



Teknik Geofisika ITS & MGMP Geografi
Jatim mempersembahkan :

Webinar

"BERKAH GEOWISATA INDONESIA"

 Sabtu
2 Sept 23

 08.30 s.d
11.30 WIB

 Zoom ID : 4654-4005-85





AWANG SATYANA

Geolog
Independent

 its.ac.id/tgeofisika

 [teknik_geofisika_its](https://www.instagram.com/teknik_geofisika_its)

 Teknik Geofisika ITS

 Teknik Geofisika ITS



Diskusi

- 1. Geologi Indonesia**
- 2. Warisan Geologi, Geopark, Geowisata**
- 3. Berkah Geowisata Indonesia**




Diskusi

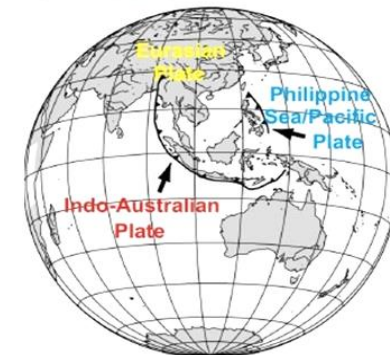
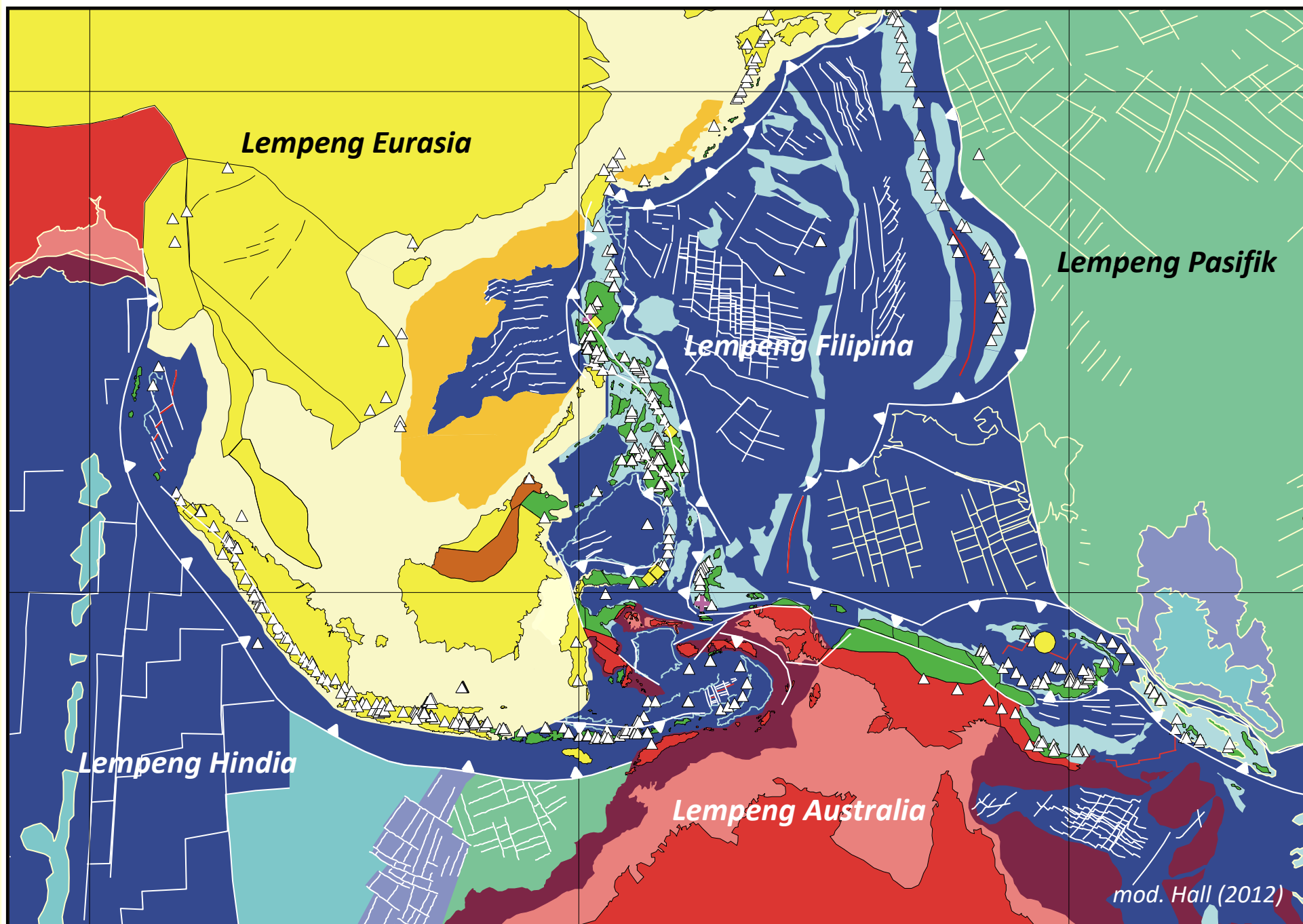
1. Geologi Indonesia

2. Warisan Geologi, Geopark, Geowisata
3. Berkah Geowisata Indonesia





Sukanto dan Purbo-Hadiwidjoyo (1993): “Dari segi ilmu kebumihan, Indonesia benar-benar merupakan daerah yang sangat menarik. Kepentingannya terletak pada rupabuminya, jenis dan sebaran endapan mineral serta energi yang terkandung di dalamnya, keterhuniannya, dan tektonikanya....”

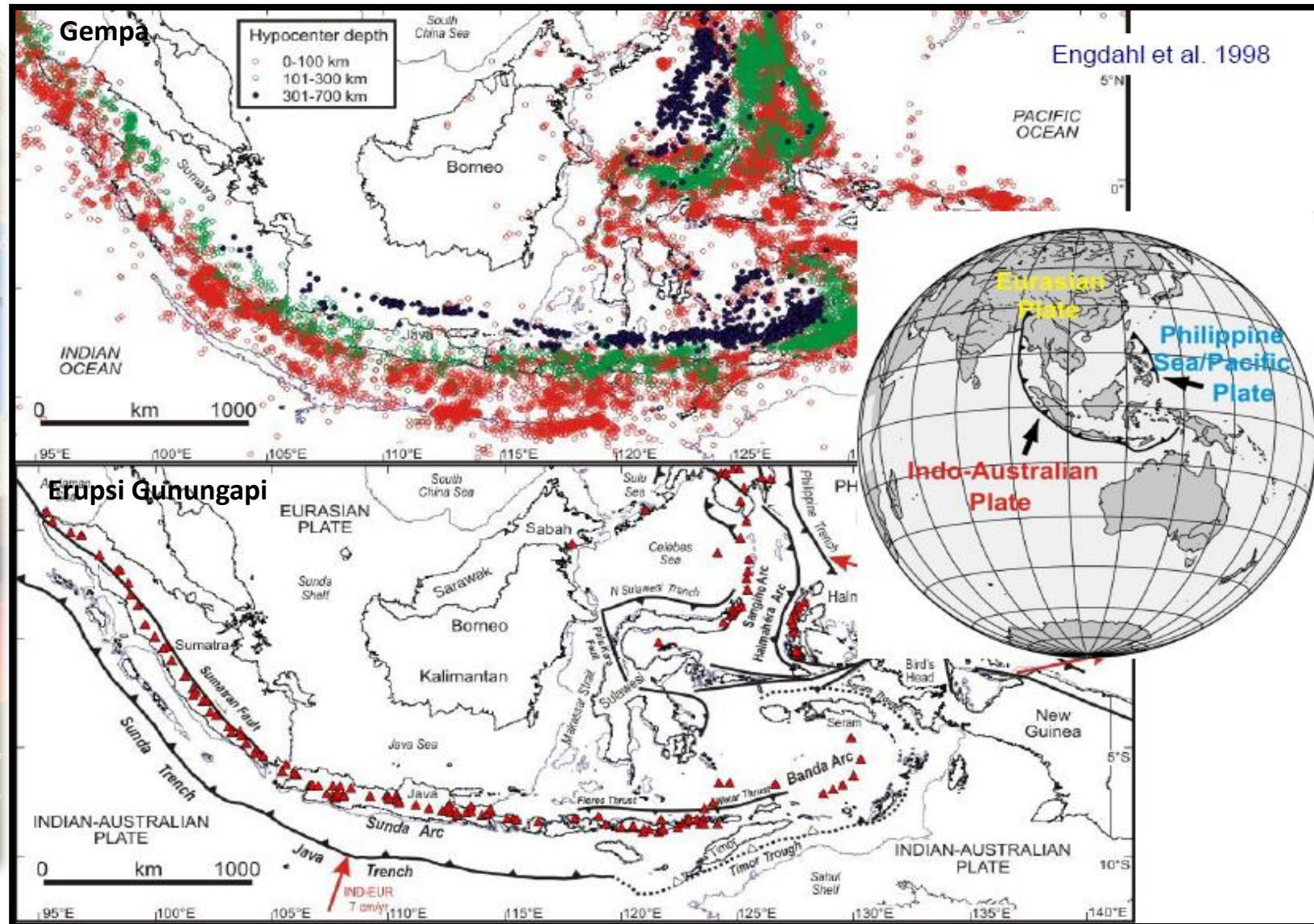


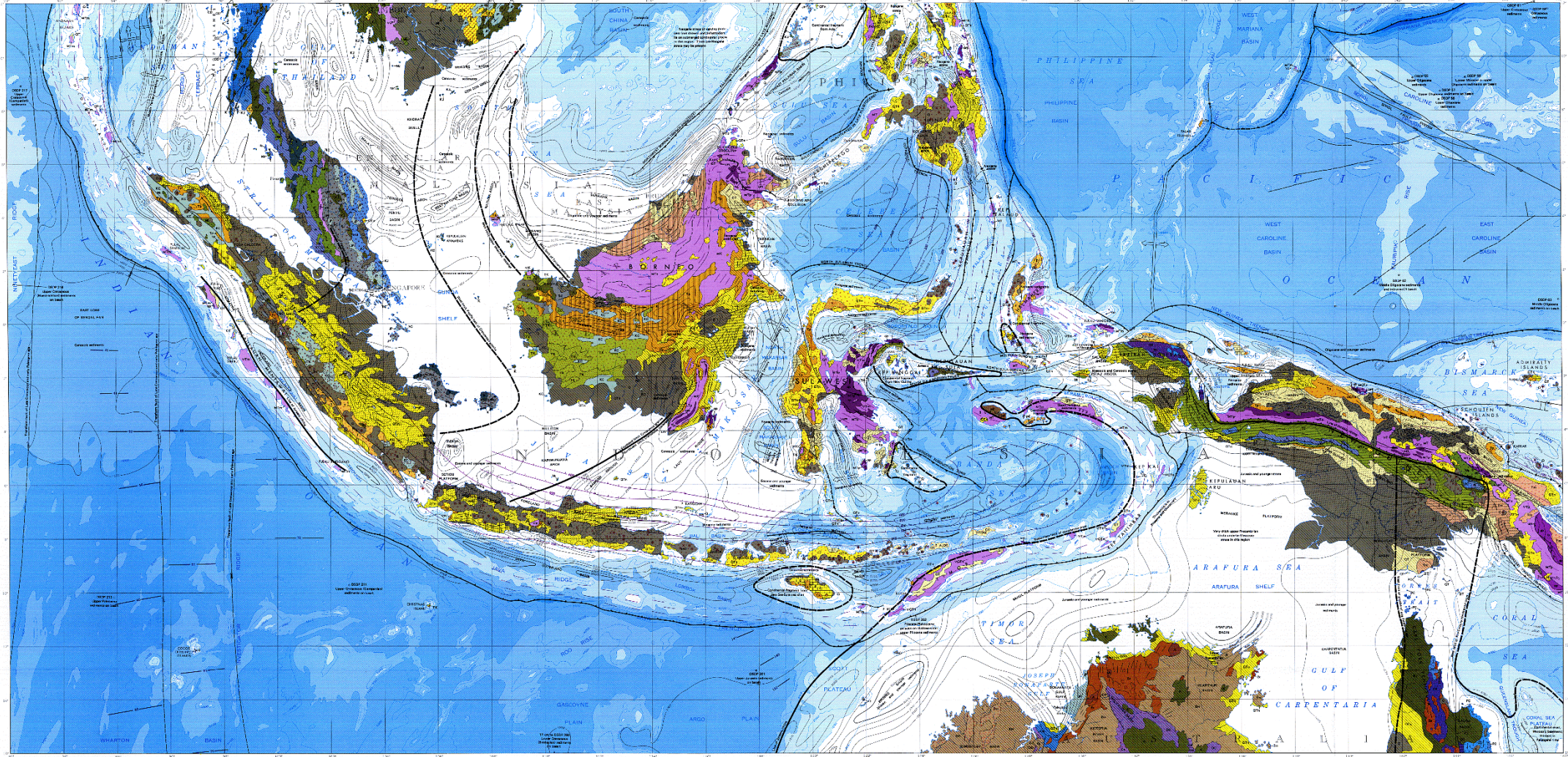
Tataan Tektonik Lempeng Indonesia Masa Kini

Pertemuan lempeng merupakan wilayah kegempaan dan gunungapi



Newsweek (Dec. 2005)





Map title, scale, and publication information. Includes a scale bar in kilometers and miles.

COLOR AND LETTER SYMBOLS INDICATE AGE OF MATERIAL
CORRELATION OF MAP UNITS
TECTONIC ENVIRONMENT OR ENVIRONMENT OF DEPOSITION OF SEDIMENTARY BASINS
STRUCTURAL FEATURES
VOLCANIC AREAS AND RELATED FEATURES

FEATURES OF SUBDUCTION ZONES AND OF COLLISION, CRIST AND RIBBLE
SOURCES OF DATA
AGE OF DEPOSITED ROCKS

Map title, scale, and publication information. Includes a scale bar in kilometers and miles.

TECTONIC MAP OF THE INDOONESIAN REGION

Hamilton (1979)

Potensi Warisan Geologi (KESDM, 2019)

110 POTENSI WARISAN GEOLOGI NUSANTARA

KALIMANTAN (10)

72. Bukit Kelam, Sintang, Kalbar
73. Danau Rawa Sentarum, Kalbar
74. Geantiklin Schwaner, Kalteng
75. Pegunungan Vulkanik Tua, Kalteng
76. Intan Martapura, Kalsel
77. Pegunungan Meratus, Kalsel
78. Delta Mahakam, Kaltim
79. Karst Sangkayang-Mangkalihat, Kaltim
80. Gunung Makita (Longnawan), Kaltara
81. Kubah Garam Krayan, Kaltara

SULAWESI (14)

82. Karst Maros-Pangkep, Sulsel
83. Melange Bantimala, Sulsel
84. Plato Toraja, Sulsel
85. Kompleks Danau Malili, Sulsel
86. Danau Tektonik Poso, Sulteng
87. Lembah Palu, Sulteng
88. Anjakan Batui, Sulteng
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90. Plato Minahasa, Sulut
91. Air Terjun Maremo, Sultra
92. Aspal Buton, Sultra
93. Karst Muna, Sultra
94. Terumbu Karang Wakatobi, Sultra
95. Travertin Konawe, Sultra

MALUKU (5)

96. Karst Pulau Morotai, Maluku
97. Busur Vulkanik Halmahera, Maluku
98. Lava Bantal Bacan, Maluku
99. Metamorf Pulau Seram
100. Kompleks Gunungapi Banda Neira, Maluku

PAPUA (10)

101. Karst Rajaampat, Pabar
102. Sedimen Laut Dalam Misool, Pabar
103. Karst Ayamaru Sorong, Pabar
104. Kompleks Danau Anggi, Pabar
105. Kompleks Danau Paniai, Pabar
106. Puncak Newangkawi, Jayawijaya, Papua
107. Lembah Baliem, Wamena, Papua
108. Danau Habbema, Wamena, Papua
109. Danau Sentani, Jayapura, Papua
110. Sabana & Rawa Wasur, Merauke, Papua

SUMATRA (22)

1. Vulkanik Pulau Weh, NAD
2. Tsunami Aceh Besar, NAD
3. Tektono Laut Tawar, NAD
4. Kaldera Danau Toba, Sumut
5. Bono Sungai Kampar, Riau
6. MetaSedimen Natuna, Kepri
7. Lembah Harau, Sumbar
8. Maninjau-Ngarai Sianok, Sumbar
9. Karst Kamang Mudiak, Sumbar
10. Danau Singkarak, Sumbar
11. Tambang Sawahlunto, Sumbar
12. Danau Kembar Solok, Sumbar
13. Gunung Kerinci, Sumbar-Jambi
14. Graben Sungai penuh, Jambi
15. Paleoflora Merangin, Jambi
16. Emas Lebong Tandai, Bengkulu
17. Endokarst Padangbindu, Sumsel
18. Danau Kaldera Rantau, Sumsel
19. Kompleks Kaldera Suoh, Lampung
20. Diabas Permian Bangka, Babel
21. Lava Bantal Belitung, Babel
22. Kompleks Krakatau, Lampung

34. Panabumi Plato Garut, Jabar
35. Bukit Sepuluhribo Galunggung, Jabar
36. Cukangtaneuh Pangandaran, Jabar
37. Laguna Segara-anakan Gilacap, Jateng
38. Karst Karaibolong, Jate

47. Situs Fosil Gajah Blora, Jateng
48. Geologi Migas Bojonegoro, Jatim
49. Gunungapi Purba Bawean, Jatim
50. Gunungapi Lumpur Sidoarjo, Jatim

JAWA-MADURA (33)

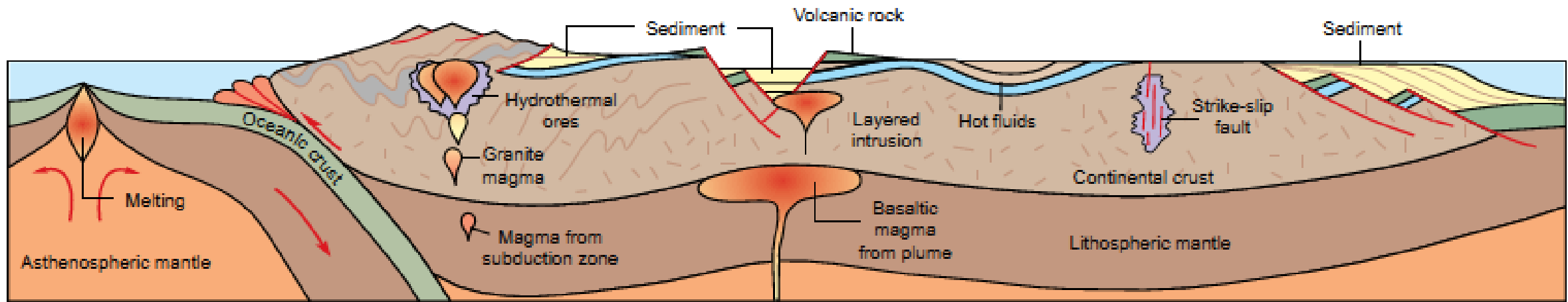
23. Kaldera Rawa Danau, Banten
24. Gunungapi Tua Ujungkulon, Banten
25. Bayah Dome, Banten
26. Kepulauan Seribu, DKI Jakarta
27. Muara Sungai Citarum, Jabar
28. Bekas Tambang Emas Pongkor, Jabar
29. Geysir Cisolok, Sukabumi, Jabar
30. Melange Ciletuh, Sukabumi, Jabar
31. Karst Rajamandala, Jabar
32. Gunung Sunda Tua, Jabar
33. Cekungan Bandung, Jabar
39. Melange Karangsembung, Kabumen, Jateng
40. Plato Vulkanik Dieng, Jateng
41. Vulkano Merapi-Merbabu, Jateng
42. Telaga Purba Borobudur, Jateng
43. Gumuk Pasir Parangtritis, Yogyakarta
44. Karst Pegunungan Sewu, Jateng-Jatim
45. Situs Manusia Purba Dome Sangiran, Jateng
46. Kepulauan Karimunjawa, Jateng

BALI-NUSA TENGGARA (16)

56. Danau Kaldera Buyan-Bratan, Bali
57. Kompleks Kaldera Batur, Bali
58. Semenanjung Jimbaran, Bali
59. Karst Nusa Perida, Bali
60. Kompleks Kaldera Rinjani, Lombok, NTB
61. Vulkanik Tua Bawah Laut, Lombok, NTB
62. Bekas Tambang Emas Batuhijau, NTB
63. Gunung Tambora, Sumbawa, NTB
64. Danau Vulkanik Tua Satonda, NTT
65. Vulkanik Tua Kep.Komodo, Flores, NTT
66. Danau Kaldera Sanonggoang, Flores, NTT
67. Situs Fosil Purba Cekungan Soa, Flores, NTT
68. Gunung Kelimutu, Flores, NTT
69. Mikrokontinen Sumba, NTT
70. Geantiklin Pulau Sawu, NTT
71. Clay Melange Timor, NTT

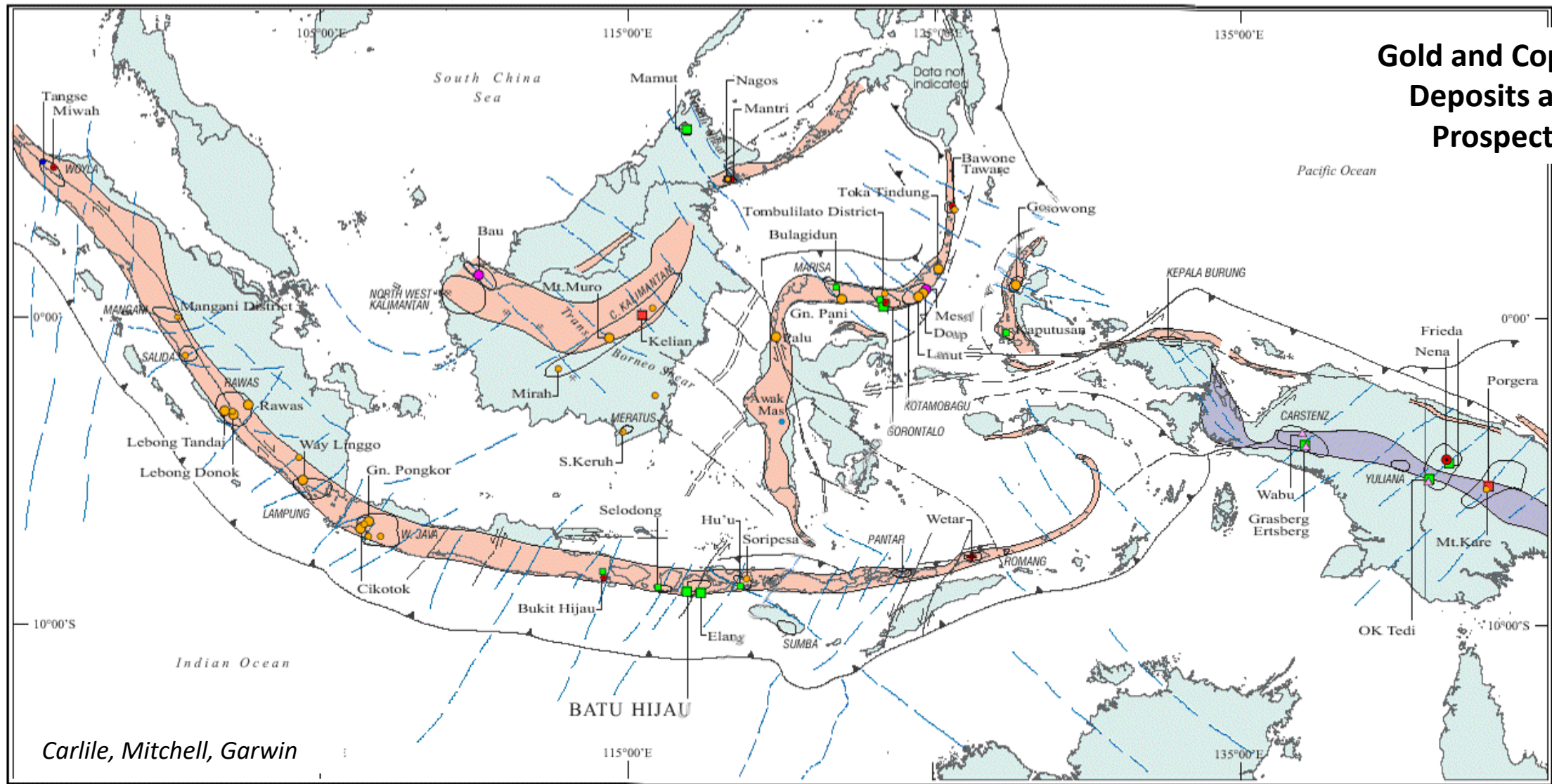
Kontrol Tektonik Lempeng atas Sumber Daya

Midoceanic ridge	Accretionary wedge	Magmatic arc	Foreland basin	Continental rift / Hot spot	Continental basin	Shield	Rifted continental margin
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Magmatic segregation chromium platinum Hydrothermal sulfides copper zinc	Oceanic ridge deposits in melange copper zinc nickel chromium	Hydrothermal vein deposits gold silver Contact metamorphic copper, lead, zinc, gold, silver, iron, tin, tungsten, molybdenum	Sedimentary coal oil oil shale gas	Magmatic segregation platinum copper, nickel Hydrothermal copper, lead, zinc, silver Sedimentary evaporites, brines sand, gravel	Sedimentary oil, gas, coal, salt Hydrothermal lead, zinc fluorite	Metamorphic shear zone gold tungsten	Sedimentary oil, gas, coal, evaporites, beach placers Precambrian Banded iron formations
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Gold and Copper: Deposits and Prospects



Carlile, Mitchell, Garwin

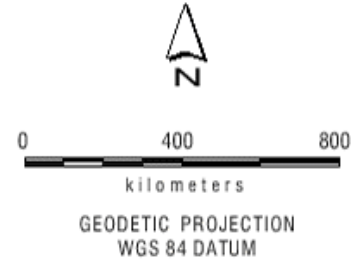
EXPLANATION

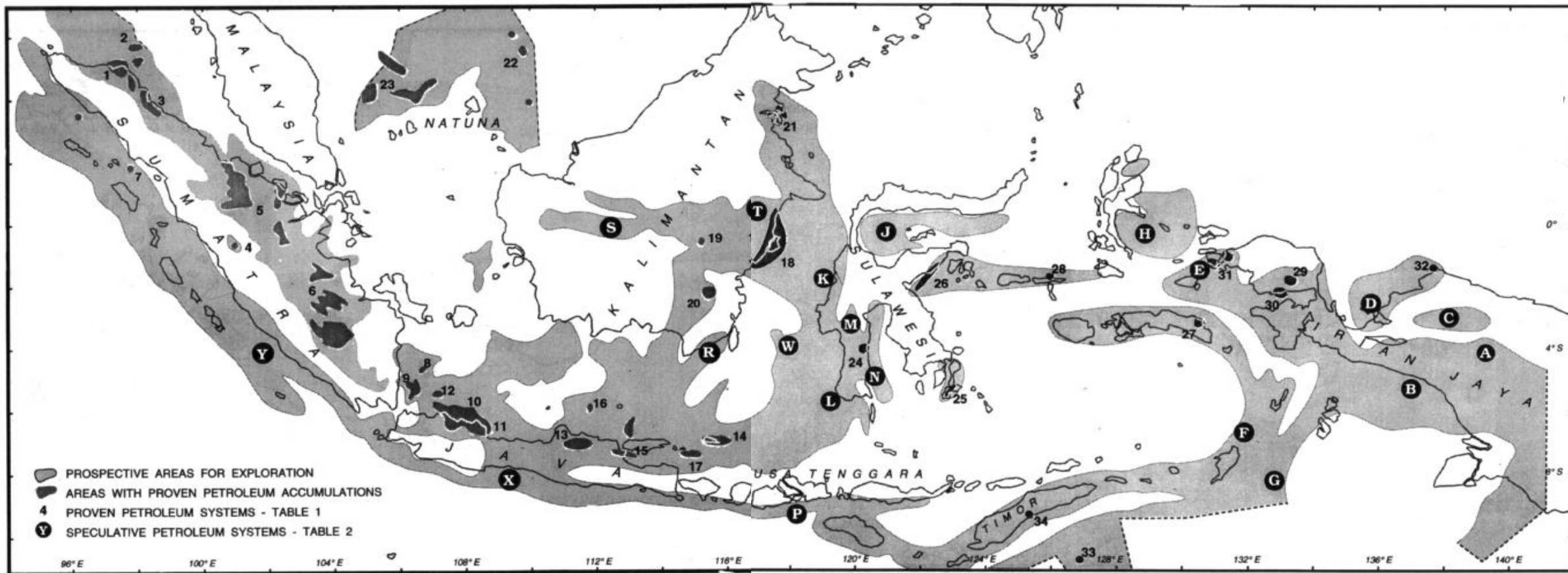
- Neogene Magmatic Arc
- Orogenic belt with significant Neogene magmatism
- Significant lineament or inferred fault
- Trace of subduction zone or thrust fault (solid teeth-active, open teeth-inactive)

- Strike-slip fault (solid-active, dashed-inactive)
- Spreading center (inactive)
- Gold district or region

DEPOSIT TYPES

- Cu-Au porphyry
- Cu-Mo-Au porphyry
- Skarn
- Carbonate-base metal-gold
- Epithermal-high sulfidation
- Epithermal-low sulfidation
- Quartz lode
- Massive sulphide
- Sediment hosted
- Placer





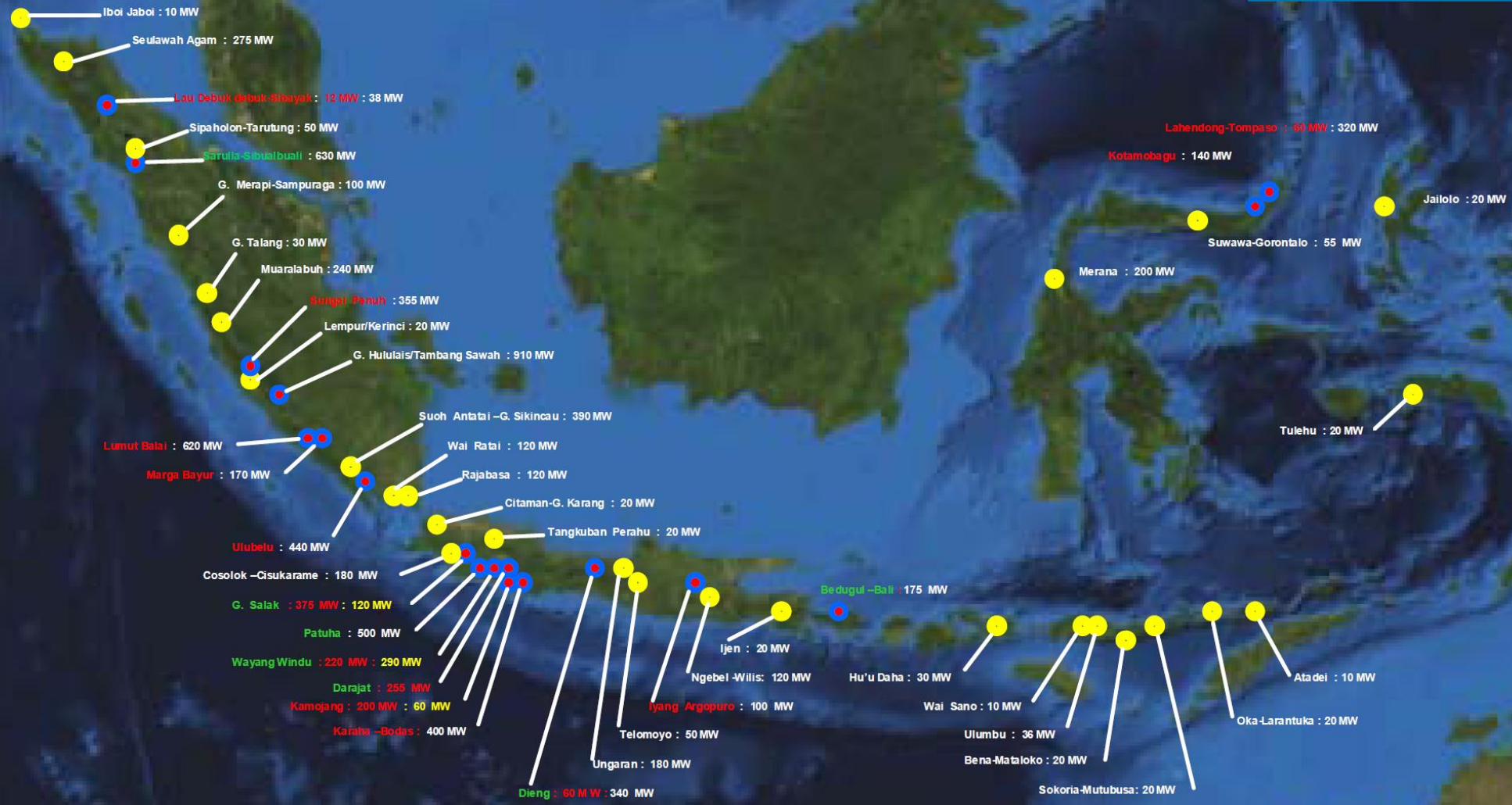
Howes & Tisnawijaya (1995)

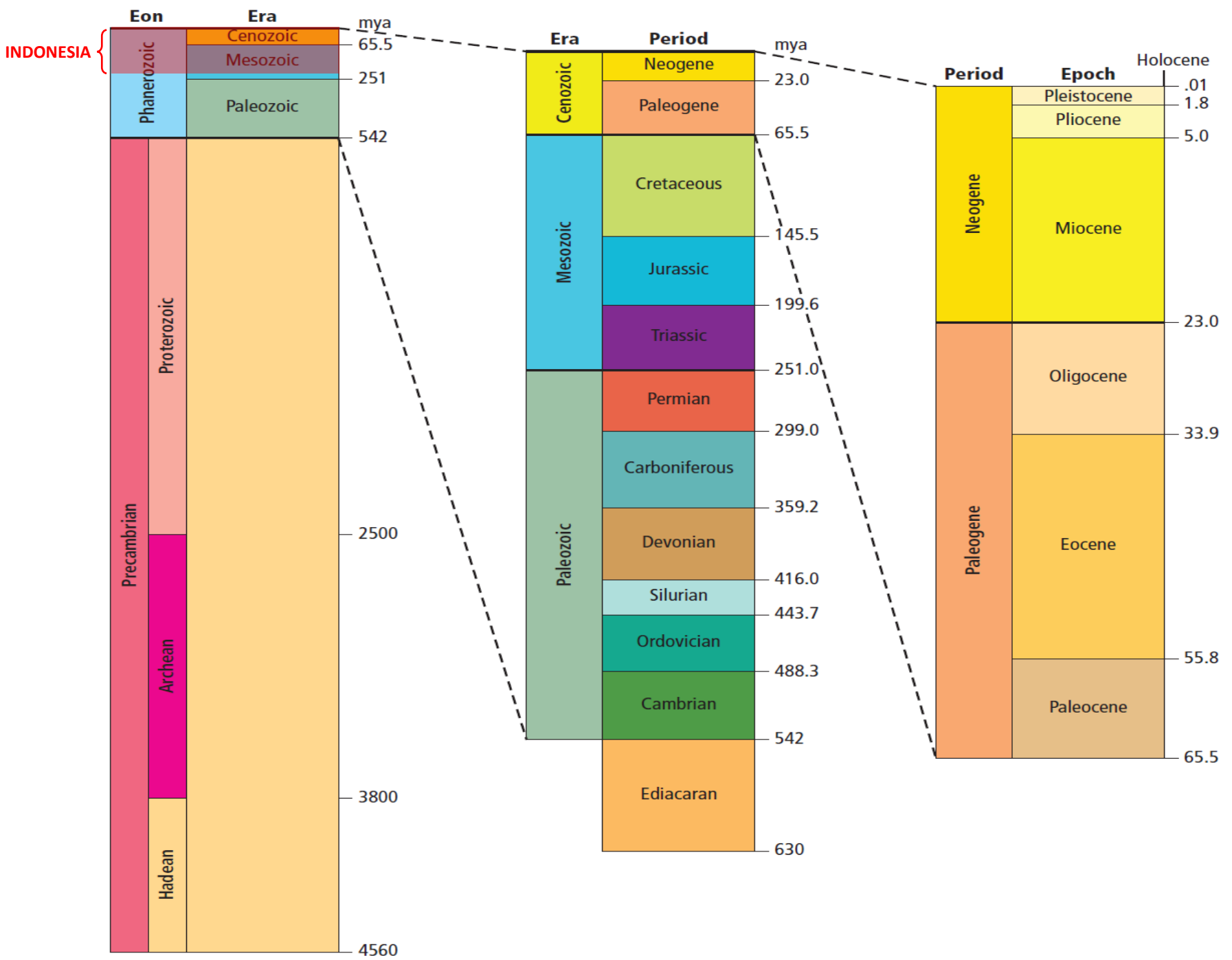
Proven and Prospective Petroleum Areas in Indonesia

Lapangan Geotermal Produksi dan Dapat Dikembangkan di Indonesia

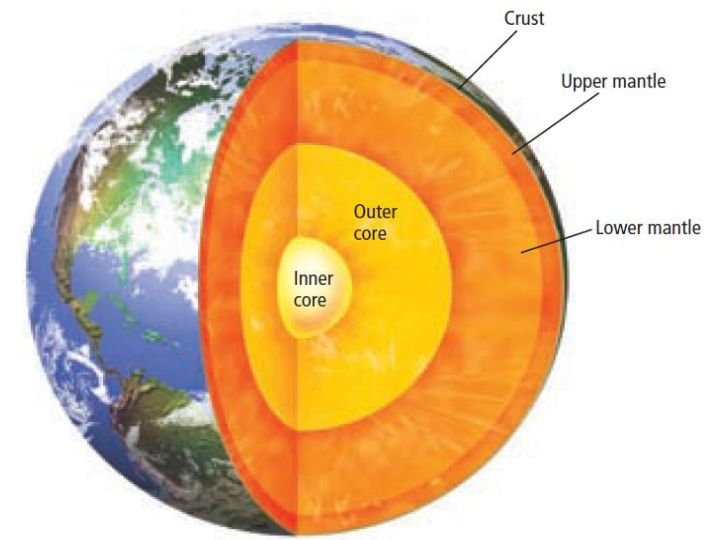
Legend :

- produksi
- dapat dikembangkan



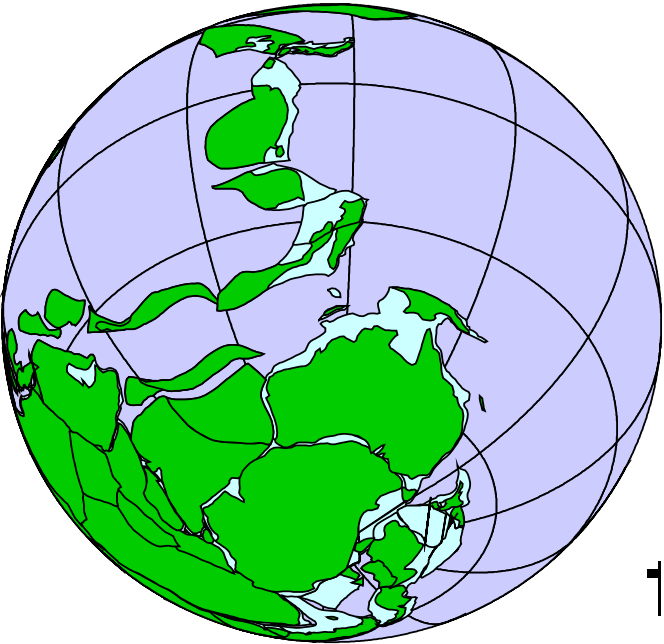
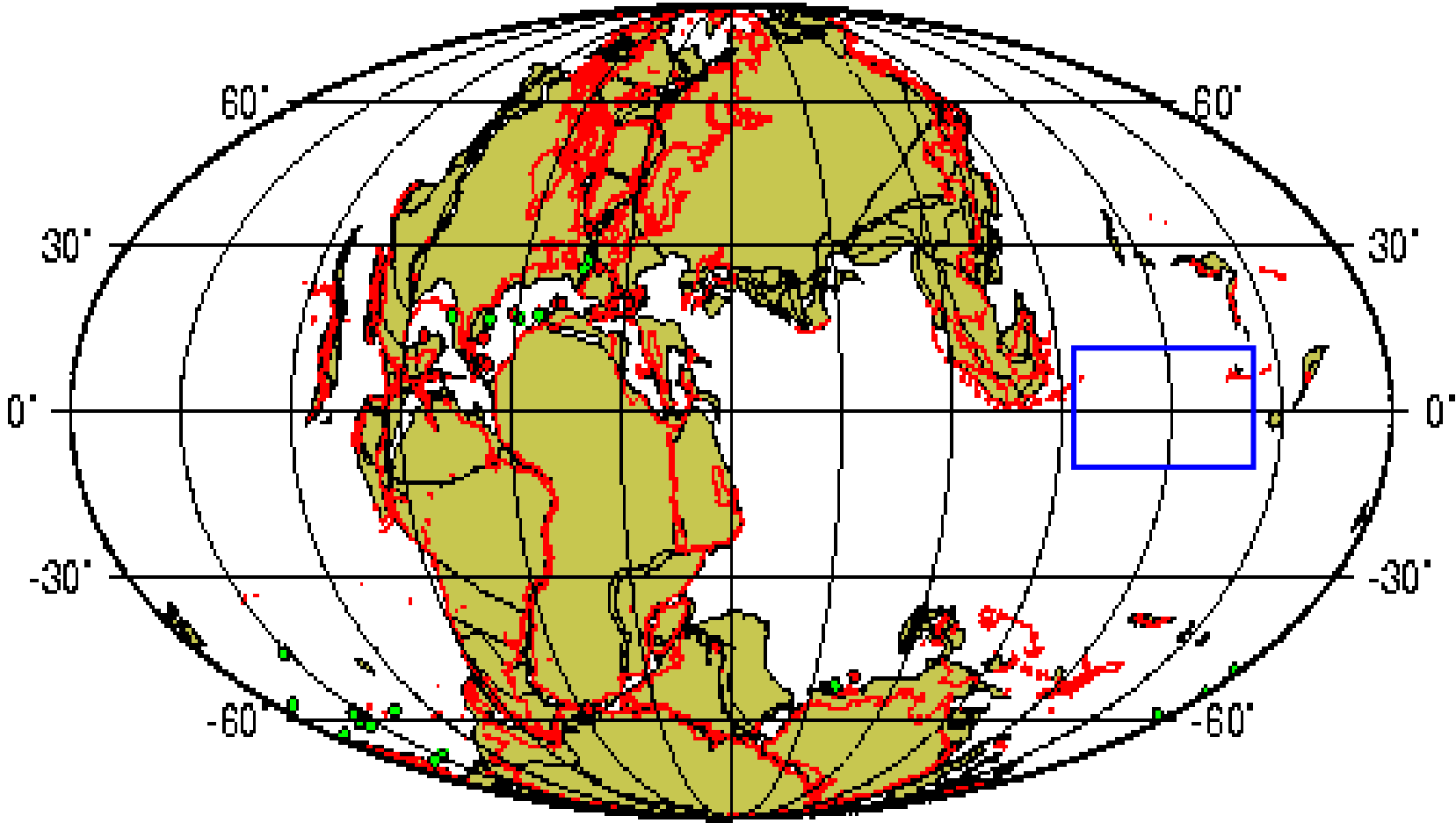
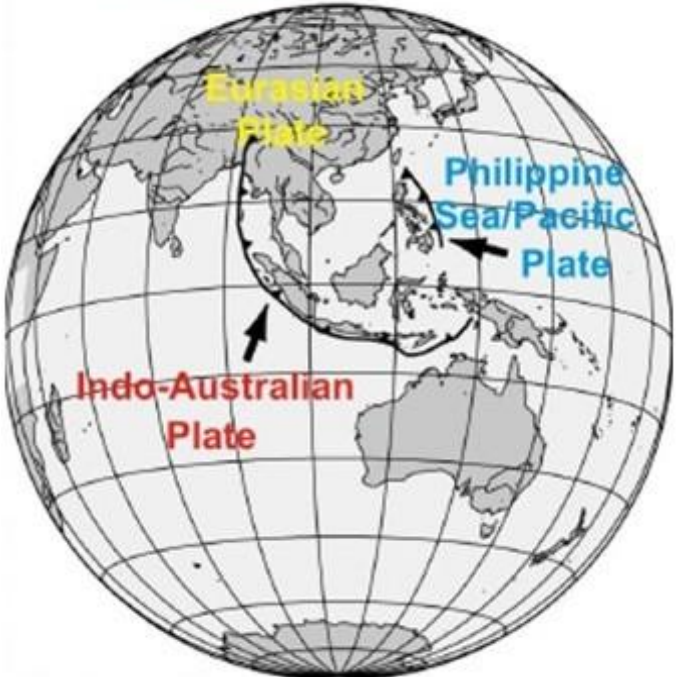


Waktu Geologi dalam Sejarah Bumi



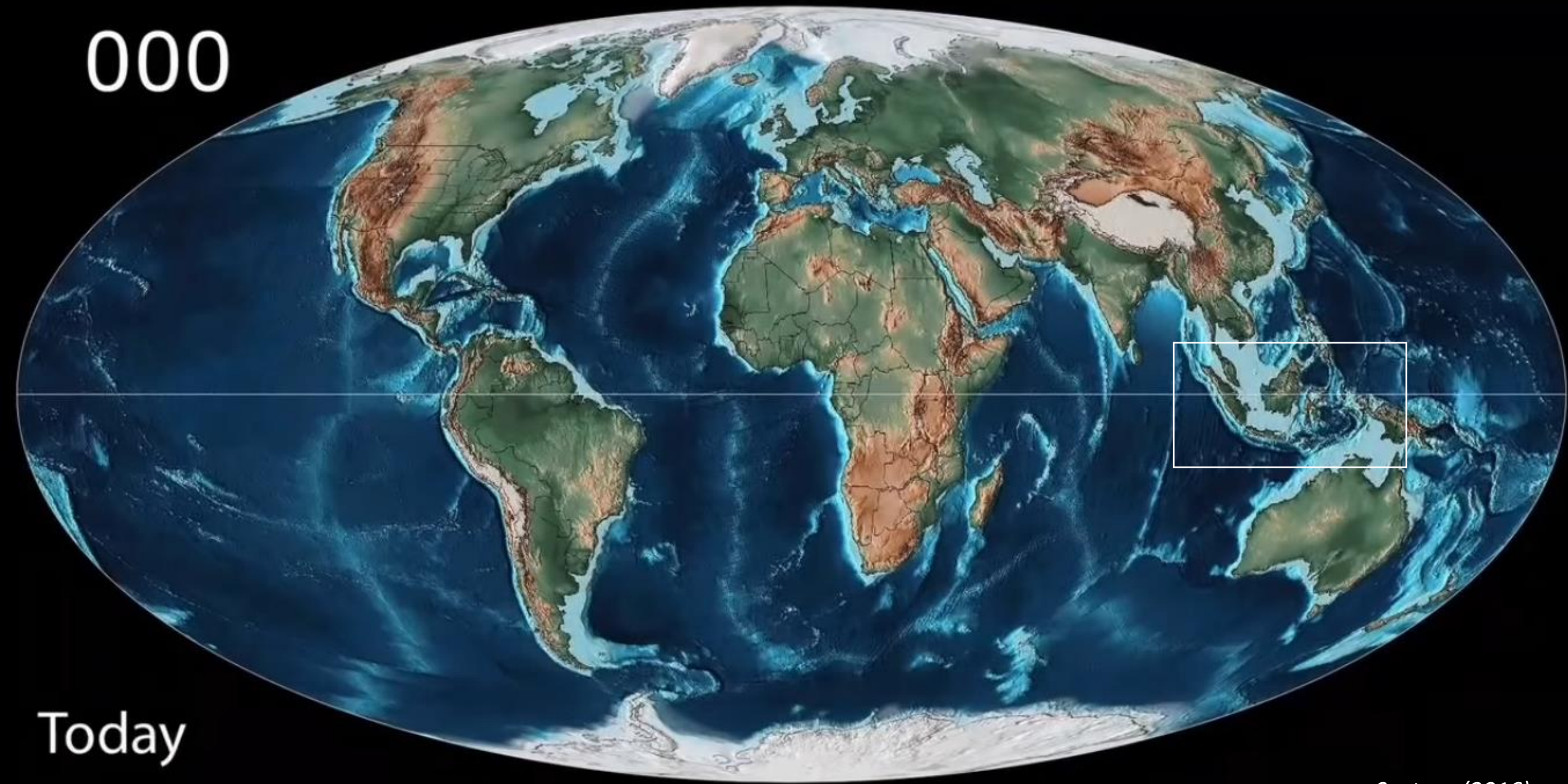
National Geographic (2008)

Rekonstruksi Pembentukan Kepulauan Indonesia



150 My Reconstruction

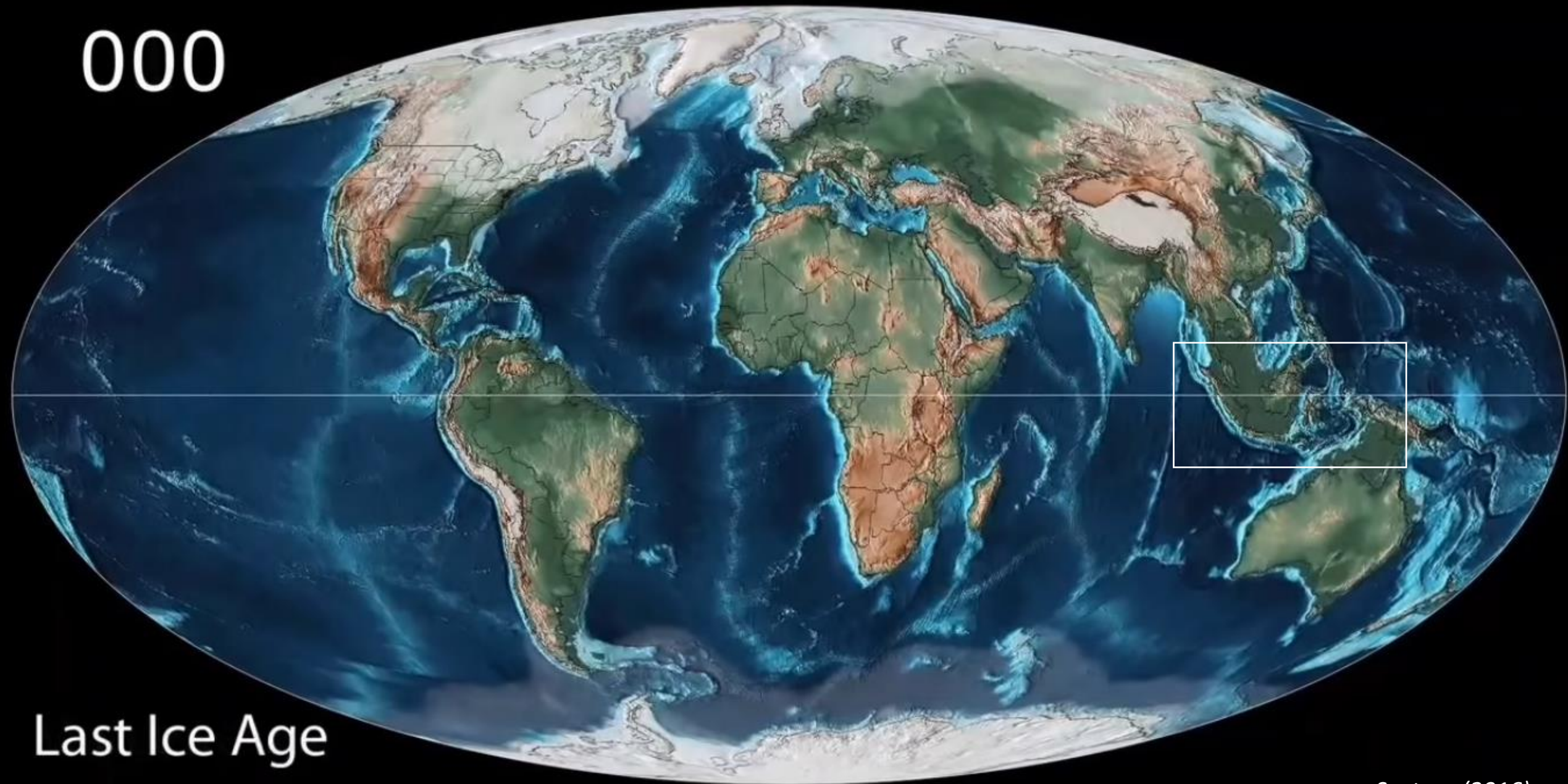
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Today

Scotese (2016)

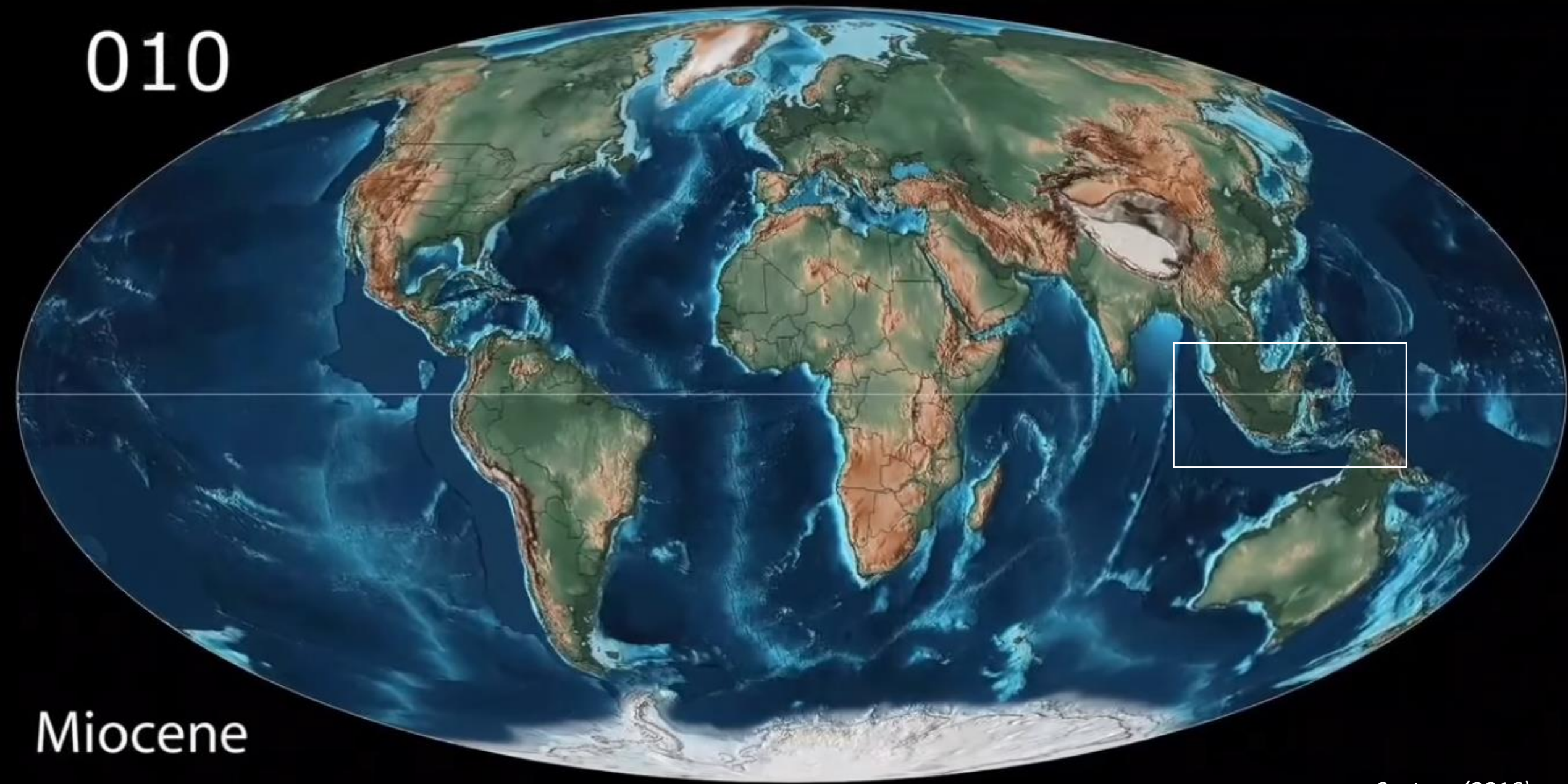
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Last Ice Age

Scotese (2016)

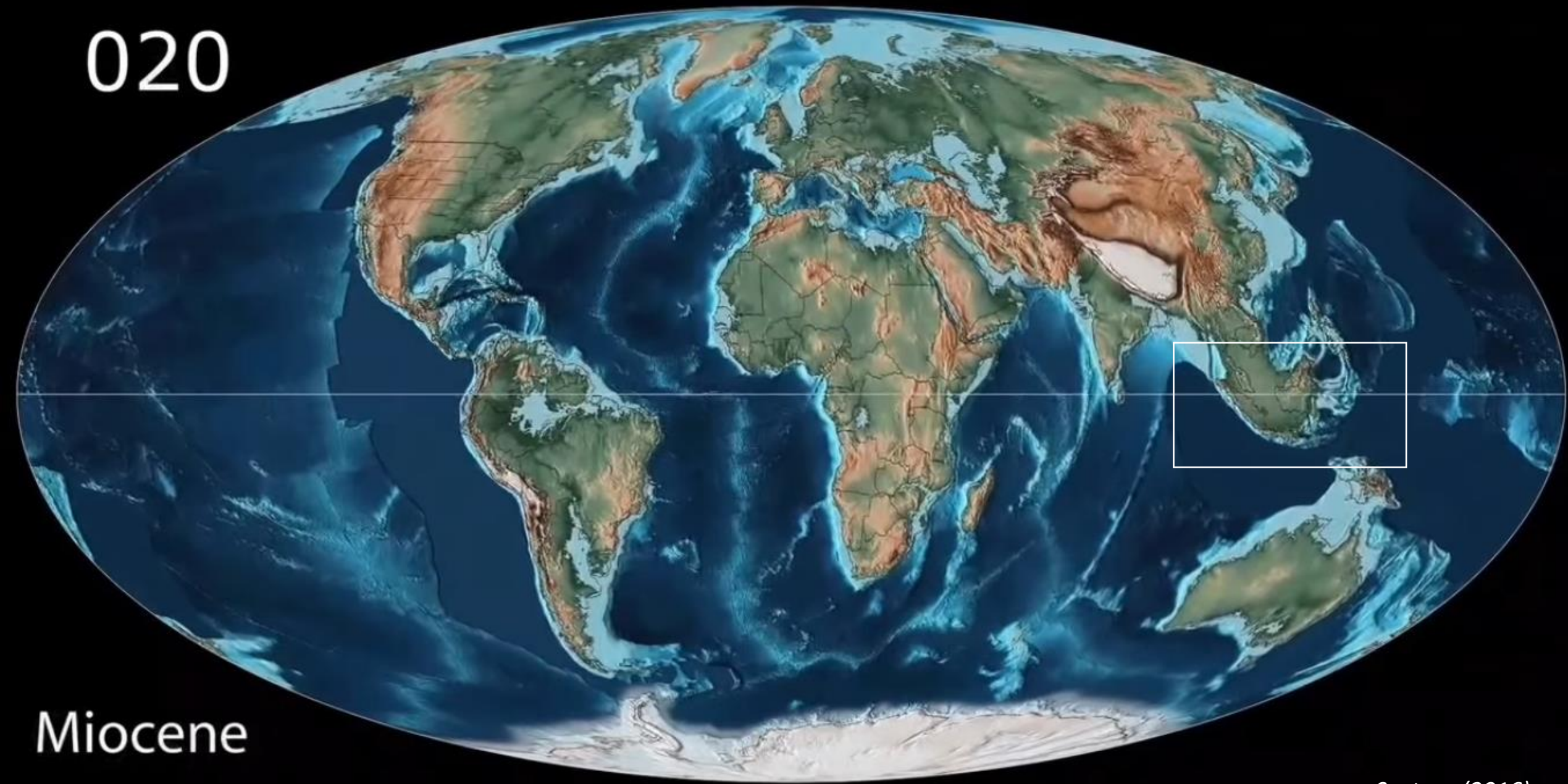
010



Miocene

Scotese (2016)

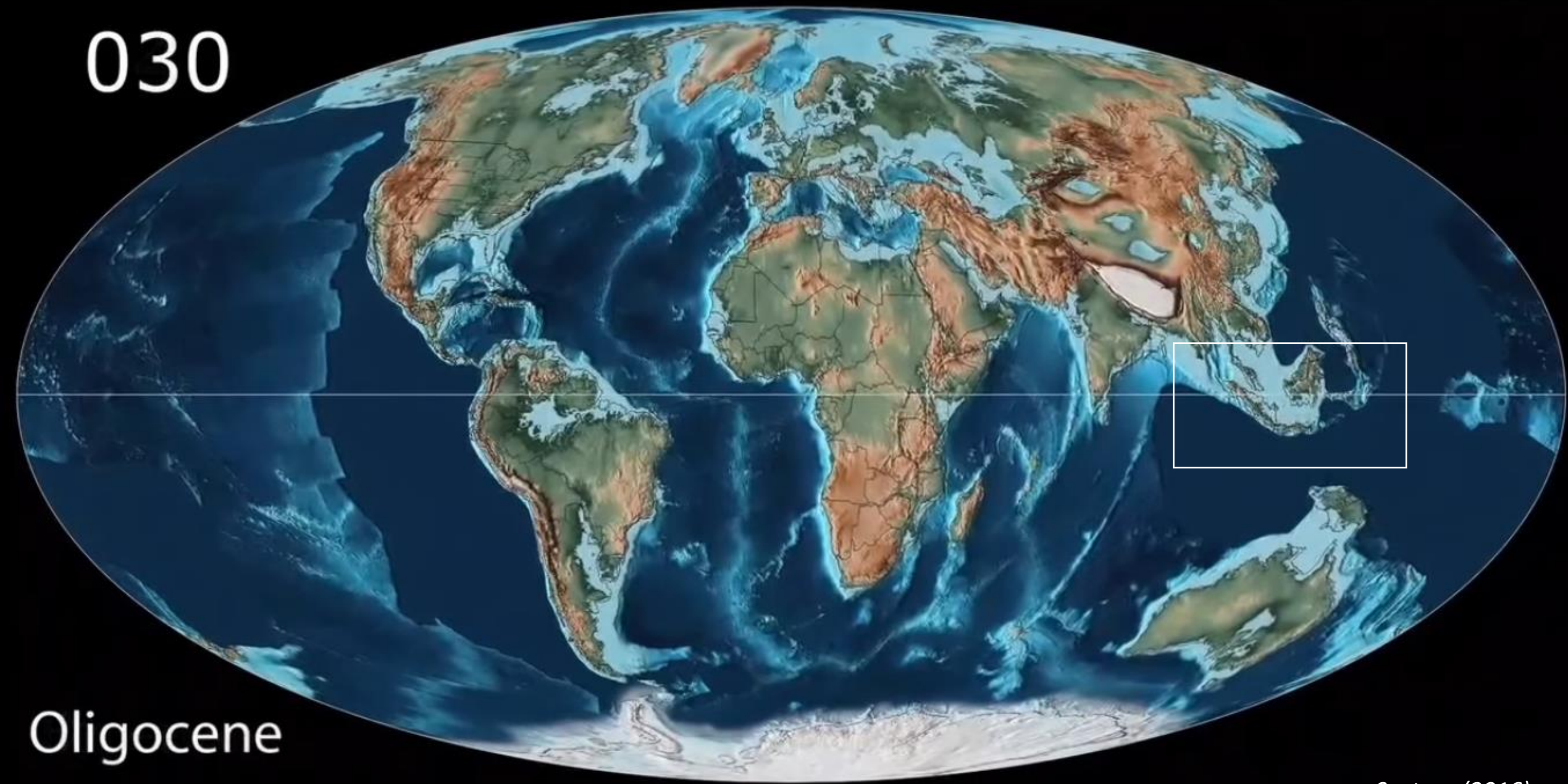
020



Miocene

Scotese (2016)

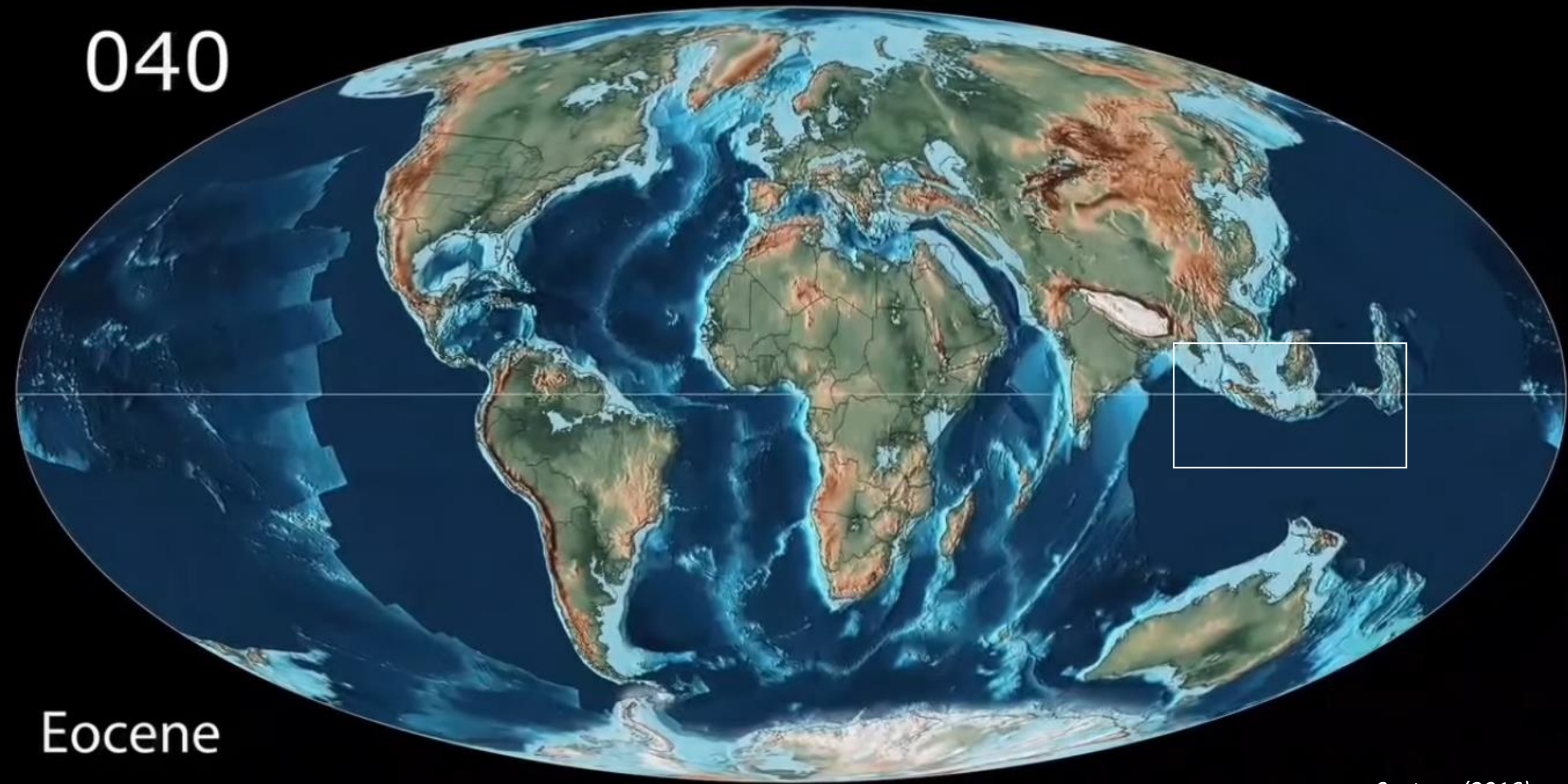
030



Oligocene

Scotese (2016)

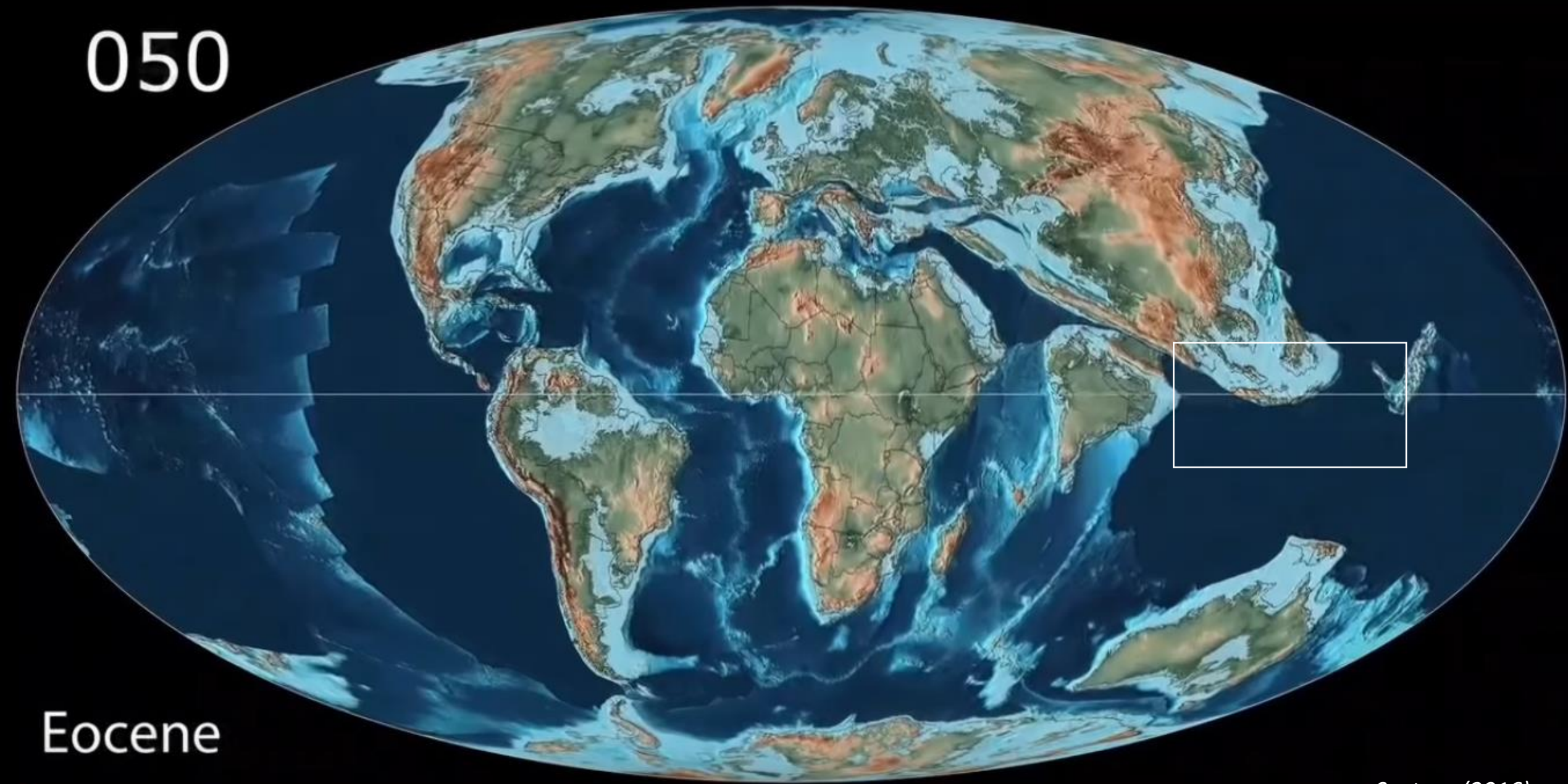
040



Eocene

Scotese (2016)

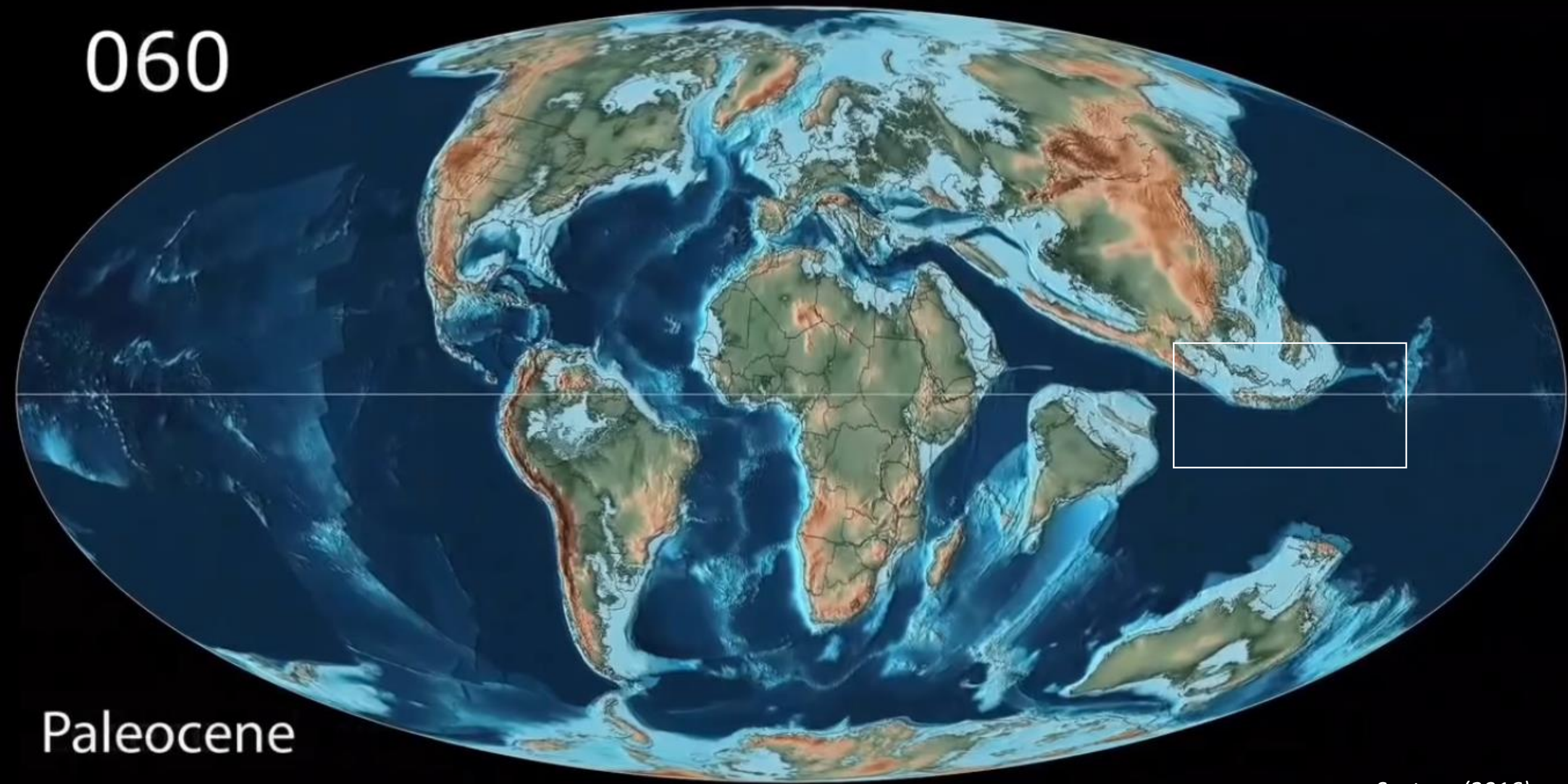
050



Eocene

Scotese (2016)

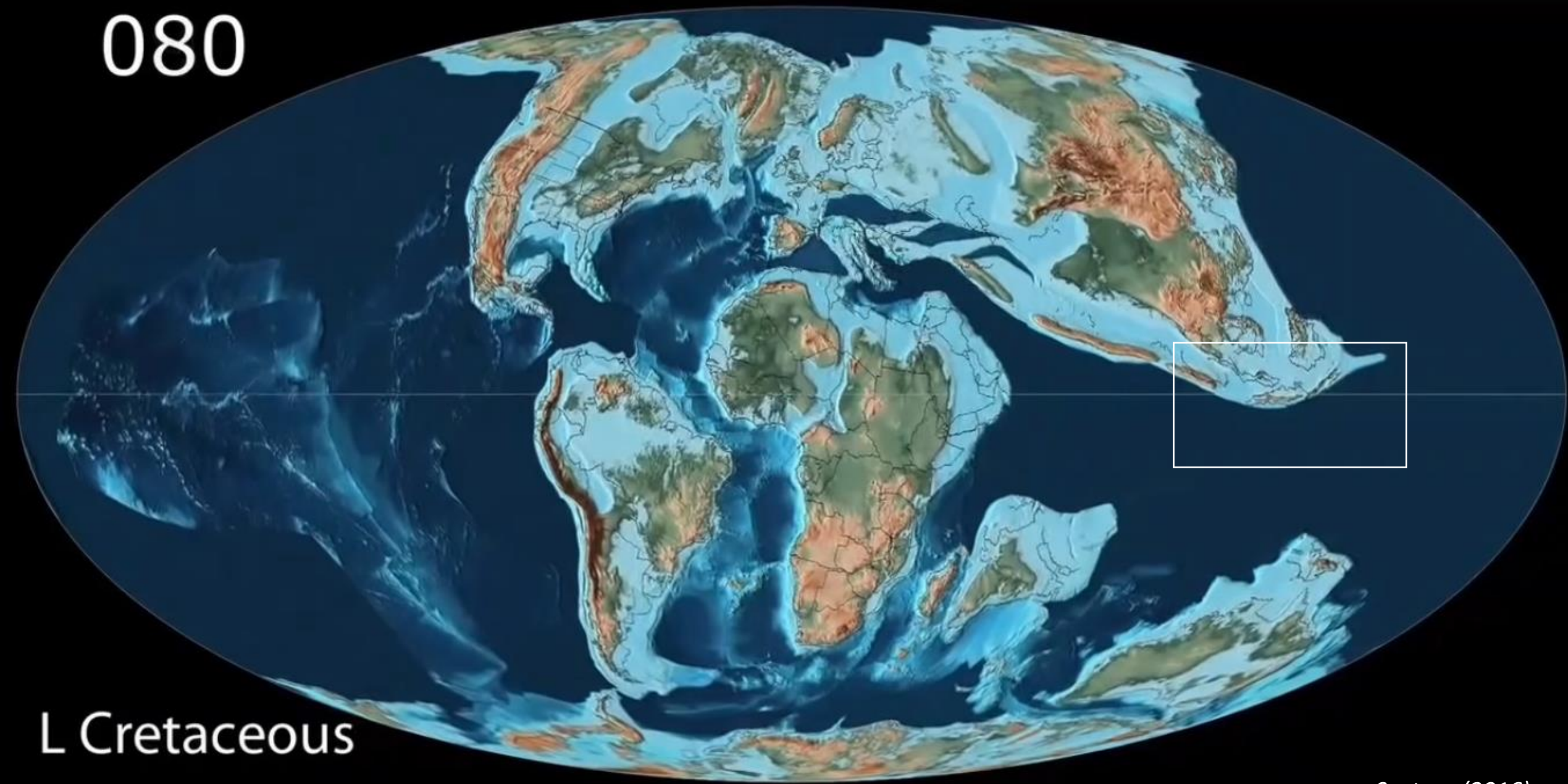
060



Paleocene

Scotese (2016)

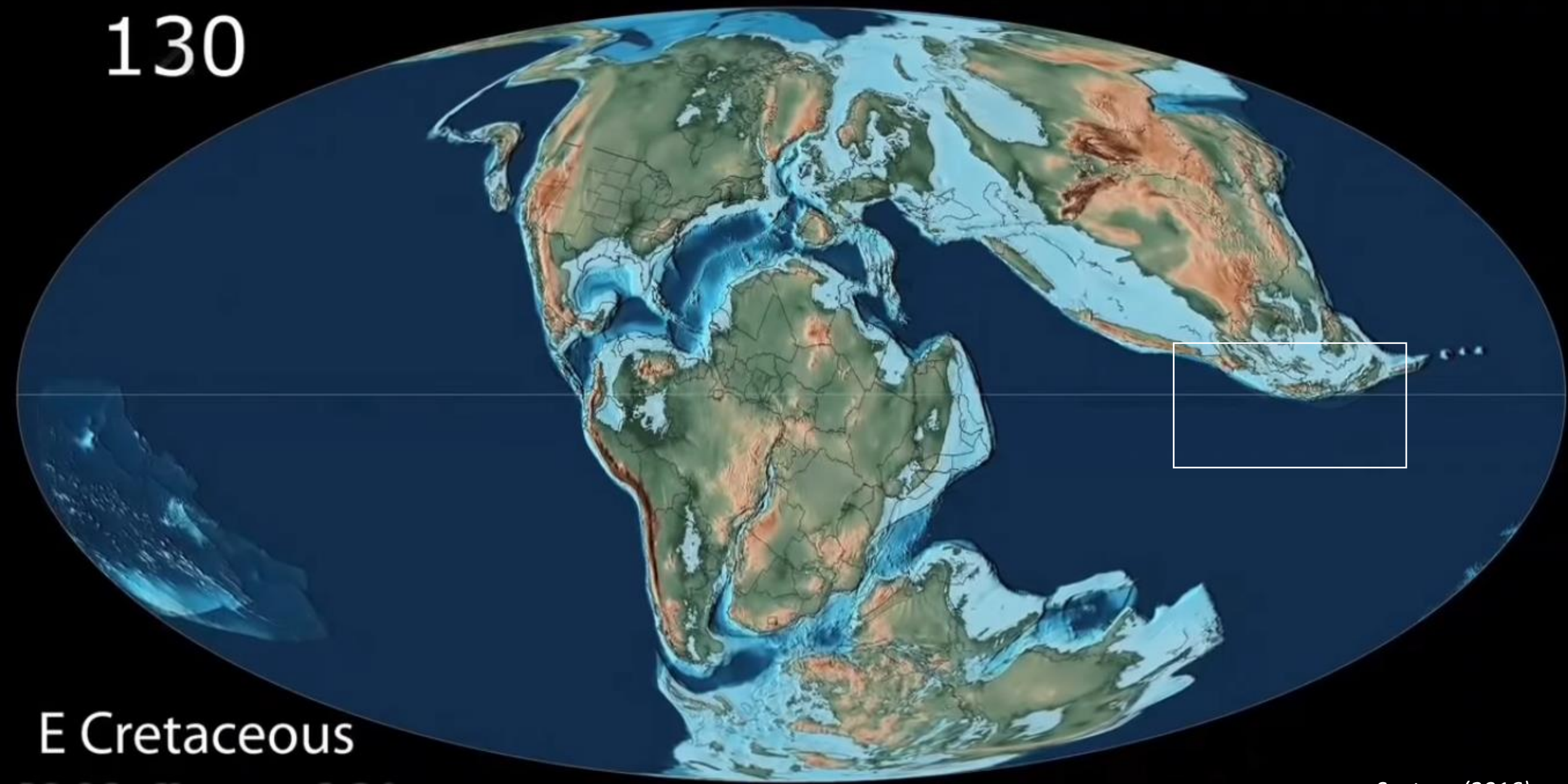
080



L Cretaceous

Scotese (2016)

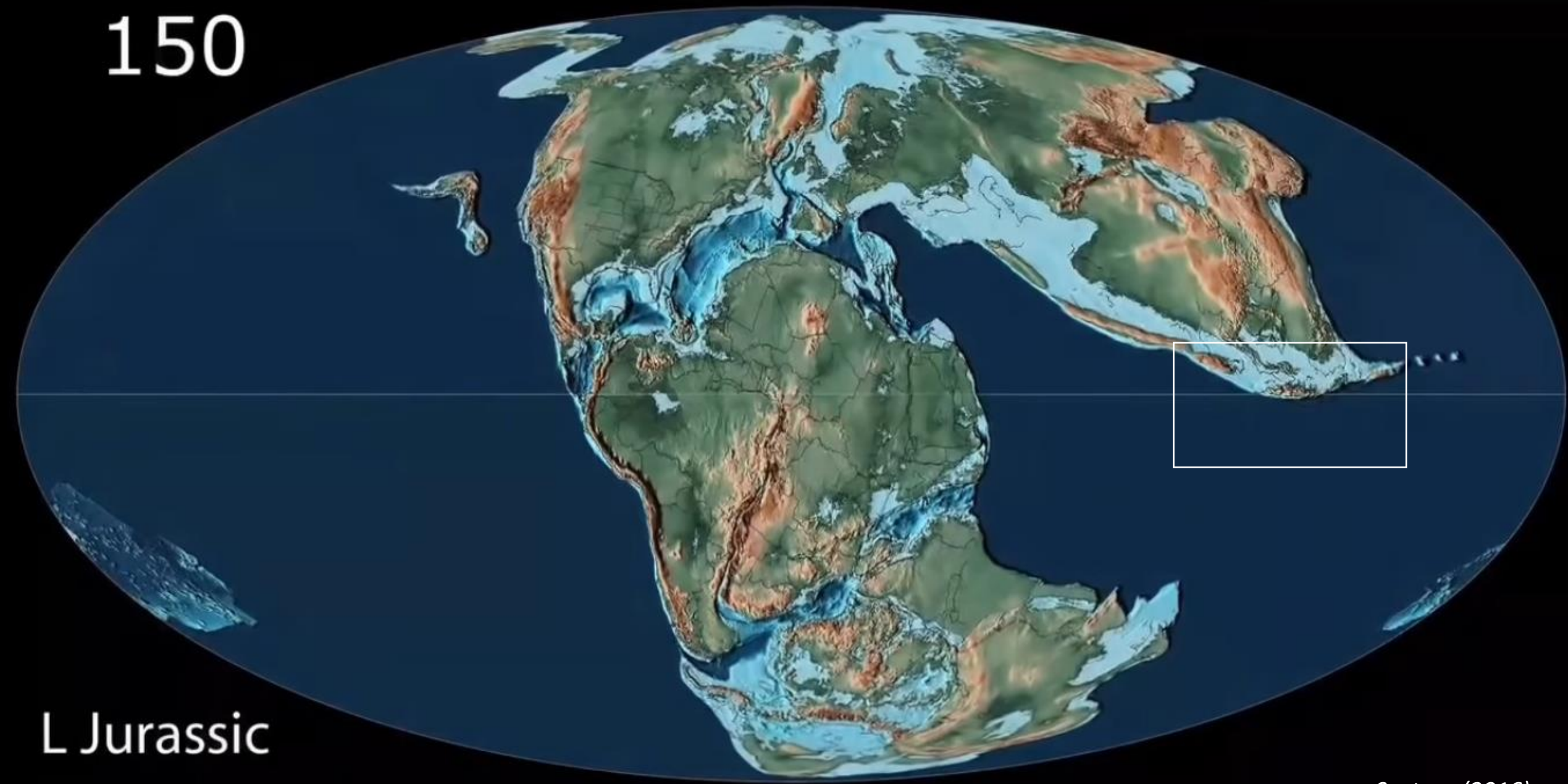
130



E Cretaceous

Scotese (2016)

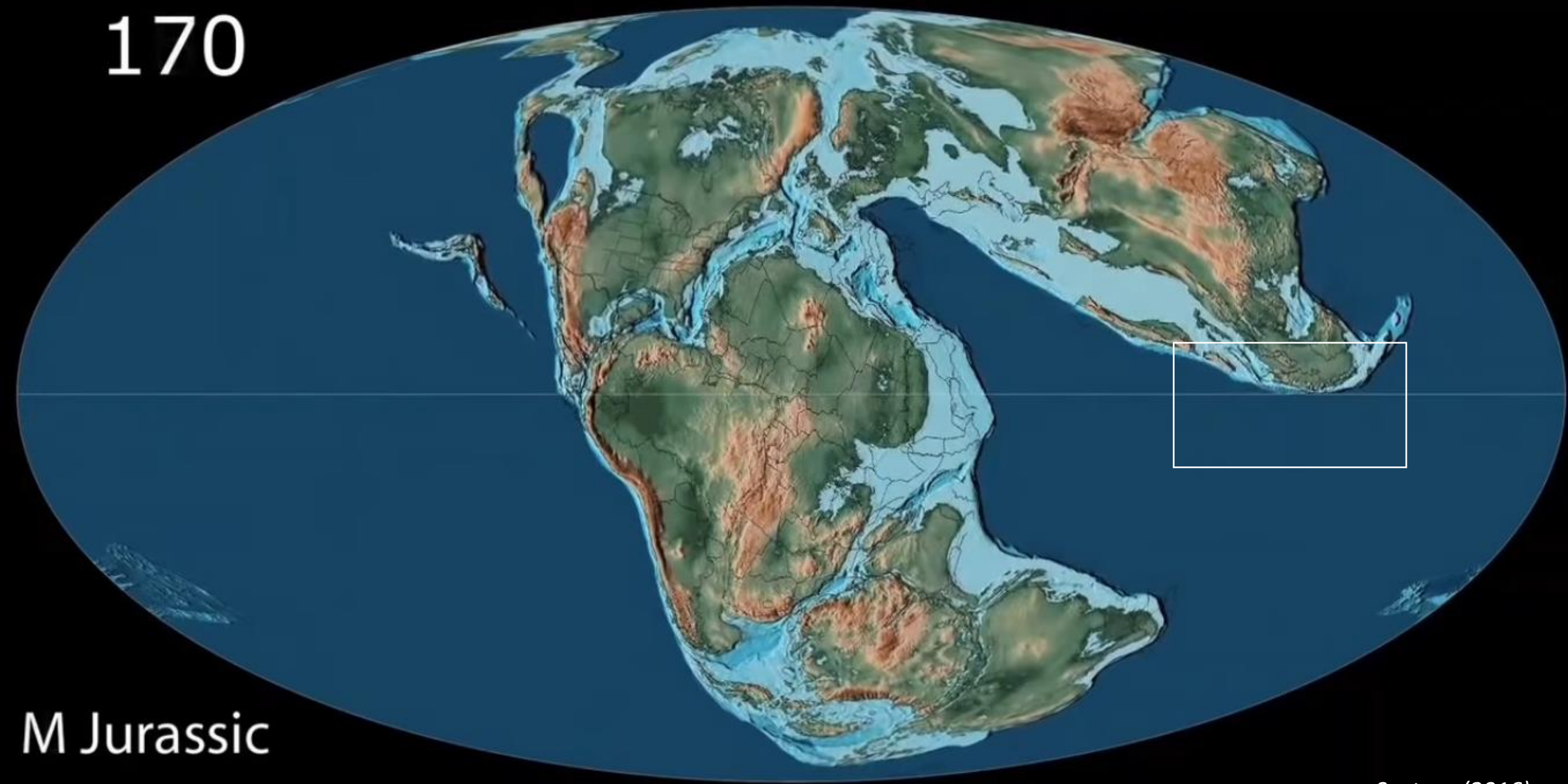
150



L Jurassic

Scotese (2016)

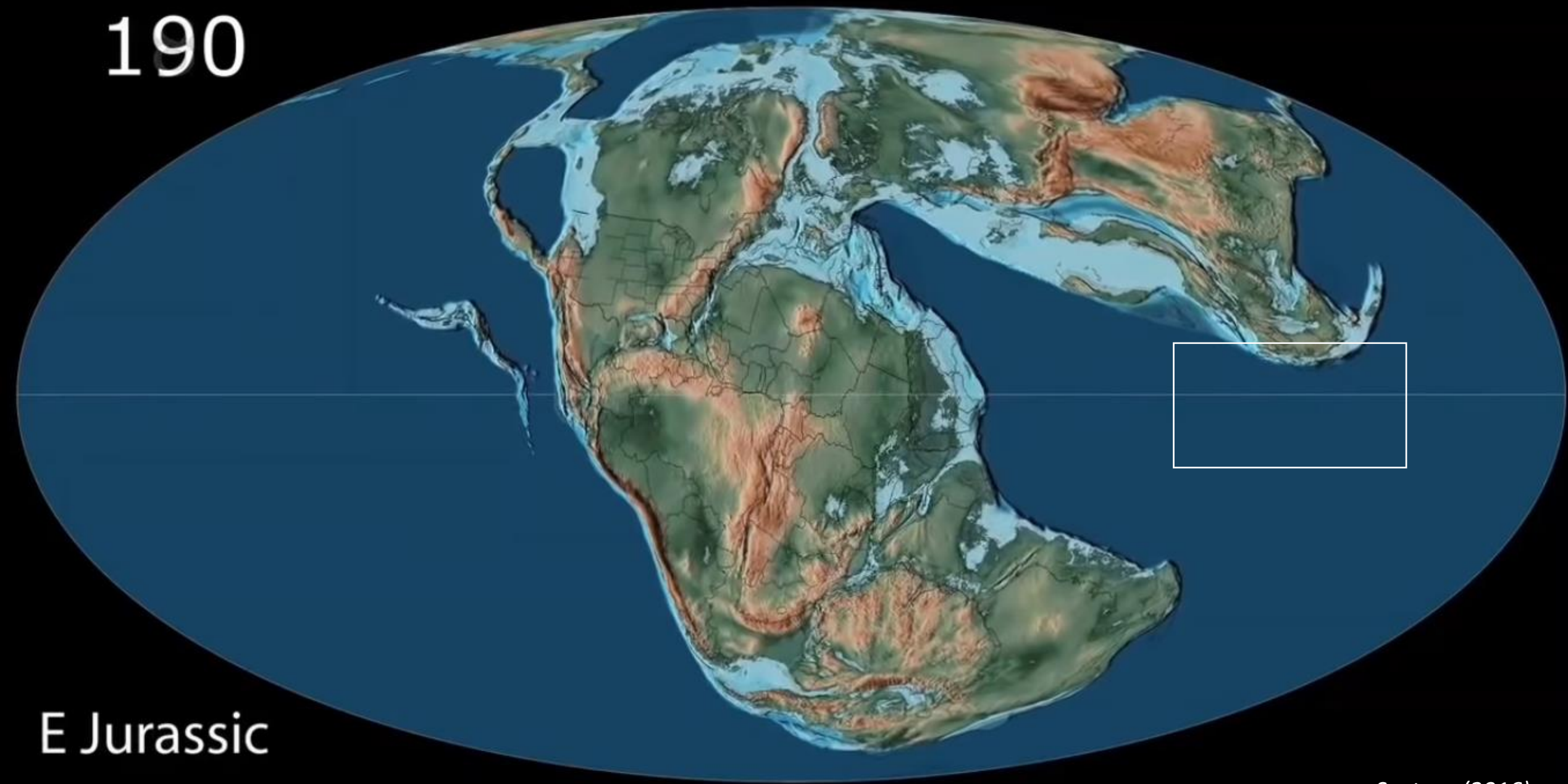
170



M Jurassic

Scotese (2016)

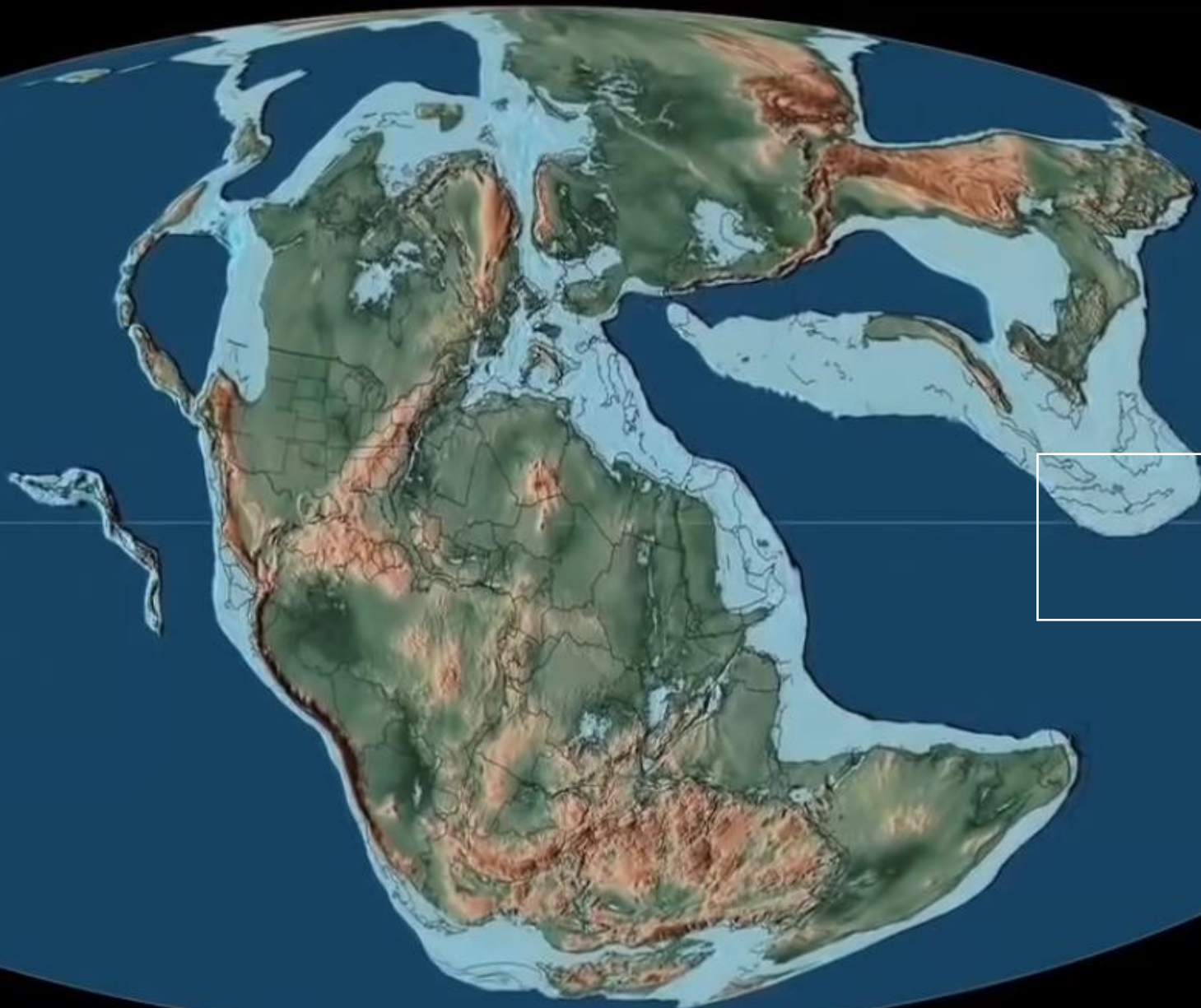
190



E Jurassic

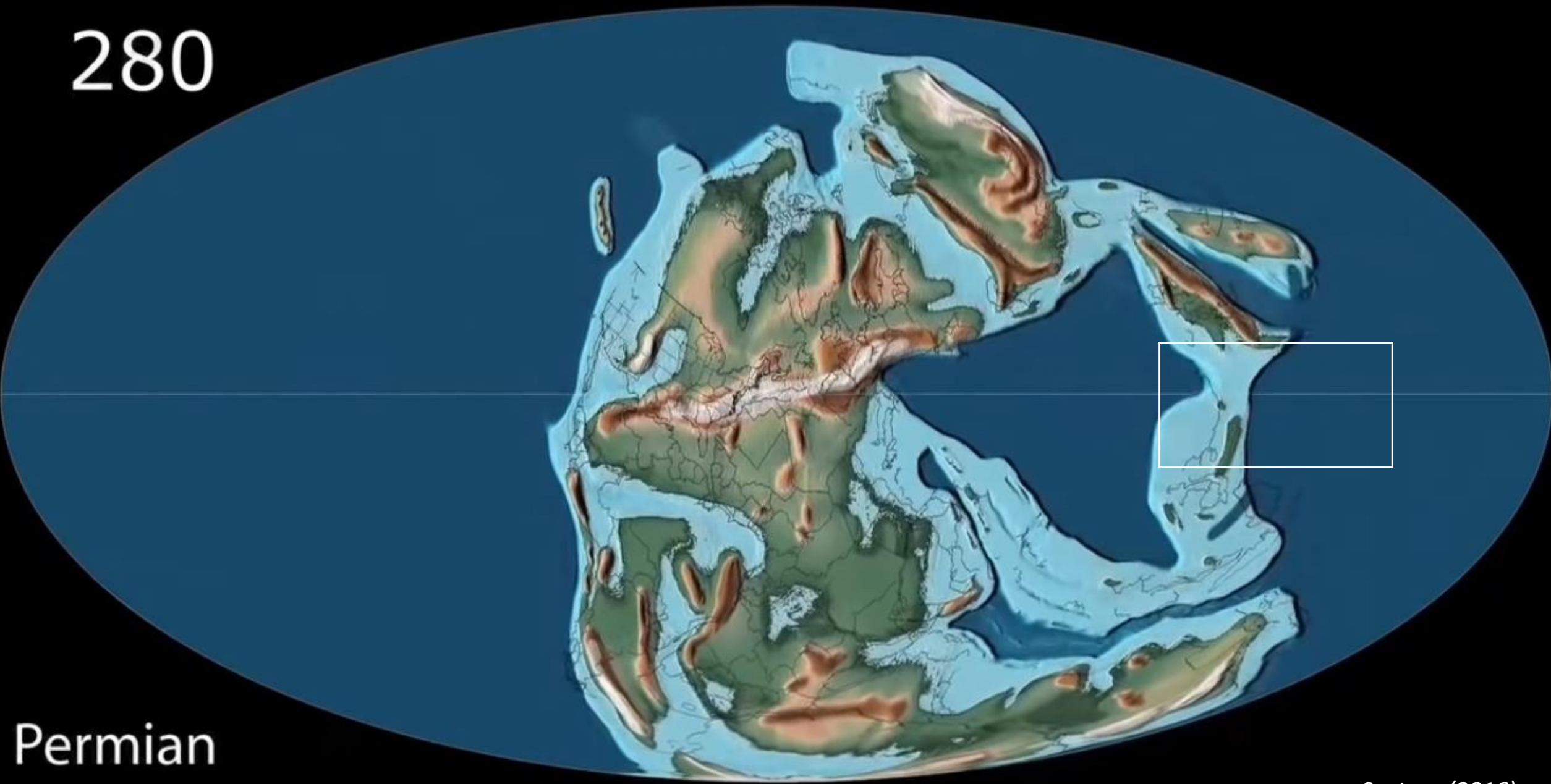
Scotese (2016)

220



Triassic

280



Permian

Scotese (2016)

Diskusi

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3. Berkah Geowisata Indonesia



Latar Belakang

Tempat pertemuan 3 lempeng tektonik besar, yaitu lempeng **Indo-Australia, Eurasia** dan **Lempeng Pasifik**



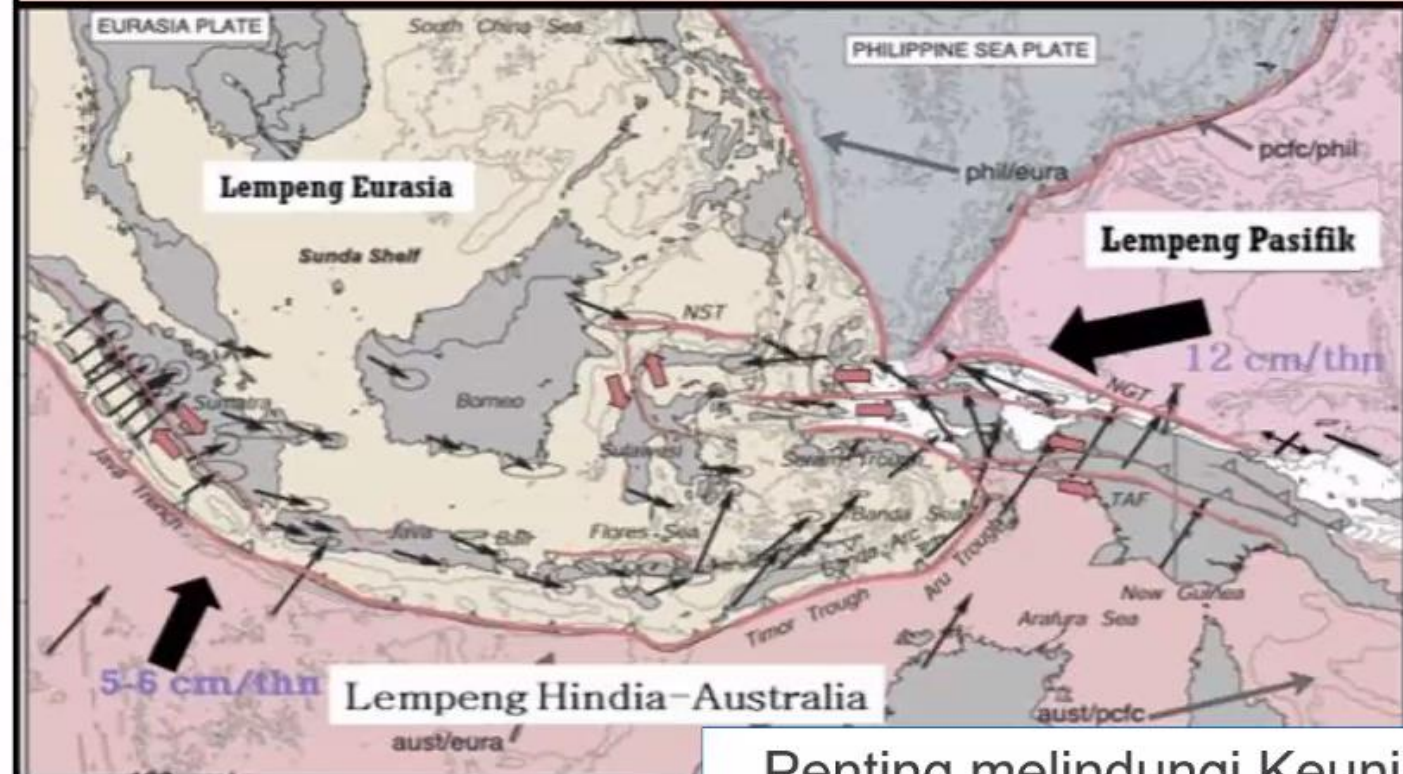
Kondisi tektonik menimbulkan **keragaman dan keunikan serta nilai kelangkaan dan keindahan objek geologi**, yang bermanfaat sebagai:

- Pengembangan ilmu kebumihian
- Pengembangan pariwisata



Penting melindungi Keunikan Geologi yang menjadi bukti pembentukan Planet Bumi
Penetapan KCAG adalah solusinya

INDONESIA : Laboratorium Alam



Pengklasifikasian Warisan Geologi



Nilai Ilmiah



Nilai Edukasi



Nilai Pariwisata

Nilai Ilmiah

nilai – nilai keilmuan khususnya pada suatu situs warisan geologi yang dapat menjelaskan fitur dan proses geologi.

Terdapat 4 (empat) kriteria dalam penilaian *scientific* yaitu:

1. suatu situs warisan geologi yang dapat mewakili topik geologi, proses, unsur, dan kerangka geologi;
2. hubungan status konservasi suatu lokasi situs warisan geologi;
3. suatu unsur geologi yang tidak dapat ditemukan di lokasi lain; dan
4. keterdapatannya data *scientific* yang telah terpublikasi mengenai lokasi situs warisan geologi tersebut

Nilai Edukasi

nilai – nilai pendidikan yang terkandung dalam suatu situs warisan geologi sehingga dapat menjadi pembelajaran pada setiap jenjang pendidikan. Nilai-nilai pendidikan tersebut didasarkan pada 4 (empat) kriteria yaitu:

1. kapasitas suatu unsur geologi yang dapat dimengerti oleh siswa dengan berbagai tingkat pendidikan,
2. jumlah keragaman suatu unsur geologi yang dapat dijadikan pembelajaran,
3. akses untuk sampai ke lokasi situs warisan geologi, dan
4. keamanan bagi para siswa saat melakukan pembelajaran di lokasi situs warisan geologi.

Nilai Pariwisata

nilai – nilai pariwisata yang terkandung dalam suatu situs warisan geologi yang dapat memberikan nilai tambah pendapatan suatu daerah. Nilai-nilai pariwisata tersebut didasarkan pada 4 (empat) kriteria yaitu:

1. berhubungan dengan keindahan suatu pemandangan geologi untuk dapat dilihat dari berbagai arah,
2. kemudahan untuk dapat dimengerti oleh orang awam,
3. kemudahan akses bagi para pengunjung umum, dan
4. keamanan bagi para wisatawan.



Suatu wilayah geografis tunggal



Memiliki Situs Warisan Geologi (Geosite) dan bentang alam yang bernilai (Nasional/Internasional)



Memiliki keterkaitan antara aspek geo, bio dan culture

Pengertian Geopark

Kegiatan Konservasi, edukasi, dan pembangunan perekonomian masyarakat



Dikelola secara berkelanjutan dengan keterlibatan aktif dari masyarakat



Menumbuhkan pemahaman dan kepedulian masyarakat terhadap bumi dan lingkungan



Asep Permana – Badan Geologi (2022)



Geology for Protection and Public Prosperity



www.geologi.esdm.go.id



@kabargeologi



Badan Geologi



Badan Geologi



@kabargeologi

UNESCO GLOBAL GEOPARK

1. Batur
2. Gunung Sewu
3. Ciletuh-Palabuhanratu
4. Rinjani-Lombok
5. Kaldera Toba
6. Belitong
7. Maros Pangkep
8. Merangin Jambi
9. Ijen
10. Raja Ampat

NATIONAL GEOPARK

1. Tambora
2. Bojonegoro
3. Pongkor
4. Natuna
5. Karangsembung-Karangbolong
6. Sawahlunto
7. Ngaraisianok-Maninjau
8. Siloek
9. Meratus

Geopark Indonesia

Indonesian Geopark





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English



Our Expertise

Our Impact

Ideas & Data

Get Involved



International Geoscience and Geoparks Programme

International Geoscience and Geoparks Programme

Indonesia

- [Batur UNESCO Global Geopark](#)
- [Belitong UNESCO Global Geopark](#)
- [Ciletuh - Palabuhanratu UNESCO Global Geopark](#)
- [Gunung Sewu UNESCO Global Geopark](#)
- [Ijen UNESCO Global Geopark](#)
- [Maros Pangkep UNESCO Global Geopark](#)
- [Merangin Jambi UNESCO Global Geopark](#)
- [Raja Ampat UNESCO Global Geopark](#)
- [Rinjani-Lombok UNESCO Global Geopark](#)
- [Toba Caldera UNESCO Global Geopark](#)

List of UNESCO Global Geoparks and Regional Networks

A UNESCO Global Geopark uses its geological heritage, in connection with all other aspects of the area's natural and cultural heritage, to enhance awareness and understanding of key issues facing society, such as using our earth's resources sustainably, mitigating the effects of climate change and reducing natural hazard-related risks. At present, 195 geoparks are found in 48 countries.

Last update: 25 May 2023

<https://www.unesco.org/en/igpp/geoparks?hub=67817>

Selamat datang Unesco Global Geopark terbaru di Indonesia (Mei 2023).

Geopark Maros-Pangkep



Geopark Raja Ampat



Geopark Ijen



Geopark Merangin Jambi



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Potensi Warisan Geologi (KESDM, 2019)

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89. Danau Tektonik Limboto, Gorontalo
90. Plato Minahasa, Sulut
91. Air Terjun Maremo, Sultra
92. Aspal Buton, Sultra
93. Karst Muna, Sultra
94. Terumbu Karang Wakatobi, Sultra
95. Travertin Konawe, Sultra

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6. MetaSedimen Natuna, Kepri
7. Lembah Harau, Sumbar
8. Maninjau-Ngarai Sianok, Sumbar
9. Karst Kamang Mudiak, Sumbar
10. Danau Singkarak, Sumbar
11. Tambang Sawahlunto, Sumbar
12. Danau Kembar Solok, Sumbar
13. Gunung Kerinci, Sumbar-Jambi
14. Graben Sungai penuh, Jambi
15. Paleoflora Merangin, Jambi
16. Emas Lebong Tandai, Bengkulu
17. Endokarst Padangbindu, Sumsel
18. Danau Kaldera Rantau, Sumsel
19. Kompleks Kaldera Suoh, Lampung
20. Diabas Permian Bangka, Babel
21. Lava Bantal Belitung, Babel
22. Kompleks Krakatau, Lampung

34. Panabumi Plato Garut, Jabar
35. Bukit Sepuluhribo Galunggung, Jabar
36. Cukangtaneuh Pangandaran, Jabar
37. Laguna Segara-anakan Gilacap, Jateng
38. Karst Kara Bolong, Jate

47. Situs Fosil Gajah Blora, Jateng
48. Geologi Migas Bojonegoro, Jatim
49. Gunungapi Purba Bawean, Jatim
50. Gunungapi Lumpur Sidoarjo, Jatim

JAWA-MADURA (33)

23. Kaldera Rawa Danau, Banten
24. Gunungapi Tua Ujungkulon, Banten
25. Bayah Dome, Banten
26. Kepulauan Seribu, DKI Jakarta
27. Muara Sungai Citarum, Jabar
28. Bekas Tambang Emas Pongkor, Jabar
29. Geysir Cisolok, Sukabumi, Jabar
30. Melange Ciletuh, Sukabumi, Jabar
31. Karst Rajamandala, Jabar
32. Gunung Sunda Tua, Jabar
33. Cekungan Bandung, Jabar
39. Melange Karangsembung, Kabumen, Jateng
40. Plato Vulkanik Dieng, Jateng
41. Vulkano Merapi-Merbabu, Jateng
42. Telaga Purba Borobudur, Jateng
43. Gumuk Pasir Parangtritis, Yogyakarta
44. Karst Pegunungan Sewu, Jateng-Jatim
45. Situs Manusia Purba Dome Sangiran, Jateng
46. Kepulauan Karimunjawa, Jateng

BALI-NUSA TENGGARA (16)

56. Danau Kaldera Buyan-Bratan, Bali
57. Kompleks Kaldera Batur, Bali
58. Semenanjung Jimbaran, Bali
59. Karst Nusa Perida, Bali
60. Kompleks Kaldera Rinjani, Lombok, NTB
61. Vulkanik Tua Bawah Laut, Lombok, NTB
62. Bekas Tambang Emas Batuhijau, NTB
63. Gunung Tambora, Sumbawa, NTB
64. Danau Vulkanik Tua Satonda, NTT
65. Vulkanik Tua Kep.Komodo, Flores, NTT
66. Danau Kaldera Sanonggoang, Flores, NTT
67. Situs Fosil Purba Cekungan Soa, Flores, NTT
68. Gunung Kelimutu, Flores, NTT
69. Mikrokontinen Sumba, NTT
70. Geantiklin Pulau Sawu, NTT
71. Clay Melange Timor, NTT



Tsunami Aceh, 26 Des. 2004

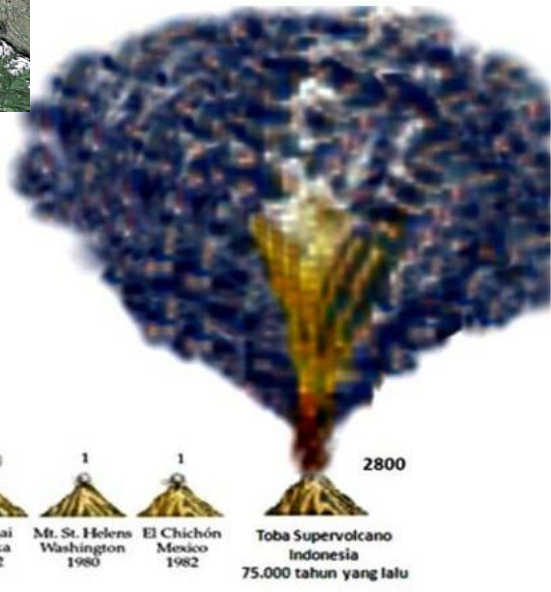
- Awang Satyana, June 2021



Danau Toba, Erupsi Katastropik 74 Ka - Awang Satyana, June 2021



Bowen (2012)



Merdeka.com

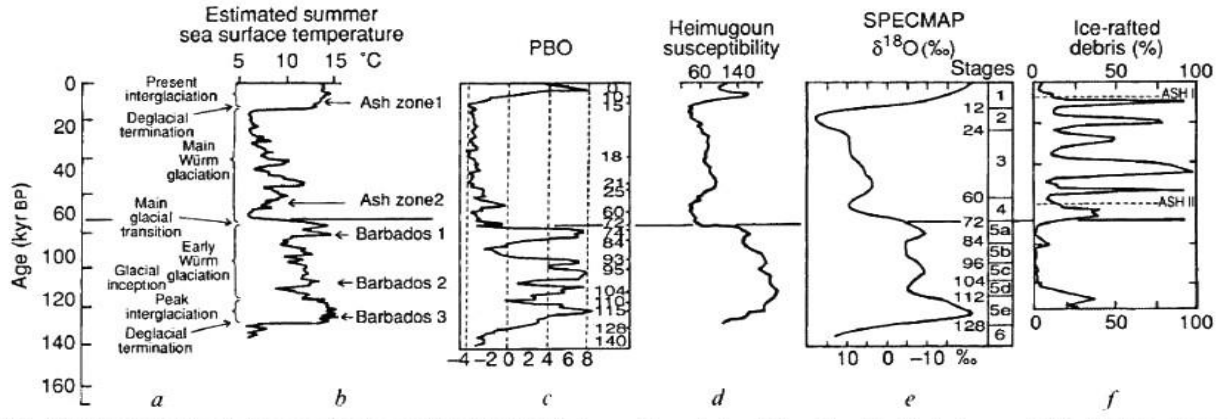
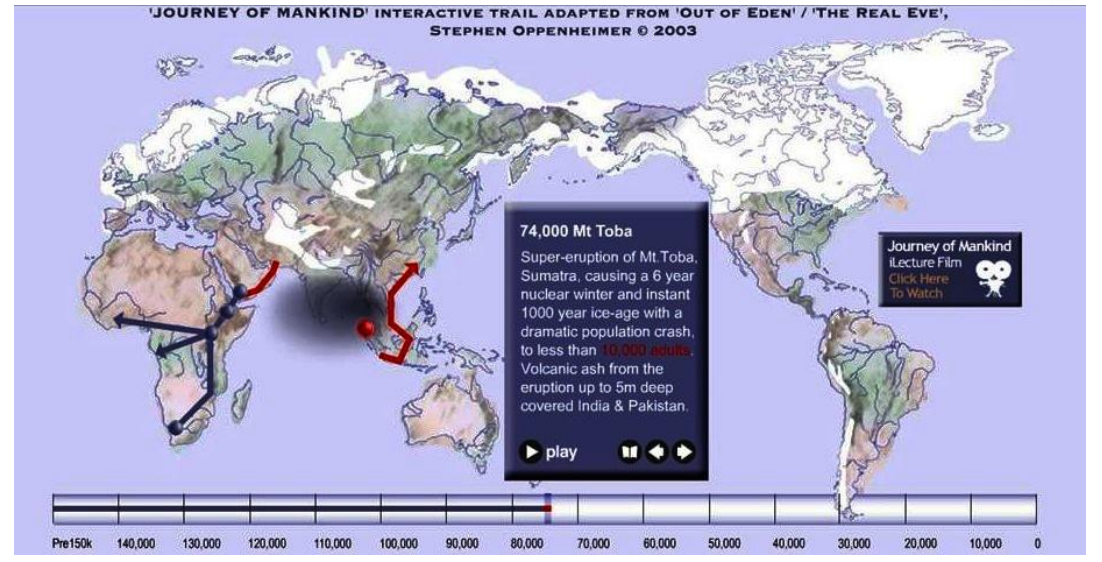


FIG. 1 Climate indicators for the past 140 kyr. a, Climatic states³³. b, Reconstructed summer SST (planktonic foraminiferal assemblage data), deep-sea core V23-82, North Atlantic¹⁵. Dates: Ash Zone 1 (9.5 kyr), Ash Zone 2 (65 kyr), Barbados 1 Terrace (~85 kyr), Barbados 2 (~110 kyr) and Barbados 3 (~125 kyr). c, Palaeobioclimatic operator (PBO), a measure of the 'best possible' climate profile based on multivariate statistical analysis of Les Echets, France pollen records. Higher PBO indicates warmer climate.

The vertical scale is nonlinear⁴⁵. d, Magnetic susceptibility, Heimugou loess section, Central China. Loess in palaeosols formed in warm intervals has higher susceptibility than loess deposited in cold intervals⁴⁶. e, SPECMAP $\delta^{18}O$ scale. Stages and dates of boundaries shown at right³. $\delta^{18}O = [(^{18}O/^{16}O)_{sample}/(^{18}O/^{16}O)_{standard}] - 1$, where standard is PDB (cretaceous belemnite carbonate). f, Percentage of ice-rafted detritus in North Atlantic deep-sea core Me69-17. Depth in metres¹⁴.

Rampino & Self (1992)



74,000 Mt Toba
 Super-eruption of Mt. Toba, Sumatra, causing a 6 year nuclear winter and instant 1000 year ice-age with a dramatic population crash, to less than 10,000 adults. Volcanic ash from the eruption up to 5m deep covered India & Pakistan.

Journey of Mankind
 Lecture Film
[Click Here To Watch](#)

Oppenheimer (2003)



Tempo.co



Kastara.id



minanews.net



tagar.id

Pulau Natuna

- Awang Satyana, June 2021

Tokongbelayar, Granit Anambas, 80-70 juta tahun, pulau terluar teritorial



Granit Natuna (100-70 juta tahun)



foto: Johannes Karundeng



Ngarai Sianok

aroengbinang



Danau Singkarak, dalam 149 m

bobo.grid.id



Dari bentang alam: dari atas pesawat udara dapat terlihat kelurusan dari jalur patahan yang membelah bumi (jalur merah pada ilustrasi 3a). Jalur ini seringkali juga ditandai oleh kenampakan bukit-bukit kecil di sepanjang patahan, pergeseran alur-alur sungai (lihat ilustrasi 3b-foto udara), dan danau-danau yang terjadi karena pergeseran bumi (contohnya: Danau Singkarak).

bpbd.solokkota.go.id



Gn. Marapi, 2891 m

Tribunnews.com

Merangin Jambi, fosil flora 300-275 Ma - Awang Satyana, June 2021



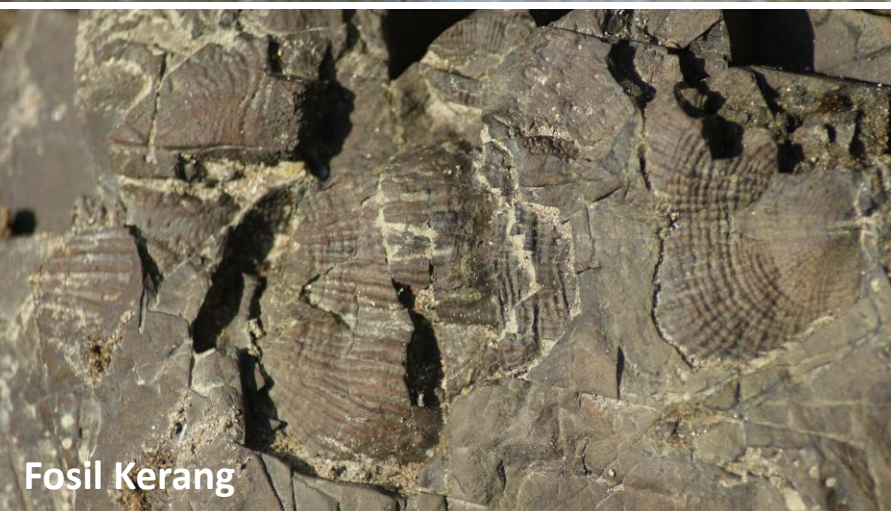
youtube

Fosil Pakis



youtube

Fosil Pandan



Fosil Kerang



Indepedia.com



youtube

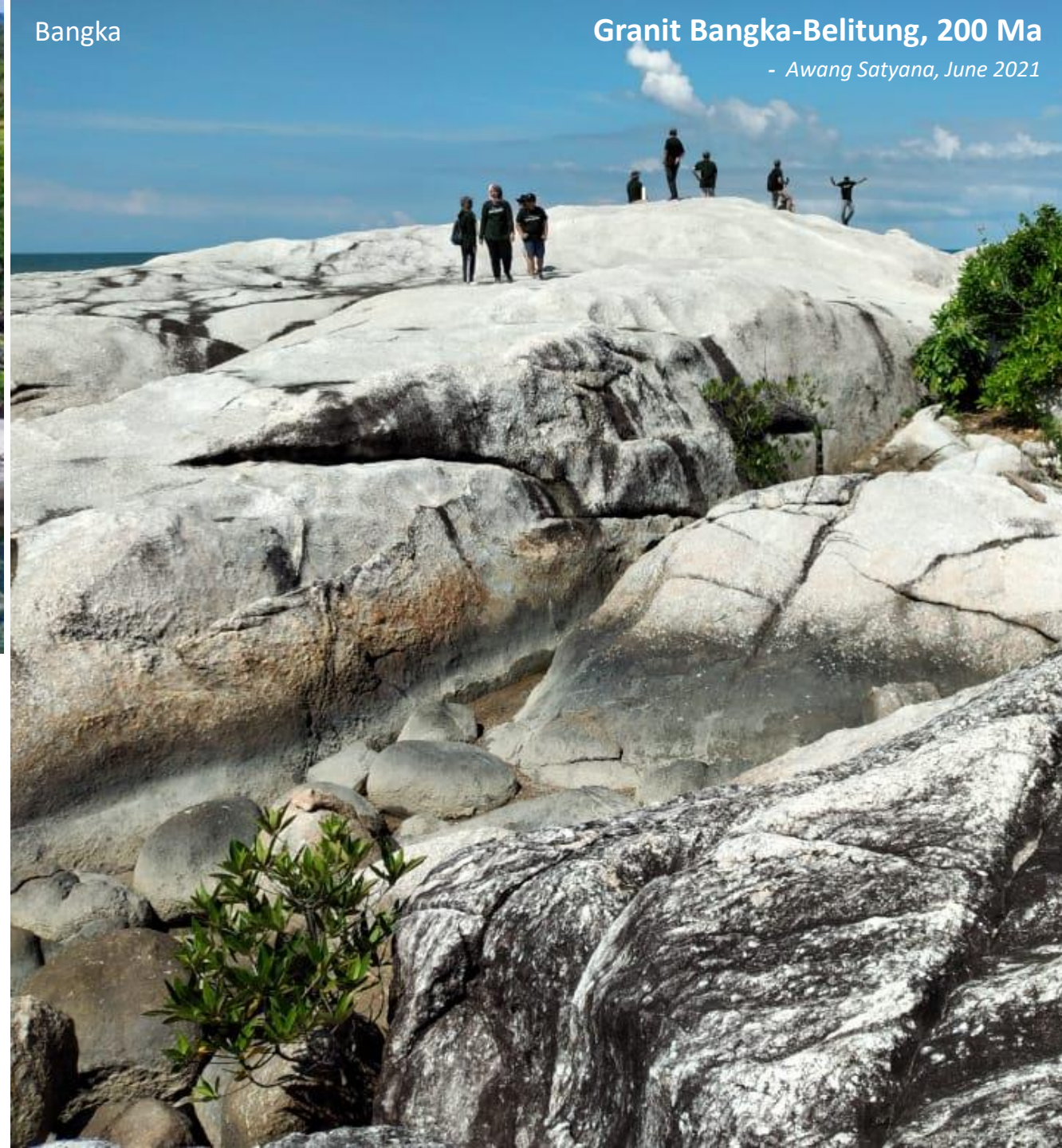
Fosil Pohon

Belitung



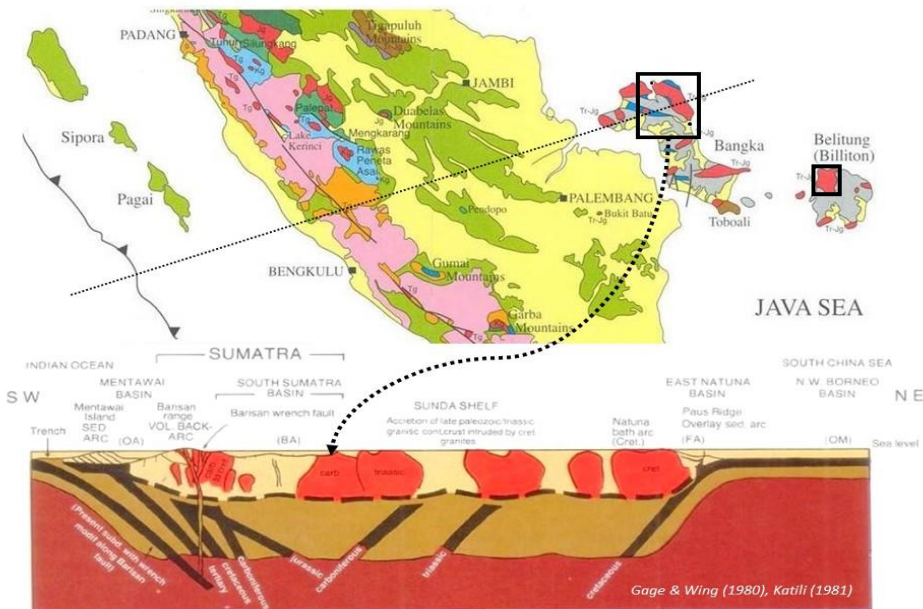
Travel Kompas

Bangka

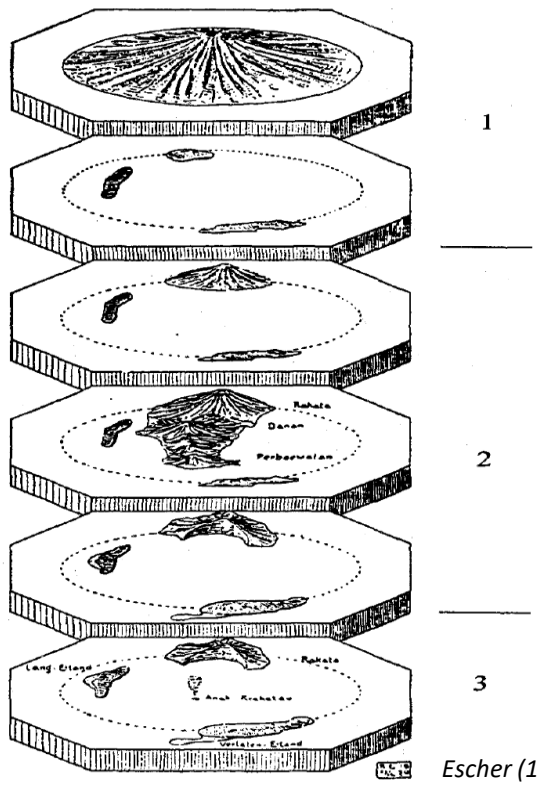


Granit Bangka-Belitung, 200 Ma

- Awang Satyana, June 2021



Gn. Krakatau - Awang Satyana, June 2021



Escher (1919, 1948)



Ferry Yustiana

Gn. Anak Krakatau (Juli 2018)

Gn. Anak Krakatau (Juli 2018)

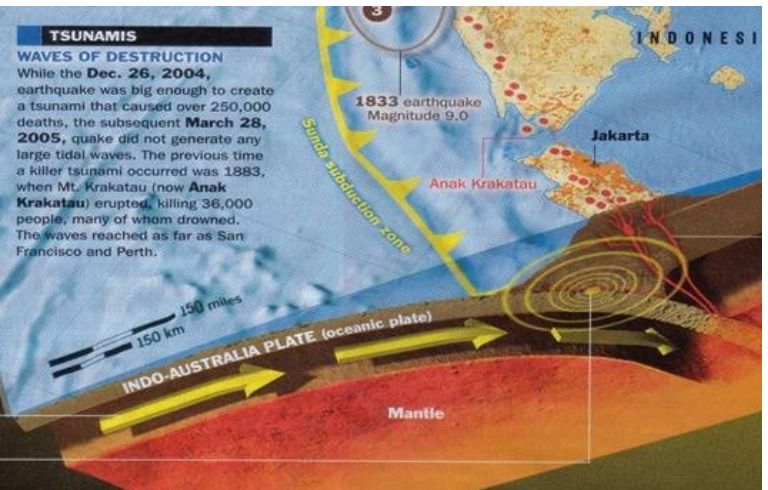


Gn. Anak Krakatau (Juli 2018)



Ferry Yustiana

Gn. Anak Krakatau (Jan. 2019)

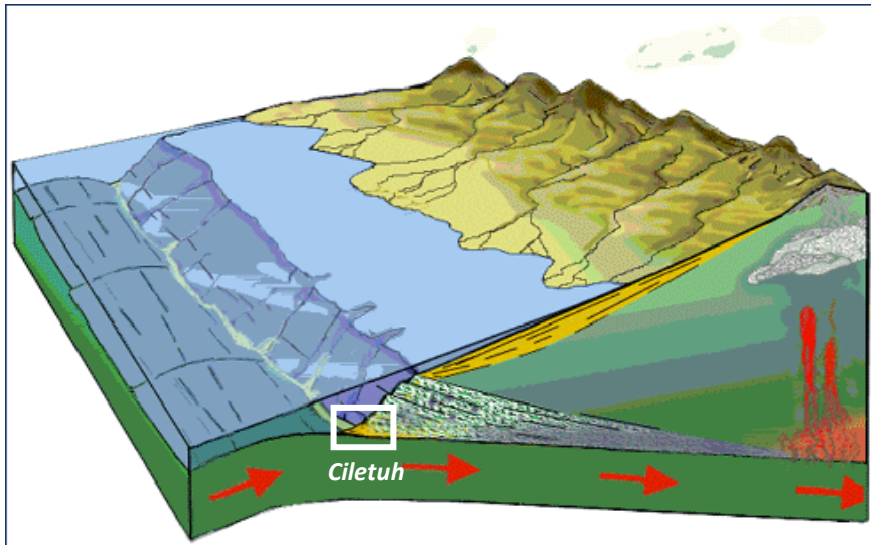


TSUNAMIS
WAVES OF DESTRUCTION
 While the Dec. 26, 2004, earthquake was big enough to create a tsunami that caused over 250,000 deaths, the subsequent March 28, 2005, quake did not generate any large tidal waves. The previous time a killer tsunami occurred was 1883, when Mt. Krakatau (now Anak Krakatau) erupted, killing 36,000 people, many of whom drowned. The waves reached as far as San Francisco and Perth.

Newsweek (Des. 2005)

Kompleks Subduksi Purba Ciletuh, Sukabumi

- Awang Satyana, June 2021



Amfiteater Ciletuh



Lava Bantal



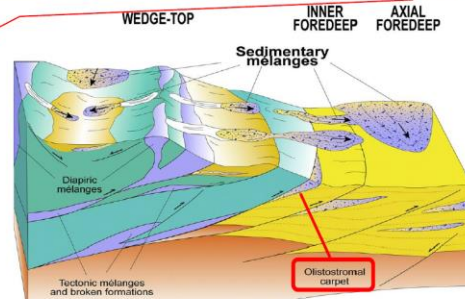
Gabro



OLISTOSTROM



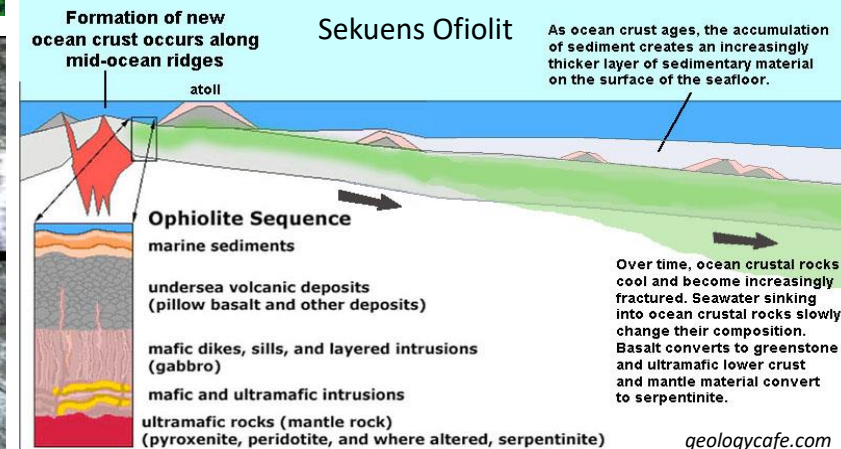
Geotrek Indonesia



An olistostrome is a sedimentary deposit composed of a chaotic mass of heterogeneous material, such as blocks and mud, known as olistoliths, that accumulates as a semifluid body by submarine gravity sliding or slumping of the unconsolidated sediments. (WIKIPEDIA)



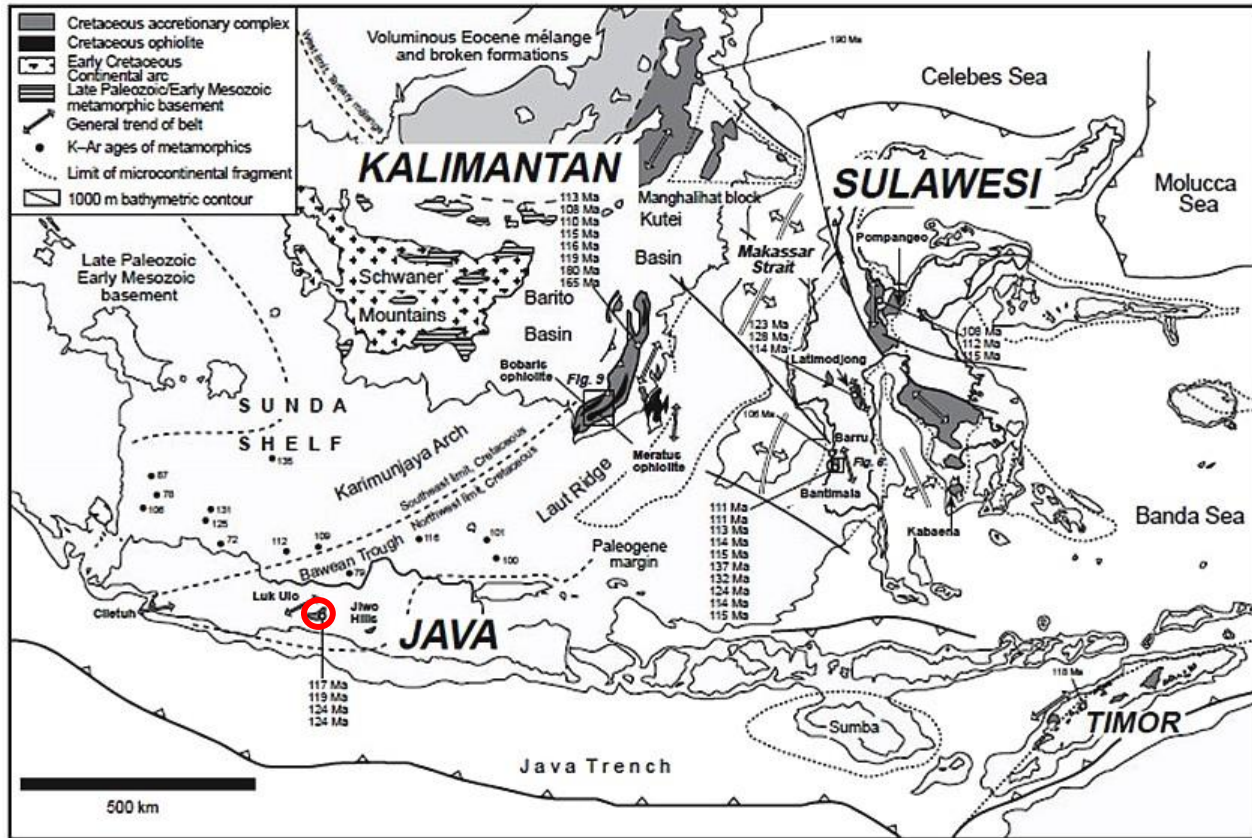
Sekis Hijau



Sekuens Ofiolit

Kompleks Subduksi Kapur Bawah Luk Ulo/Karangsambung

- Awang Satyana, June 2021



Karangsambung, Central Java



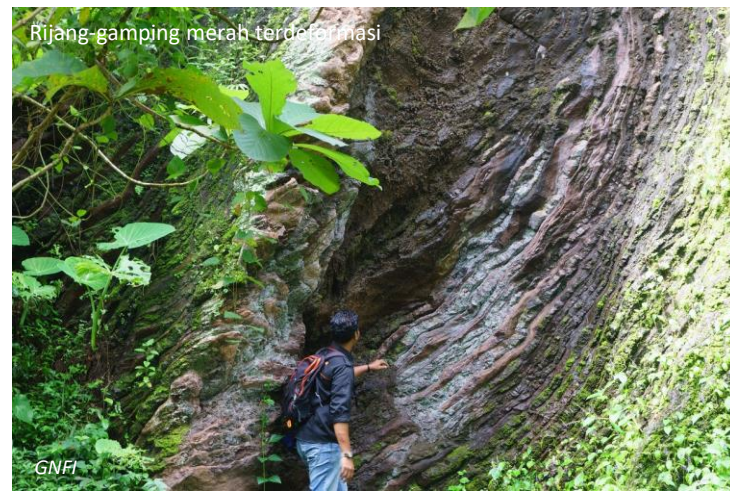
Deformed Cretaceous cherts

Hall (2014)



Lava bantal dan rijang-gamping merah

karangsambung.lipi.go.id



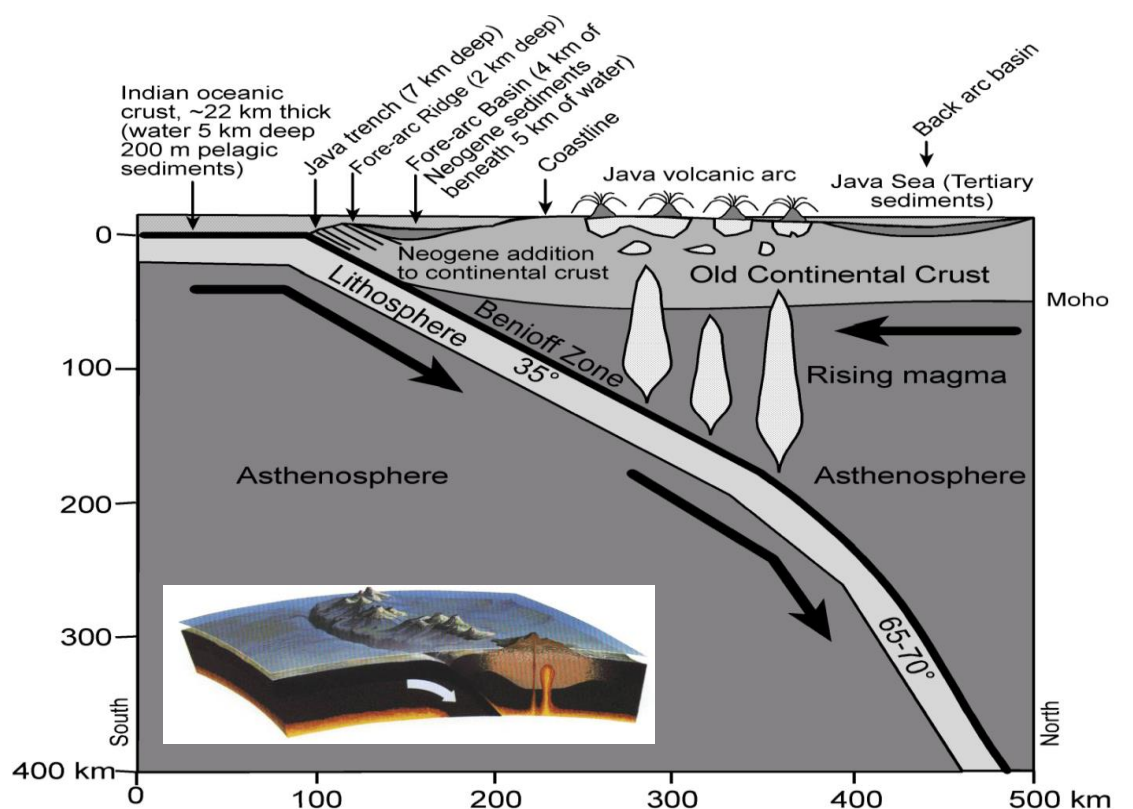
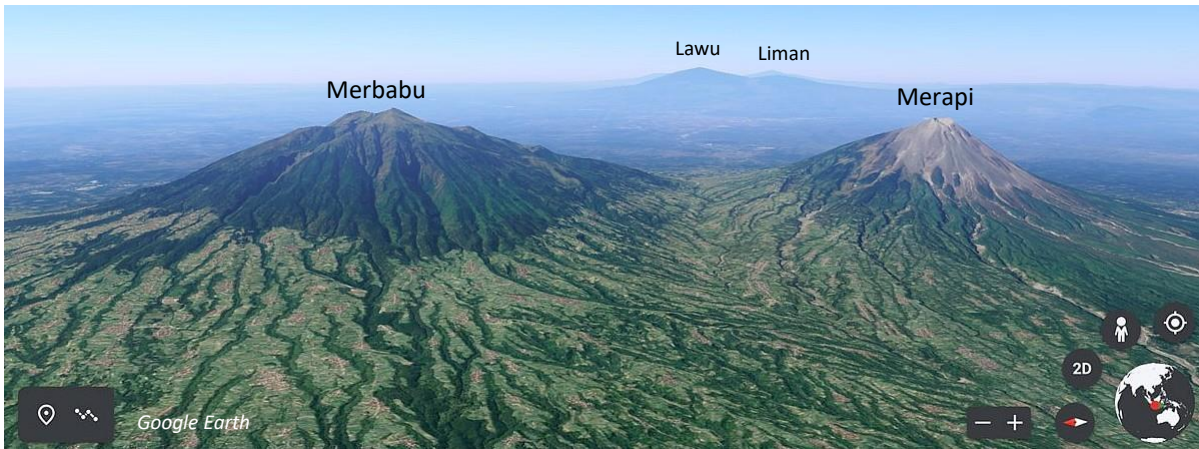
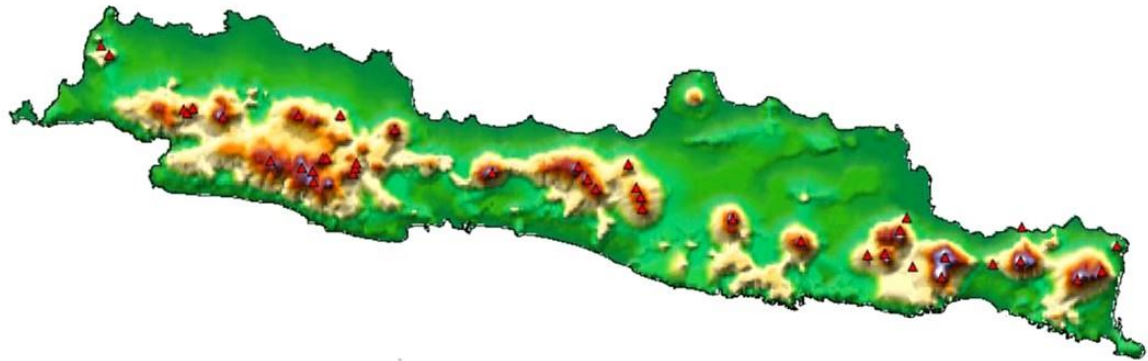
Rijang-gamping merah terdeformasi

GNFI



LEMBAGA ILMU
PENGETAHUAN
INDONESIA
LIPI

Jalur Gunungapi Kwartir Jawa - Awang Satyana, June 2021



A generalised cross section depicting the relationship of the tectonic and magmatic zones to the Benioff Zone in central Java along the 111° meridian (adapted from Hatherton and Dickinson, 1969; Katili, 1972; 1975; Hamilton, 1973; 1979; Tjia, 1978; Hutchison, 1989; SEATAR, 1981; Koesoemadinata *et al.*, 1985).



Kaldera Bromo-Tengger - Awang Satyana, June 2021



www.wikiwand.co



Gn. Bromo

www.wikiwand.com



Erupsi Bromo 22 Januari 2011

www.wikiwand.com

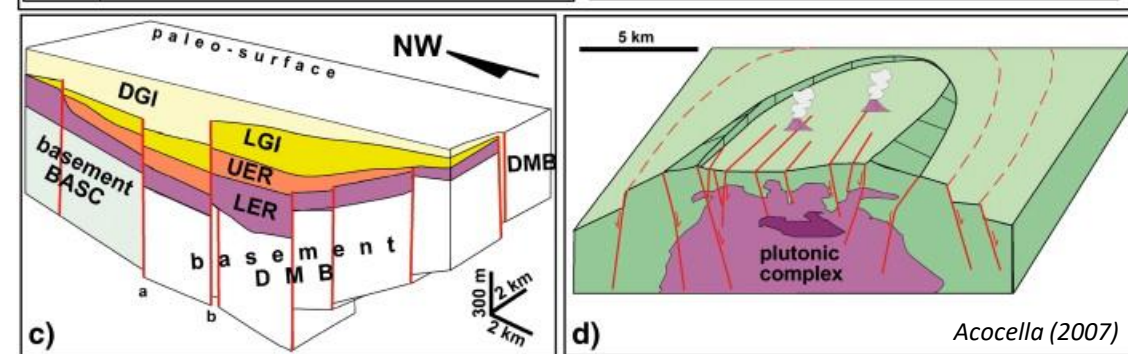
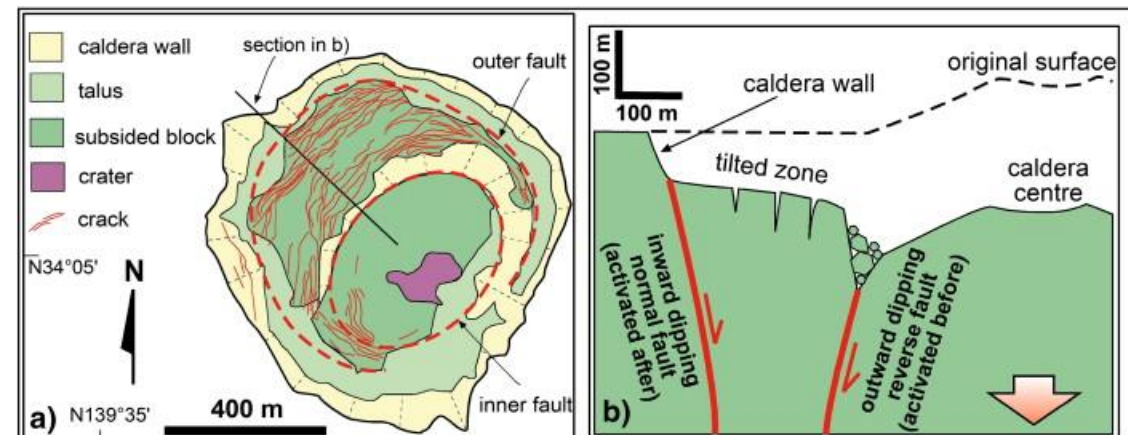


Yadya Kasada di Gunung Bromo

jatinhow.com



EXPLOREBROMO.COM



Acocella (2007)

Jalur Gunungapi Purba Jawa (Pegunungan Selatan), 30-20 Ma - Awang Satyana, Juli 2021

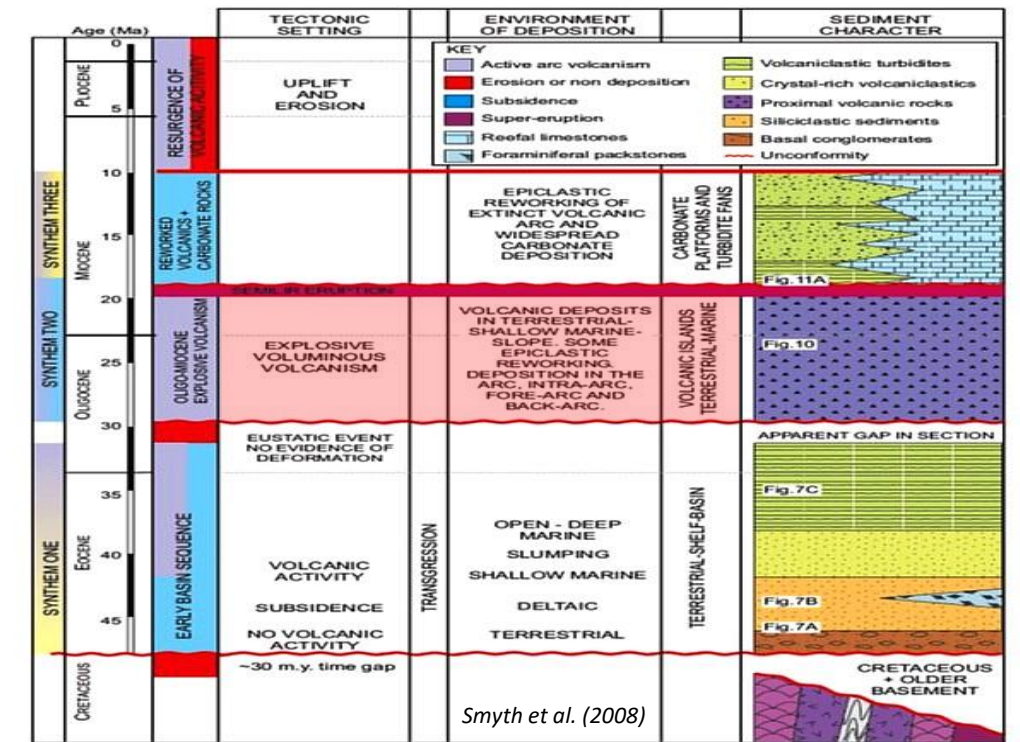
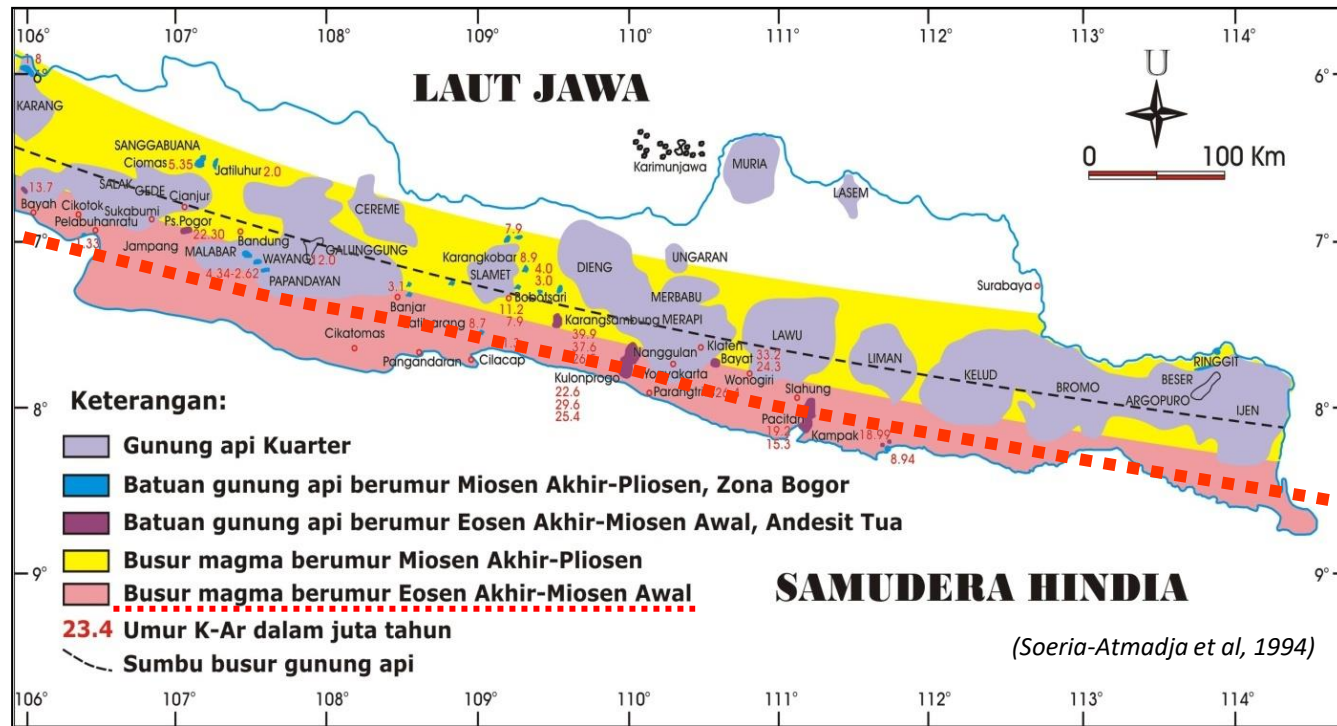
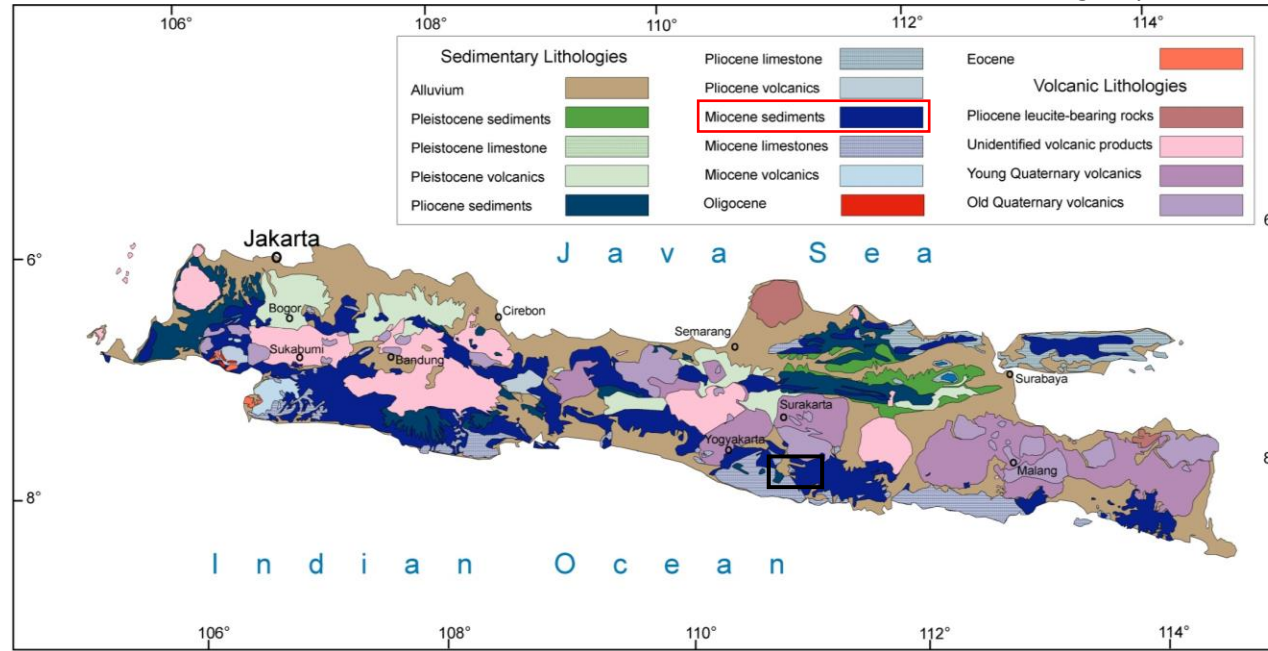


Figure 6. Simplified stratigraphic column of the Southern Mountains Arc. The column shows the three synthems mentioned in the text and indicates the phases of arc development recorded by the sedimentary succession.

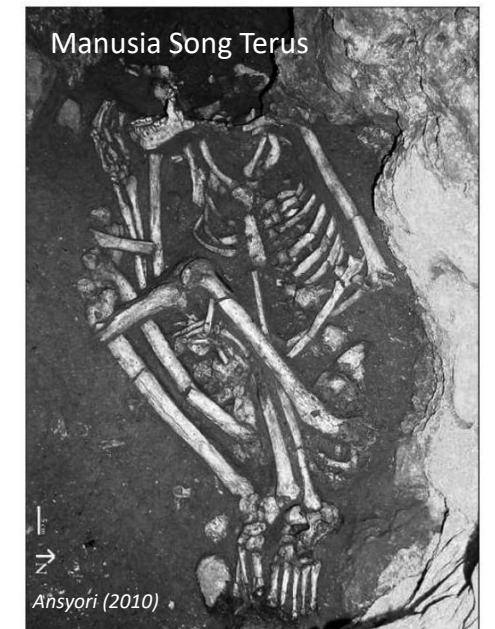
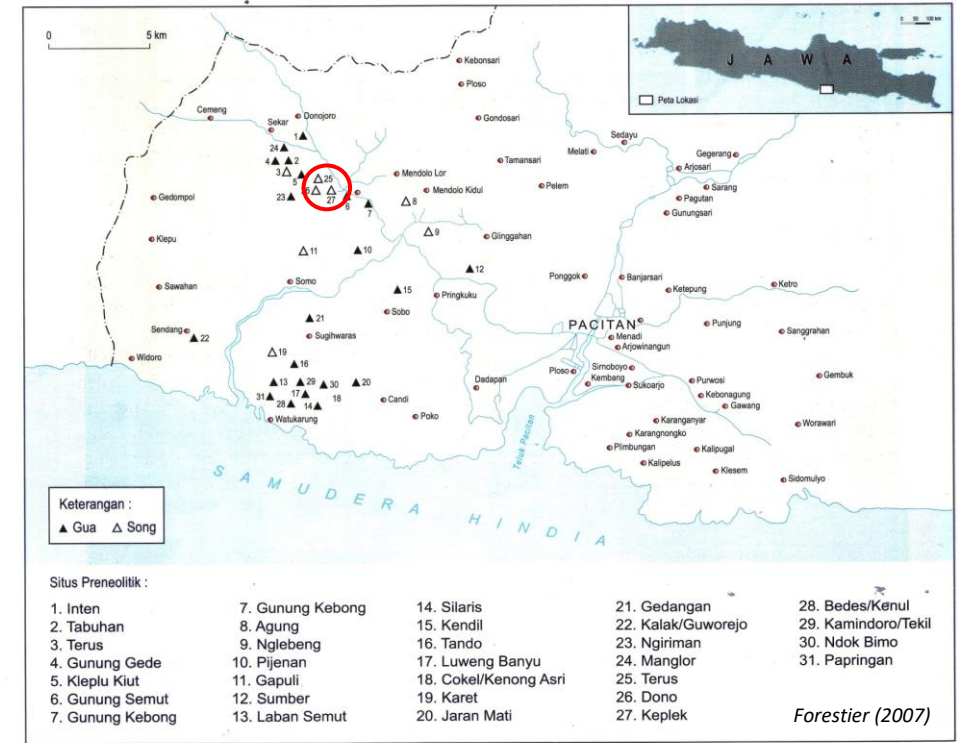


Batugamping Miosen Pegunungan Selatan Jawa dan Hunian Manusia Purba

- Awang Satyana, June 2021



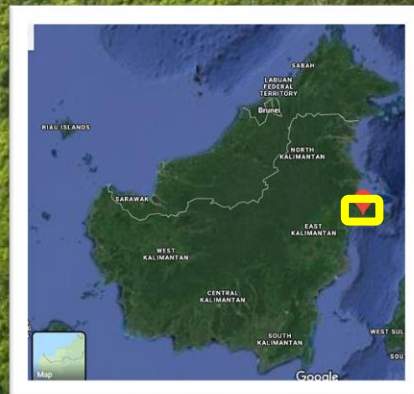
Simplified geological map of Java and Madura adapted from the 1:2,000,000 scale map of Java and Madura (Geological Survey of Indonesia, 1977).



Kars Sangkulirang, Mangkalihat – Hunian Purba- *Awang Satyana, June 2021*

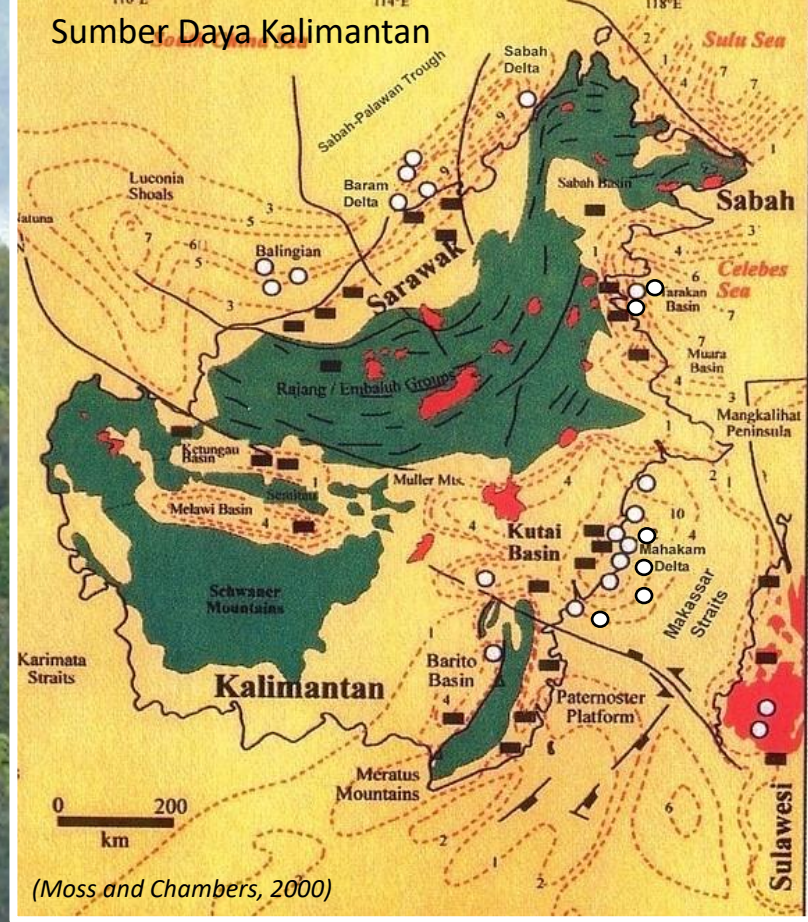
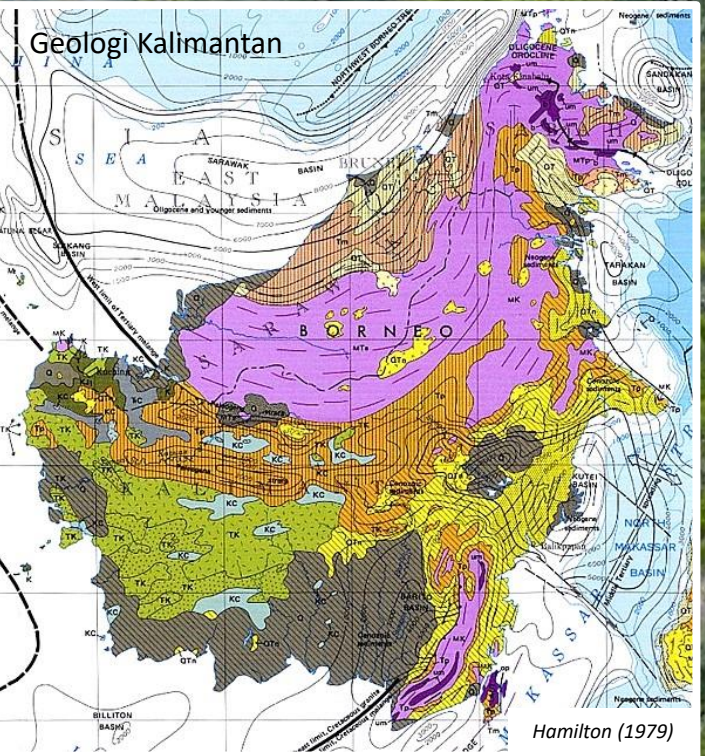
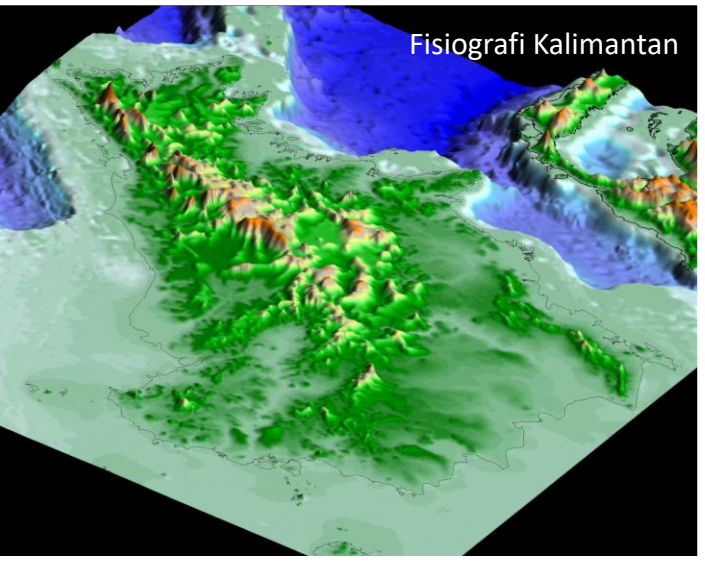
- Umur gambar cadas: 40 ribu tahun yl.
- Mengindikasi aktivitas masyarakat purba.
- Jengjang perubahan iklim:
 1. Iklim benua: ketika paparan Sunda masih daratan (40.000-21.000 SM),
 2. iklim sabana tropis dan kepulauan (12.000- 7.000 SM),
 3. Iklim hutan hujan tropis (1.000 SM).
- Secara korelatif, interpretasi geologi menunjukkan perubahan tutupan lahan.
- Perubahan mempengaruhi cara hidup purba; dari berburu sampai meramu.

Alam (2020)



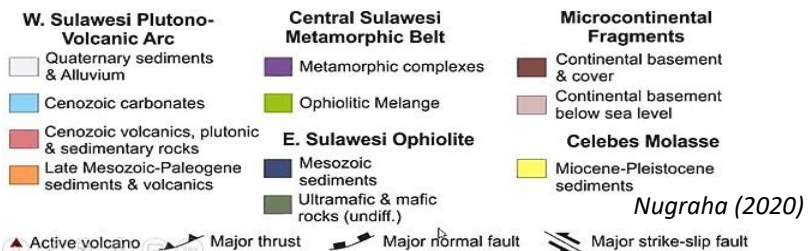
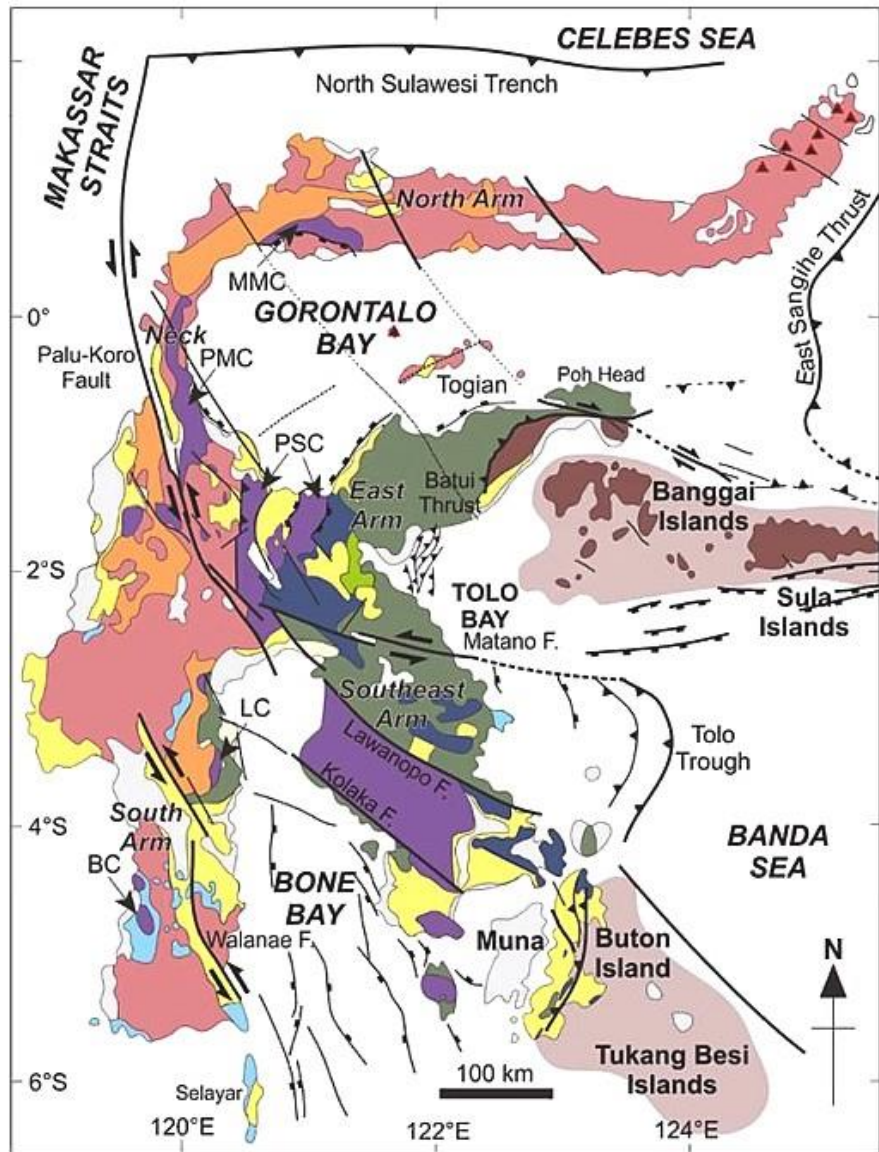
Prabowo (2020)

Kalimantan, Pulau Besar dan Kaya - Awang Satyana, June 2021

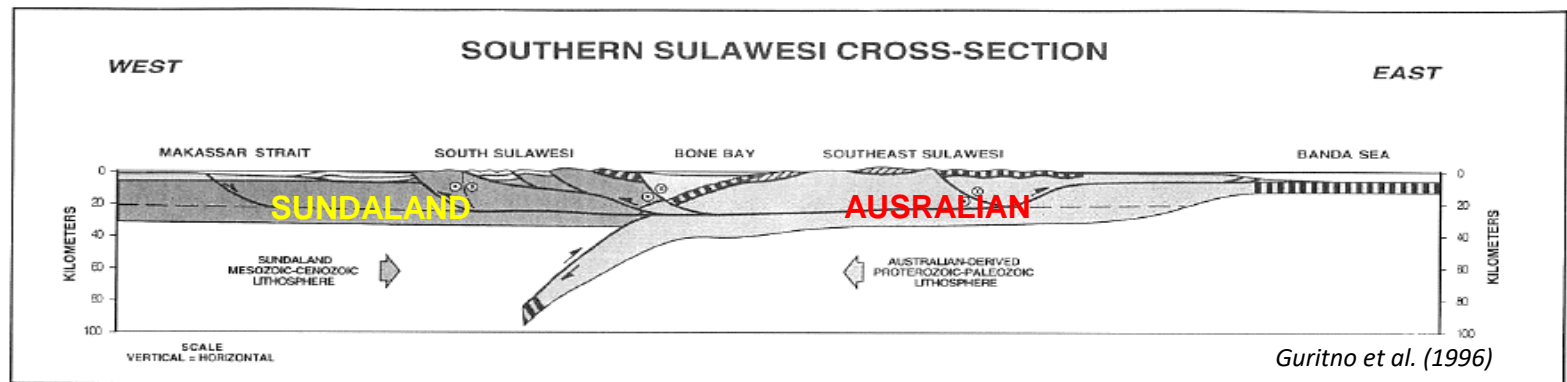
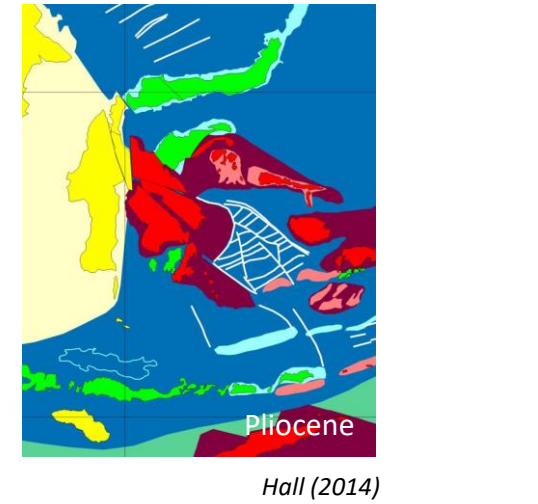
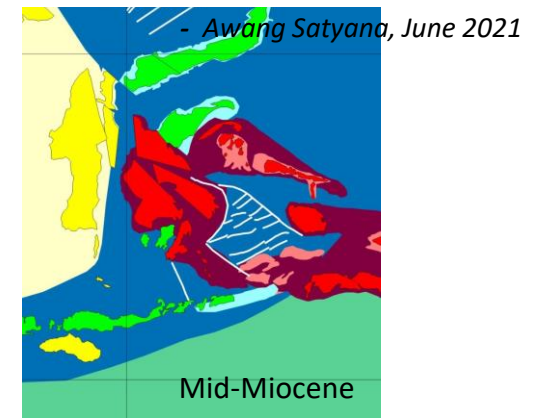
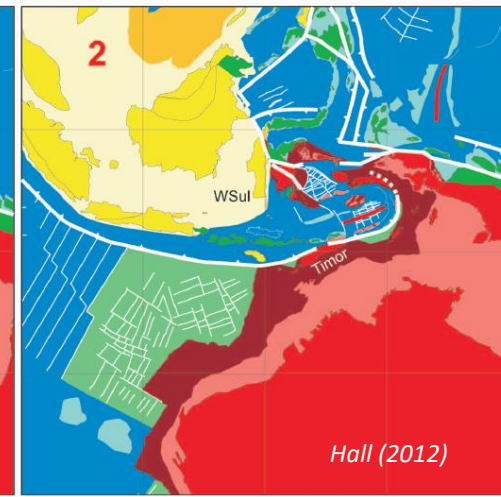
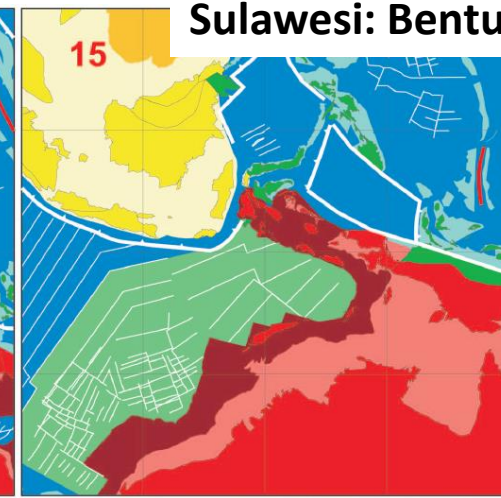
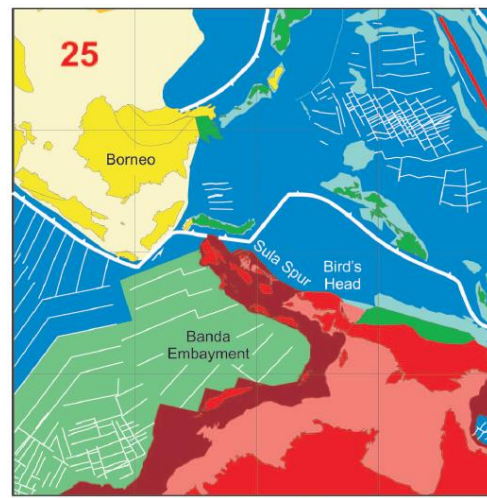


- KEY**
- Cenozoic sedimentary lithologies (undifferentiated)
 - Cenozoic volcanics and associated intrusives
 - Pre-Tertiary and early Tertiary rock units
 - Coal & peat deposits
 - Hydrocarbon accumulations, both oil and gas
 - Marginal oceanic basin
 - Isopachs in Tertiary sedimentary basins; in thousands of metres
 - Strike-slip faults
 - Normal faults



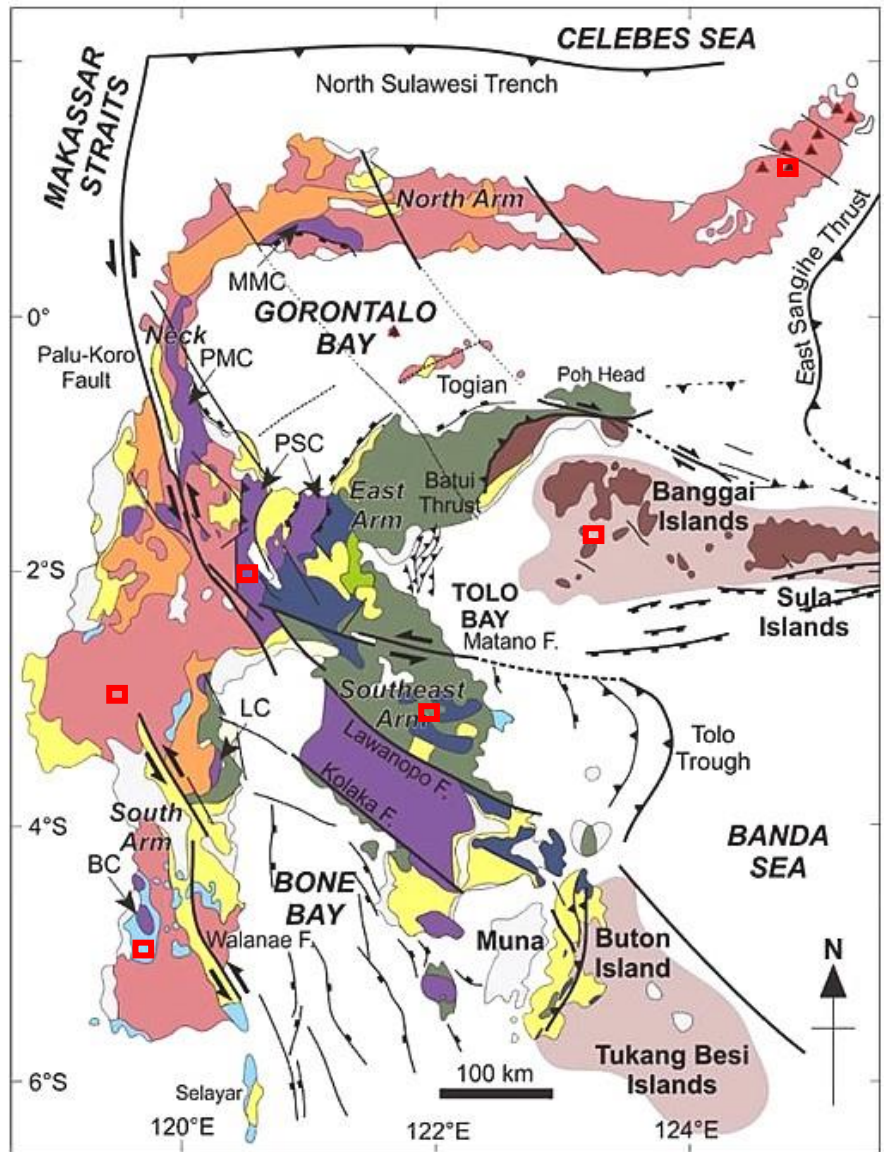


Sulawesi: Benturan Sundaland vs. Australian



Sulawesi: Aneka Topografi dan Batuan

- Awang Satyana, June 2021



- | | | |
|--|--|---|
| <p>W. Sulawesi Plutono-Volcanic Arc</p> <ul style="list-style-type: none"> Quaternary sediments & Alluvium Cenozoic carbonates Cenozoic volcanics, plutonic & sedimentary rocks Late Mesozoic-Paleogene sediments & volcanics | <p>Central Sulawesi Metamorphic Belt</p> <ul style="list-style-type: none"> Metamorphic complexes Ophiolitic Melange <p>E. Sulawesi Ophiolite</p> <ul style="list-style-type: none"> Mesozoic sediments Ultramafic & mafic rocks (undiff.) | <p>Microcontinental Fragments</p> <ul style="list-style-type: none"> Continental basement & cover Continental basement below sea level <p>Celebes Molasse</p> <ul style="list-style-type: none"> Miocene-Pleistocene sediments |
|--|--|---|
- ▲ Active volcano ↗ Major thrust ↘ Major normal fault ⇄ Major strike-slip fault

Nugraha (2020)



Gunung Soputan

Sindonews



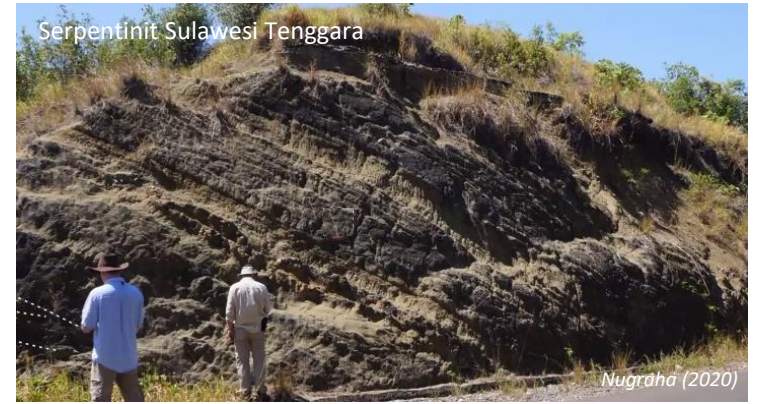
Kep. Banggai

Eloratur



Perbukitan vulkanik Enrekang

Celebes



Serpentinit Sulawesi Tenggara

Nugraha (2020)



Kars Tonasa Maros

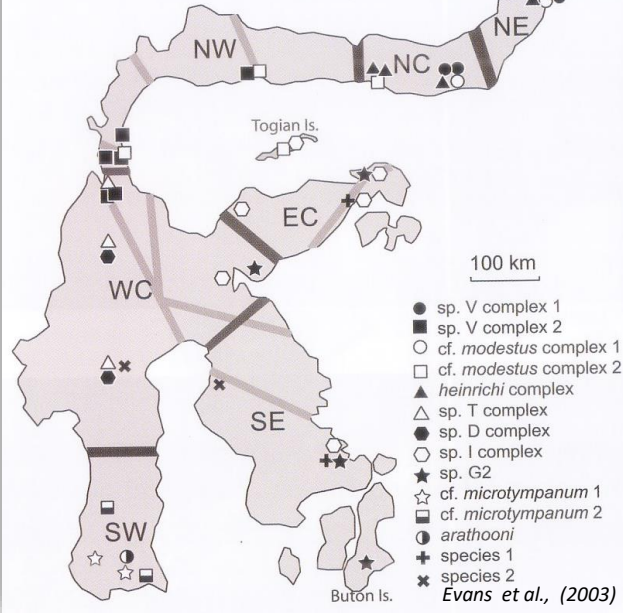
topindonesiaholidays



Dataran Poso

Nugraha (2020)

Pattern of faunal blocks/regions



Distribution areas of monkeys, frogs and tree geckos in Sulawesi, once lived in separated islands, now due to island collision assembling Sulawesi, live in together in island of Sulawesi.

1. Sulawesi macaque (*Macaca nigra*)
2. Sulawesi rail (*Aramidopsis plateni*)
3. Lowland anoa (*Bubalus depressicornis*)
4. Maleo bird (*Macrocephalon maleo*)
5. Pigafetta palm (*Pigafetta filaris*)
6. Orchid (*Dendrobium macrophyllum*)
7. Bear cuscus (*Phalanger ursinus*)
8. Tonkean macaque (*Macaca tonkeana*)
9. Ancient stone megalith, tandulako
10. Ancient stone water urns, kalamba
11. Spectral tarsier (*Tarsius spectrum*)
12. Highland anoa (*Bubalus quarlesi*)
13. Babirusa (*Babirusa babirusa*)
14. Lesser cuscus (*Phalanger celebensis*)
15. Kingfisher (*Cittura cyanotis*)
16. Sulawesi giant civet (*Macrogalidia musschenbroekii*)
17. Bee eater (*Meropogon forsteri*)
18. Vanda orchid (*Vanda celebica*)
19. Dugong (*Dugong dugong*)
20. Moor macaque (*Macaca maura*)
21. Sulawesi hornbill (*Rhyticeros cassidix*)
22. & 23. Swallowtail butterflies (*Papilio iswara*, (*Papilio peranthus*))

Faunal distribution of Sulawesi Island



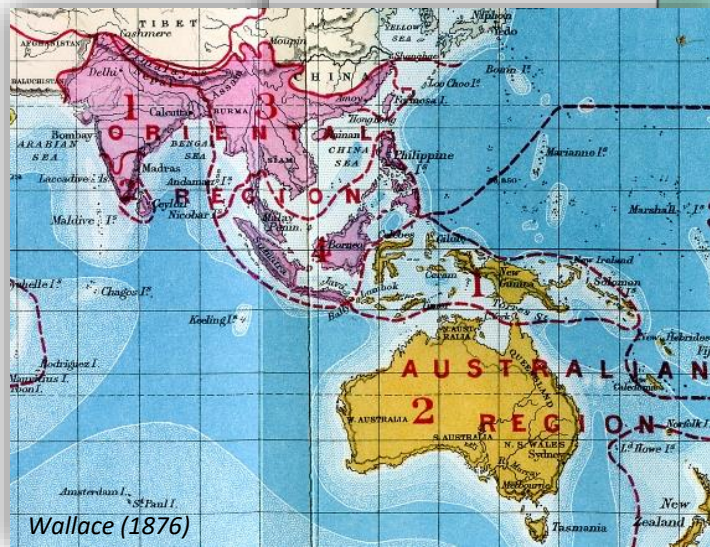
MacKinnon (1992)

Kontrol Geologi atas Fauna Sulawesi

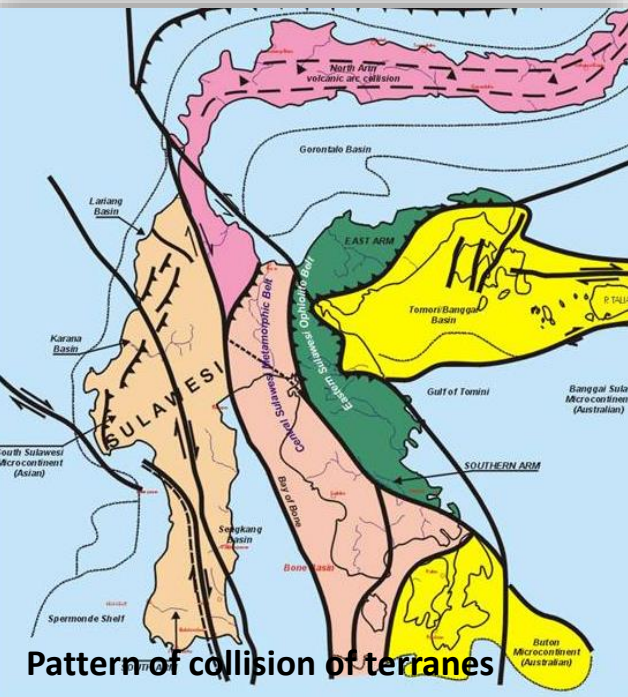
- Awang Satyana, June 2021

Ape/ monkey macaque came from Kalimantan/Java. Hornbill bird is western Indonesia large bird with specialized development in Sumatra, Jawa and Kalimantan islands. Anoa is dwarf buffalo of western Indonesia due to island dwarfism. Cuscus is typical fauna of eastern Indonesia and Papua

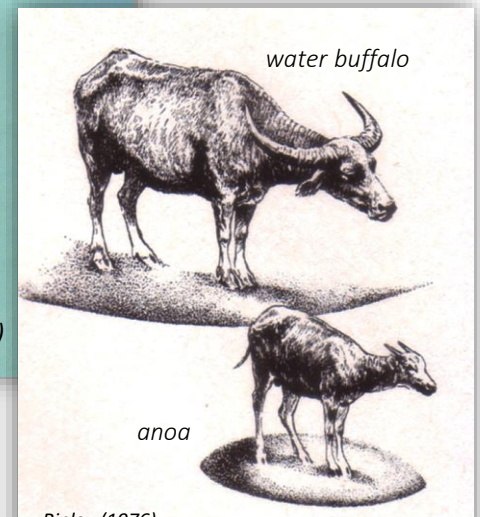
Zoogeographical Regions of Indonesia

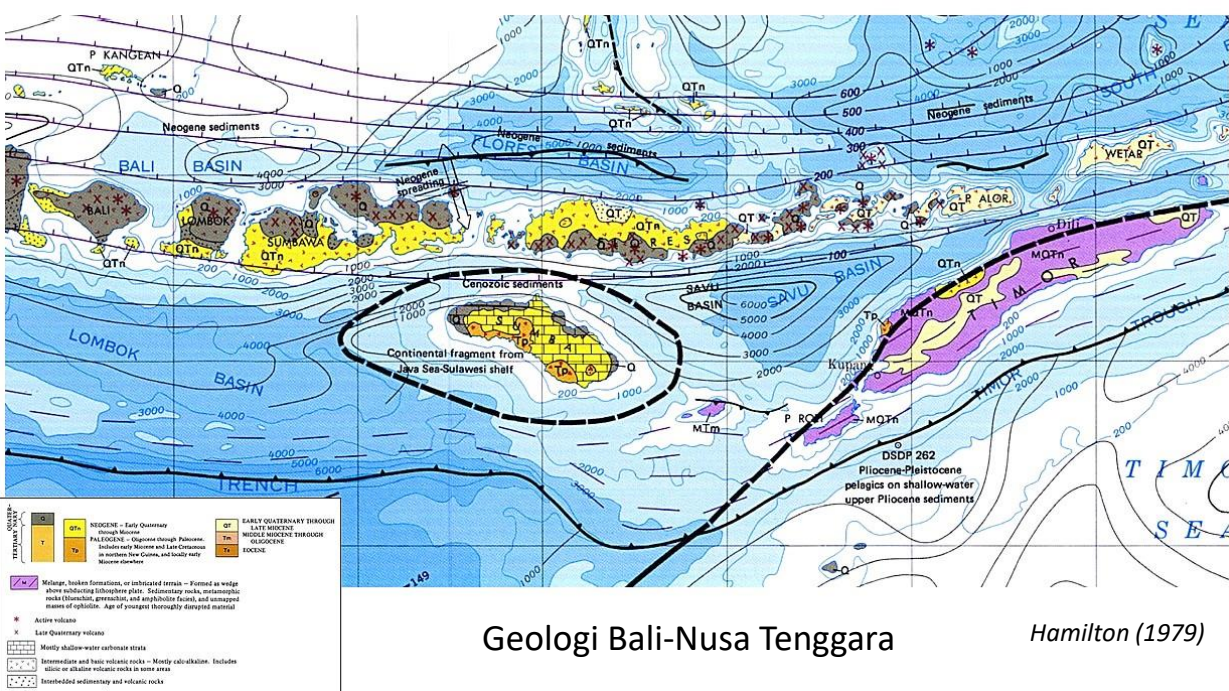


Pattern of collision of terranes



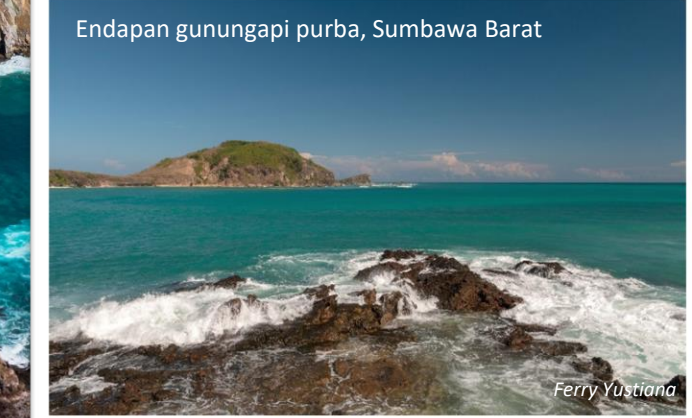
Island dwarfism





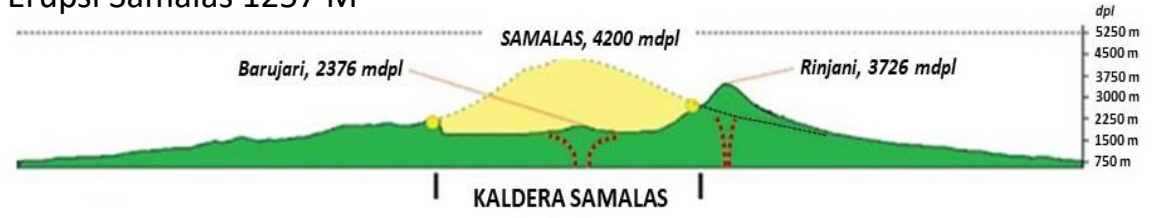
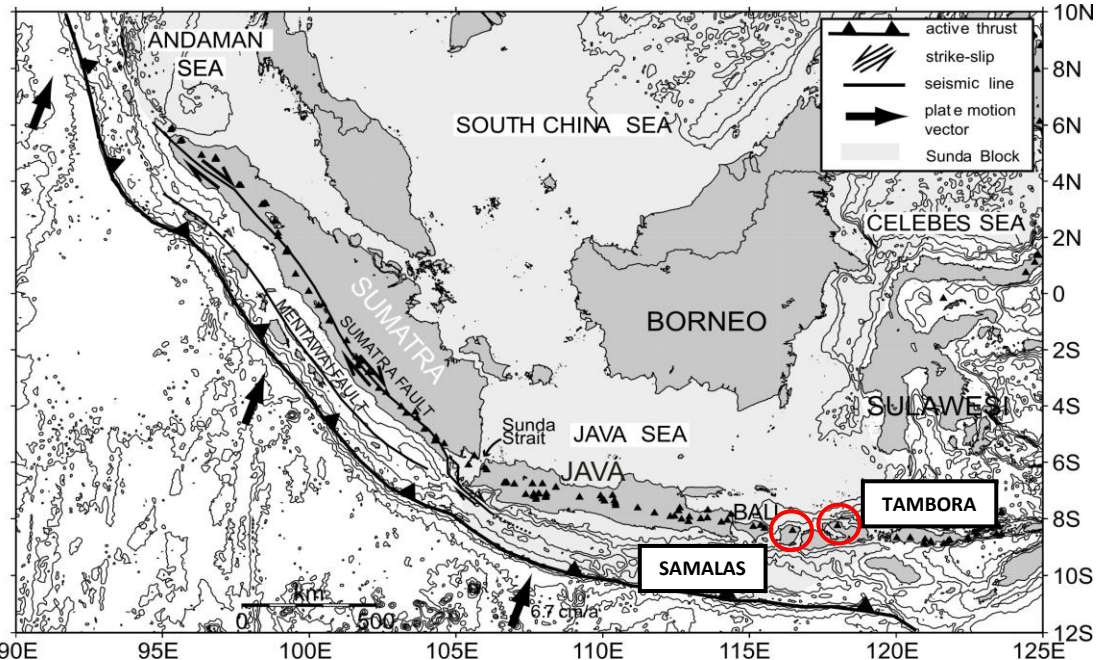
Bali-Nusa Tenggara, gunungapi purba dan gunungapi Kuartar

- Awang Satyana, June 2021



Erupsi Katastropik Samalas dan Tambora - Awang Satyana, June 2021

Erupsi Samalas 1257 M



Rachmat (2016)



THE ERUPTION OF MOUNT TAMBORA APRIL 1815

EXPULSED INTO THE ATMOSPHERE
24 mi³ (100 km³) OF ASH, PUMICE, AND AEROSOLS
60 MEGATONS OF SULFUR

FACTS & FIGURES

- Stratovolcano
- Forms the entire 37.3-mi- (60-km-) wide Sanggar peninsula on Sumbawa island, Indonesia
- Largest observed eruption in recorded history
- Measure of 7 on the volcanic explosivity index (VEI)

CASUALTIES

- 10,000 LOCAL DEATHS FROM INITIAL ERUPTION
- 80,000 REGIONAL DEATHS DUE TO STARVATION AND DISEASE

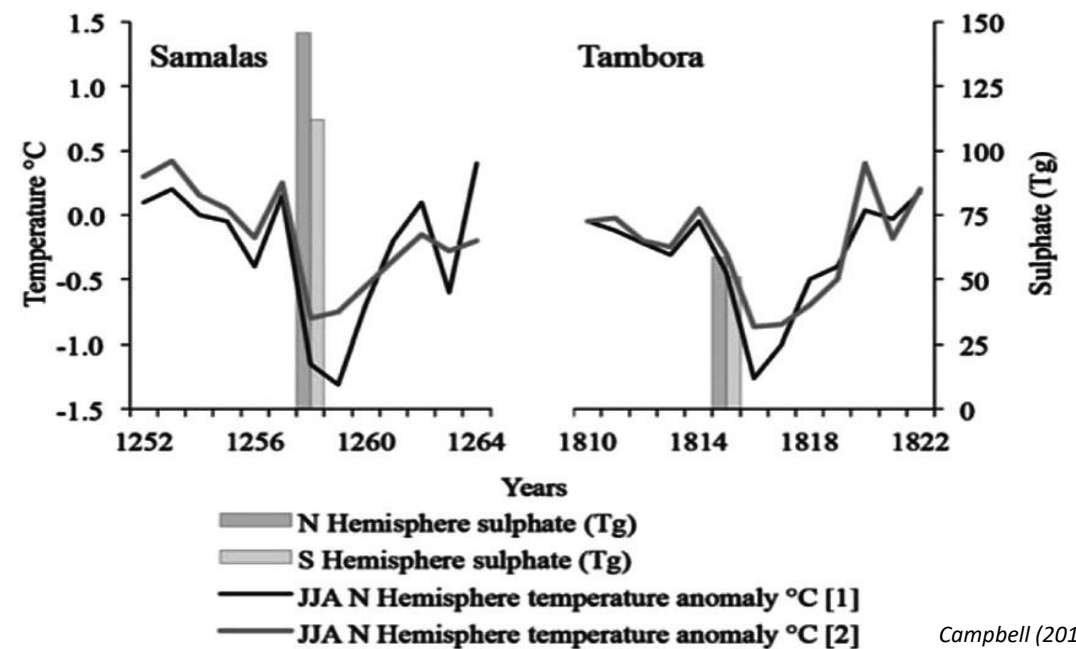
YEAR WITHOUT A SUMMER
1816
AVERAGE GLOBAL TEMPERATURE REDUCED BY 5.4 °F (3 °C)

INDONESIA

VOLCANO DIMENSIONS

- approx. height at eruption: 14,000 ft (4,268 m)
- current height: 9,354 ft (2,861 m)
- width of caldera: 10,000 ft (3,048 m)
- depth of caldera: 4,101 ft (1,250 m)

Sulfate content of volcanic eruption and temperature drop

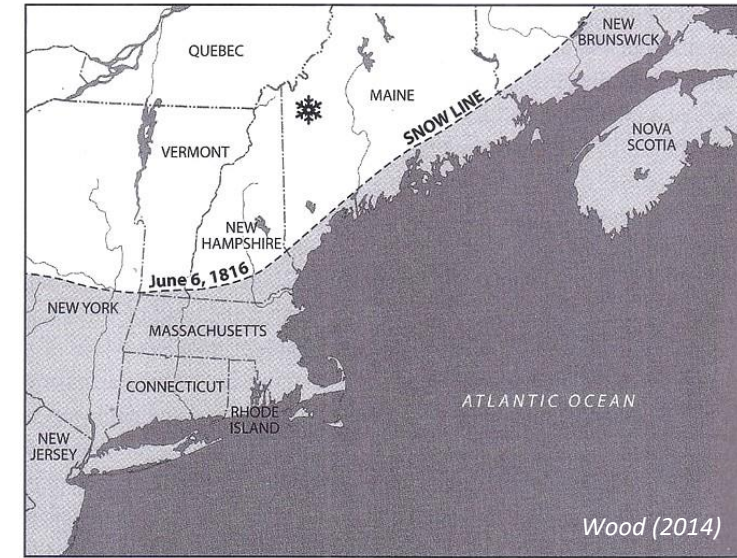
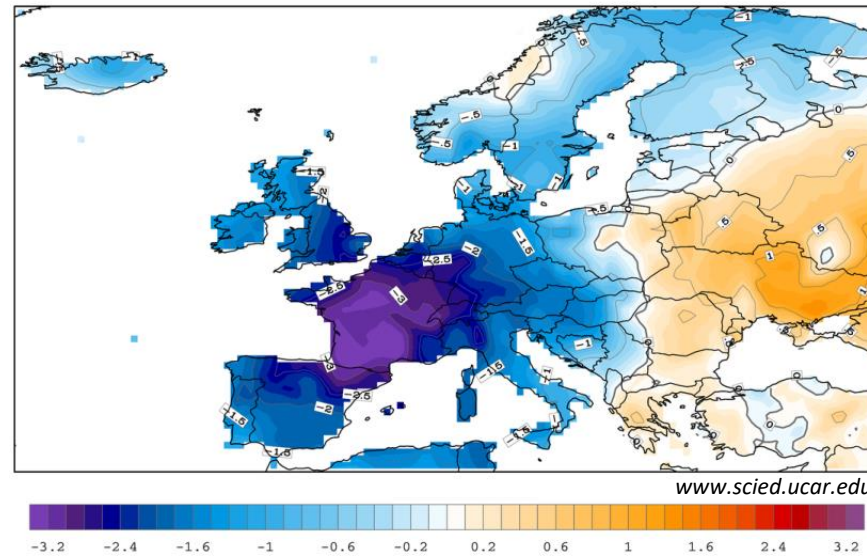


Campbell (2017)

Tambora 1815 AD Effect to Environment & Life - Awang Satyana, June 2021



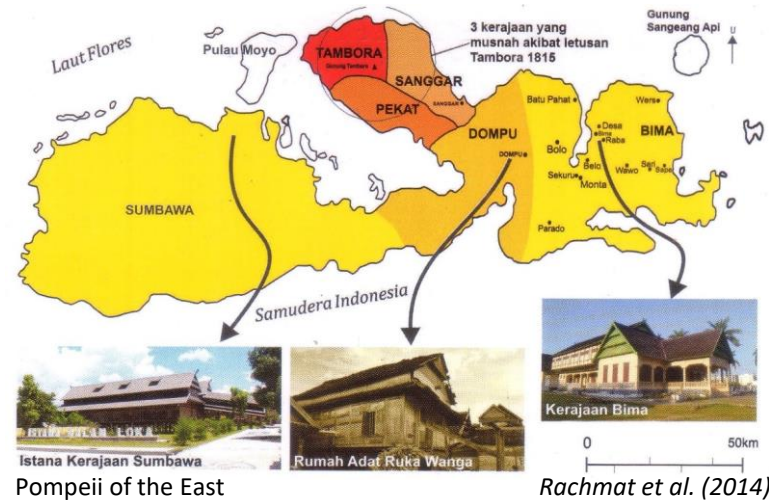
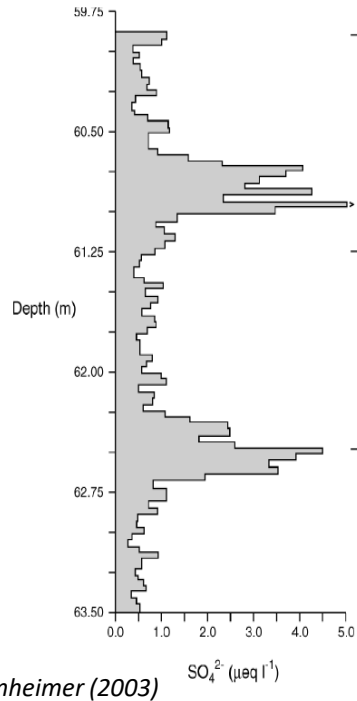
1816 Summer temperature anomaly



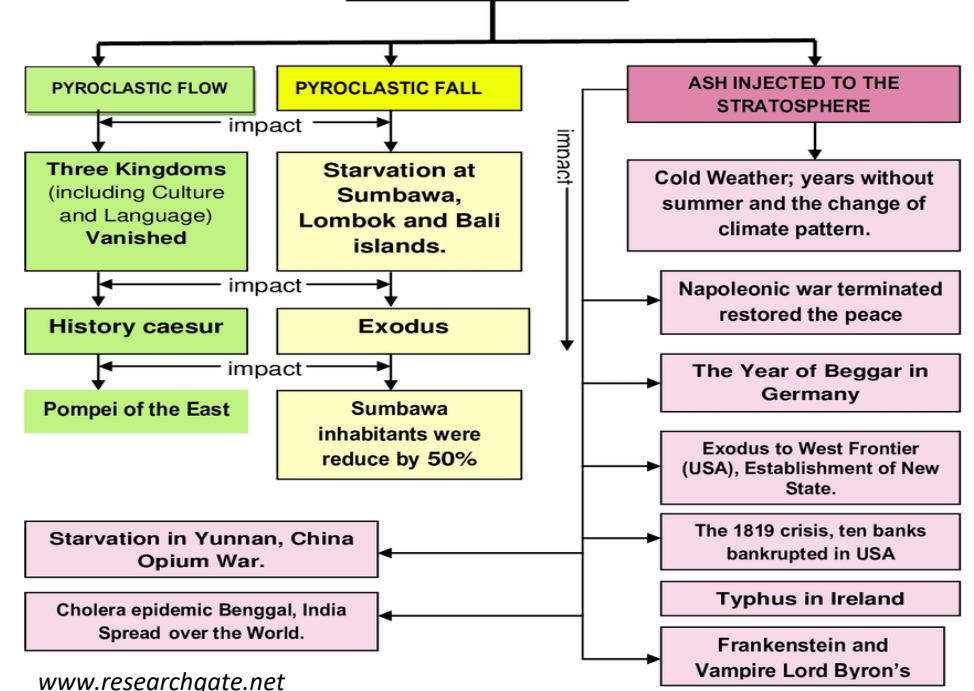
Antarctica



Greenland



TYPE OF TAMBORA ERUPTION PRODUCTS



Flores, NTT: Land of Gigantism & Dwarfism

- Awang Satyana, June 2021

Varanus komodoensis



LuxuryLaunches

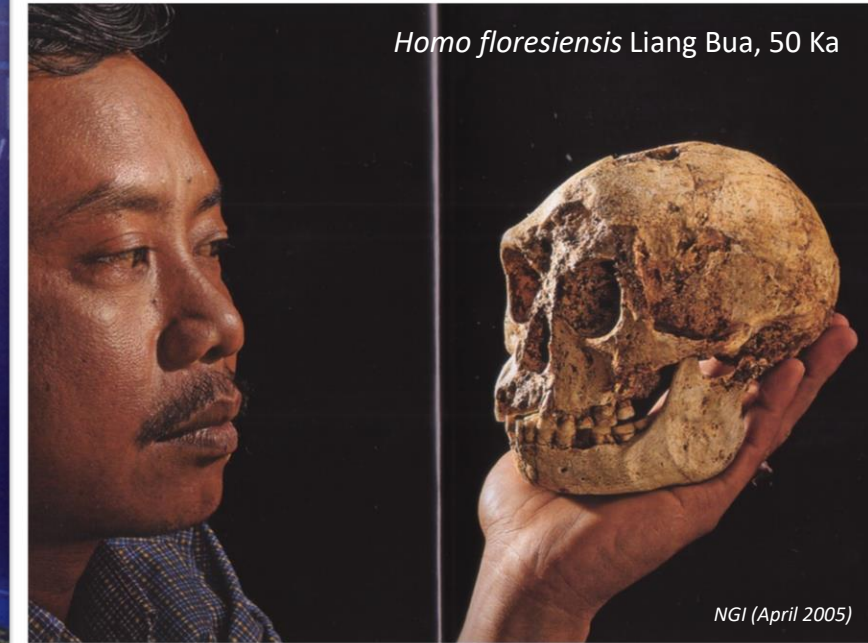


Komodo

Liang Bua

Flores

Lembah Soa



Homo floresiensis Liang Bua, 50 Ka

NGI (April 2005)



Stegodon Lembah Soa

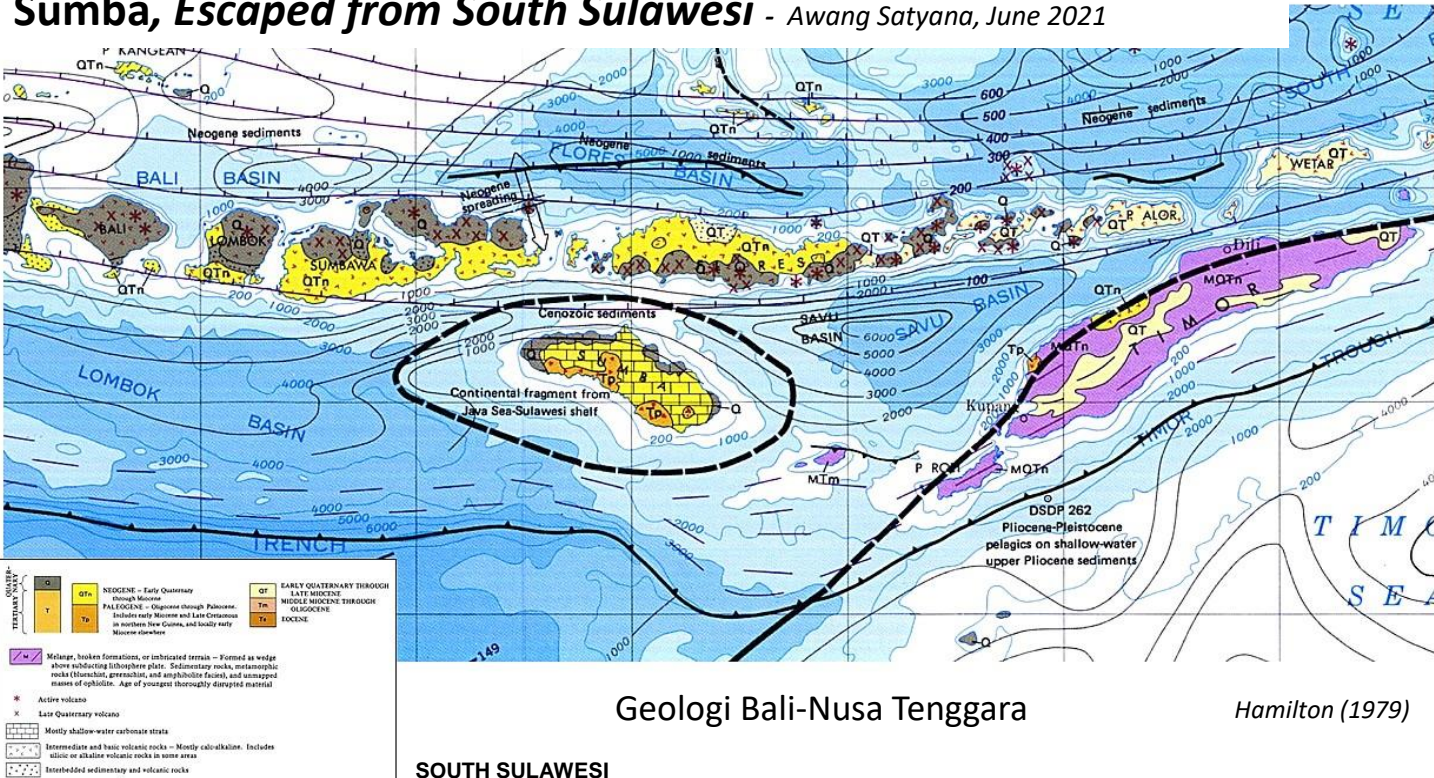
Tikus coklat dan Tikus raksasa Flores

Gajah Asia dan stegodon Liang Bua

Biawak air dan Komodo

NGI (April 2005)

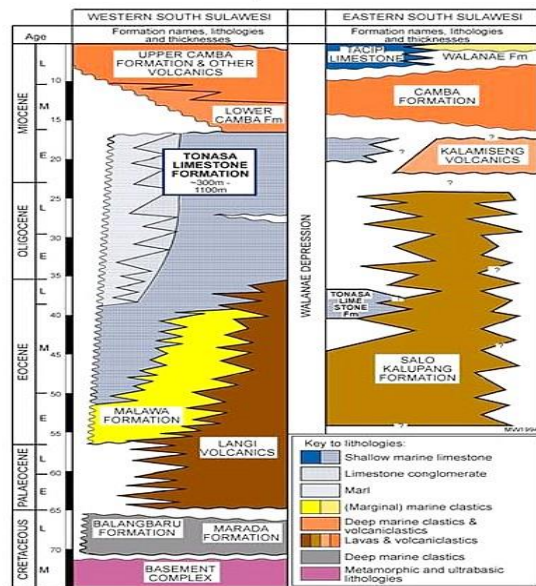
Sumba, Escaped from South Sulawesi - Awang Satyana, June 2021



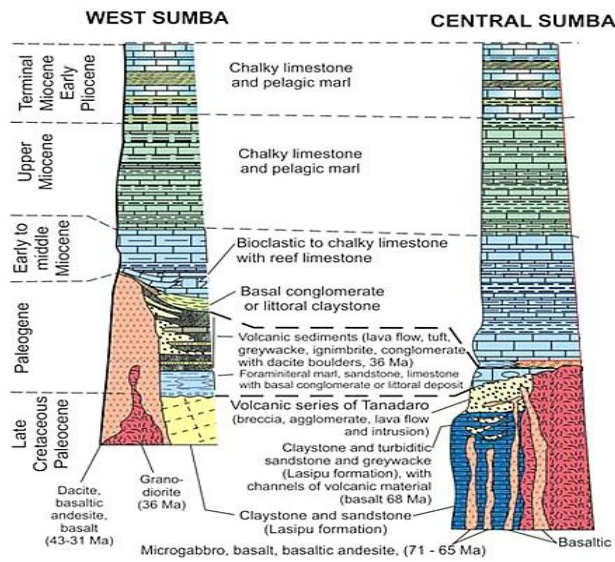
Geologi Bali-Nusa Tenggara

Hamilton (1979)

SOUTH SULAWESI



Wilson et al. (1996)



Abdullah (1994)

Wairinding, hilly savanna of Pliocene carbonates



Pinterest

Waimarang, Upper Miocene carbonates



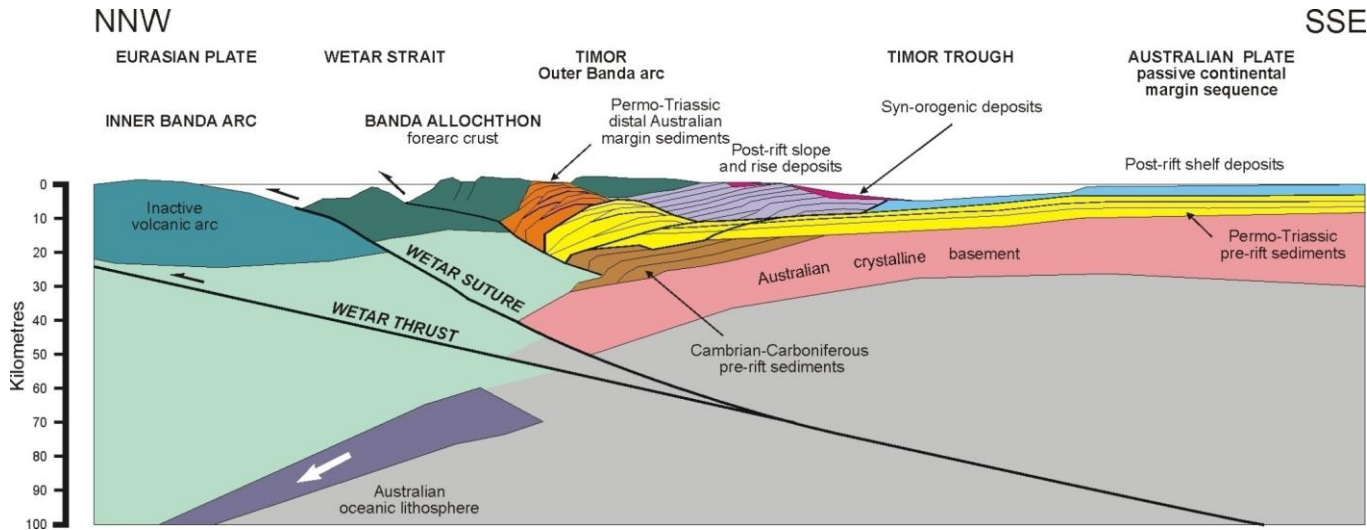
Ferry Yustiana

Watuparunu, Pliocene mass transport complex



Ferry Yustiana

Timor, Collision in the Making, since 5 Ma - Awang Satyana, June 2021

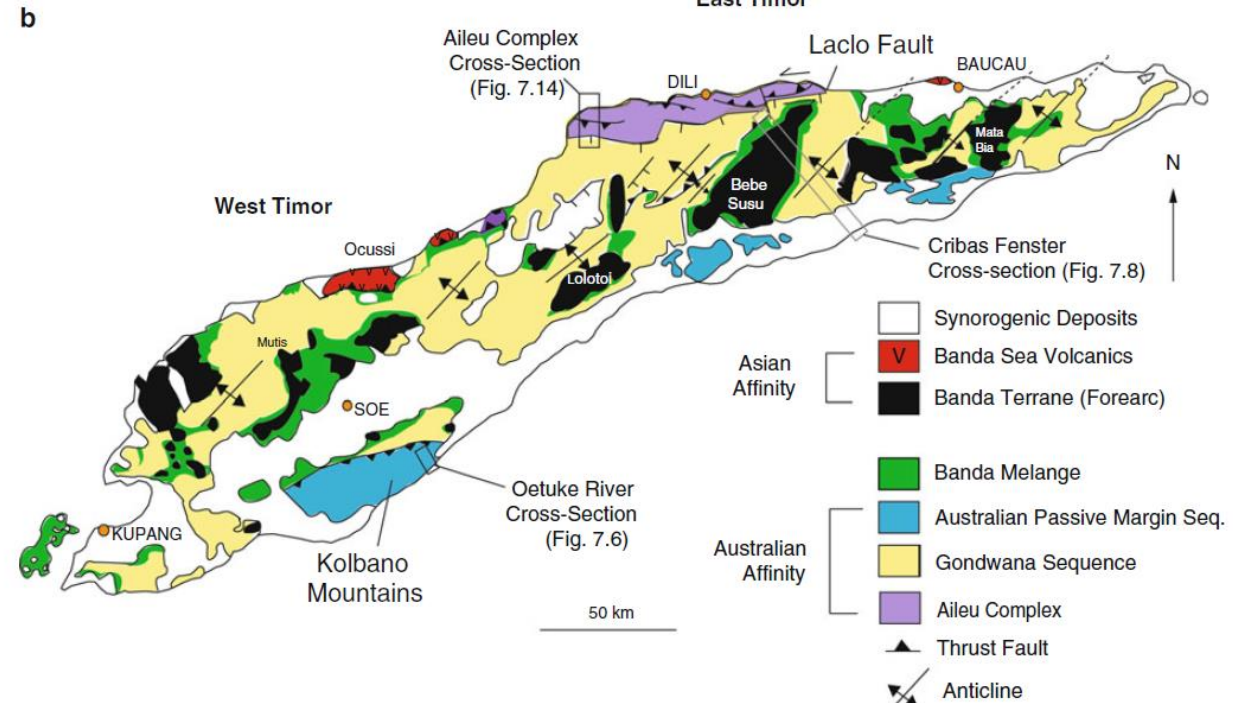


Model of collision of Timor & Australia

Hall and Wilson (2000)



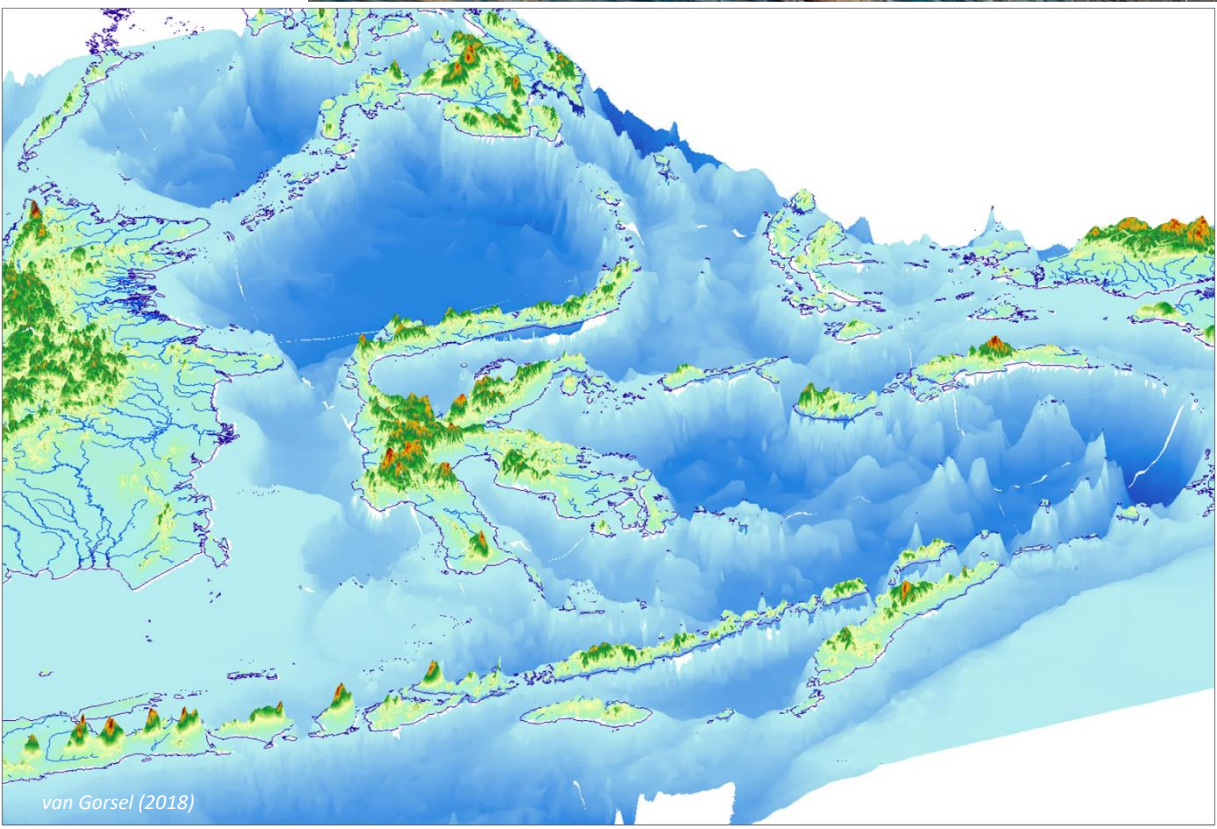
Steeply dipping Triassic Aitutu outer shelf limestones, north of Soe.



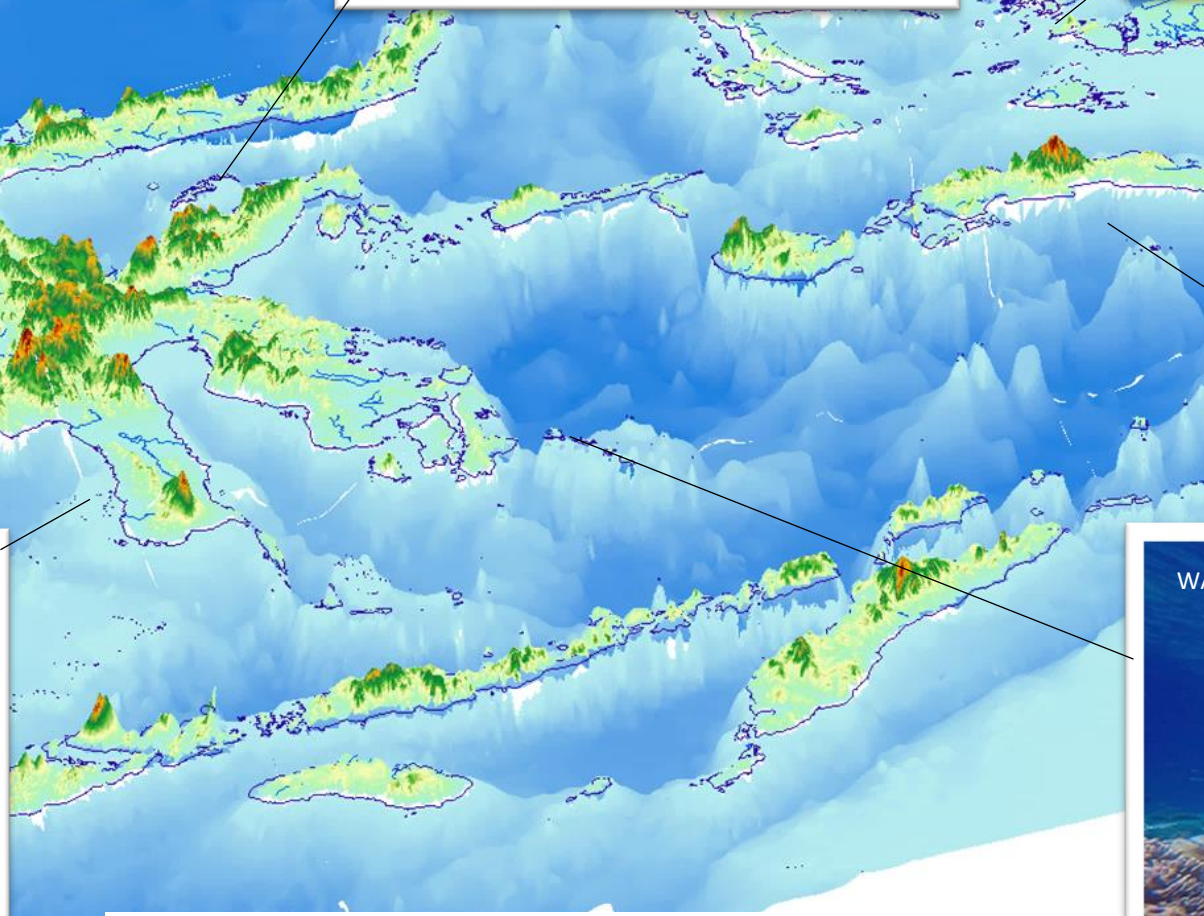
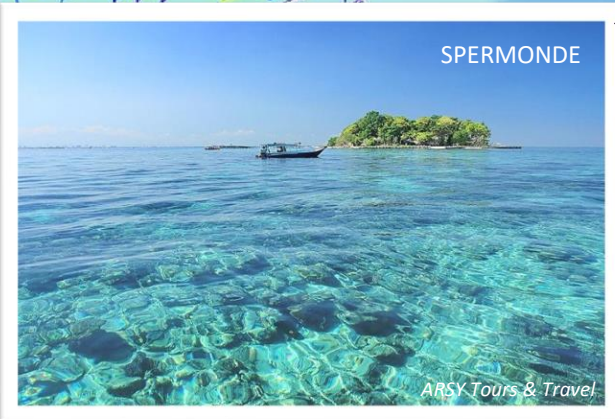
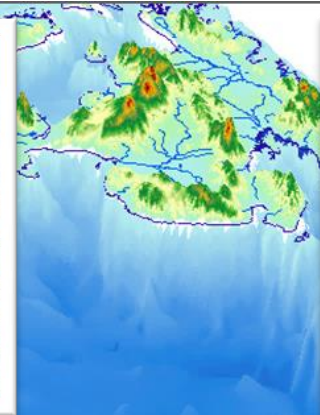
POTENSI WISATA BAHARI



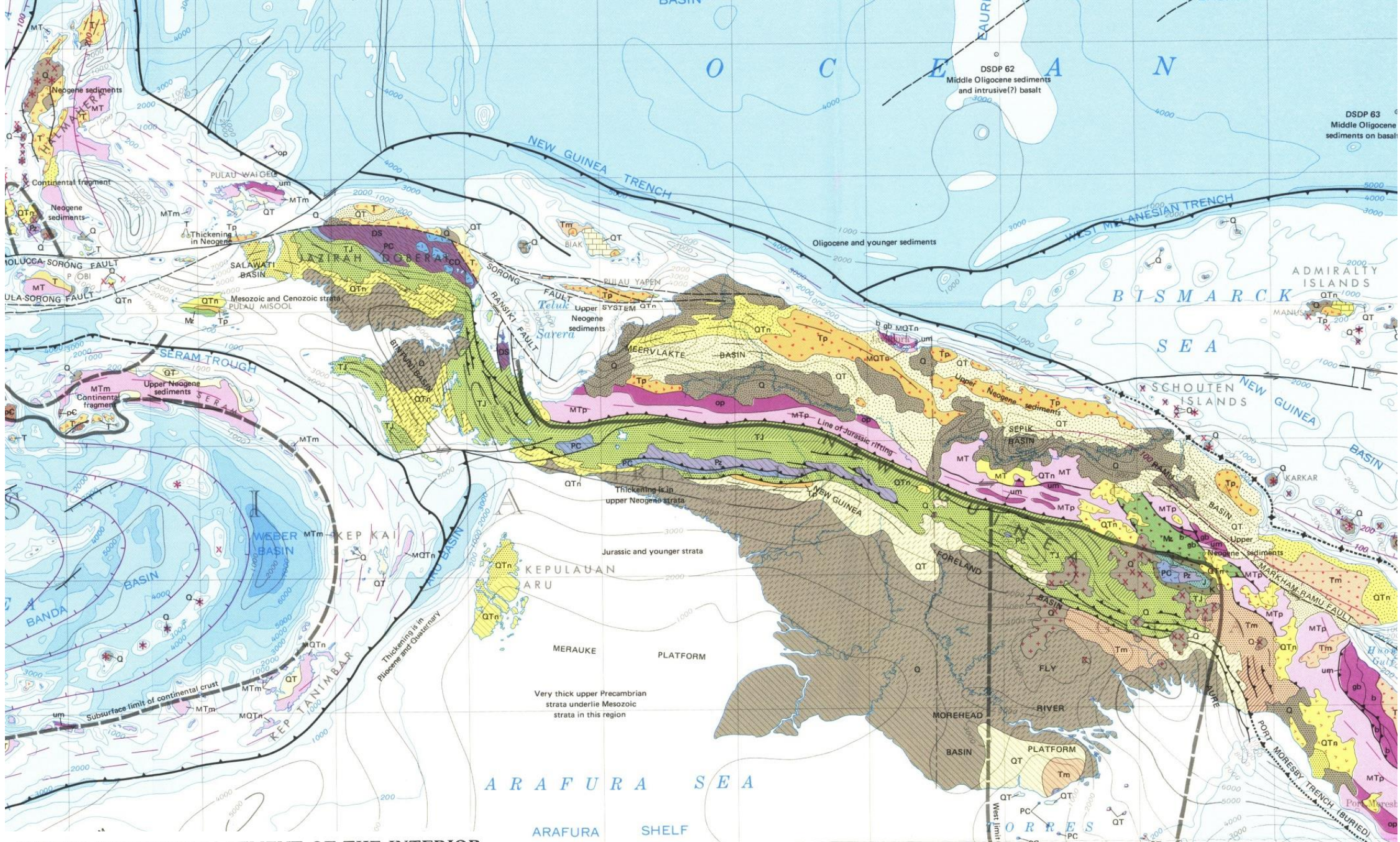
Coral Triangle Ecoregions: East Indonesia - Awang Satyana, June 2021



Rainforest Cruises



Sea Resorts of East Indonesia- Awang Satyana, June 2021



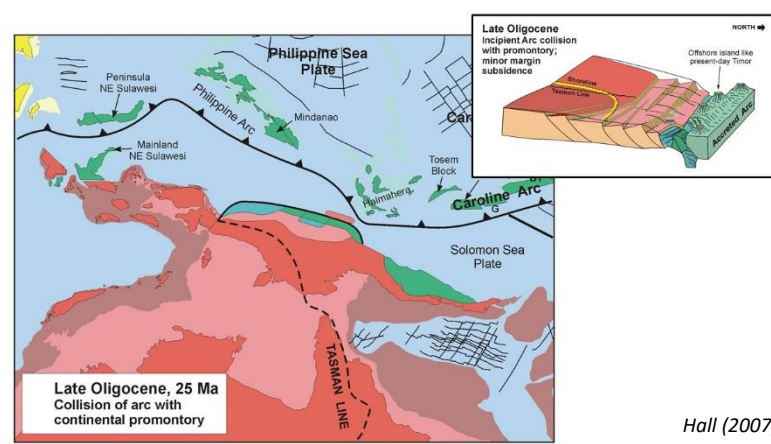
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Hamilton (1979)

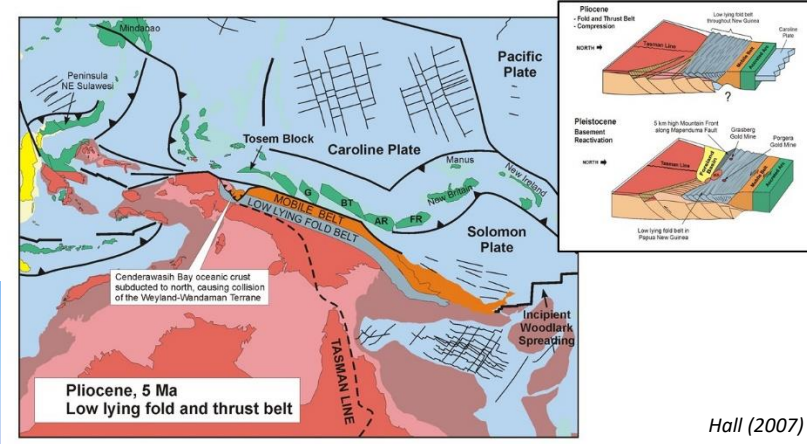
Jurassic and younger
sediments



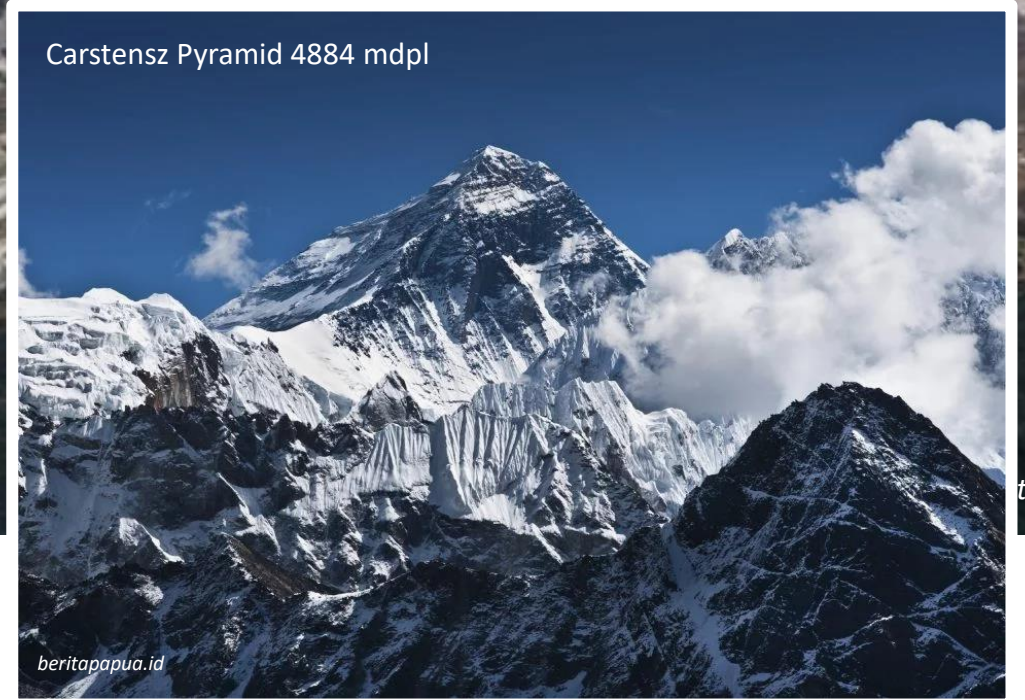
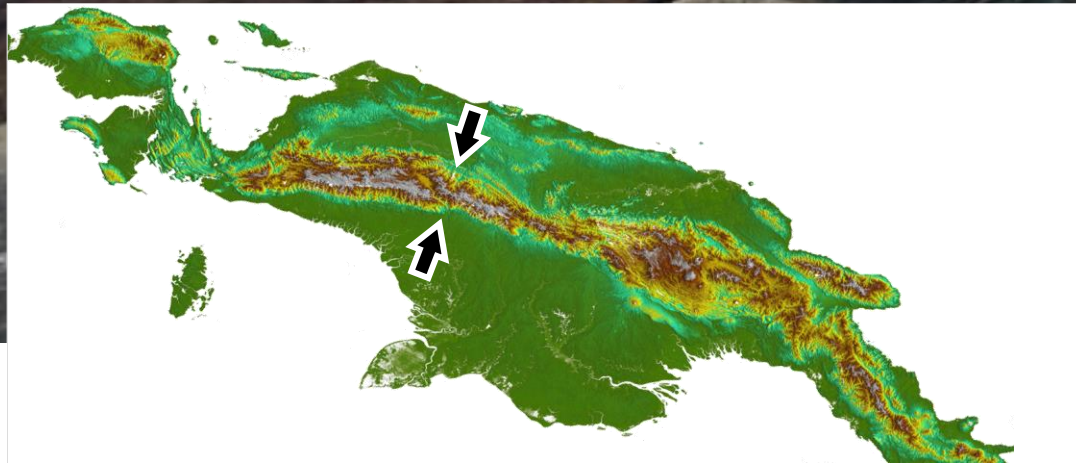
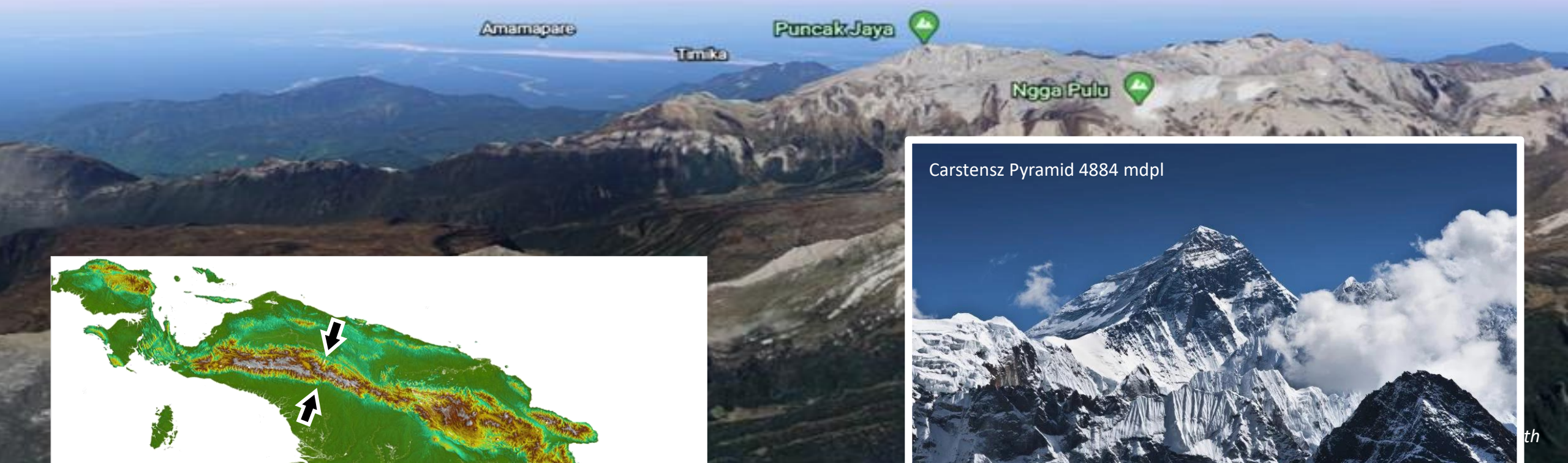
darmadhitama



Hall (2007)



Hall (2007)



th

Pegunungan Tengah Papua: Benturan Australia vs. Pasifik - Awang Satyana, June 2021

Pegunungan di tepi Lembah Baliem, batugamping dolomitan.



foto: Johannes Karundeng

Wamena, perkampungan.



Wamena, perang.



foto: Johannes Karundeng

Terima kasih atas perhatian Anda.



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