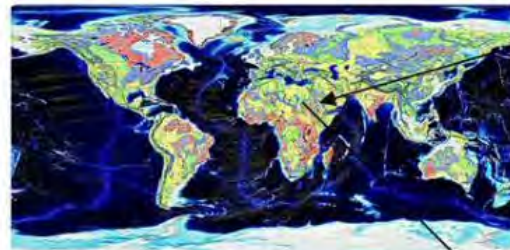
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
Image IBCAO

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Google earth

The Global Geology Database

The Global Geology Database is both an archive of stratigraphic information and a portal to the geology of the world. Like a cross between Google Maps and Wikipedia, GlobalGeology.com helps users discover and enter geological information.



Find a location...

...select a time scale...



...and discover or enter geologic data.

Click [here](#) or the image above to begin viewing geologic data.

Global Geology Paleoglobes

Paleoglobes are reconstructions of the ancient earth that show the past positions of the continents, along with the changing distribution of mountains, shallow seas, and other features through time. The Global Geology Paleoglobe tool lets you select a time interval and download a Google Earth-style paleoglobe that illustrates a variety of features, such as: paleotopography, paleobathymetry, plate tectonic boundaries, paleowinds, paleotemperature, or ancient oceanic circulation. You can add stratigraphic information from the Global Geology database or plot user-defined localities that appear as pins on a interactive Google Earth display.



You must be a registered user to create and download Paleoglobes. Not Registered? [Register Here](#) to join Global Geology!



Export Paleoglobe with Geologic Data

Map Name	Era	Period	Epochs	Stages	# of Geologic Records
Pleistocene	Cenozoic	Neogene	Pleistocene Pliocene	Piacenzian/Gelasian Zanclean	209
Late Miocene	Cenozoic	Neogene	Miocene	Messinian Tortonian	104
Early Miocene	Cenozoic	Neogene	Miocene	Serravalian Langhian Burdigalian Aquitanian	183
Oligocene	Cenozoic	Paleogene	Oligocene	Chattian Rupelian	127
Late Eocene	Cenozoic	Paleogene	Eocene	Priabonian Bartonian	136
Middle Eocene	Cenozoic	Paleogene	Eocene	Lutetian	102
Early Eocene	Cenozoic	Paleogene	Eocene	Ypresian	100
PETM	Cenozoic	Paleogene		Ypresian Thanetian	80
Paleocene	Cenozoic	Paleogene	Paleocene	Thanetian Selandian Danian	177
KT	Mesozoic	Cretaceous	Cretaceous-Late	Danian Maastrichtian	162
Late Cretaceous	Mesozoic	Cretaceous	Cretaceous-Late	Campanian Santonian Coniacian	267
Mid Cretaceous	Mesozoic	Cretaceous	Cretaceous-Late	Turonian Cenomanian	214
Albian	Mesozoic	Cretaceous	Cretaceous-Early	Albian	128
Late Aptian	Mesozoic	Cretaceous	Cretaceous-Early	Aptian	123
Early Aptian	Mesozoic	Cretaceous	Cretaceous-Early	Aptian	123
Late, Early Cretaceous	Mesozoic	Cretaceous	Cretaceous-Early	Barremian Hauterivian	197
Earliest Cretaceous	Mesozoic	Cretaceous	Cretaceous-Early	Valanginian Berriasian	207
Latest Jurassic	Mesozoic	Jurassic	Jurassic-Late	Tithonian	97
	Mesozoic	Jurassic	Jurassic-Late	Kimmeridgian	

Instructions

First, click on the time interval in the table to the left to select the Paleogeographic Map. Only one time interval may be selected.

Next, select the overlay map that will be displayed under the geological data. (Not all overlay maps are available for every time period.)

- ☒ Paleogeography High resolution paleogeography with 3D relief ([Example](#))
- ☐ Simplified Paleogeography Low resolution paleogeography with highstand/lowstand shorelines ([Example](#))
- ☐ Basemap Basemap with coastlines, political boundaries and white background ([Example](#))
- ☐ Relief Basemap Basemap with coastlines, political boundaries and grayscale 3D relief ([Example](#))
- ☐ Geology Geology with 3D relief ([Example](#))
- ☐ Paleoclimate Zones Paleoclimate Zones based on Lithologies (coals, evaporites, etc) ([Example](#))
- ☐ Temperature Mean Annual Surface Temperature with isotherms ([Example](#))
- ☐ Rainfall and Runoff Rainfall (blue squares), Wet Regions (Green), Deserts (Brown) ([Example](#))
- ☐ Paleoclimate Reconstruction Tropical Everwet, Arid, Warm Temperate, Cool Temperate, Polar ([Example](#))
- ☐ Winds Isobars and Winds ([Example](#))
- ☐ Salinity Ocean Salinity ([Example](#))
- ☐ Anoxia Ocean Anoxia ([Example](#))
- ☐ Upwelling Zones of Oceanic Upwelling ([Example](#))
- ☐ Tectonics Plate Tectonics ([Example](#))

Admin ONLY: Include all map overlays: ☐

Next, select what should be included in your Paleoglobe file.

- ☒ Maps with geological data.
- ☐ Maps only, without geological data.

Next, if you'd like to plot your own data, browse for a data file.

no file selected

(Click [here](#) for information about the format of the data file.)



SIMPLIFIED PALEOGEOGRAPHY

You are logged or

[G](#)
[Do](#)

ographic Map.

f ([Example](#))

d/lowstand shorelines ([Example](#))

and white background ([Example](#))

and grayscale 3D relief ([Example](#))

als, evaporites, etc) ([Example](#))

erms ([Example](#))

Deserts (Brown) ([Example](#))

I Temperate, Polar ([Example](#))

ns can be downloaded at no charge.

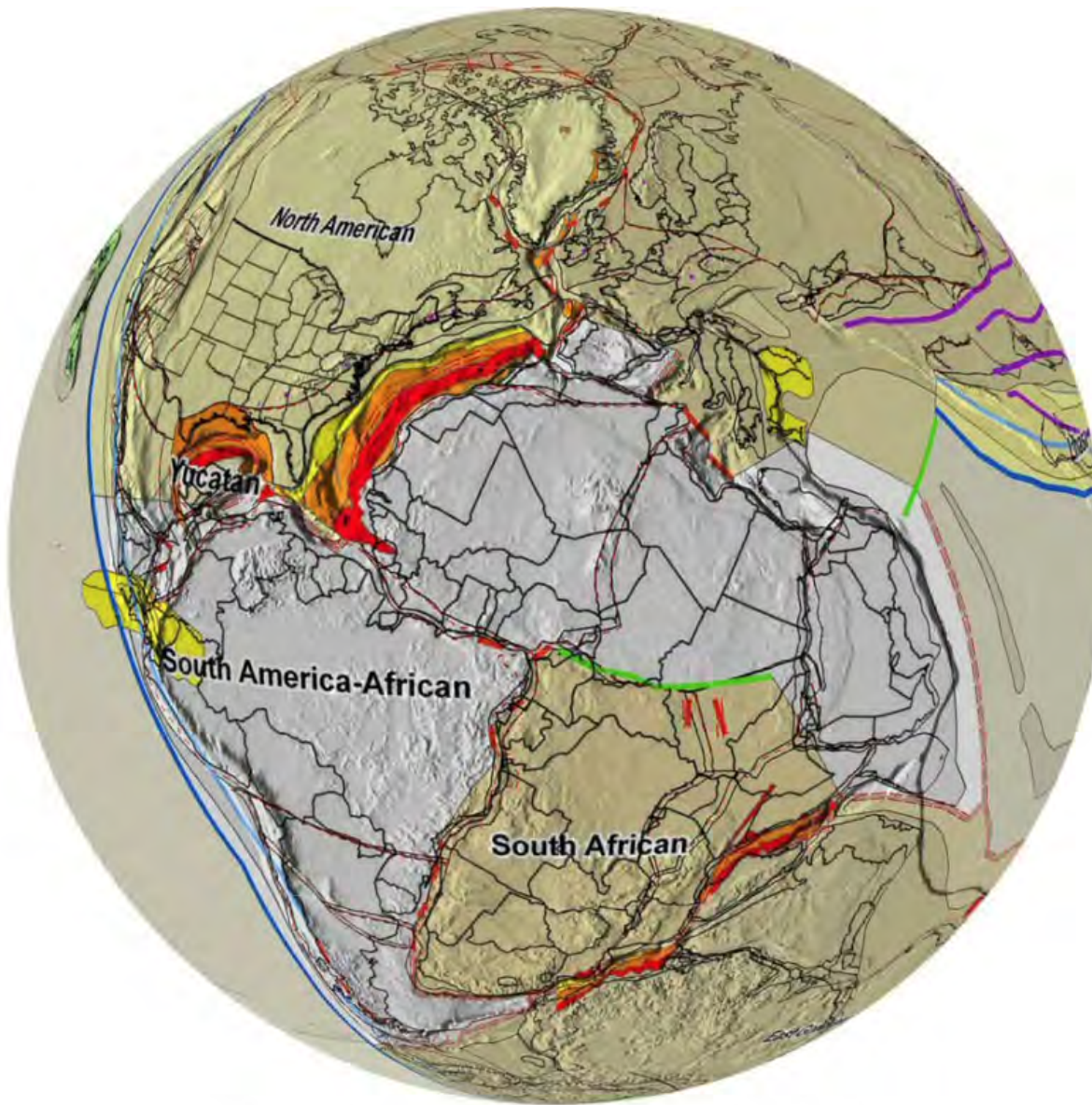


PLATE TECTONICS

with ACTIVE PLATE BOUNDARIES & ANCIENT PLATES

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ographic Map.

f ([Example](#))

d/lowstand shorelines ([Example](#))

and white background ([Example](#))

and grayscale 3D relief ([Example](#))

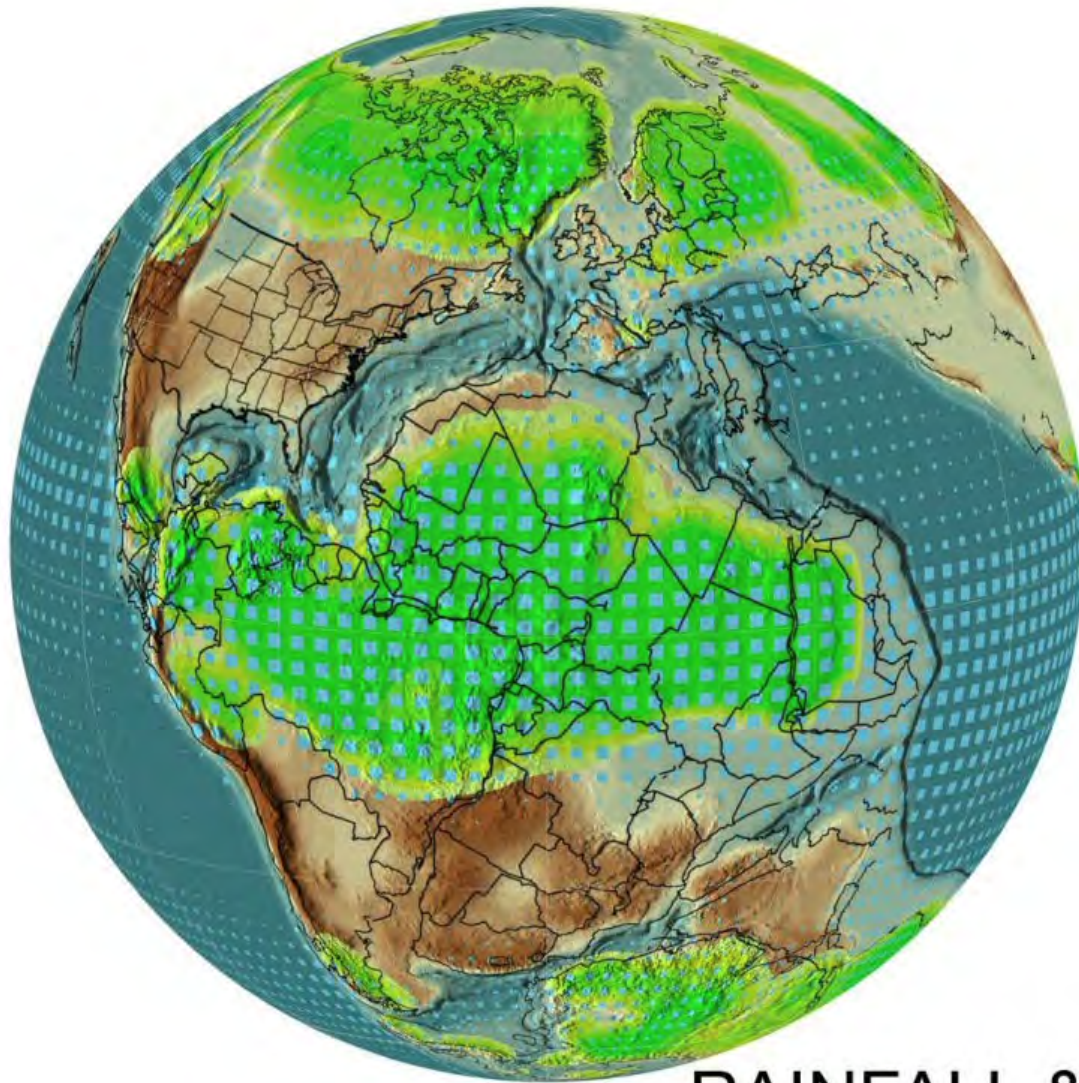
als, evaporites, etc) ([Example](#))

erms ([Example](#))

Deserts (Brown) ([Example](#))

I Temperate, Polar ([Example](#))

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RAINFALL & RUNOFF

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al data.

D relief ([Example](#))

ghstand/lowstand shorelines ([Example](#))

idaries and white background ([Example](#))

idaries and grayscale 3D relief ([Example](#))

es (coals, evaporites, etc) ([Example](#))

n isotherms ([Example](#))

Green), Deserts (Brown) ([Example](#))

e, Cool Temperate, Polar ([Example](#))

e)



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	Mesozoic	Jurassic	Jurassic-Late	Kimmeridgian	

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Admin ONLY: Include all map overlays: ☐

Next, select what should be included in your Paleoglobe file.

- ☒ Maps with geological data.
- ☐ Maps only, *without* geological data.

Next, if you'd like to plot *your own* data, browse for a data file.

no file selected

(Click [here](#) for information about the format of the data file.)

Middle Eocene	Cenozoic	Paleogene	Eocene	Lutetian	102
Early Eocene	Cenozoic	Paleogene	Eocene	Ypresian	100
PETM	Cenozoic	Paleogene		Ypresian Thanetian	80
Paleocene	Cenozoic	Paleogene	Paleocene	Thanetian Selandian Danian	177
KT	Mesozoic	Cretaceous	Cretaceous-Late	Danian Maastrichtian	162
Late Cretaceous	Mesozoic	Cretaceous	Cretaceous-Late	Campanian Santonian Coniacian	267
Mid Cretaceous	Mesozoic	Cretaceous	Cretaceous-Late	Turonian Cenomanian	214
Albian	Mesozoic	Cretaceous	Cretaceous-Early	Albian	128
Late Aptian	Mesozoic	Cretaceous	Cretaceous-Early	Aptian	123
Early Aptian	Mesozoic	Cretaceous	Cretaceous-Early	Aptian	123
Late, Early Cretaceous	Mesozoic	Cretaceous	Cretaceous-Early	Barremian Hauterivian	197
Earliest Cretaceous	Mesozoic	Cretaceous	Cretaceous-Early	Valanginian Berriasian	207
Latest Jurassic	Mesozoic	Jurassic	Jurassic-Late	Tithonian	97
Late Jurassic	Mesozoic	Jurassic	Jurassic-Late	Kimmeridgian Oxfordian	149
Middle Jurassic	Mesozoic	Jurassic	Jurassic-Middle	Callovian Bathonian Bajocian Aalenian	274
Late, Early Jurassic	Mesozoic	Jurassic	Jurassic-Early	Toarcian	94
Early Jurassic	Mesozoic	Jurassic	Jurassic-Early	Pliensbachian Sinemurian	150
Triassic Jurassic	Mesozoic	Jurassic		Hettangian Rhaetian	126
Latest Triassic	Mesozoic	Triassic	Triassic-Late	Rhaetian Norian	170
Late Triassic	Mesozoic	Triassic	Triassic-Late	Camian	100
Late, Middle Triassic	Mesozoic	Triassic	Triassic-Middle	Ladinian Anisian	128
Early Triassic	Mesozoic	Triassic	Triassic-Early	Olenekian Induan	120
Permo Triassic	Mesozoic	Triassic		Induan	75

Geology	Geology with Paleogeography (Example)
Paleoclimate Zones	Paleoclimate Zones based on Lithologies (coals, evaporites, etc) (Example)
Temperature	Mean Annual Surface Temperature with isotherms (Example)
Rainfall and Runoff	Rainfall (blue squares), Wet Regions (Green), Deserts (Brown) (Example)
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Salinity	Ocean Salinity (Example)
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Upwelling	Zones of Oceanic Upwelling (Example)
Tectonics	Plate Tectonics (Example)

Admin ONLY: Include all map overlays: ☐



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- ☒ Maps with geological data.
- ☐ Maps only, without geological data.



Next, if you'd like to plot your own data, browse for a data file.

no file selected

(Click [here](#) for information about the format of the data file.)

Google Earth compatible Paleoglobes (.kmz) with geological data plotted as pins can be downloaded at no charge. [This is what they look like.](#)

In the near future, users will need a "ticket number" purchased at the PALEOMAP website (www.scotese.com) to generate downloads. Enjoy the free downloads while they last!!

Next, select a Download Ticket with remaining downloads that you've already used...



-- (1000000 remaining) --



Finally, click this button to create your Paleoglobe file.

Plotting Your Own Data

You can plot your own data on the Google Earth globe along with Paleoglobe with geologic data. To do this, create a comma-separated, pure-text file, where each line has the following format:

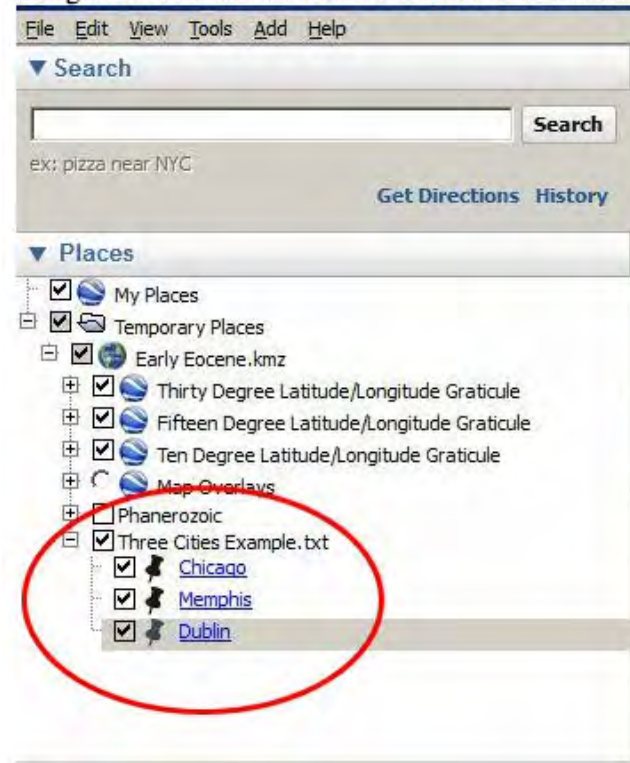
```
latitude, longitude, location-name, data-description
```

For example, the following text file, named "Three Cities Example.txt", will plot three data points on the globe.

```
41.5,-87.5,Chicago,This is where I went to school!  
35.1,-91.2,Memphis,This is the home of Elvis Presley's Graceland.  
53,-6.3,Dublin,The home of Irish music.
```

When the Google Earth kmz file is created and downloaded to the Google Earth application...

...the name of the text file appears in the Google Earth Places menu on the left side of the screen... ...and the black map pins appear on the globe.



Middle Eocene	Cenozoic	Paleogene	Eocene	Lutetian	102
Early Eocene	Cenozoic	Paleogene	Eocene	Ypresian	100
PETM	Cenozoic	Paleogene		Ypresian Thanetian	80
Paleocene	Cenozoic	Paleogene	Paleocene	Thanetian Selandian Danian	177
KT	Mesozoic	Cretaceous	Cretaceous-Late	Danian Maastrichtian	162
Late Cretaceous	Mesozoic	Cretaceous	Cretaceous-Late	Campanian Santonian Coniacian	267
Mid Cretaceous	Mesozoic	Cretaceous	Cretaceous-Late	Turonian Cenomanian	214
Albian	Mesozoic	Cretaceous	Cretaceous-Early	Albian	128
Late Aptian	Mesozoic	Cretaceous	Cretaceous-Early	Aptian	123
Early Aptian	Mesozoic	Cretaceous	Cretaceous-Early	Aptian	123
Late, Early Cretaceous	Mesozoic	Cretaceous	Cretaceous-Early	Barremian Hauterivian	197
Earliest Cretaceous	Mesozoic	Cretaceous	Cretaceous-Early	Valanginian Berriasian	207
Latest Jurassic	Mesozoic	Jurassic	Jurassic-Late	Tithonian	97
Late Jurassic	Mesozoic	Jurassic	Jurassic-Late	Kimmeridgian Oxfordian	149
Middle Jurassic	Mesozoic	Jurassic	Jurassic-Middle	Callovian Bathonian Bajocian Aalenian	274
Late, Early Jurassic	Mesozoic	Jurassic	Jurassic-Early	Toarcian	94
Early Jurassic	Mesozoic	Jurassic	Jurassic-Early	Pliensbachian Sinemurian	150
Triassic Jurassic	Mesozoic	Jurassic		Hettangian Rhaetian	126
Latest Triassic	Mesozoic	Triassic	Triassic-Late	Rhaetian Norian	170
Late Triassic	Mesozoic	Triassic	Triassic-Late	Camian	100
Late, Middle Triassic	Mesozoic	Triassic	Triassic-Middle	Ladinian Anisian	128
Early Triassic	Mesozoic	Triassic	Triassic-Early	Olenekian Induan	120
Permo Triassic	Mesozoic	Triassic		Induan	75

Geology	Geology with Paleogeography (Example)
Paleoclimate Zones	Paleoclimate Zones based on Lithologies (coals, evaporites, etc) (Example)
Temperature	Mean Annual Surface Temperature with isotherms (Example)
Rainfall and Runoff	Rainfall (blue squares), Wet Regions (Green), Deserts (Brown) (Example)
Paleoclimate Reconstruction	Tropical Everwet, Arid, Warm Temperate, Cool Temperate, Polar (Example)
Winds	Isobars and Winds (Example)
Salinity	Ocean Salinity (Example)
Anoxia	Ocean Anoxia (Example)
Upwelling	Zones of Oceanic Upwelling (Example)
Tectonics	Plate Tectonics (Example)

Admin ONLY: Include all map overlays: ☐



Next, select what should be included in your Paleoglobe file.

- ☒ Maps with geological data.
- ☐ Maps only, without geological data.



Next, if you'd like to plot your own data, browse for a data file.

no file selected

(Click [here](#) for information about the format of the data file.)

Google Earth compatible Paleoglobes (.kmz) with geological data plotted as pins can be downloaded at no charge. [This is what they look like.](#)

In the near future, users will need a "ticket number" purchased at the PALEOMAP website (www.scotese.com) to generate downloads. Enjoy the free downloads while they last!!

Next, select a Download Ticket with remaining downloads that you've already used...



-- (1000000 remaining) --



Finally, click this button to create your Paleoglobe file.

Download PALEOMAP Paleoglobe Files

Your PALEOMAP paleoglobe file, **Early Miocene_Pgeog_688.kmz**, with geologic data from the Global Geology web site was succssfully created.

To download the data, please click on [Download Paleoglobe Files](#) to download the file.

You have 1000000 downloads remaining.

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Download PALEOMAP Paleoglobe Files

Instructions

Select the PALEOMAP paleoglobe files to download and then press the Download button. Your browser will then ask if you wish to open the file or save it.

(If you select more than one file, they will be combined and downloaded as one "zip" file.)

File	Date	Number of Downloads
☐ Early Miocene_Pgeog_688.kmz	October 21, 2013 06:08.18	0
☒ Late Miocene_Pgeog_593.kmz	October 21, 2013 06:07.56	0
☐ Late Miocene_Pgeog_78.kmz	October 21, 2013 06:07.23	0
☐ MioOligoTest101513.kmz	October 15, 2013 09:51.42	1
☐ AptianAlbianGeology.kmz	October 09, 2013 11:15.06	1
☐ OligoMioPgeogGelogy.kmz	October 09, 2013 11:12.00	1
☐ Late Silurian_Pgeog_356.kmz	September 17, 2013 12:53.09	1
☐ Mid Cretaceous_Pgeog_706.kmz	September 17, 2013 12:52.26	1
☐ Pleistocene_Pgeog_657.kmz	September 17, 2013 12:51.05	1
☐ Earliest Cretaceous_Pgeog_441.kmz	August 10, 2013 12:58.32	1
☐ Triassic Jurassic_Pgeog_768.kmz	August 01, 2013 12:53.07	1

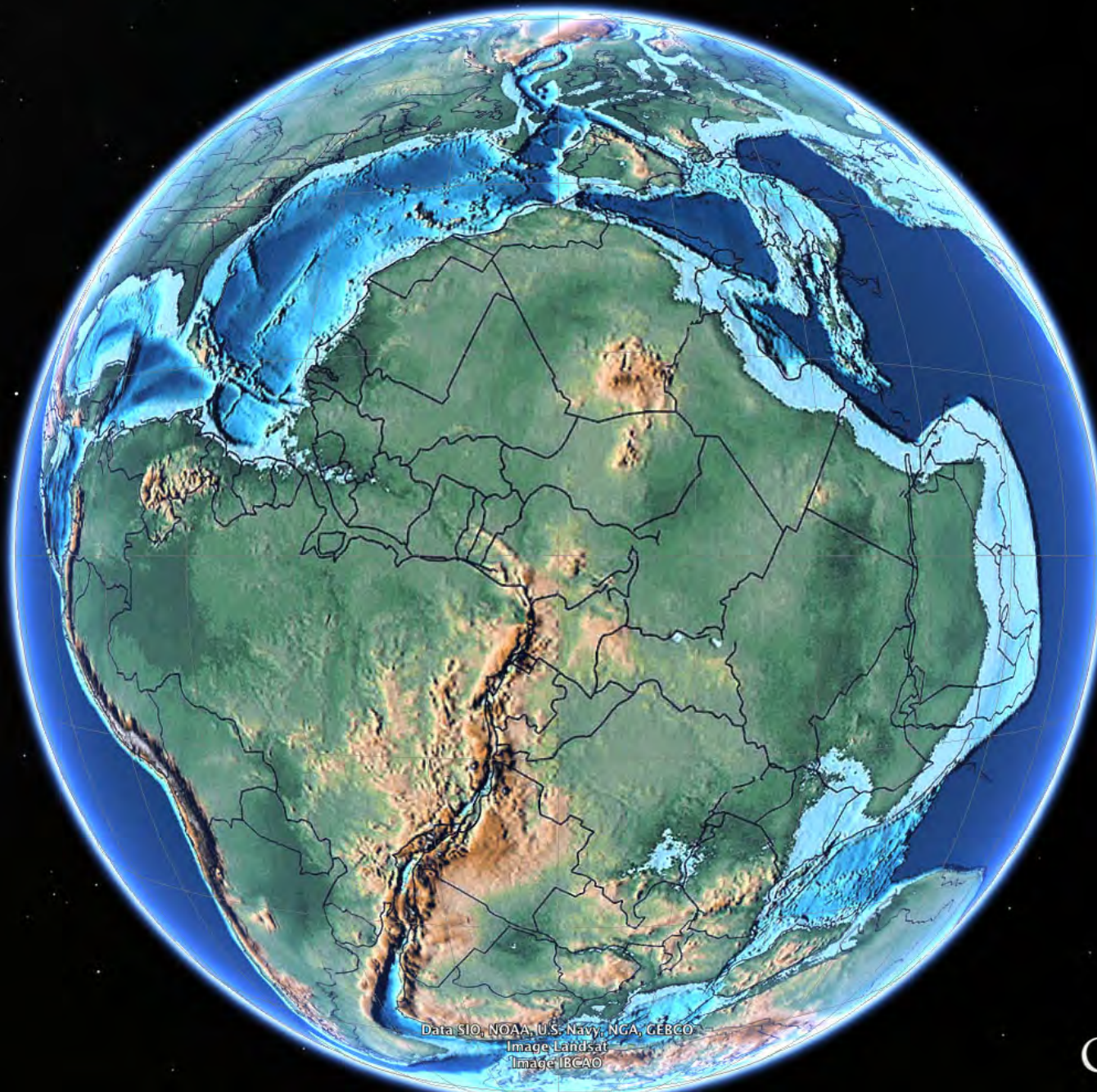
Download

Create More Paleoglobe Files with Geologic Data



Late
Miocene...3.kmz

Earliest Cretaceous



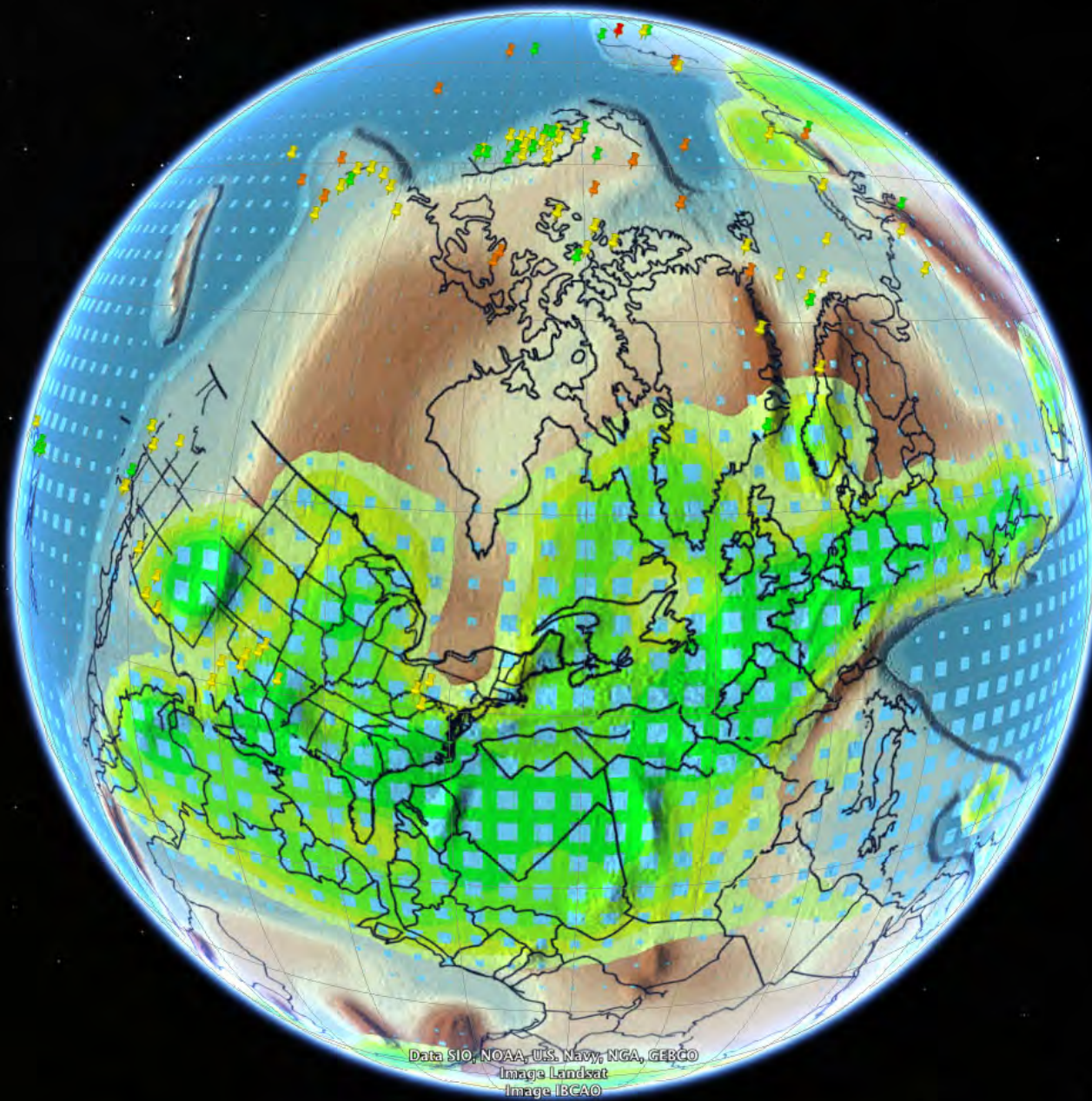
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
Image IBCAO

CR Scotese
PALEOMAP Project
© 2013

Google earth



Late, Early Permian

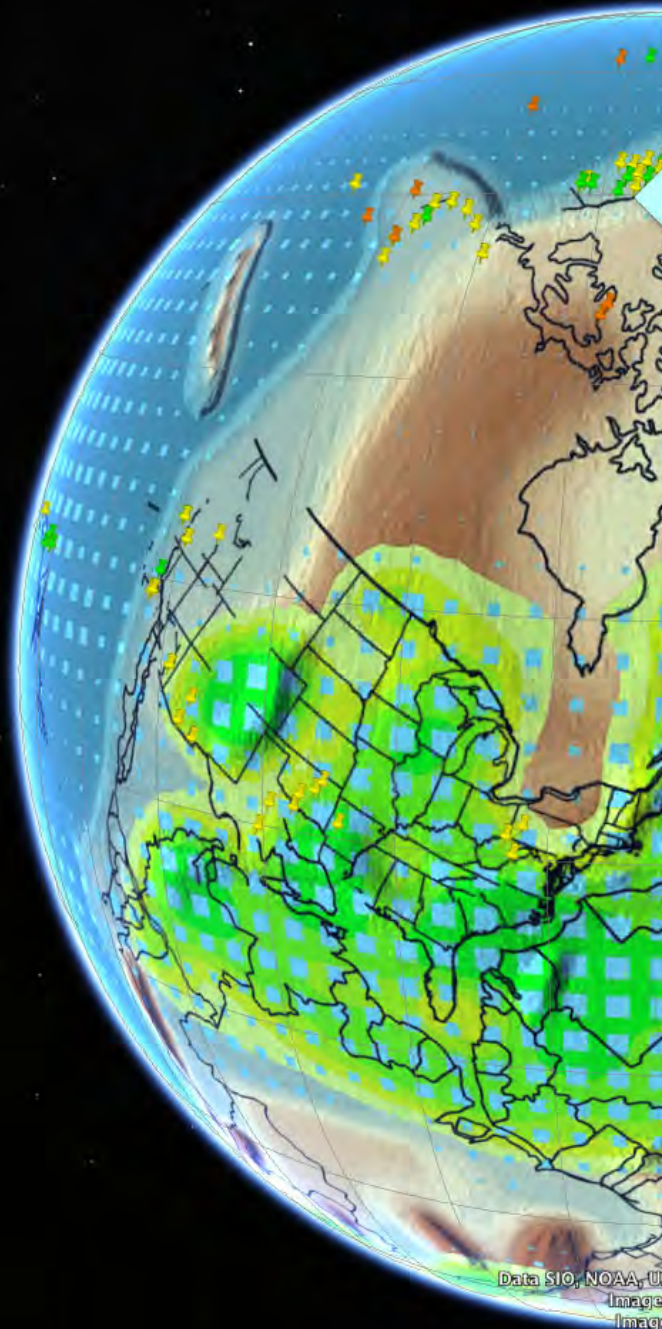


Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
Image IBCAO

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PALEOMAP Project
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Google earth

Late, Early Permian



General Information

Data submitted by: B Bammel

Name of Geological Unit: Echooka Fm./Sadlerochit Gp.

Geological Time: Artinskian

Present Day Location: 70.10, -151.50 (lat,long)

Paleo-location: 44.95, -7.09 (lat,long)

Map Age: 280 million years

Approximate Thickness of Section: 50 - 100m

Outcrop: surface outcrop

Comments: Arctic Coastal Plains Province
CSD890-3
Unit 20,21

Data References: Correlation of Stratigraphic Units of North America (COSUNA) Project

Links: (no data)

Rock Types

Principle Sedimentary Rock Types: Sandstone

Clastic to Carbonate Ratio: Sandstone

Accessory Rock Types and Minerals: (no data)

Climate Indicators: (no data)

Igneous and Metamorphic Rock Types: (no data)

Environments of Deposition

Terrestrial Environments: (no data)

Transitional and Marine Environments: Inner Shelves < -50 m
Outer Shelves < -200 m

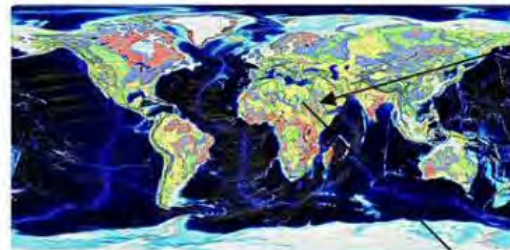
Stratigraphy

Name of Geological Unit: Name of strata above: Ivishak Fm.
Name of strata below: Sadlerochit Gp.

Major Unconformities: The age of the rock unit above this unconformity is (no data)
The age of the rock unit below this unconformity is Pennsylvanian

The Global Geology Database

The Global Geology Database is both an archive of stratigraphic information and a portal to the geology of the world. Like a cross between Google Maps and Wikipedia, GlobalGeology.com helps users discover and enter geological information.



Find a location...

...select a time scale...



...and discover or enter geologic data.

Click [here](#) or the image above to begin viewing geologic data.

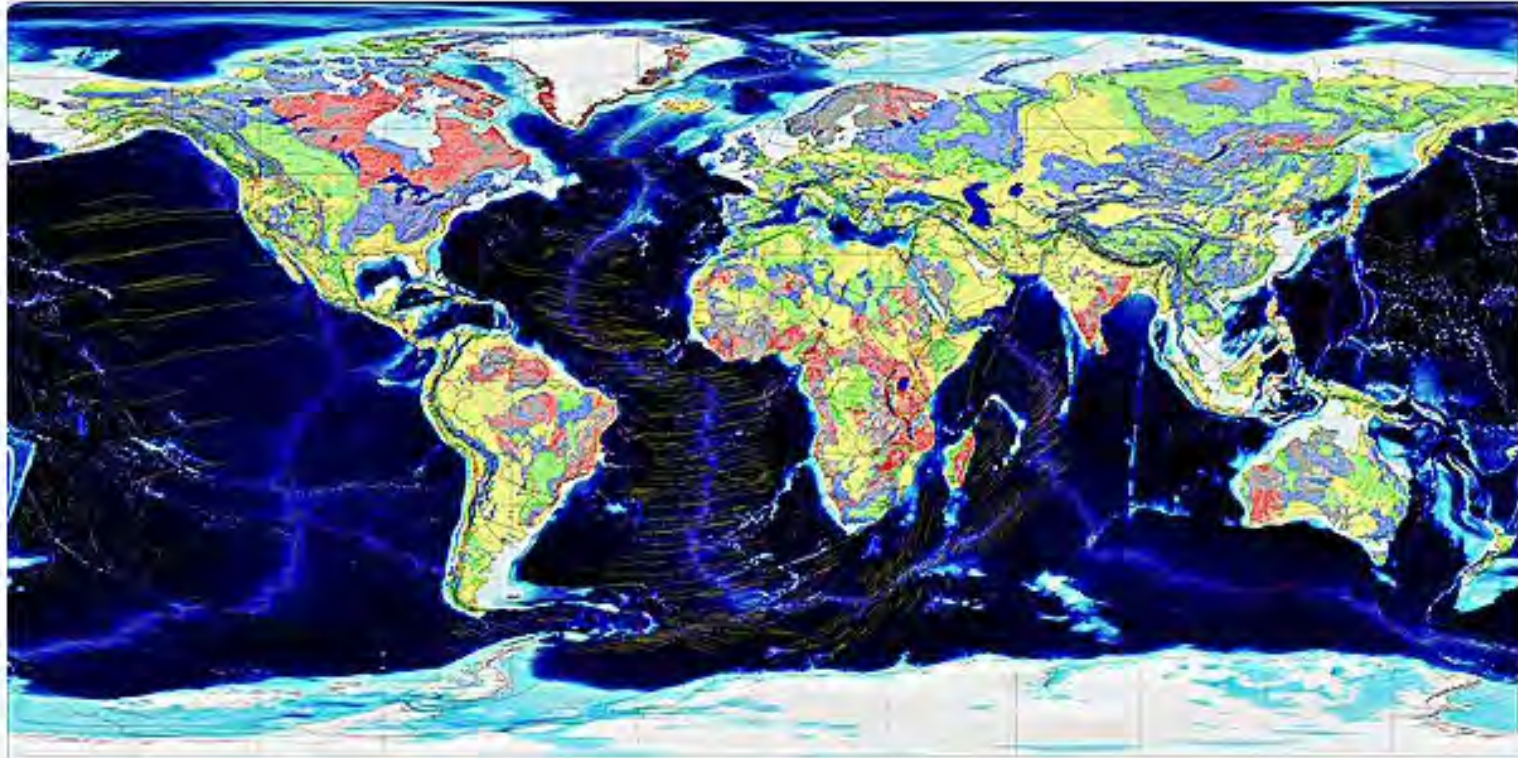
Global Geology Paleoglobes

Paleoglobes are reconstructions of the ancient earth that show the past positions of the continents, along with the changing distribution of mountains, shallow seas, and other features through time. The Global Geology Paleoglobe tool lets you select a time interval and download a Google Earth-style paleoglobe that illustrates a variety of features, such as: paleotopography, paleobathymetry, plate tectonic boundaries, paleowinds, paleotemperature, or ancient oceanic circulation. You can add stratigraphic information from the Global Geology database or plot user-defined localities that appear as pins on a interactive Google Earth display.



You must be a registered user to create and download Paleoglobes. Not Registered? [Register Here](#) to join Global Geology!

Global Geology



Instructions



To find the geology of your location

...OR...

to enter *NEW* geology data about your location,
start by clicking on your *region* of the world.

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Region Geology

Instructions

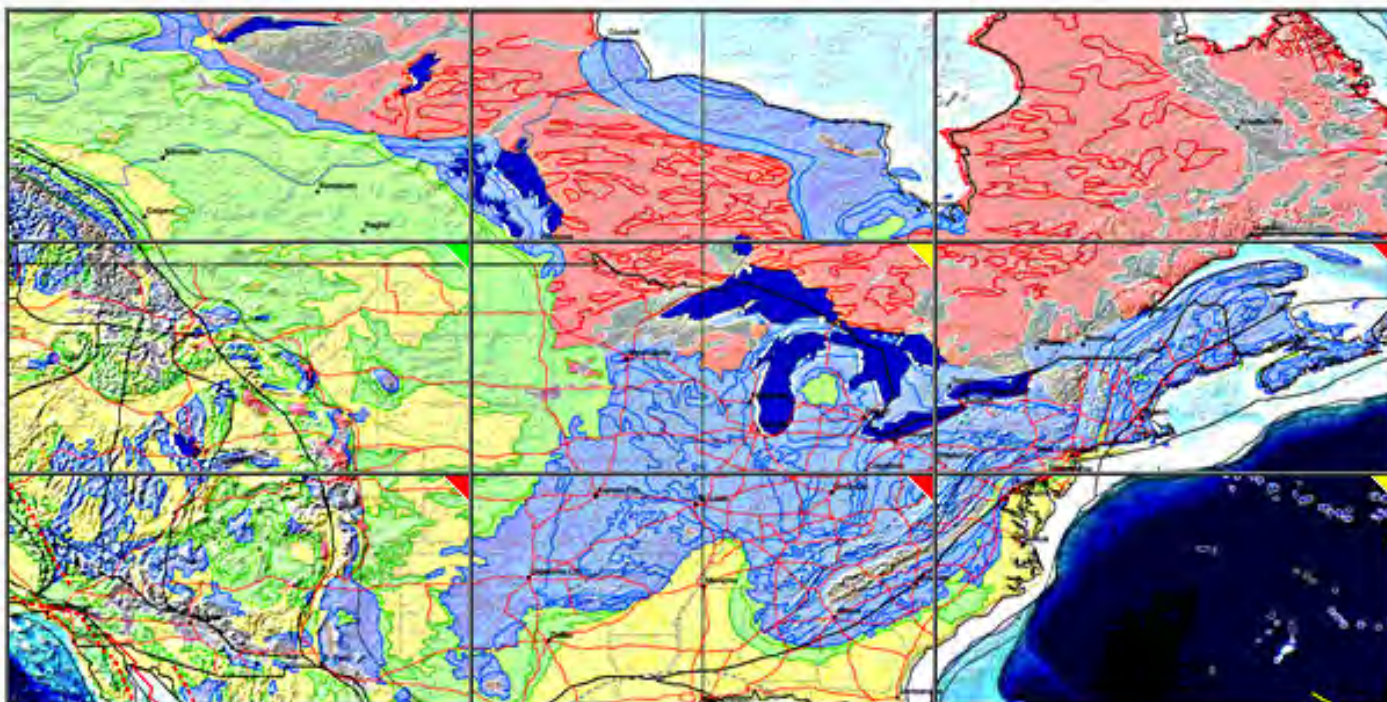


Next, click on your area of the map to zoom-in on that *locale*.

Note: The colored triangles in the upper right-hand corner of some of the grid squares indicates that geological information has been entered for that grid square.

(60.0,-120.0)

(60.0,-60.0)



(30.0,-120.0)

(30.0,-60.0)

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Locale Geology

Instructions

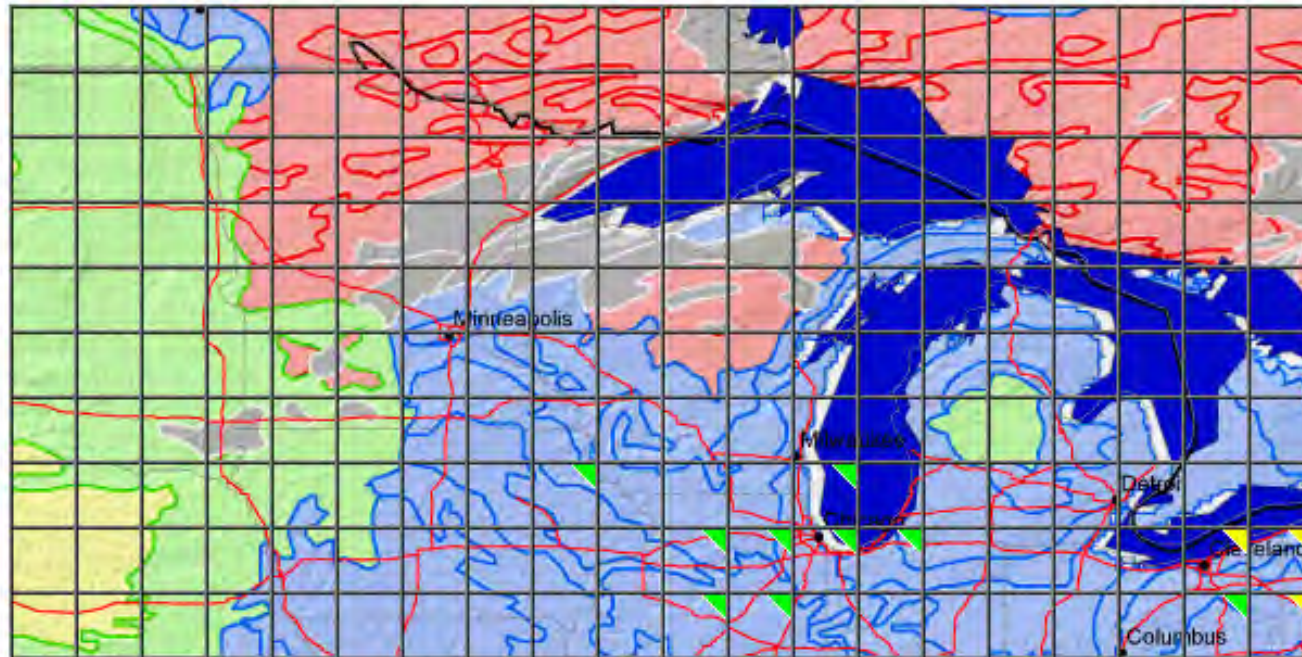


Next, click on your area of the map to zoom-in on that neighborhood.

Note: The colored triangles in the upper right-hand corner of some of the grid squares indicates that geological information has been entered for that grid square.

(50.0,-100.0)

(50.0,-80.0)



(40.0,-100.0)

(40.0,-80.0)

Paleozoic		
Carboniferous	Pennsylvanian-Late	Gzhellian Kasimovian
	Pennsylvanian-Middle	Moscovian 1
	Pennsylvanian-Early	Bashkirian
	Mississippian-Late	Serpukhovian
	Mississippian-Middle	Visean
	Mississippian-Early	Tournaisian
Devonian	Late	Famennian Frasnian
	Middle	Givetian Eifelian
	Early	Emsian
		Pragian
		Lochkovian
Silurian	Pridoli	—
	Ludlow	Ludfordian/Gorstian
	Wenlock 1	Homerian/Sheinwoodian 2
	Llandovery	Telychian
		Aeronian/Rhuddanian
Ordovician	Late	Ashgillian Caradoc
	Middle	Llandeilo Llanvirn

Messinian
Tortonian
Serravalian
Langhian
Burdigalian
Aquitanian
Chattian
Rupelian
Priabonian
Bartonian
Lutetian
Ypresian
Thanetian
Selandian
Danian
Maastrichtian
Campanian
Santonian
Coniacian
Turonian
Cenomanian
Albian
Aptian
Barremian
Hauterivian
Valanginian
Berriasian
Tithonian
Kimmeridgian
Oxfordian
Calloviaian
Bathonian
Bajocian

Instructions

These are the last 2 users who have supplied data for this location and time.

To view that data entered by a user, click on their name.

To edit a user's data, click on their name and then click here:

anr5786
cscotese

Administrative

The data below has been entered for location (41.5,-87.5) in time period Homerian/Sheinwoodian by Global Geology user [cscotese](#).

General Information

Name of Geological Unit	Thorton Quarry Silurian Reef
Approximate Thickness of Section	100 - 500m
Outcrop or Subsurface Well Log	surface outcrop
Comments	Quarry with Silurian reef exposed in #d south of I-80

Data References	BretzH.Geology of Chicago
-----------------	---------------------------

Rock Types

Principle Sedimentary Rock Types	Limestone Dolomite
Clastic to Carbonate Ratio	Pure carbonates
Accessory Rock Types and Minerals	Bedded Cherts
Climate Indicators	Bauxite Reefs
Igneous and Metamorphic Rock Types	<no data>

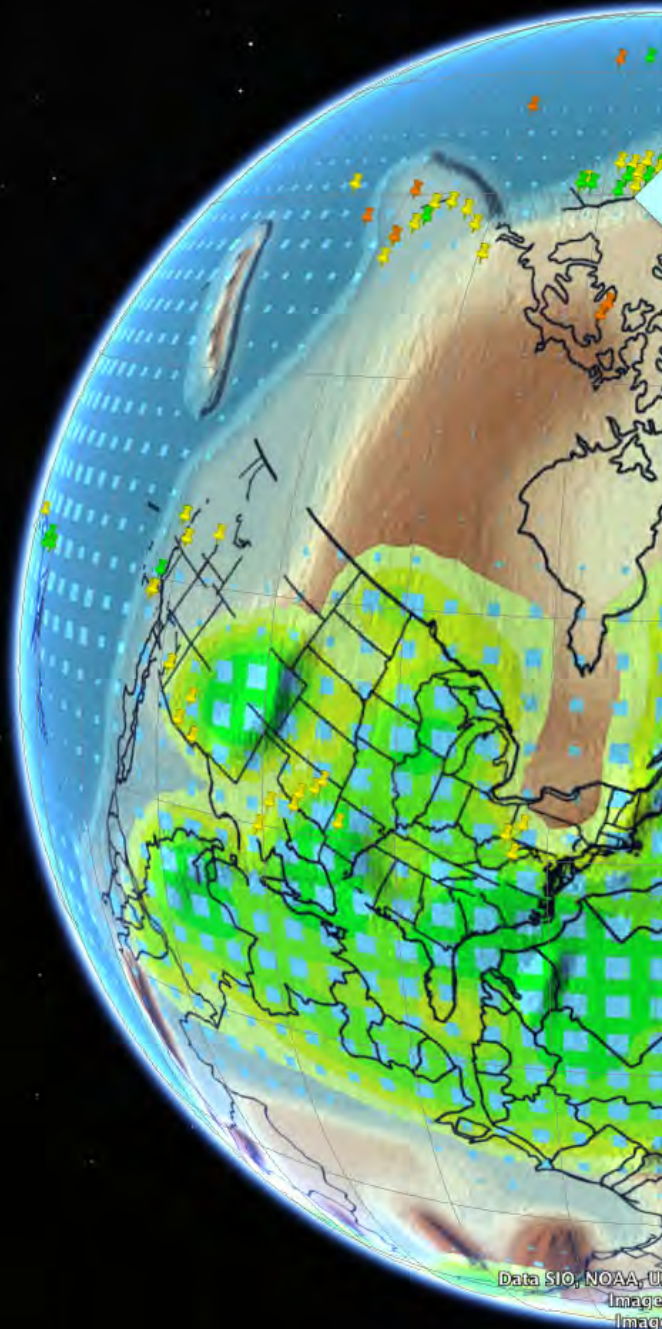
Environments of Deposition

Terrestrial Environments	<no data>
Transitional and Marine Environments	Barrier Islands and Lagoons 0 m Inner Shelves < -50 m Reef-dammed shelves < -50 m

Stratigraphy

Major Unconformities	The age of the rock unit above this unconformity is Modern soils
Stratigraphic Reliability	<no data>
Sequence Stratigraphy	<no data>

Late, Early Permian



General Information

Data submitted by: B Bammel

Name of Geological Unit: Echooka Fm./Sadlerochit Gp.

Geological Time: Artinskian

Present Day Location: 70.10, -151.50 (lat,long)

Paleo-location: 44.95, -7.09 (lat,long)

Map Age: 280 million years

Approximate Thickness of Section: 50 - 100m

Outcrop: surface outcrop

Comments: Arctic Coastal Plains Province
CSD890-3
Unit 20,21

Data References: Correlation of Stratigraphic Units of North America (COSUNA) Project

Links: (no data)

Rock Types

Principle Sedimentary Rock Types: Sandstone

Clastic to Carbonate Ratio: Sandstone

Accessory Rock Types and Minerals: (no data)

Climate Indicators: (no data)

Igneous and Metamorphic Rock Types: (no data)

Environments of Deposition

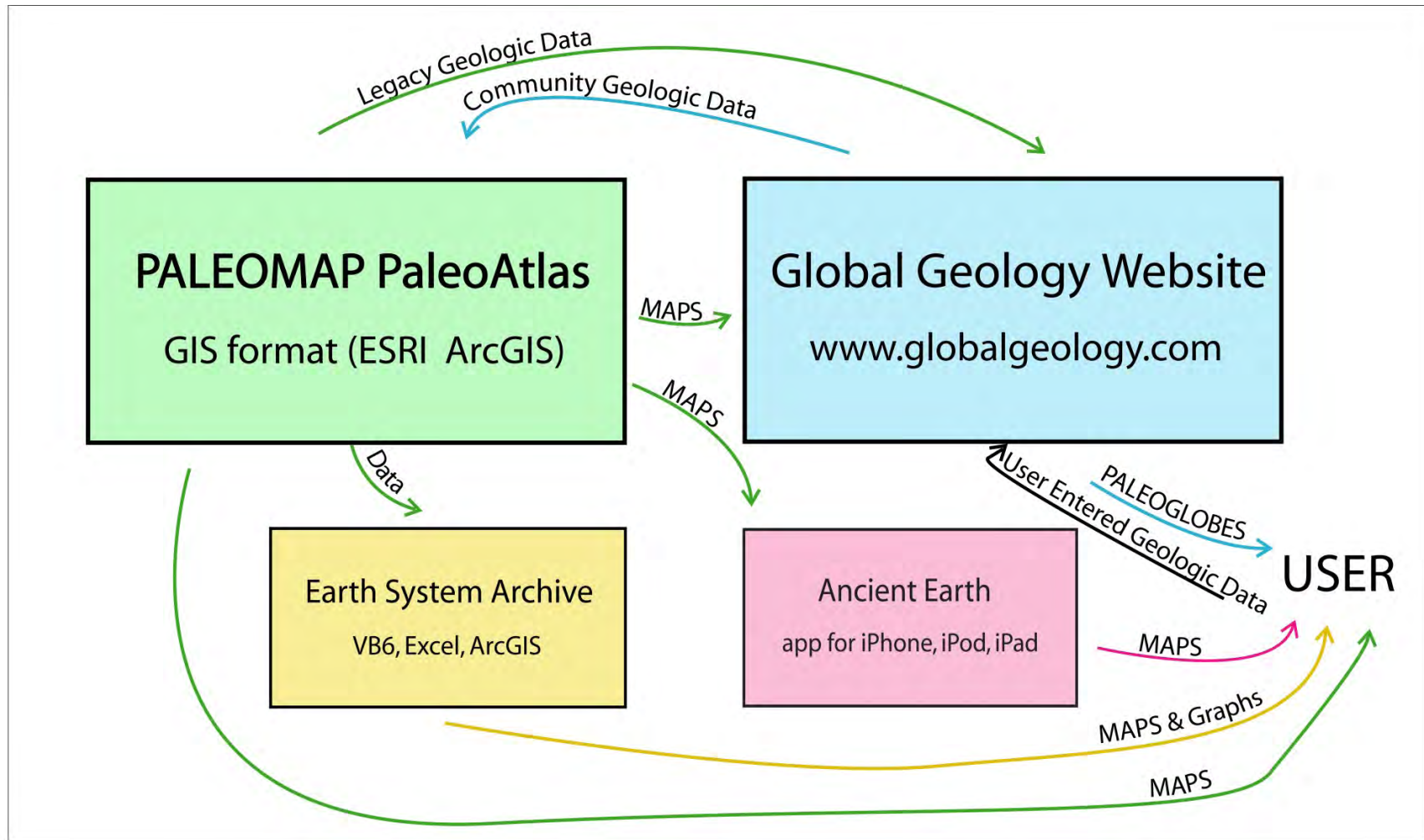
Terrestrial Environments: (no data)

Transitional and Marine Environments: Inner Shelves < -50 m
Outer Shelves < -200 m

Stratigraphy

Name of Geological Unit: Name of strata above: Ivishak Fm.
Name of strata below: Sadlerochit Gp.

Major Unconformities: The age of the rock unit above this unconformity is (no data)
The age of the rock unit below this unconformity is Pennsylvanian



Earth System Archive

VB6, Excel, ArcGIS

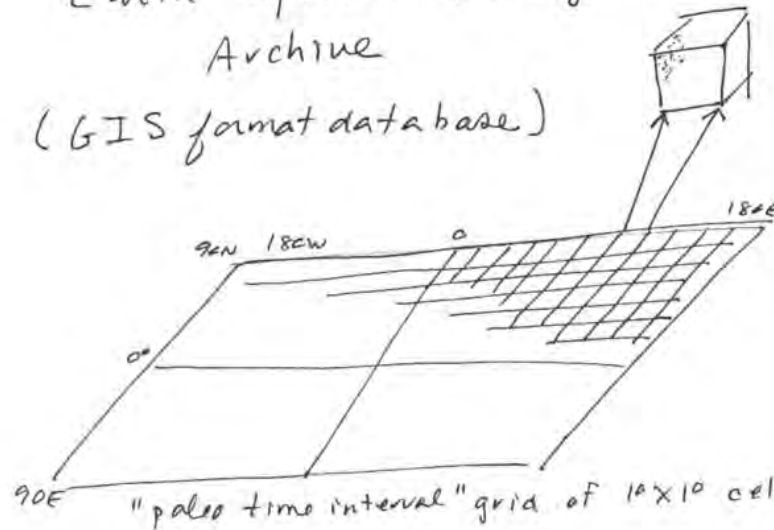
Earth System Archive

VB6, Excel, ArcGIS

- Geologic “data cube”
X,Y = paleolatitude, paleolongitude (1 x 1 degree)
Z = time (geologic stage)
- 40 Geologic and Environmental Variables including:
topography, bathymetry, lithology, wind directions,
surface temperature, surface currents, upwelling ...
- Bivariate plots track any variable through time
- “Facies Modeller” uses variables to predict geologic facies

Simple Data Structure

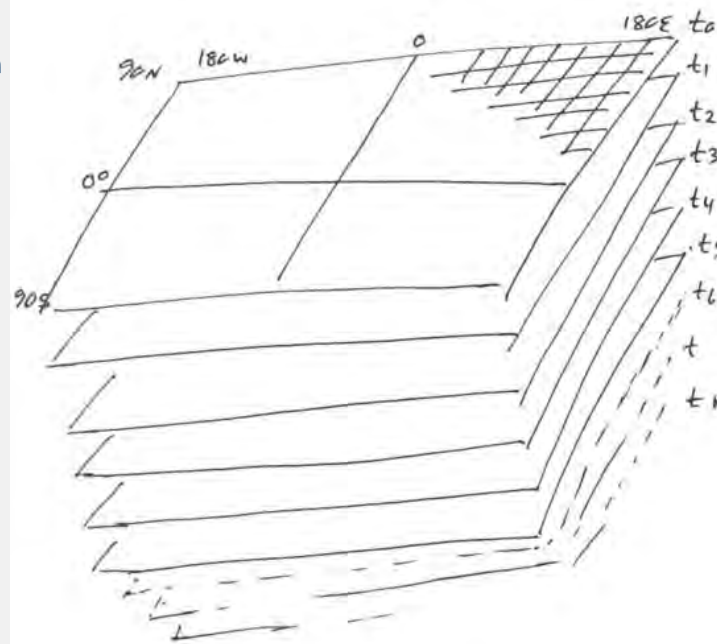
Earth System History
Archive
(GIS format database)



Each cell
stores Earth Science
and Environmental
variables for
that location

e.g. variables

- geological fm.
- gravity
- index fossils
- surface temperature
- rain fall
- river volume
- elevation, etc.



There are numerous
"paleo time interval"
grids > 50.

Enough to provide
Earth Science and
Environmental Information
back to Late Precambrian
at any temporal resolution

Figure 1.

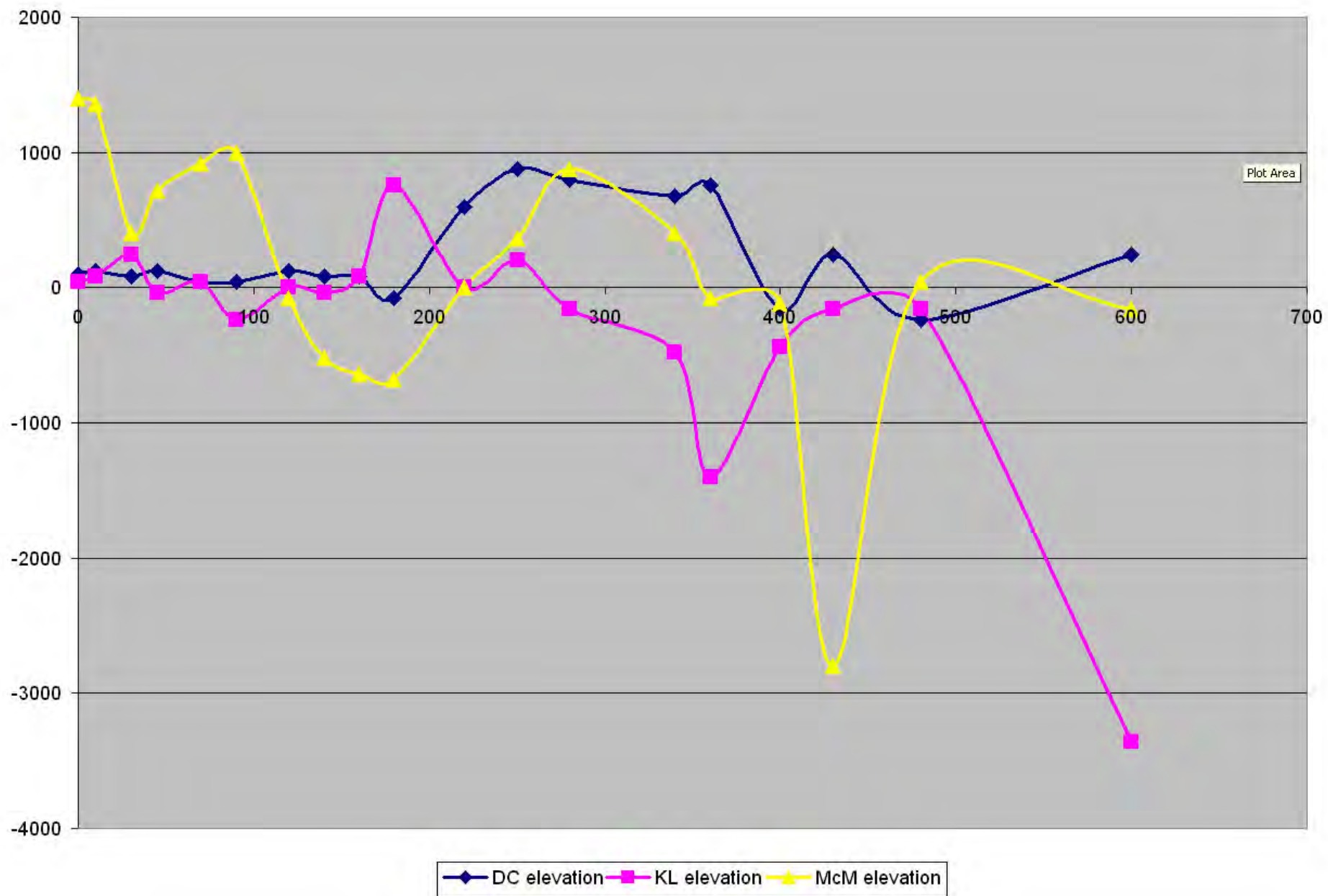
CRS 03/02/10

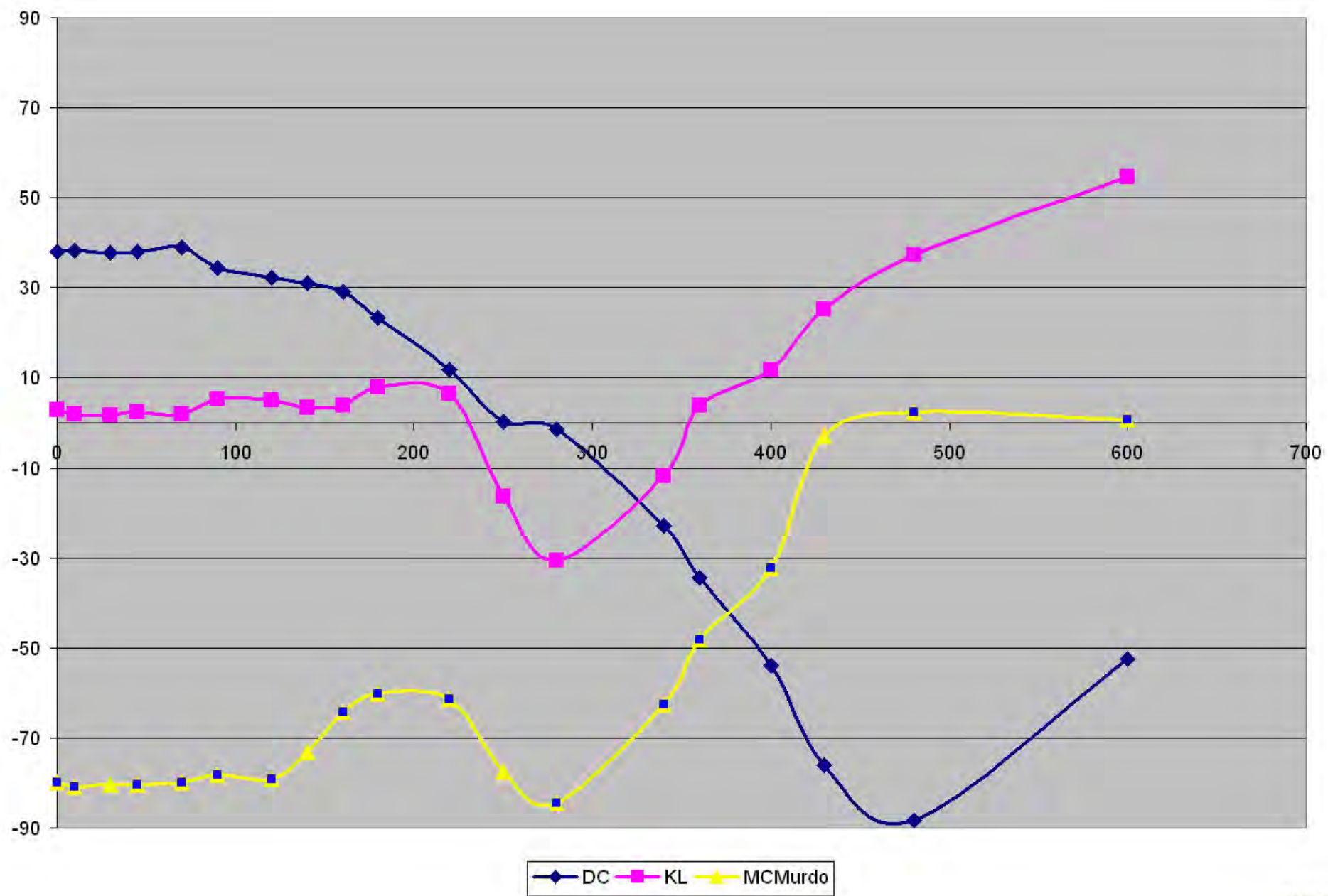
“Back-Tracking”

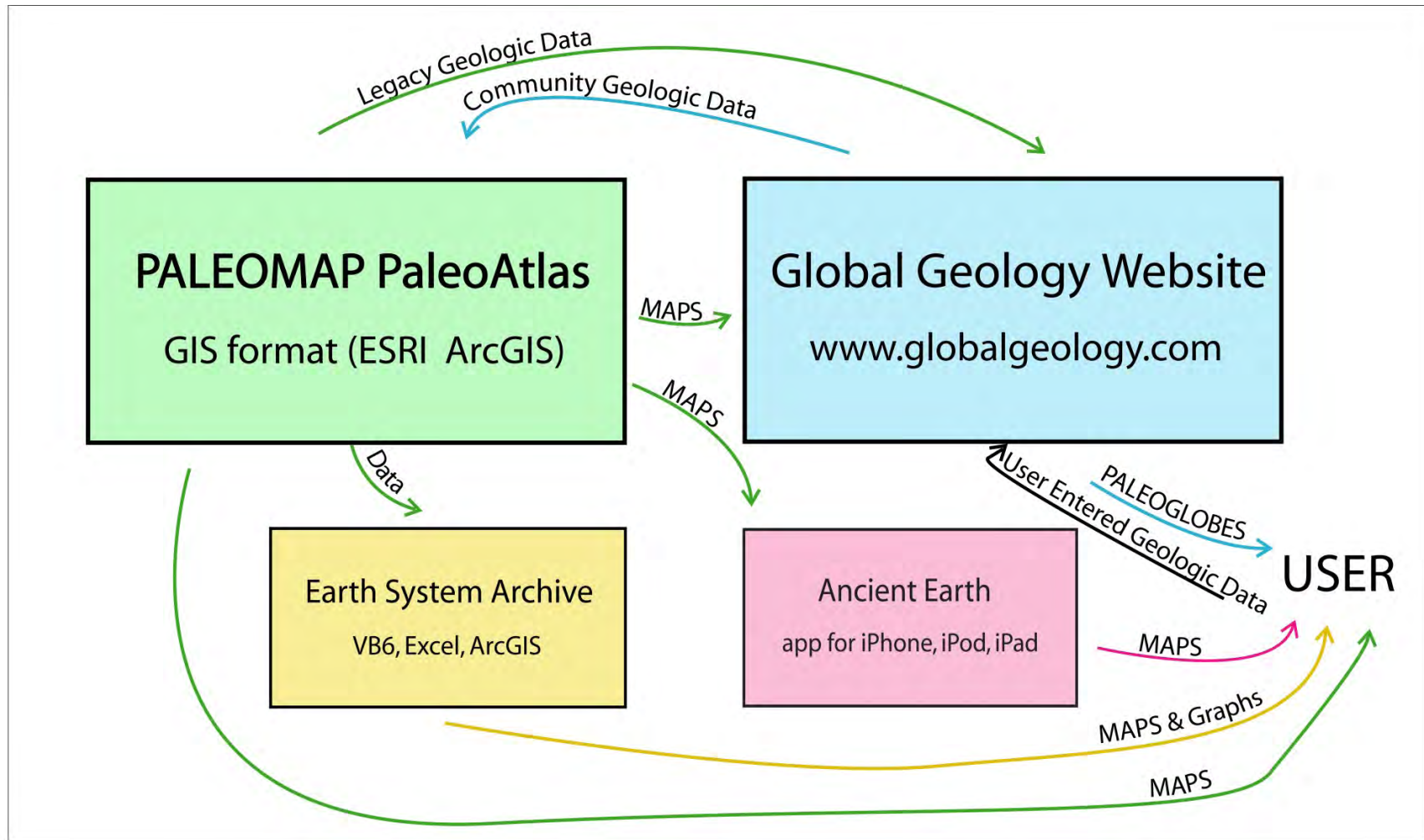
- Paleolatitude
- Elevation
- Mean Annual Temperature
- Precipitation
- & >30 other Earth System variables

Table 1. Paleoenvironmental Variables of the Earth System Archive

1. Age	18. Continentality
2. Paleolatitude	19. Ocean Salinity
3. Paleolongitude	20. Summer Surface Currents
4. Mean Annual Temperature (MAT)	21. Winter Surface Currents
5. Mean Monthly Precipitation (MMP)	22. Total Upwelling
6. Runoff (ground wetness)	23. Months of Upwelling
7. Runoff to the Ocean (probable delta location)	24. Distance from Shoreline
8. River Volume (water carried by rivers)	25. Restriction (Probability of Anoxia)
9. Course Clastic Facies Probability	26. Summer Temperature
10. Carbonate Facies Probability	27. Summer Pressure (at sea level)
11. Source Facies Probability	28. Summer Winds
12. Elevation	29. Winter Temperature
13. Topographic Relief	30. Winter Pressure (at sea level)
14. Modern Geology	31. Winter Winds
15. PaleoGeology (provenance)	32. Koeppen CLimate Zone
16. Paleotectonic Environment	33. PaleoSoil Classification
17. Drainage Pattern	bold = new variables







NSF Workshop Mandate

- Produce a interactive, user-friendly, internet-accessible tool that:
 - Produces Plate Tectonic reconstructions for any instant in time (0 – 4.5 by)
 - Provides basemaps that show paleogeographic, paleoclimatic, lithologic, tectonic, & paleoenvironmental information
 - Allows users to load geologic/stratigraphic information from across the internet (e.g. PBDB, COSUNA, etc.)
 - Allows users to add their own geologic/paleontologic /stratigraphic locality data

How to Get This Stuff

“Ancient Earth” app from iTunes

“Google Earth” paleoglobes from
www.globalgeology.com

“PALEOMAP PaleoAtlas for ArcGIS” send
me an email at cscotese@gmail.com or visit
www.scotese.com

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