Teknik Geofisika ITS & MGMP Geografi Jatim mempersembahkan :

Webinar

"BERKAH GEOWISATA INDONESIA"

AWANG SATYANA

Geolog Independent

Sabtu
2 Sept 23

08.30 s.d
11.30 WIB

Zoom ID : 4654-4005-85

its.ac.id/tgeofisika
Teknik Geofisika ITS
teknik_geofisika_its
Teknik Geofisika ITS

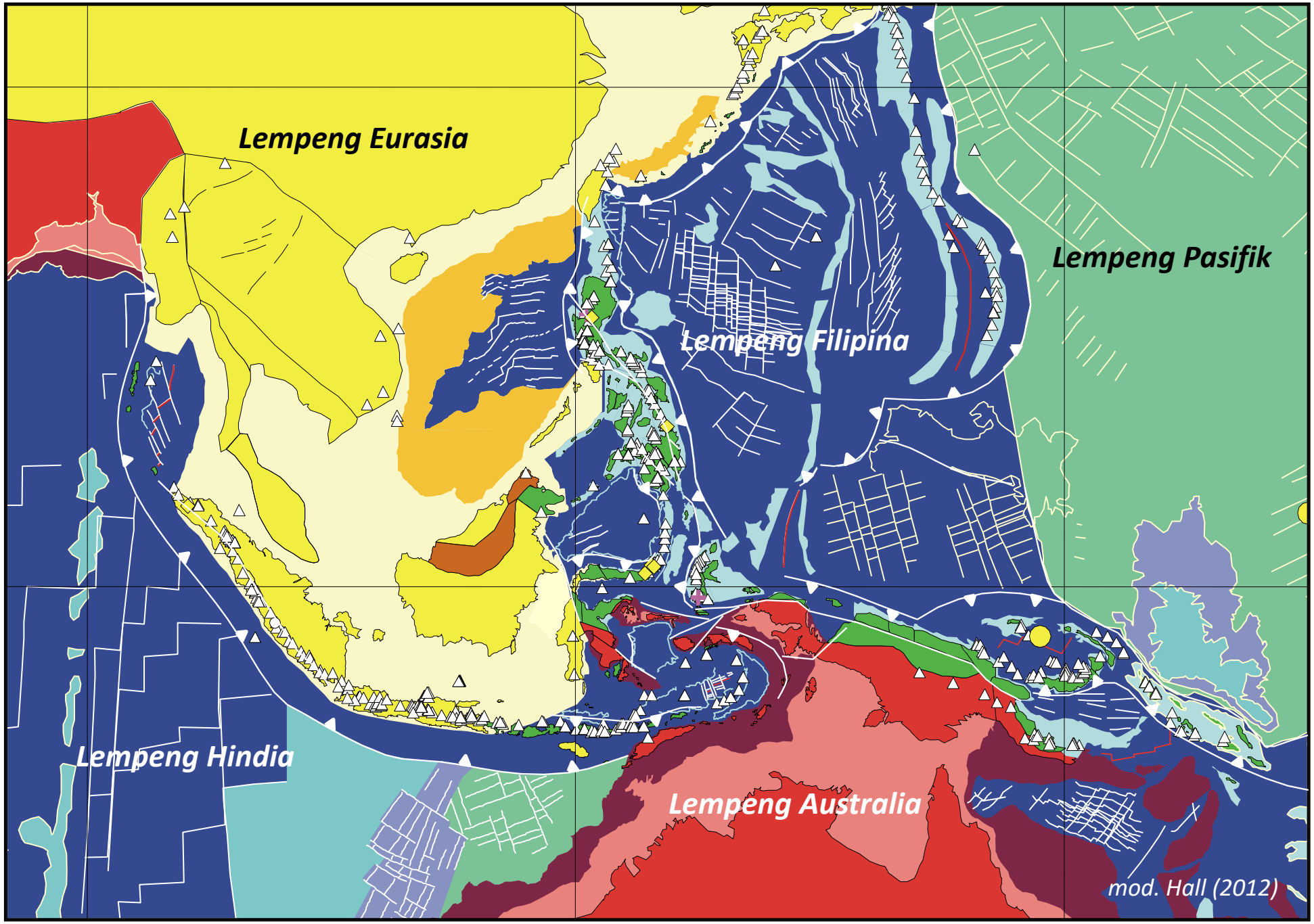
Diskusi

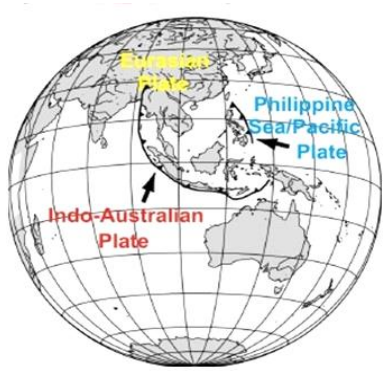
1. Geologi Indonesia
2. Warisan Geologi, Geopark, Geowisata
3. Berkah Geowisata Indonesia

Diskusi

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

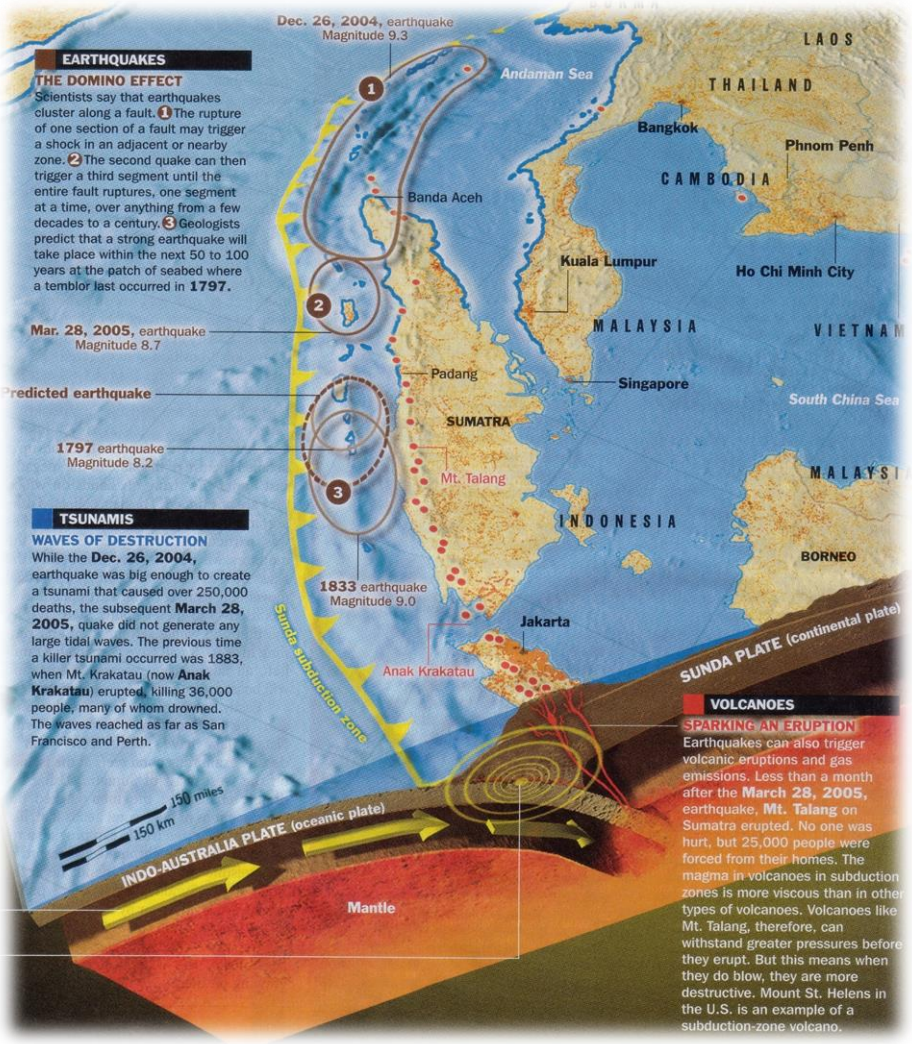
Sukamto dan Purbo-Hadiwidjoyo (1993): “Dari segi ilmu kebumian, Indonesia benar-benar merupakan daerah yang sangat menarik. Kepentingannya terletak pada rupabuminya, jenis dan sebaran endapan mineral serta energi yang terkandung di dalamnya, keterhuniannya, dan ketektonikaannya....”



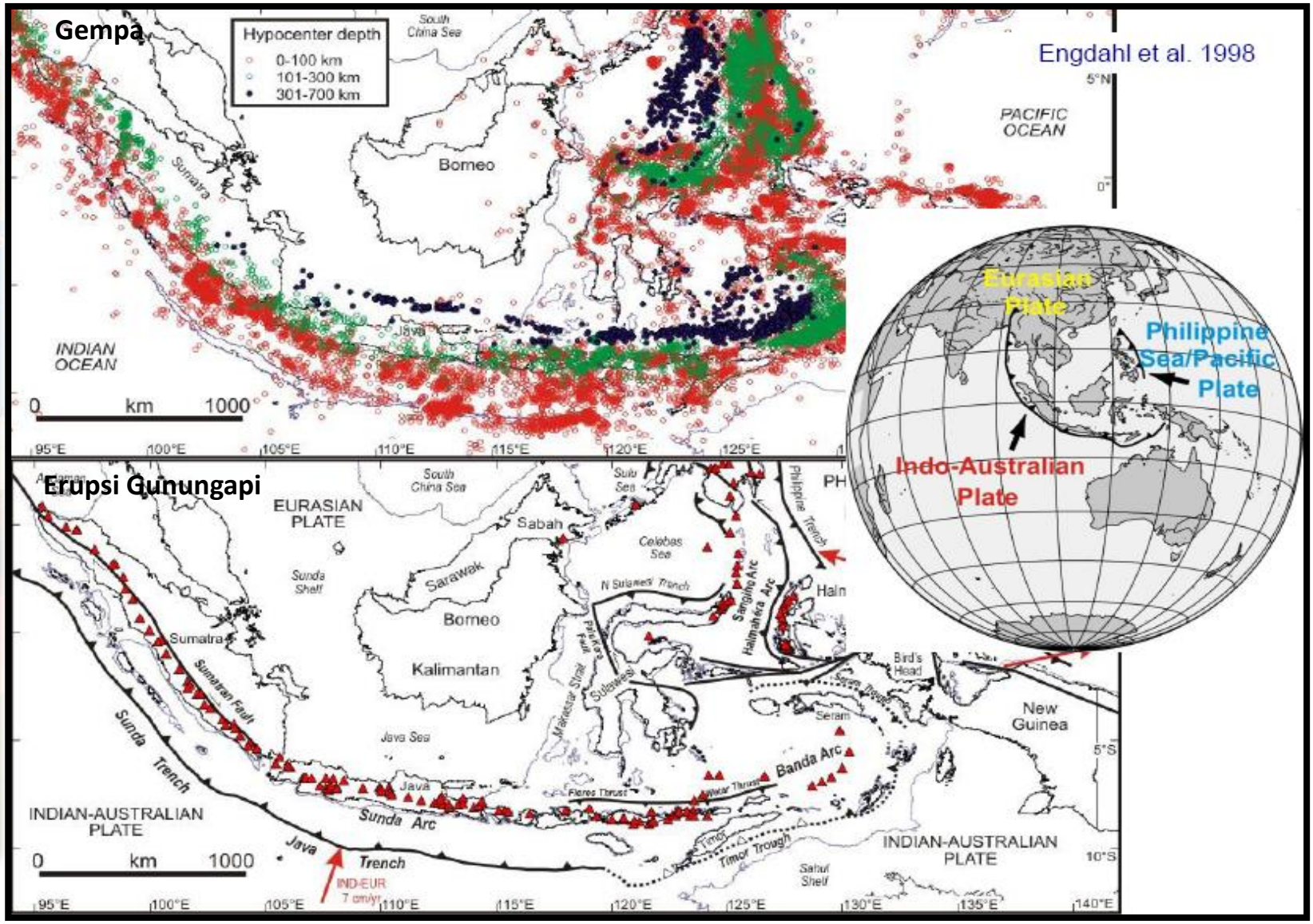


Tataan Tektonik Lempeng Indonesia Masa Kini

Pertemuan lempeng merupakan wilayah kegempaan dan gunungapi



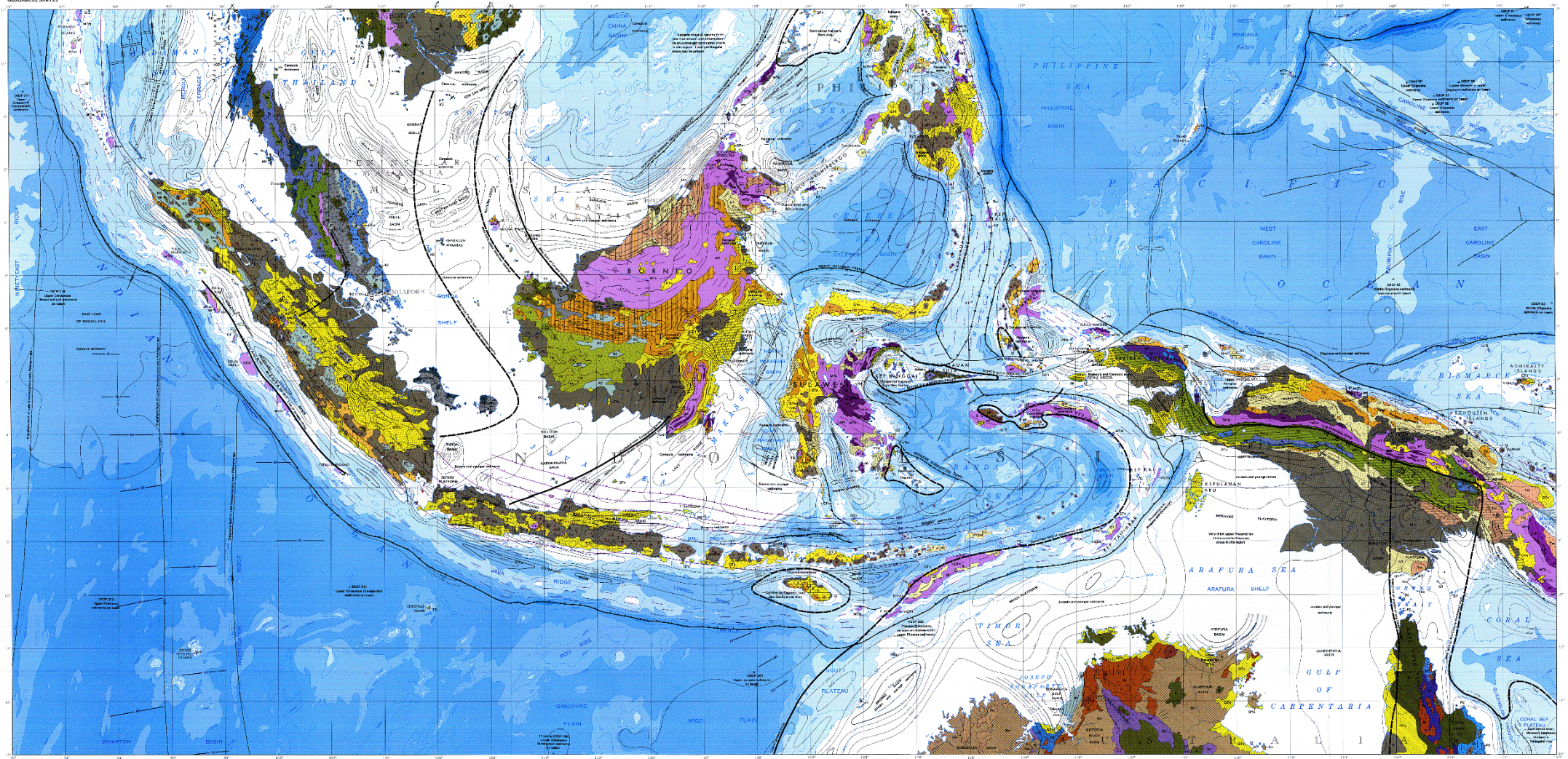
Newsweek (Dec. 2005)



UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PREPARED ON BEHALF OF THE MINISTRY OF MINES, GOVERNMENT OF INDONESIA,
AND THE AGENCY FOR INTERNATIONAL DEVELOPMENT, U.S. DEPARTMENT OF STATE,
IN COOPERATION WITH THE GEOLOGICAL SURVEY OF INDONESIA,
THE AUSTRALIAN BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS,
AND THE LAMONT-DOHERTY GEOLOGICAL OBSERVATORY OF COLUMBIA UNIVERSITY

PROFESSIONAL PAPER 1078
PLATE I



CORRELATION OF MAP UNITS
COLOR AND LETTER SYMBOL INDICATE AGE OF MATERIAL

TECTONIC ENVIRONMENT OF DEPOSITION OF SEDIMENTARY MATERIALS

SYMBOLS FOR ROCKS AND RELATED FEATURES

STRUCTURAL FEATURES

FEATURES OF SUBDUCTION ZONES AND OF OCEANIC CRUST AND MANTLE

BATHYMETRY

SOURCES OF DATA

GLOSSARY OF INDONESIAN GEOGRAPHICAL TERMS

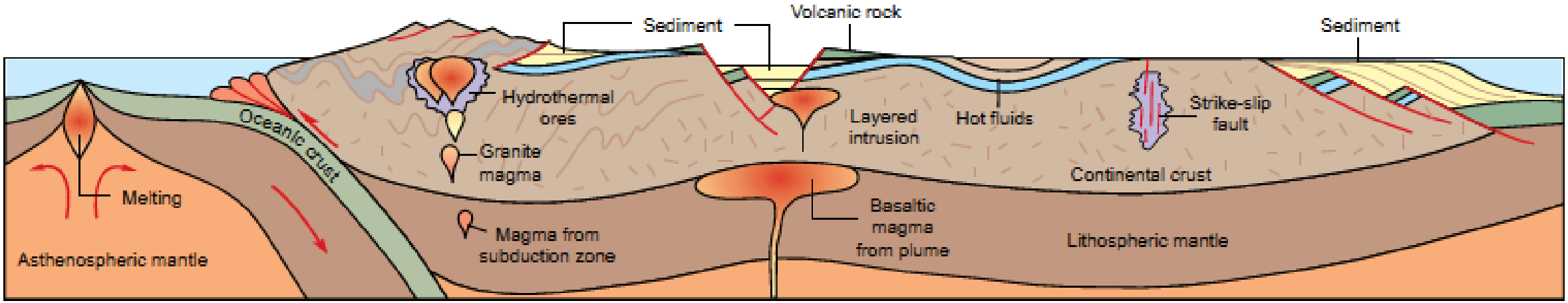
TECTONIC MAP OF THE INDONESIAN REGION

Hamilton (1979)

Potensi Warisan Geologi (KESDM, 2019)

Kontrol Tektonik Lempeng atas Sumber Daya

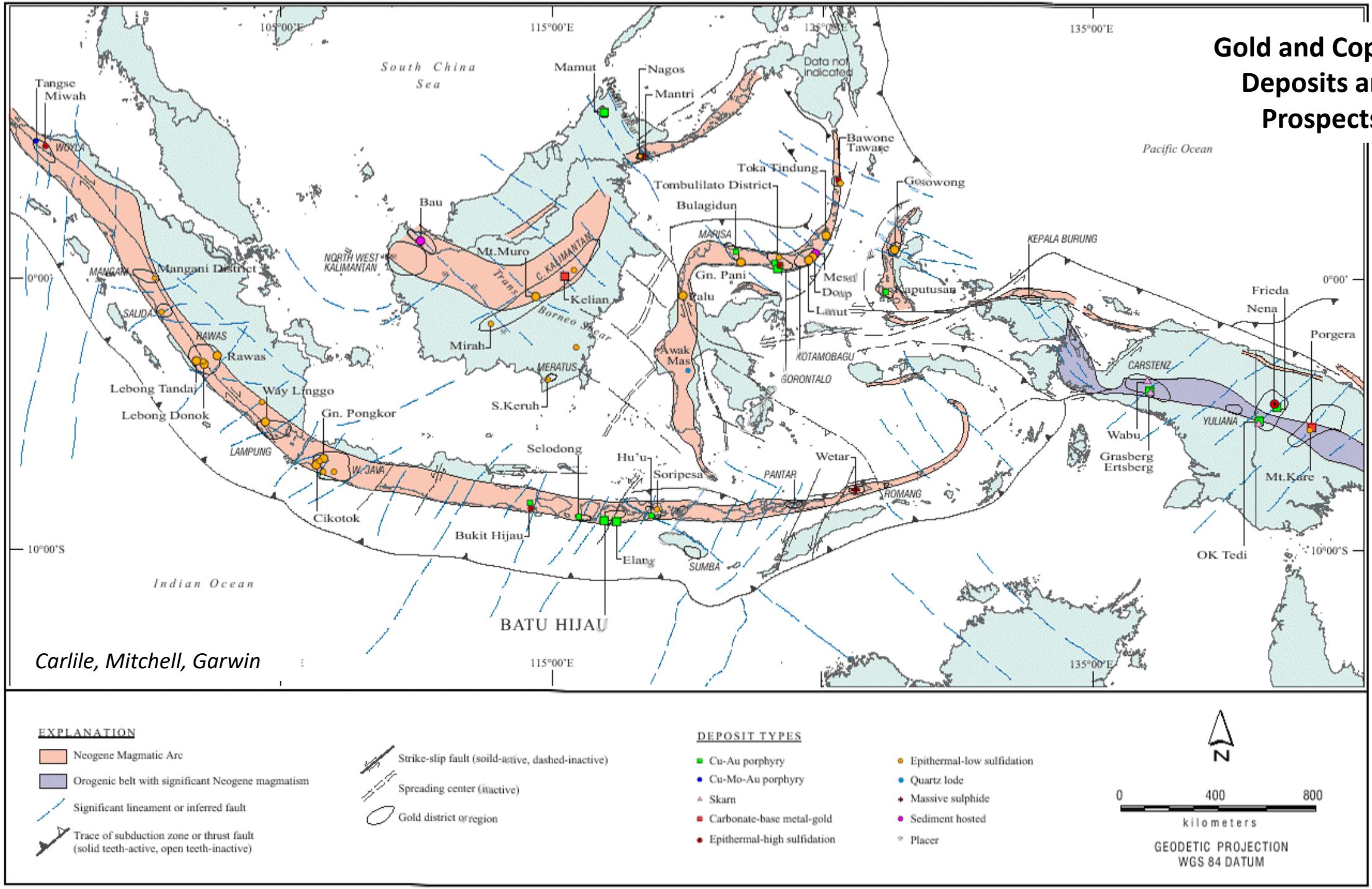
Midoceanic ridge	Accretionary wedge	Magmatic arc	Foreland basin	Continental rift / Hot spot	Continental basin	Shield	Rifted continental margin



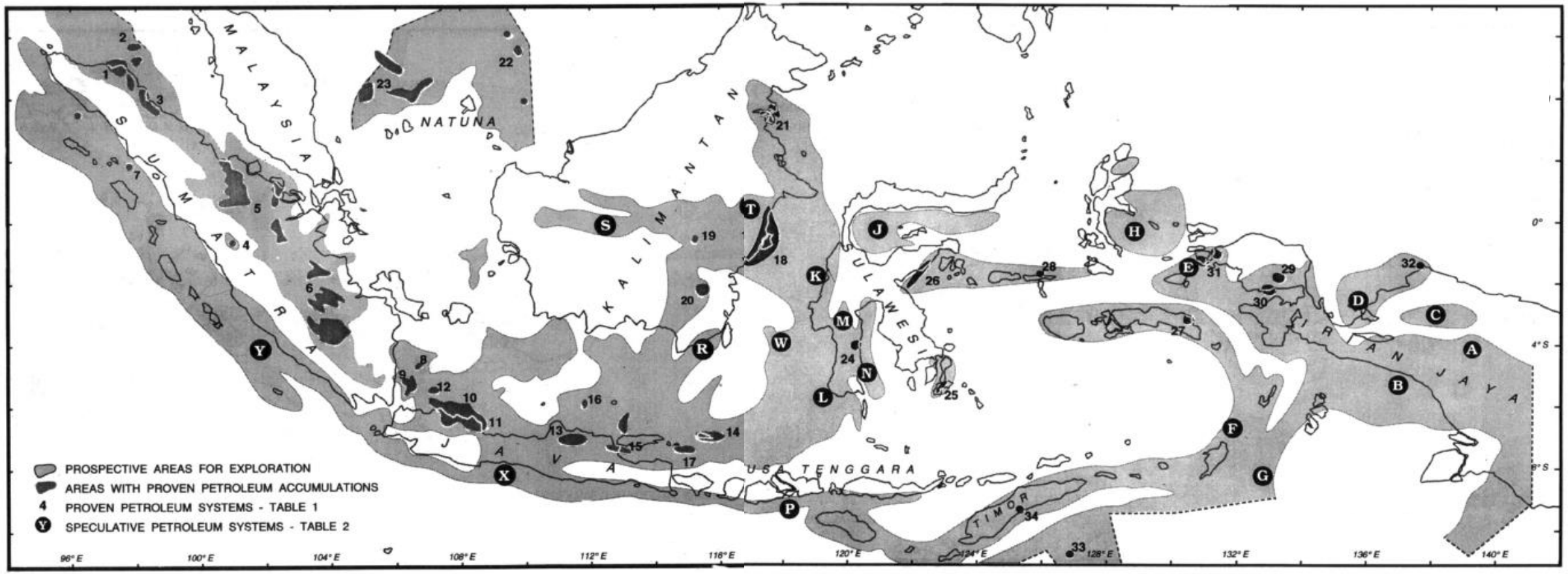
Magmatic segregation chromium platinum **Hydrothermal sulfides** copper zinc	**Oceanic ridge deposits in melange** copper zinc nickel chromium	**Hydrothermal vein deposits** gold silver **Contact metamorphic** copper, lead, zinc, gold, silver, iron, tin, tungsten, molybdenum	**Sedimentary** coal oil 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

Hamblin & Christiansen (2009)

Gold and Copper: Deposits and Prospects

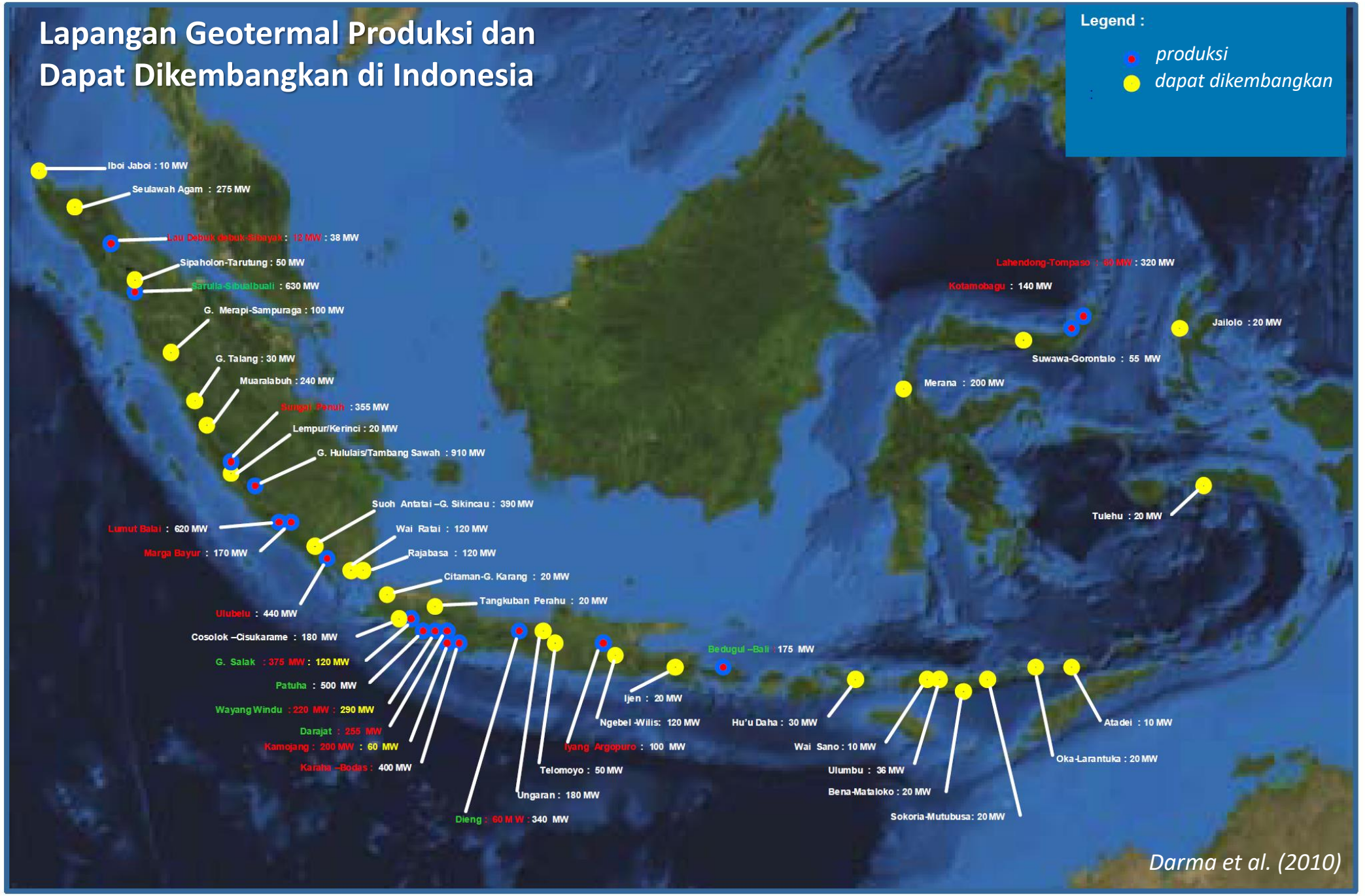


compiled by Awang Harun Satyana 20 March 2021



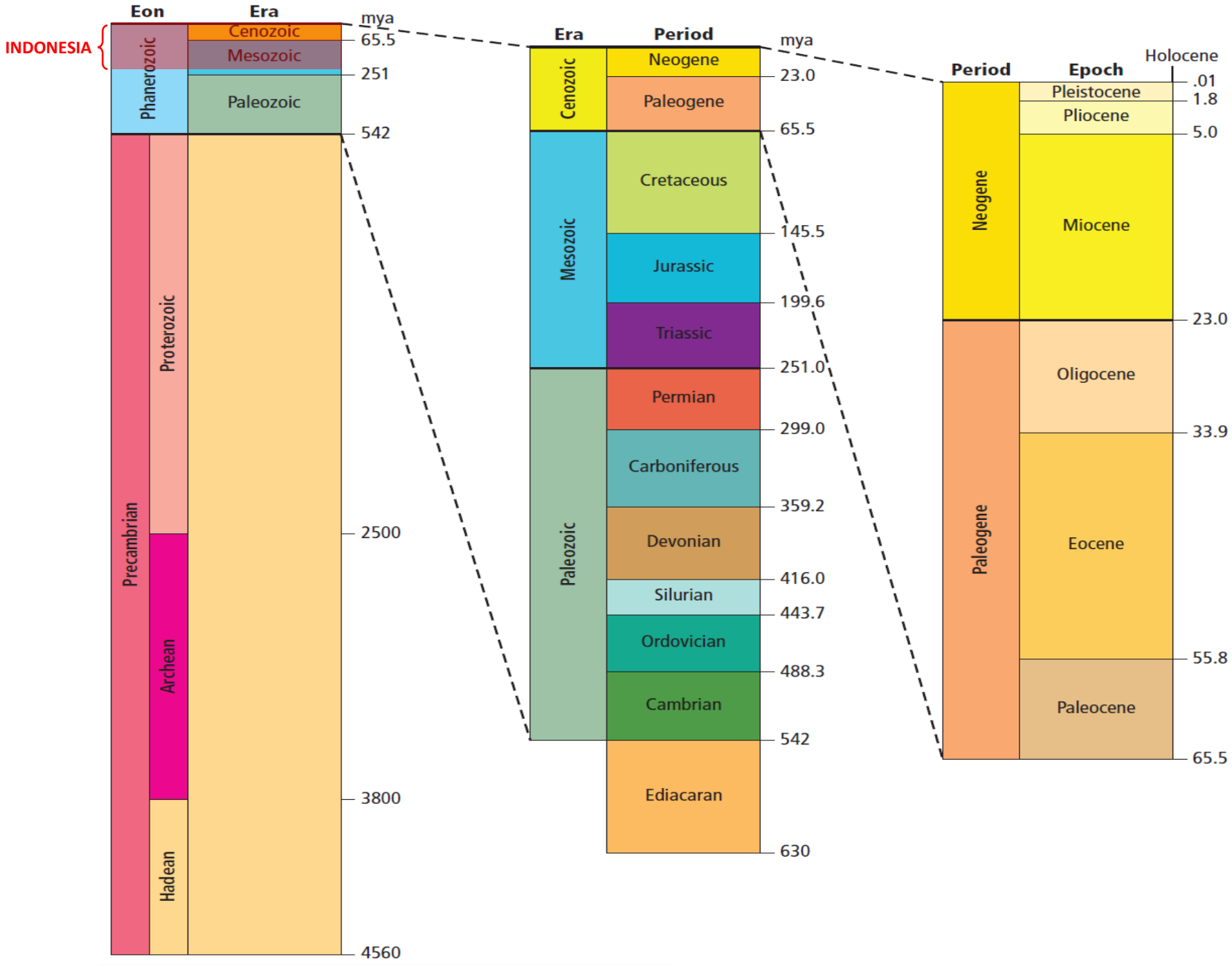
Howes & Tisnawijaya (1995)

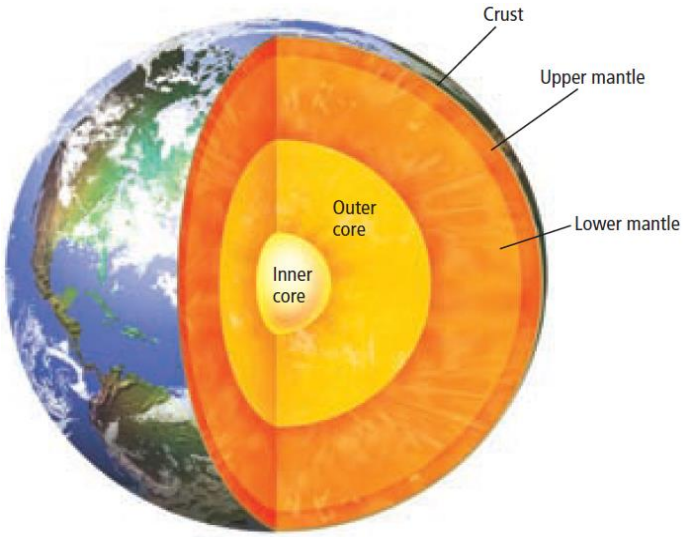
Proven and Prospective Petroleum Areas in Indonesia


Lapangan Geotermal Produksi dan
Dapat Dikembangkan di Indonesia
Legend :
produksi
dapat dikembangkan
Iboi Jaboi : 10 MW
Seulawah Agam : 275 MW
Lau Debuk debuk-Sibayak : 12 MW : 38 MW
Sipaholon-Tarutung : 50 MW
Sarulla-Sibualbuali : 630 MW
G. Merapi-Sampuraga : 100 MW
G. Talang : 30 MW
Muaralabuh : 240 MW
Sungai Penuh : 355 MW
Lempur/Kerinci : 20 MW
G. Hululais/Tambang Sawah : 910 MW
Suoh Antatai –G. Sikincau : 390 MW
Lumut Balai : 620 MW
Wai Ratai : 120 MW
Marga Bayur : 170 MW
Rajabasa : 120 MW
Citaman-G. Karang : 20 MW
Tangkuban Perahu : 20 MW
Ulubelu : 440 MW
Cosolok –Cisukarame : 180 MW
G. Salak : 375 MW : 120 MW
Patuha : 500 MW
Wayang Windu : 220 MW : 290 MW
Darajat : 255 MW
Kamojang : 200 MW : 60 MW
Karaha –Bodas : 400 MW
Dieng : 60 MW : 340 MW
Ungaran : 180 MW
Telomoyo : 50 MW
Iyang Argopuro : 100 MW
Ngebel -Wilis: 120 MW
Ijen : 20 MW
Bedugul –Bali : 175 MW
Hu'u Daha : 30 MW
Wai Sano : 10 MW
Ulumbu : 36 MW
Bena-Mataloko : 20 MW
Sokoria-Mutubusa: 20 MW
Oka-Larantuka : 20 MW
Atadei : 10 MW
Lahendong-Tompaso : 60 MW : 320 MW
Kotamobagu : 140 MW
Suwawa-Gorontalo : 55 MW
Jailolo : 20 MW
Merana : 200 MW
Tulehu : 20 MW
Darma et al. (2010)

Waktu Geologi dalam Sejarah Bumi

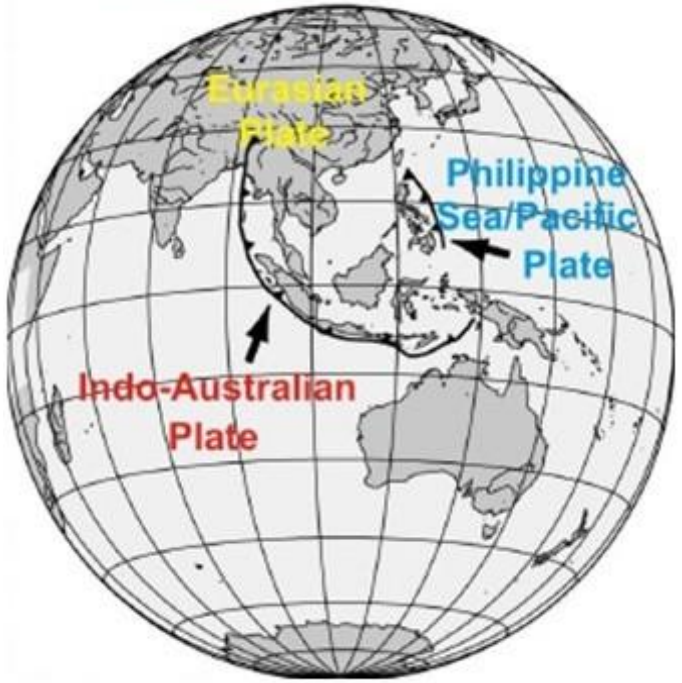
INDONESIA

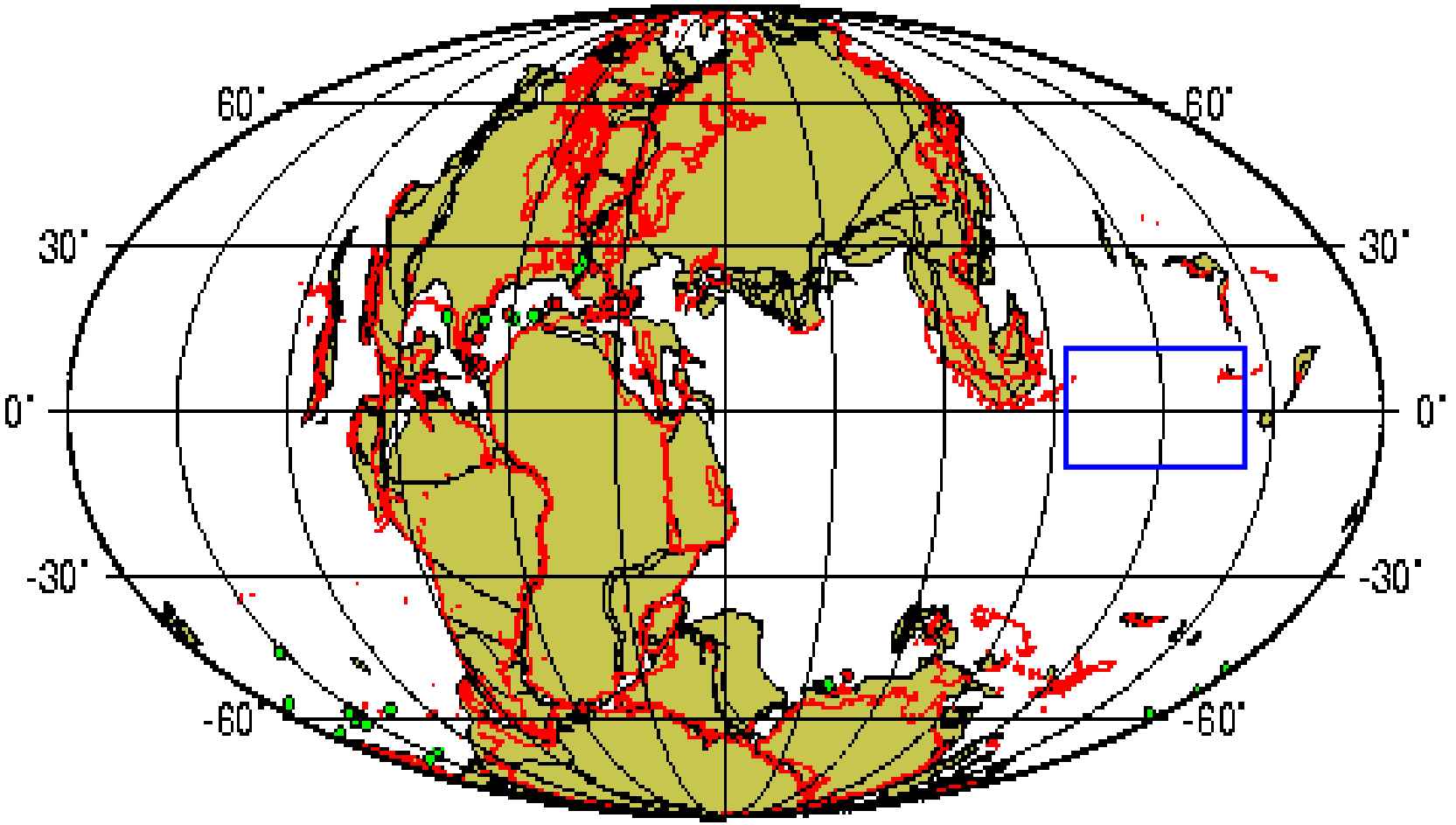


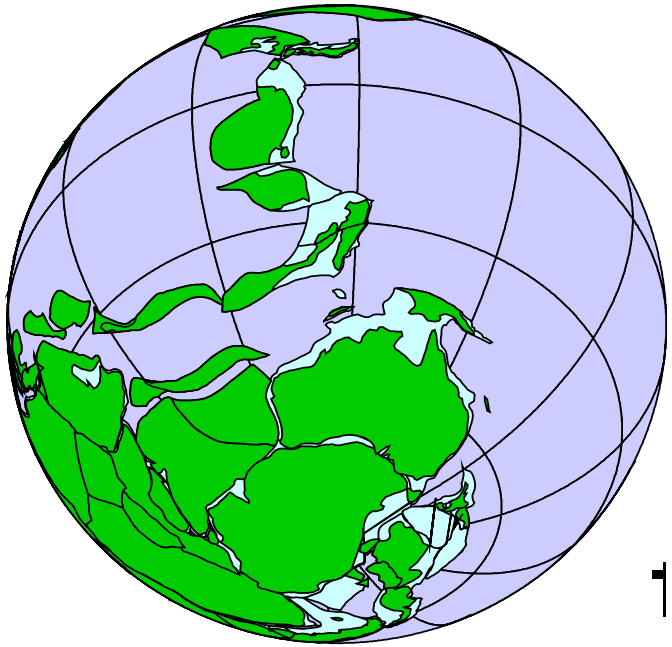


National Geographic (2008)

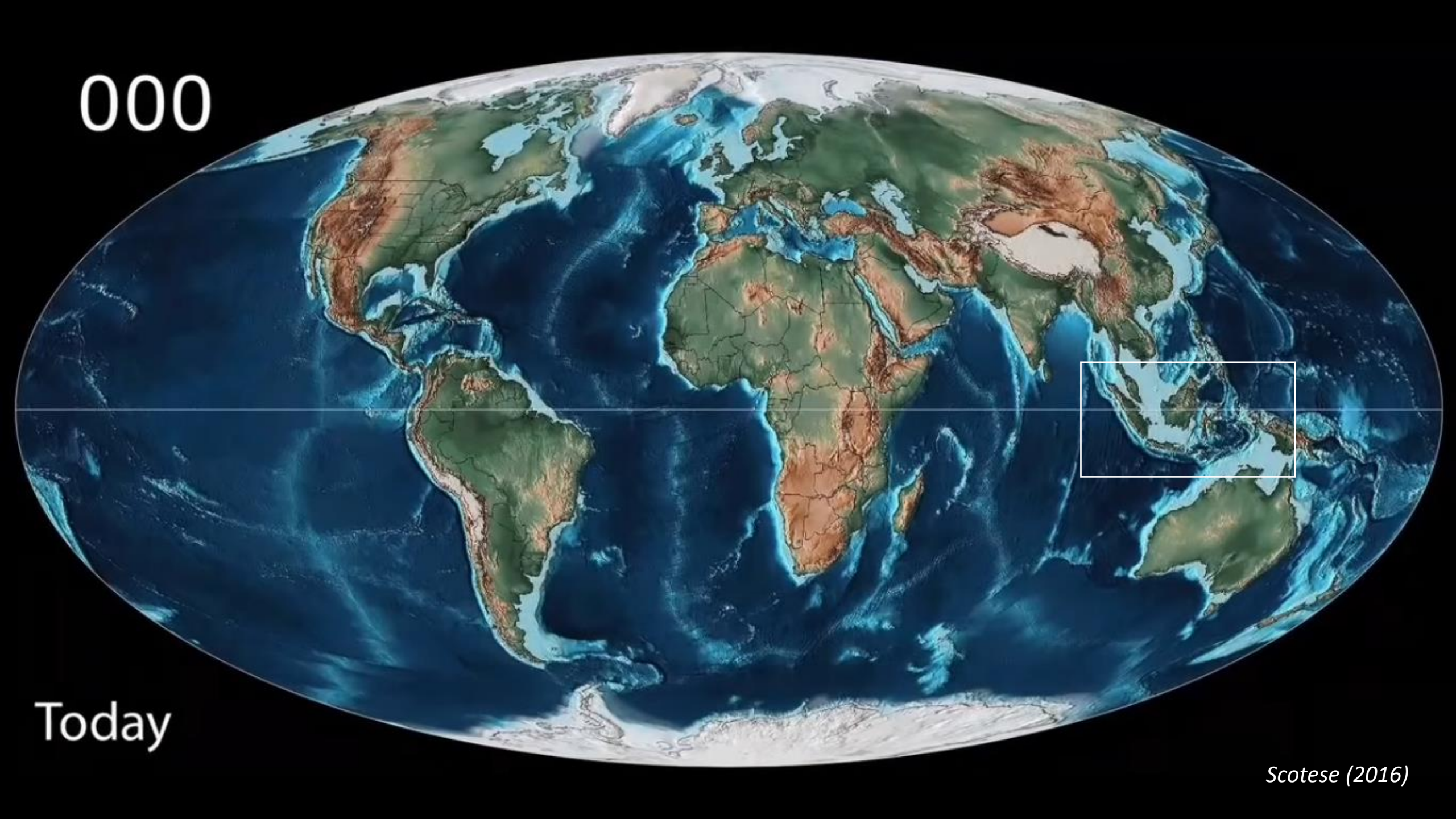
Rekonstruksi Pembentukan Kepulauan Indonesia



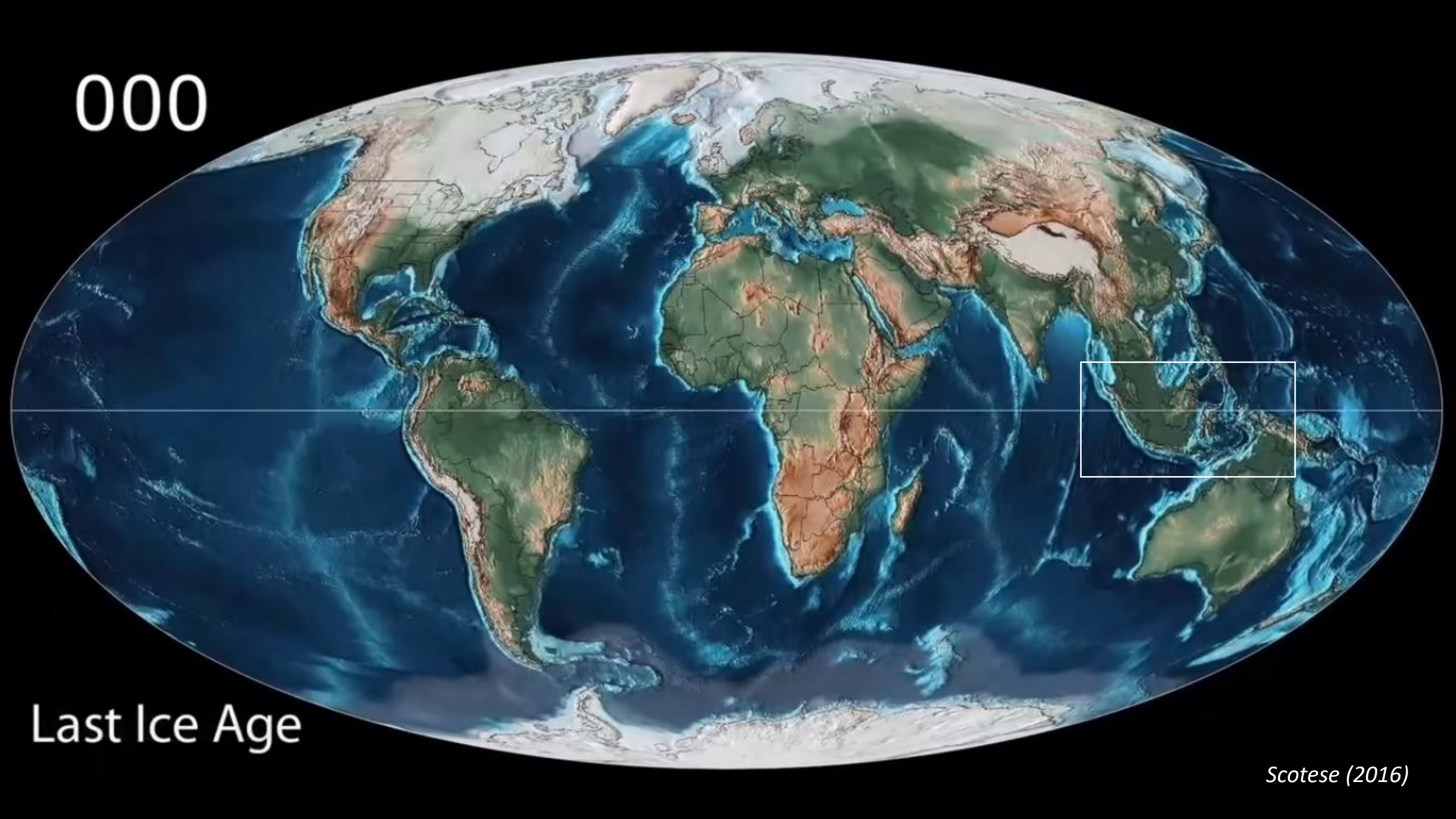




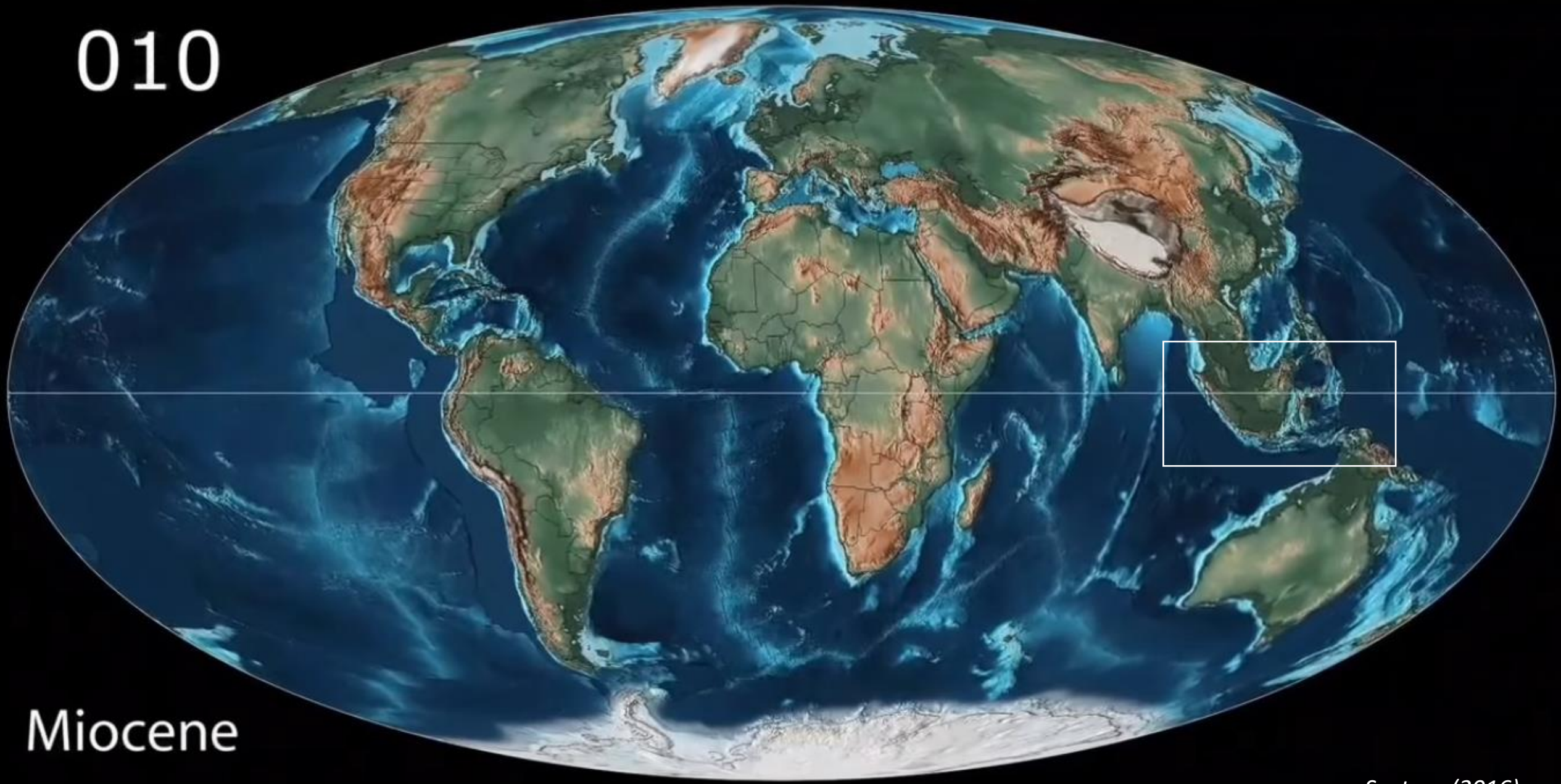
150 My Reconstruction



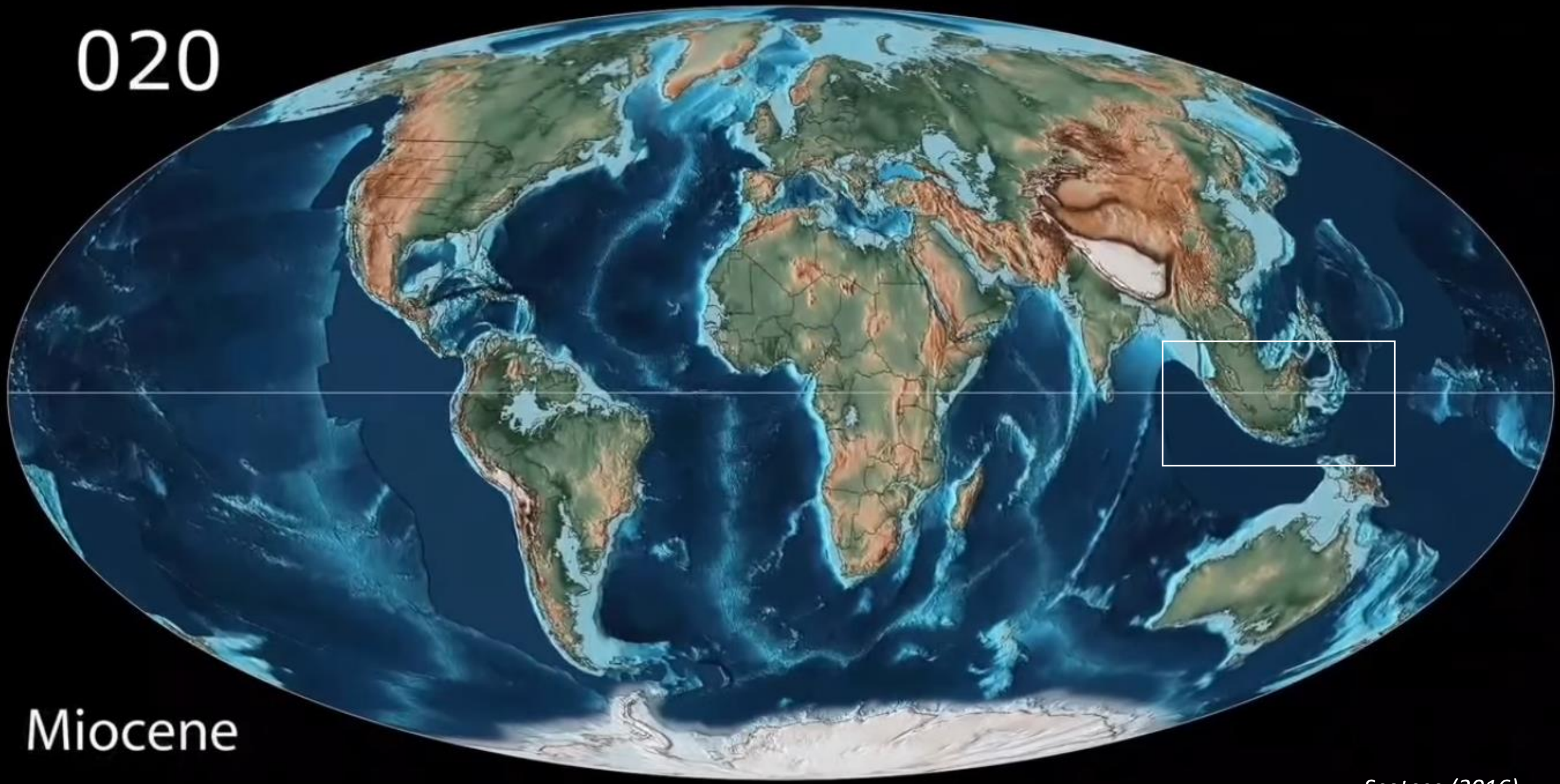
Scotese (2016)



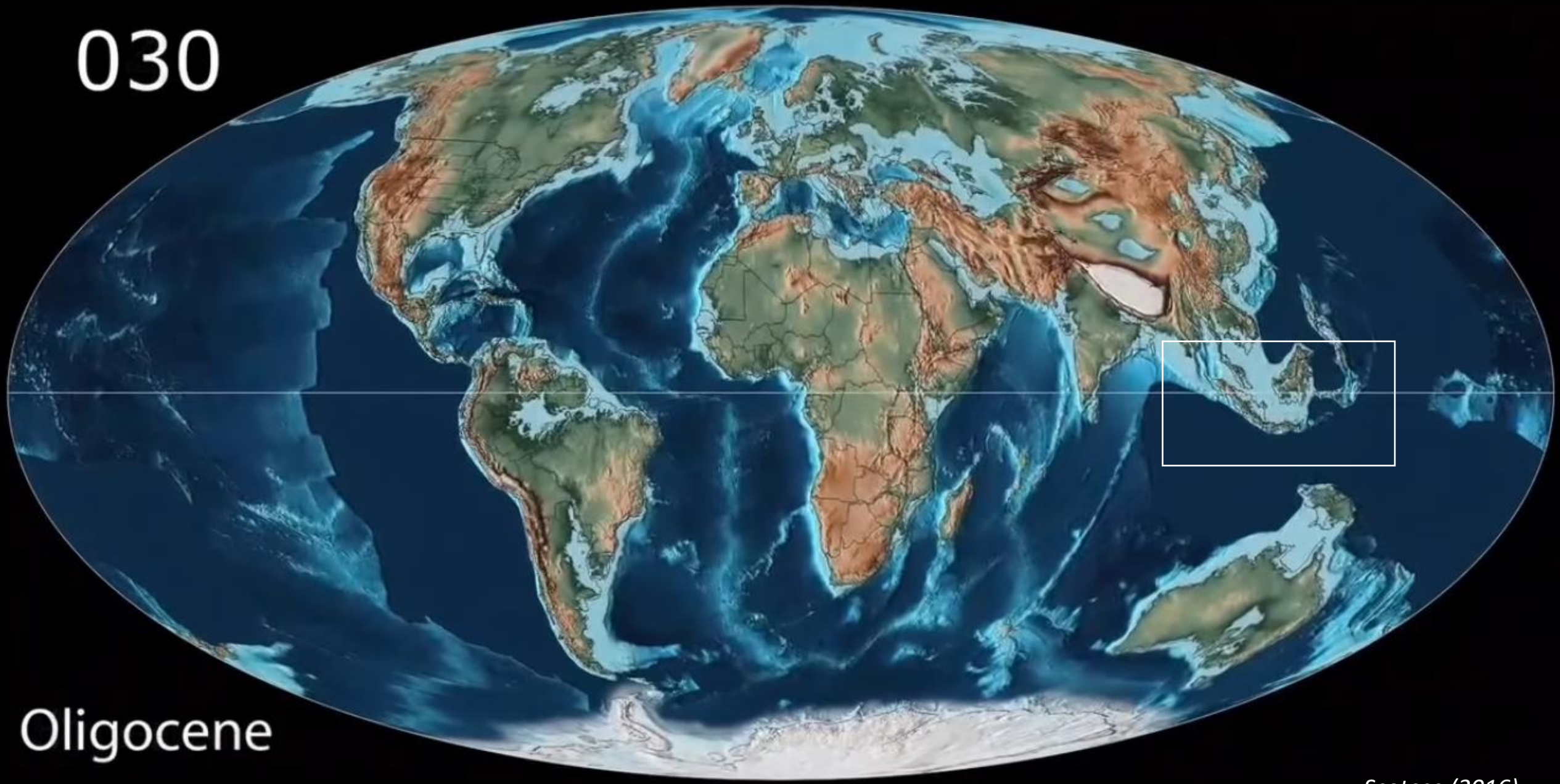
Scotese (2016)



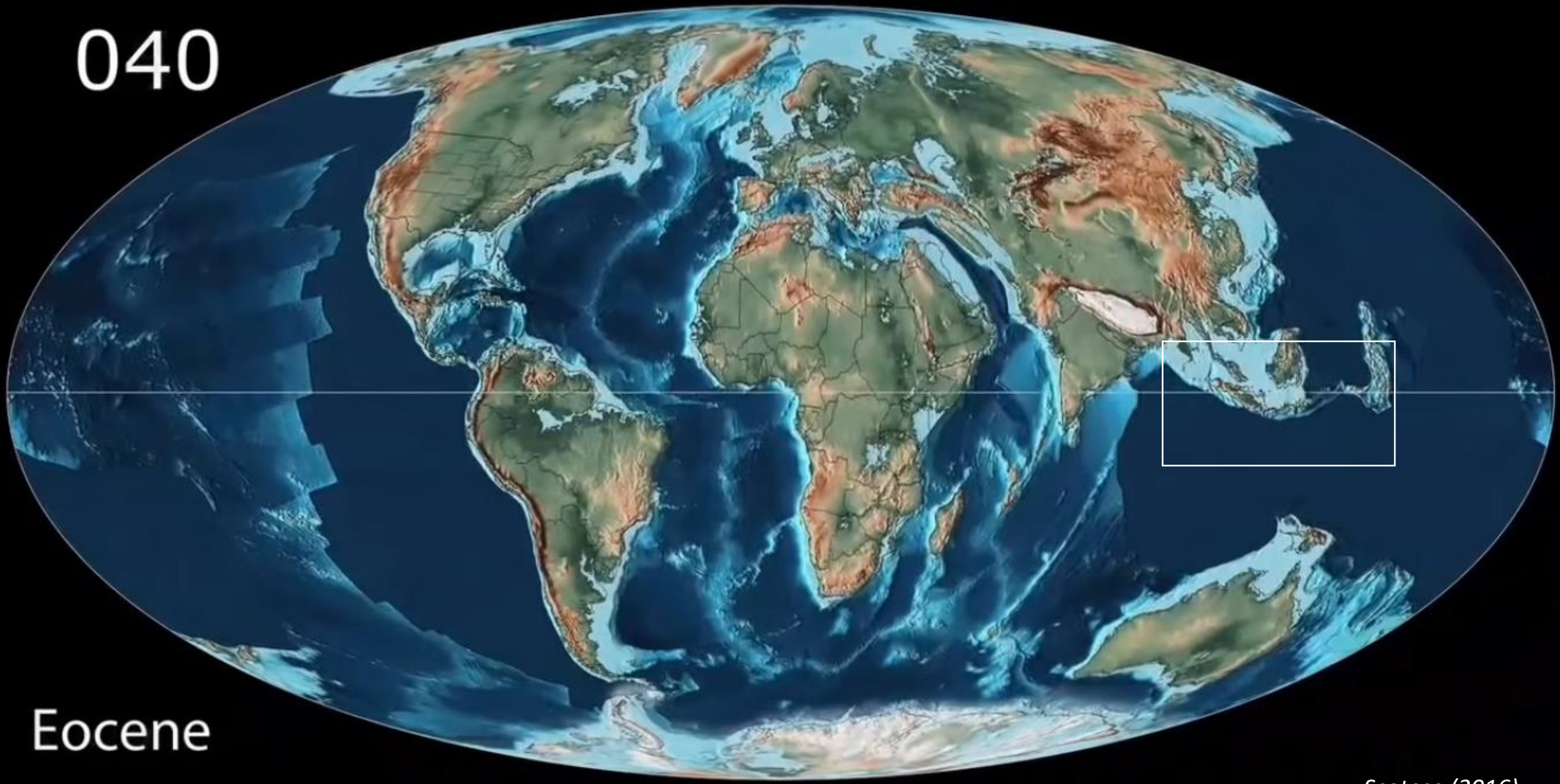
Scotese (2016)



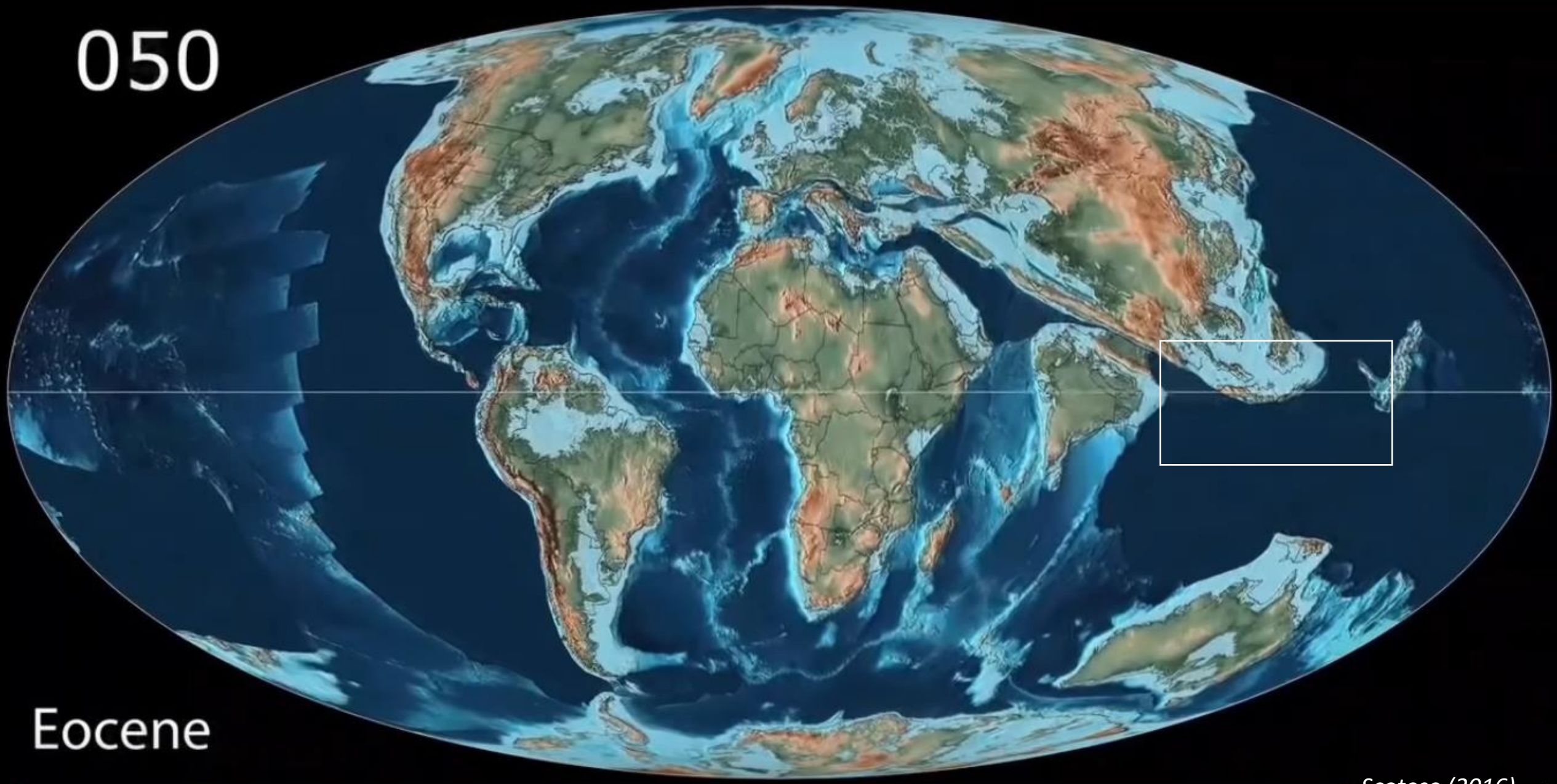
Scotese (2016)



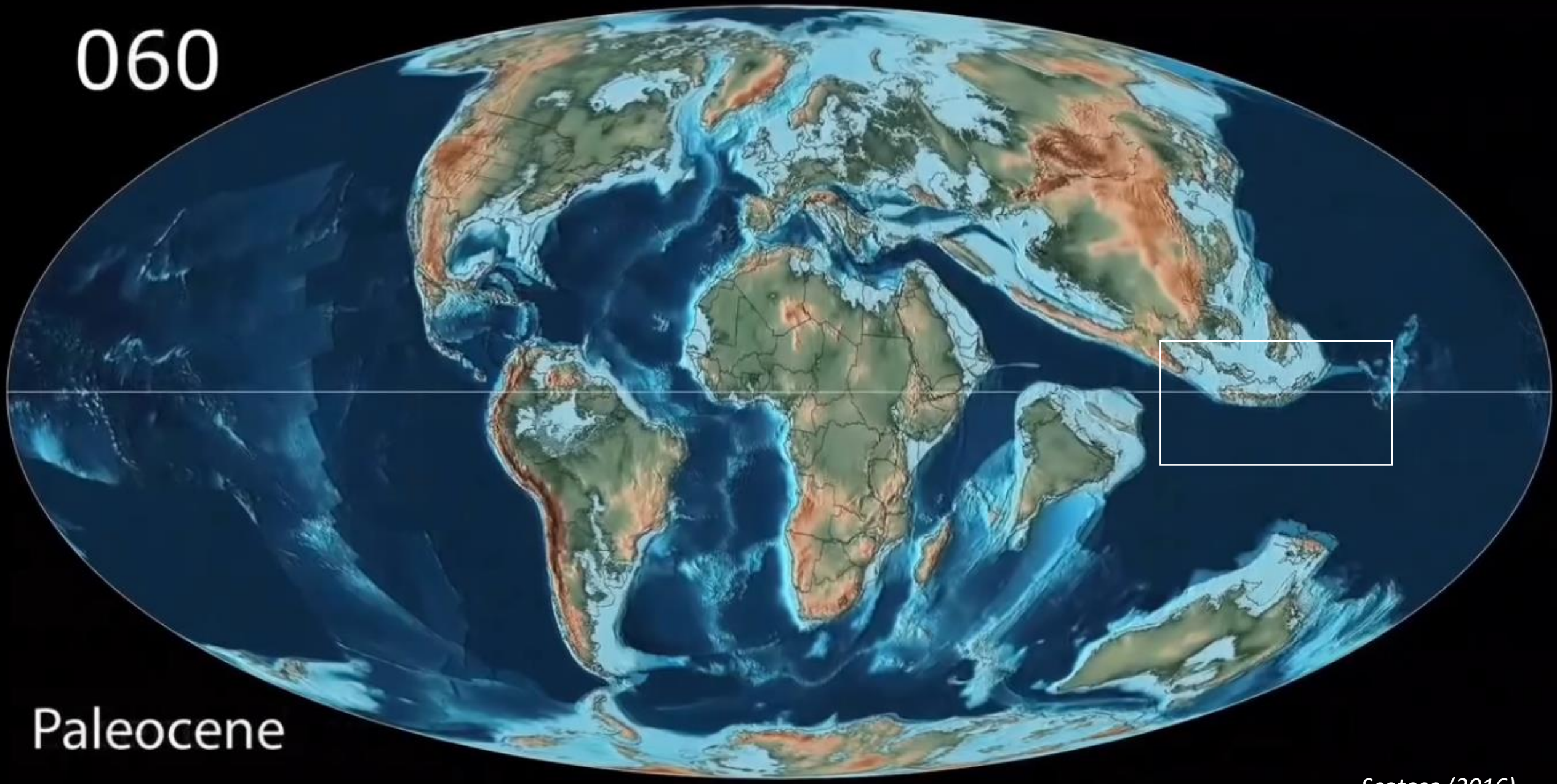
Scotese (2016)



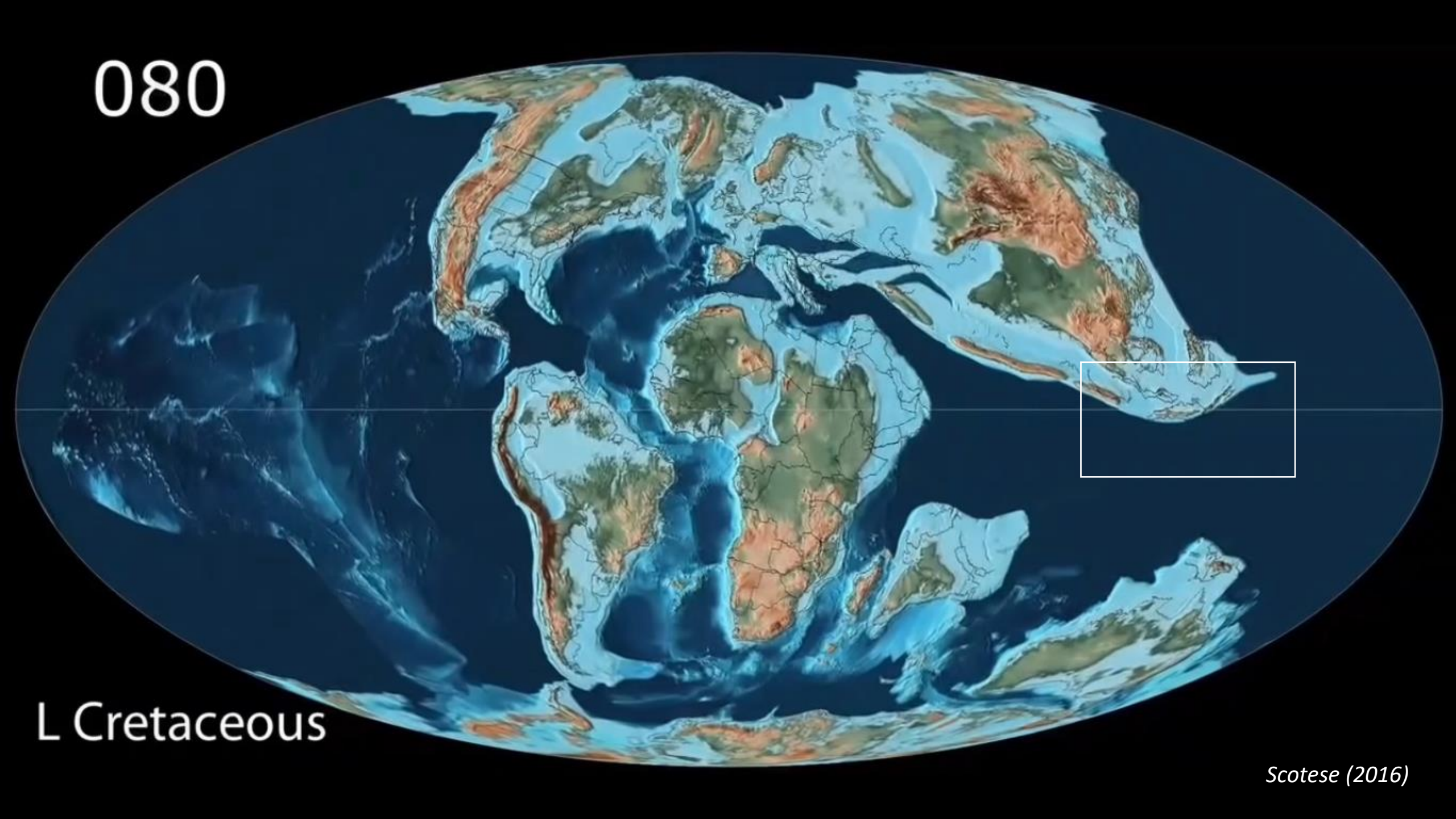
Scotese (2016)



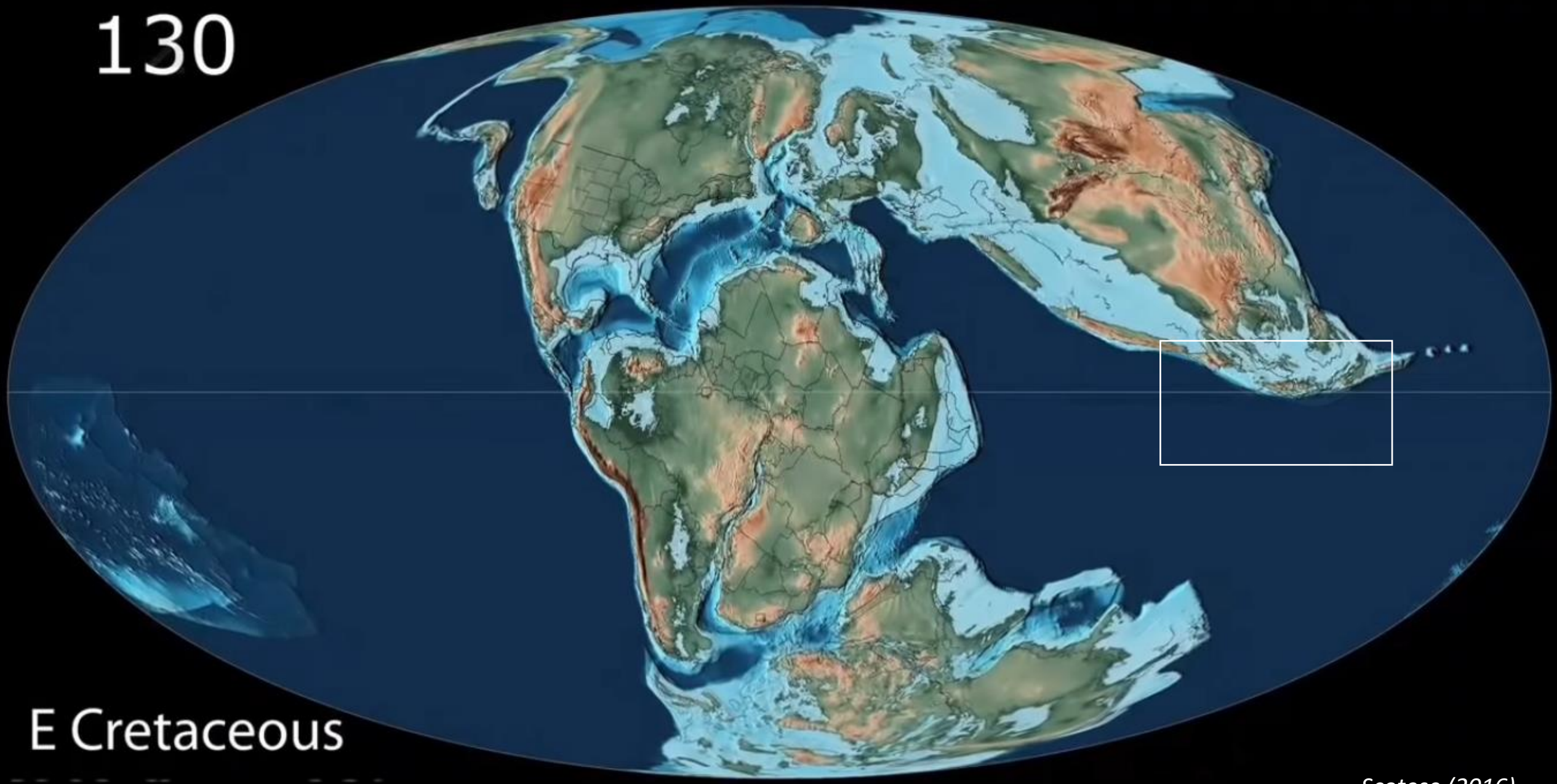
Scotese (2016)



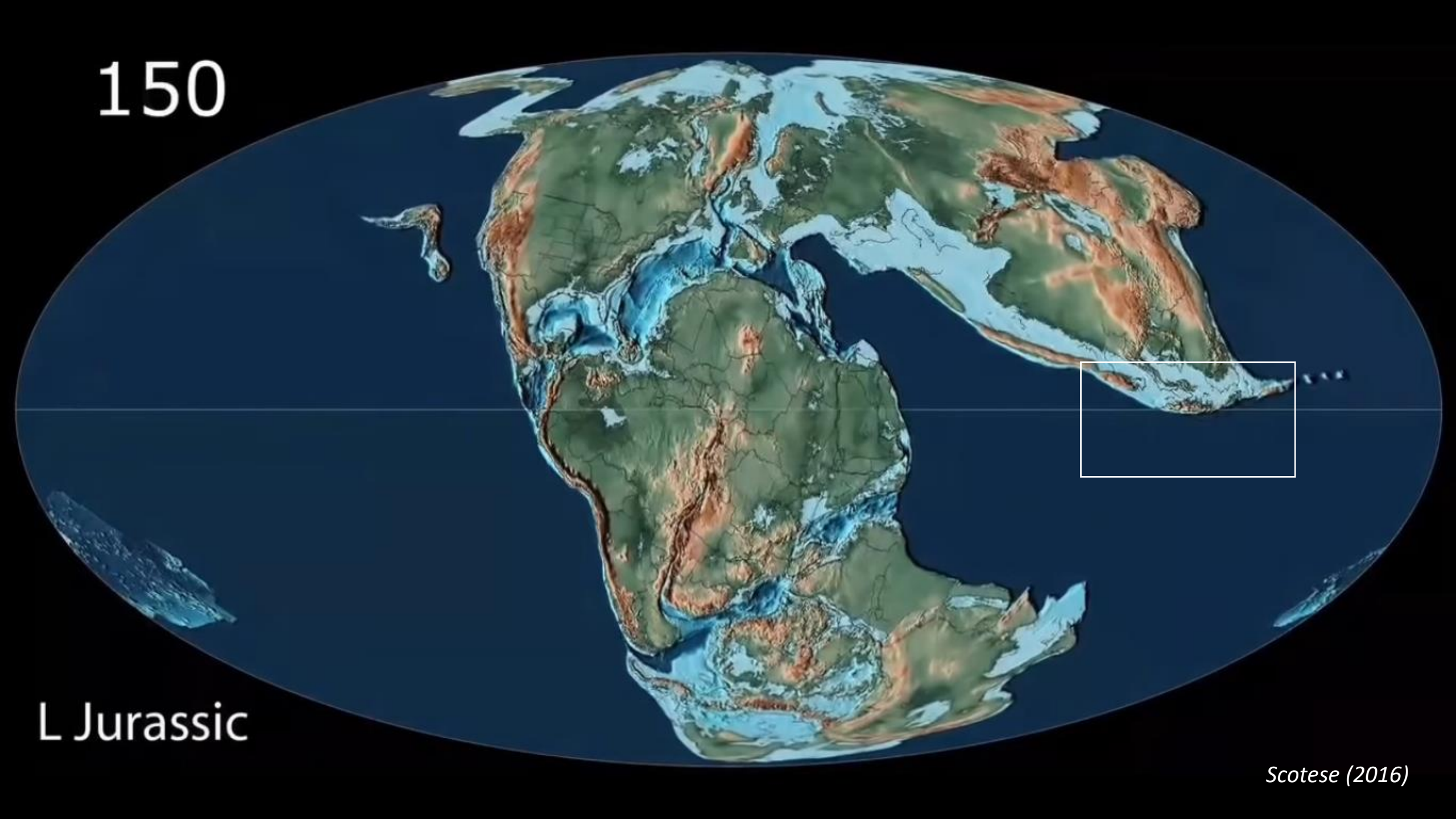
Scotese (2016)



Scotese (2016)

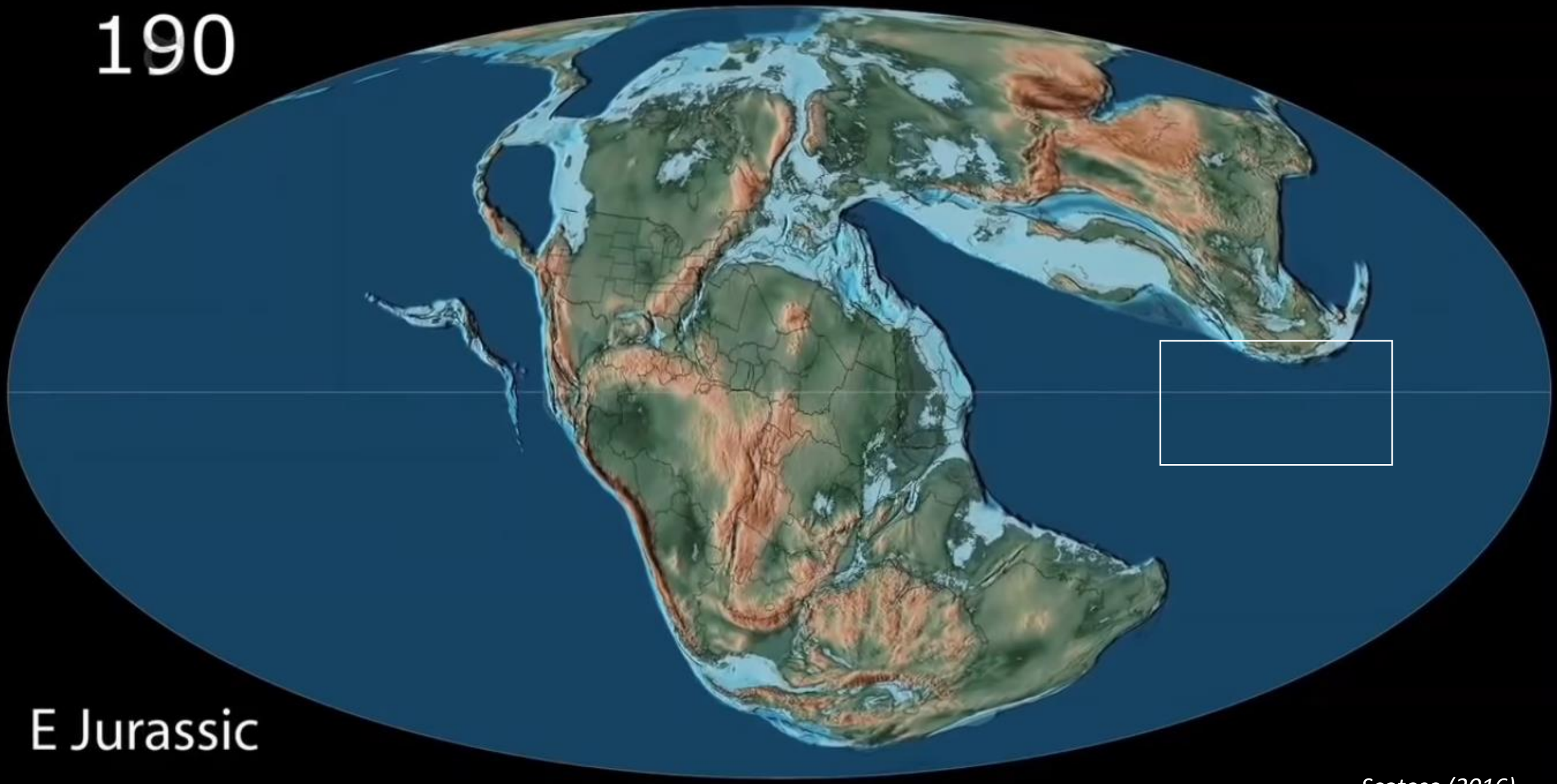


Scotese (2016)

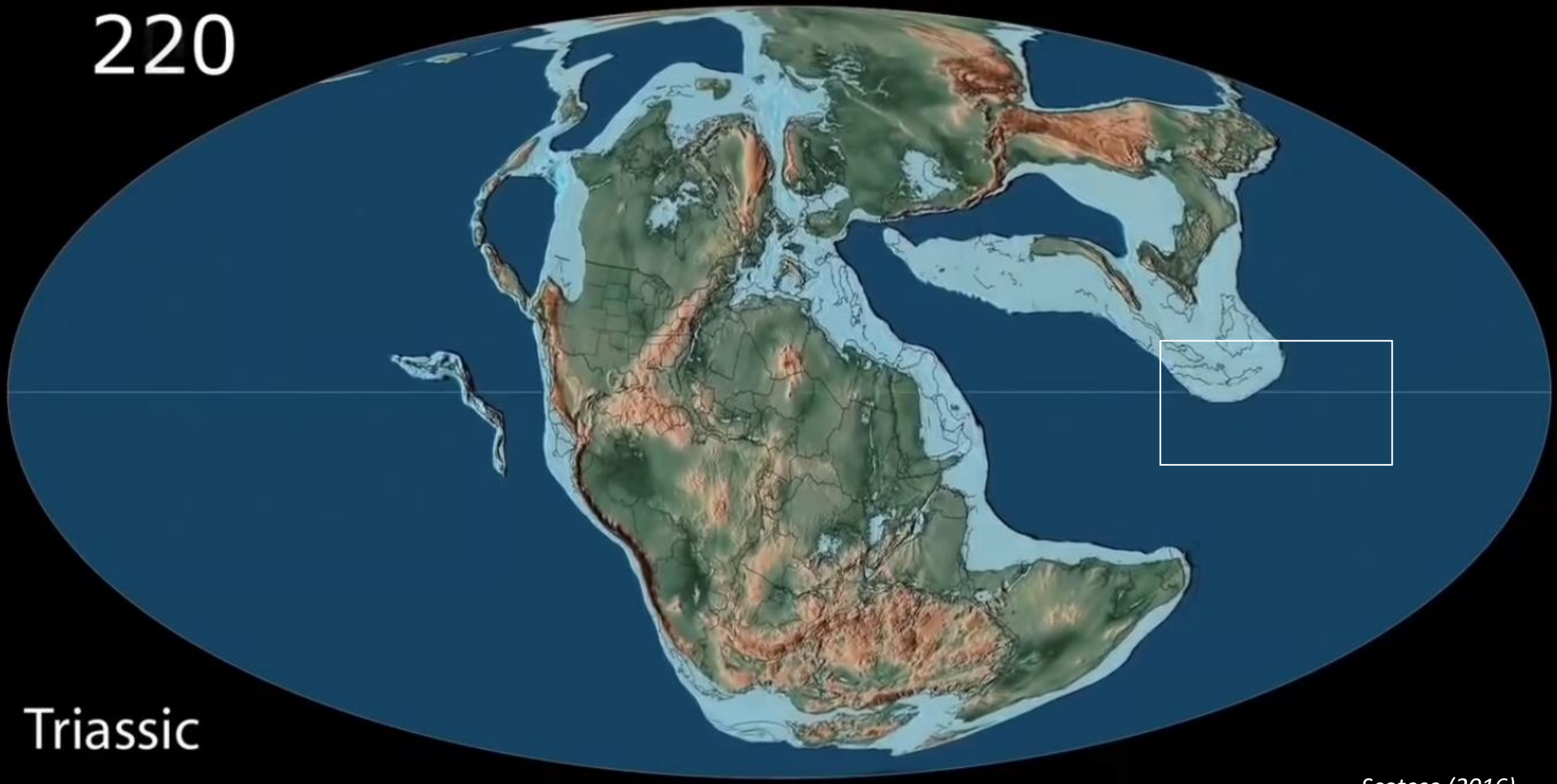


Scotese (2016)

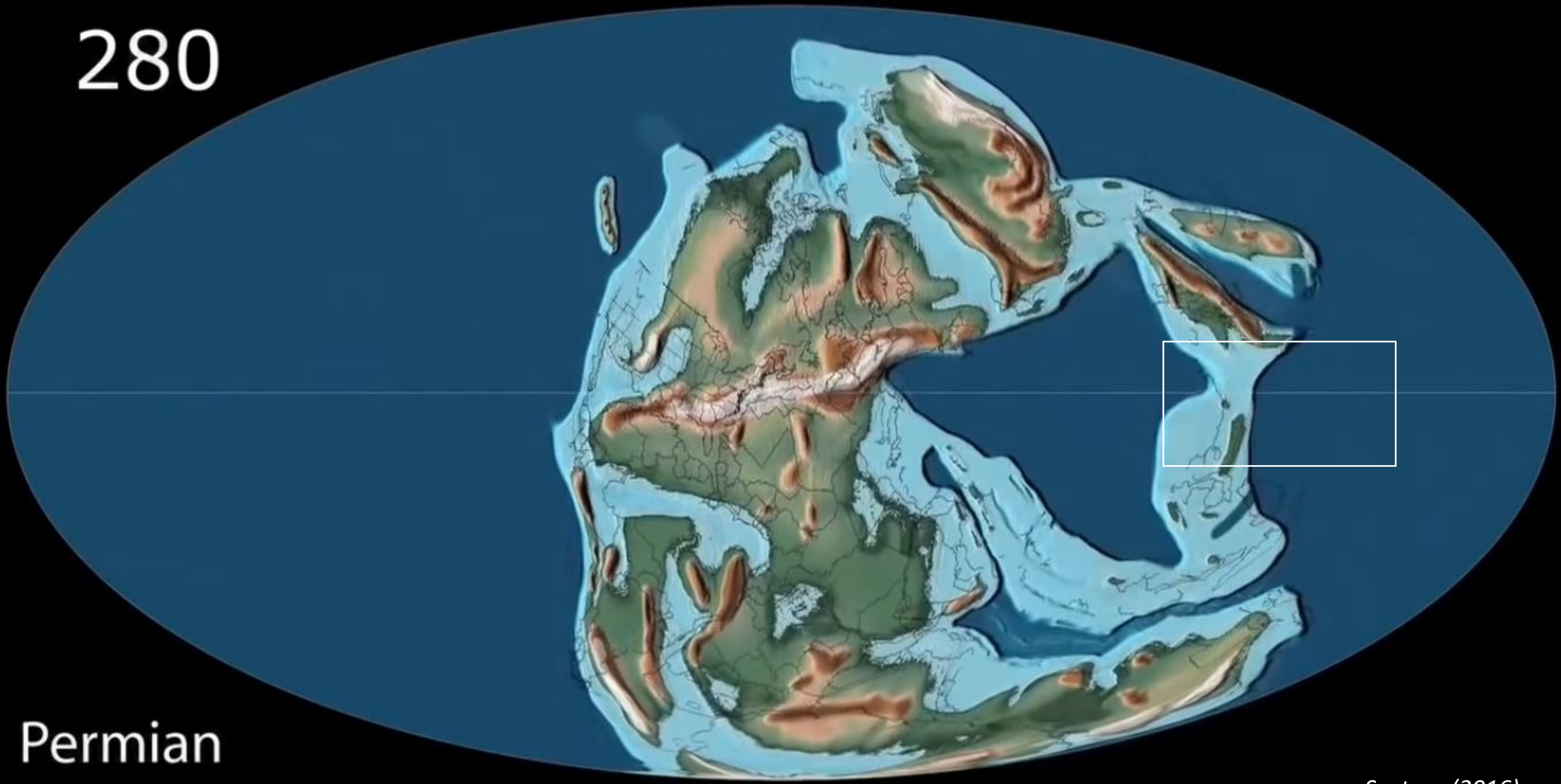
Scotese (2016)



Scotese (2016)



Scotese (2016)



Scotese (2016)

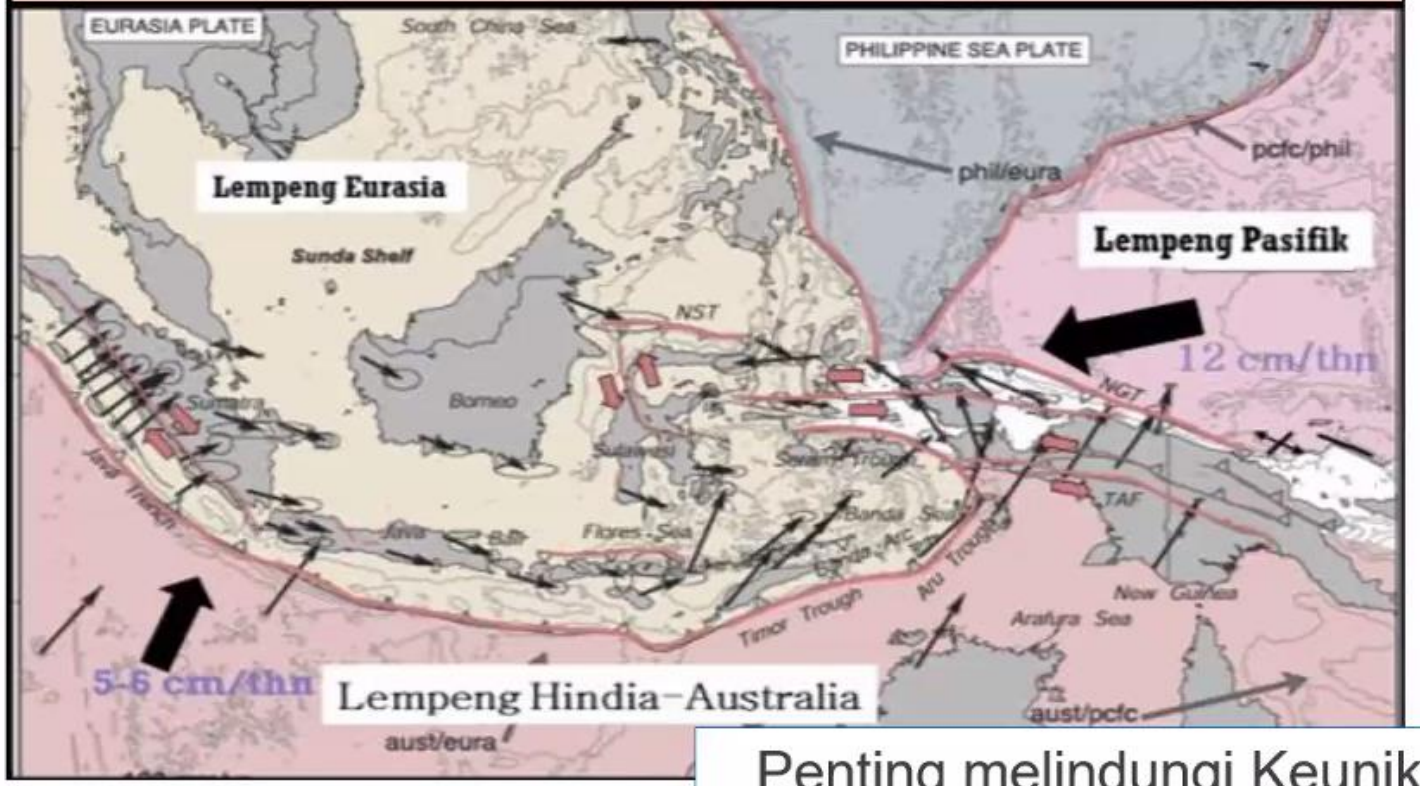
Diskusi

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

Latar Belakang

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

INDONESIA : Laboratorium Alam



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

a. **Pengembangan ilmu kebumian**
b. **Pengembangan pariwisata**

Penting melindungi Keunikan Geologi yang menjadi bukti pembentukan Planet Bumi

Penetapan KCAG adalah solusinya

Oki Oktariadi (2021)

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 dilokasi lain; dan
4. keterdapatan 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.

Aries Kusworo – Badan Geologi (2021)

Pengertian Geopark

Suatu wilayah geografis tunggal

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

Memiliki keterkaitan antara aspek geo, bio dan culture

Kegiatan Konservasi, edukasi, dan pembangunan perekonomian masyarakat

Dikelola secara berkelanjutan dengan keterlibatan aktif dari masyarakat

Menumbuhkan pemahaman dan kepedulian masyarakat terhadap bumi dan lingkungan

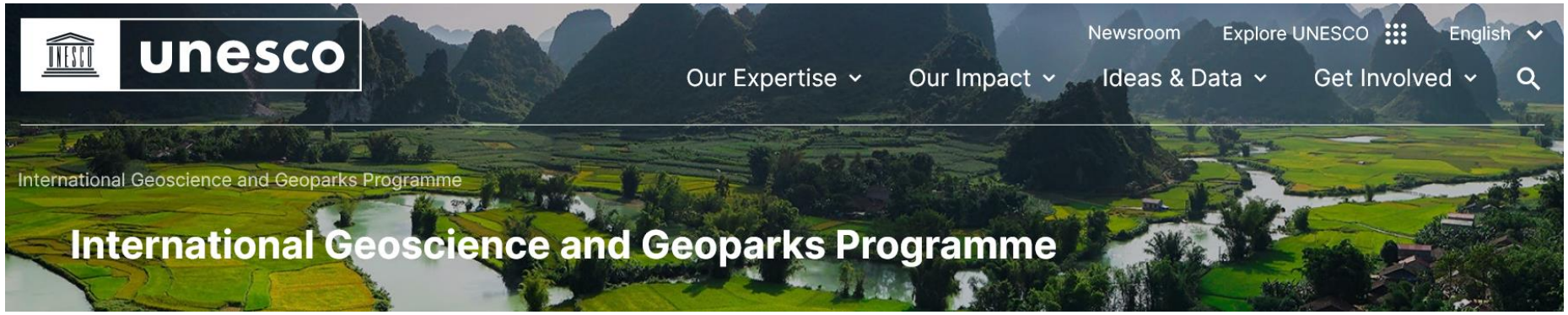
Asep Permana – Badan Geologi (2022)

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. Karangsambung-Karangbolong
6. Sawahlunto
7. Ngaraisianok-Maninjau
8. Silokek
9. Meratus



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/iggp/geoparks?hub=67817

Selamat datang Unesco Global Geopark terbaru di Indonesia

(Mei 2023).

Geopark Maros-Pangkep

Geopark Raja Ampat

Geopark Ijen

Geopark Merangin Jambi

Diskusi

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

Potensi Warisan Geologi (KESDM, 2019)

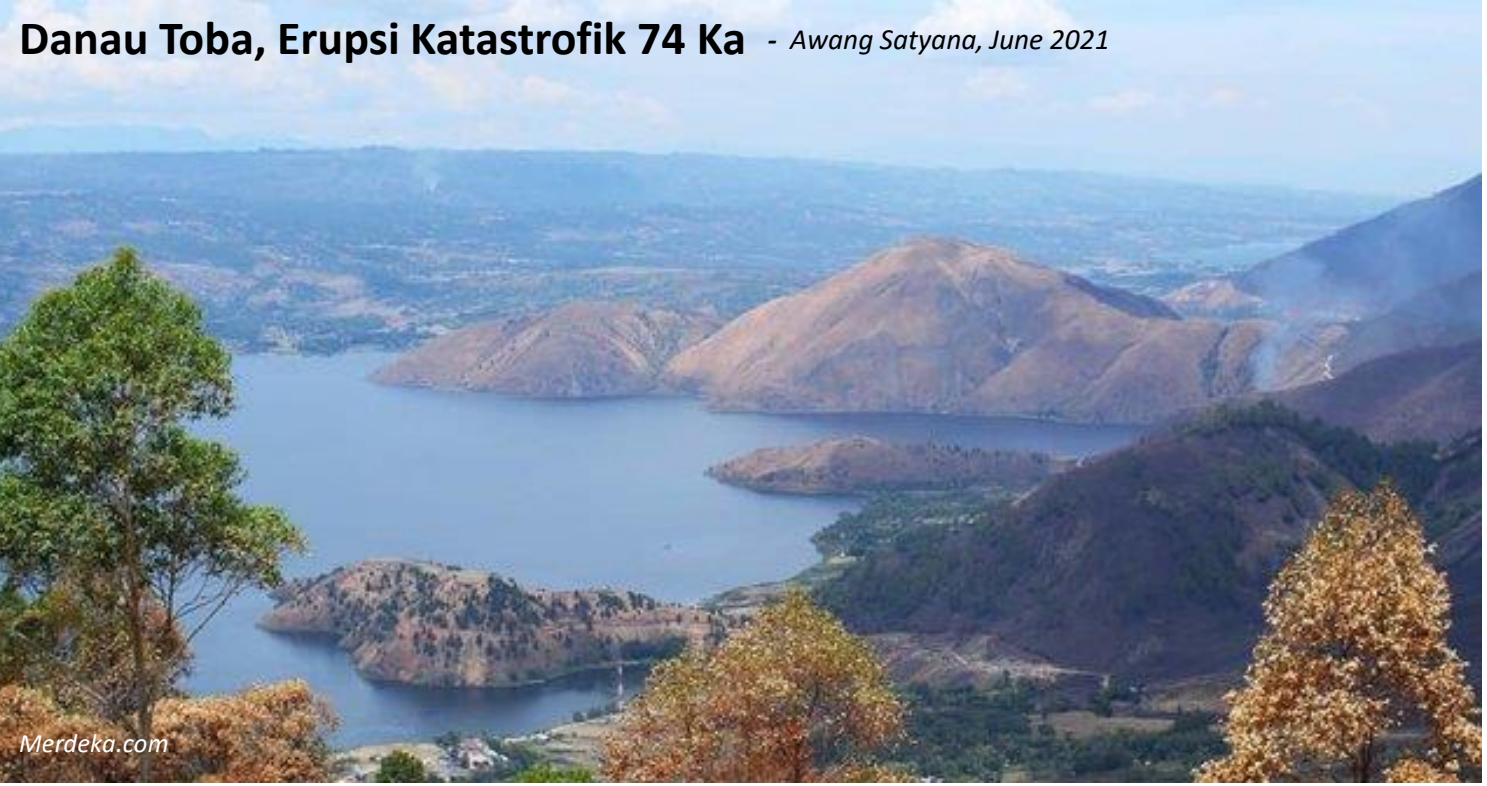
Newsweek (Des. 2005)

Tsunami Aceh, 26 Des. 2004

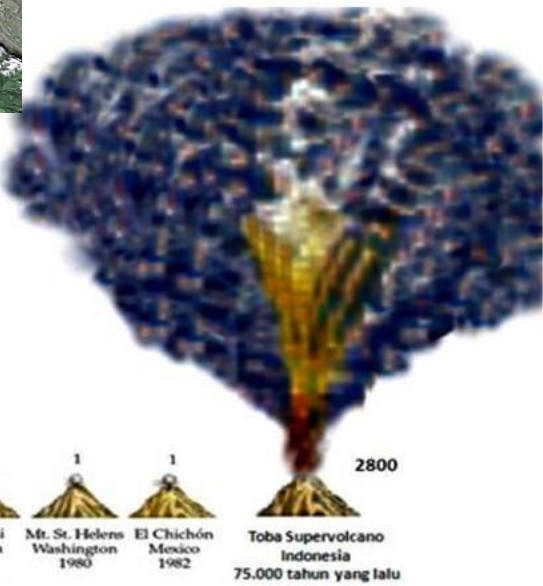
- Awang Satyana, June 2021

Liputan 6

Danau Toba, Erupsi Katastrofik 74 Ka - *Awang Satyana, June 2021*



Bowen (2012)



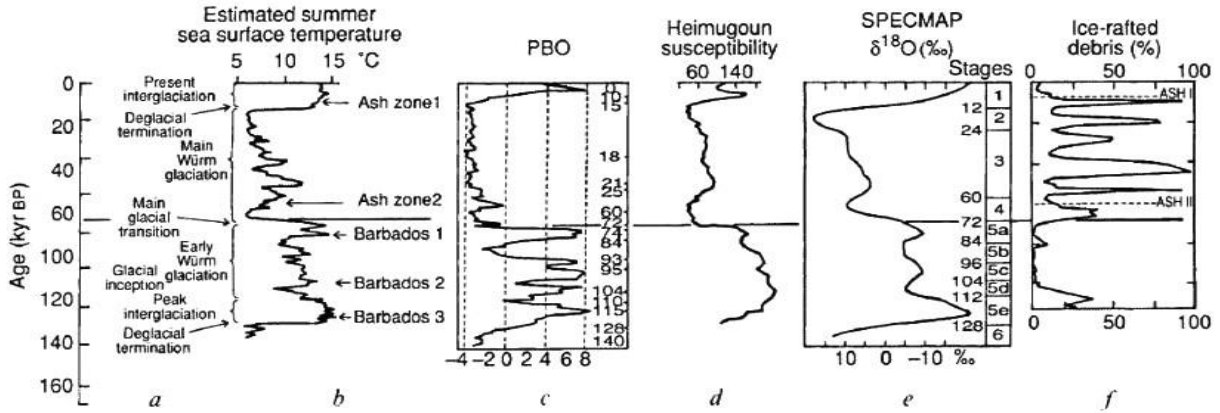
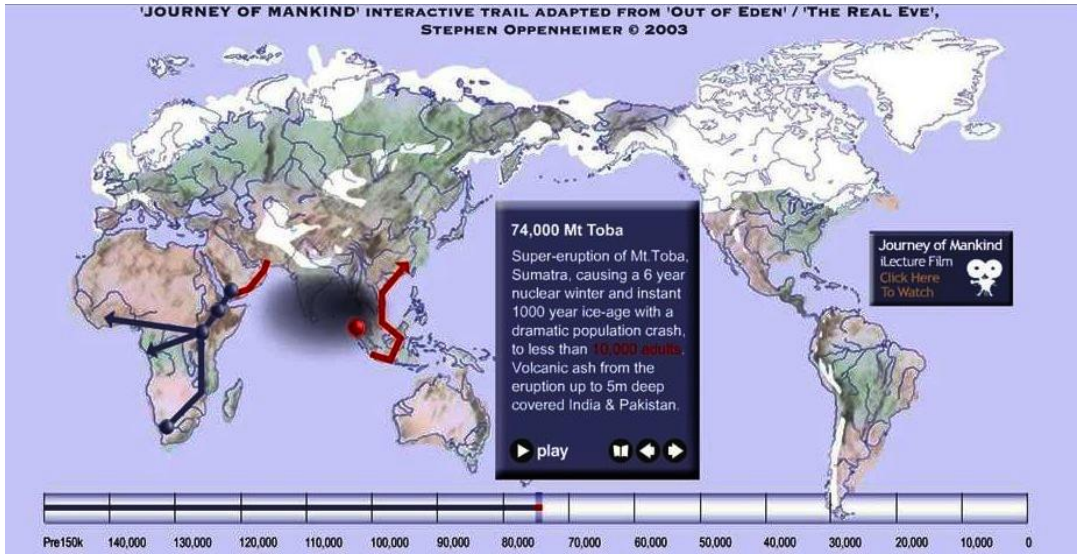


FIG. 1 Climate indicators for the past 140 kyr. *a*, Climatic states[33]. *b*, Reconstructed summer SST (planktonic foraminiferal assemblage data), deep-sea core V23-82, North Atlantic[15]. Dates: Ash Zone 1 (9.5 kyr), Ash Zone 2 (65 kyr), Barbados 1 Terrace (~85 kyr), Barbados 2 (~110 kyr) and Barbados 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 nonlinear[45]. *d*, Magnetic susceptibility, Heimuguon loess section, Central China. Loess in palaeosols formed in warm intervals has higher susceptibility than loess deposited in cold intervals[46]. *e*, SPECMAP $\delta^{18}O$ scale. Stages and dates of boundaries shown at right[3]. $\delta^{18}O = [(^{18}O/^{16}O)_{sample}/(^{18}O/^{16}O)_{standard}] - 1$, where standard is PDB (cretaceous belemnite carbonate). *f*, Percentage of ice-rafted detritus in North Atlantic deep-sea core Me69-17. Depth in metres[14].

Rampino & Self (1992)



Oppenheimer (2003)

Pulau Natuna

- Awang Satyana, June 2021

Tempo.co

Kastara.id

minanews.net

tagar.id

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

foto: Johannes Karundeng

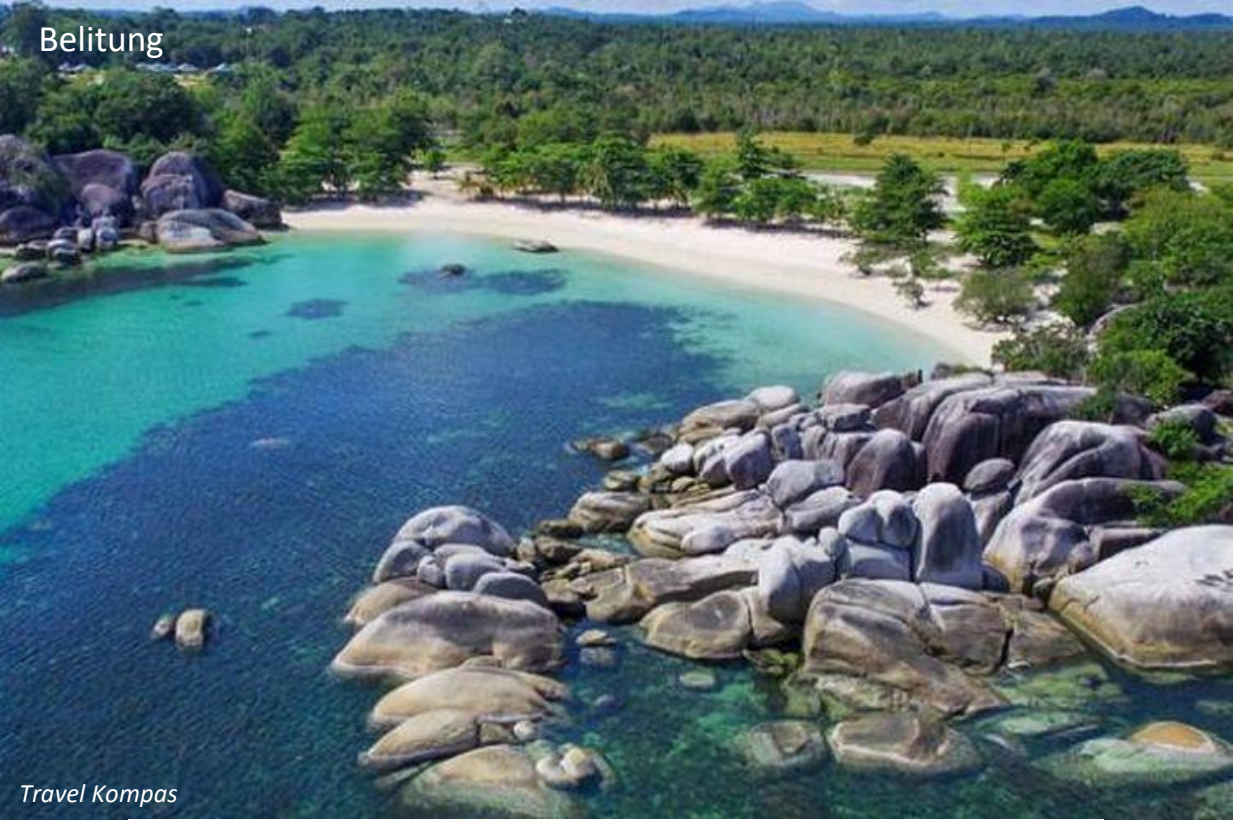

Granit Natuna (100-70 juta tahun)
foto: Johannes Karundeng

Topografi Sesar Sumatra - *Awang Satyana, June 2021*

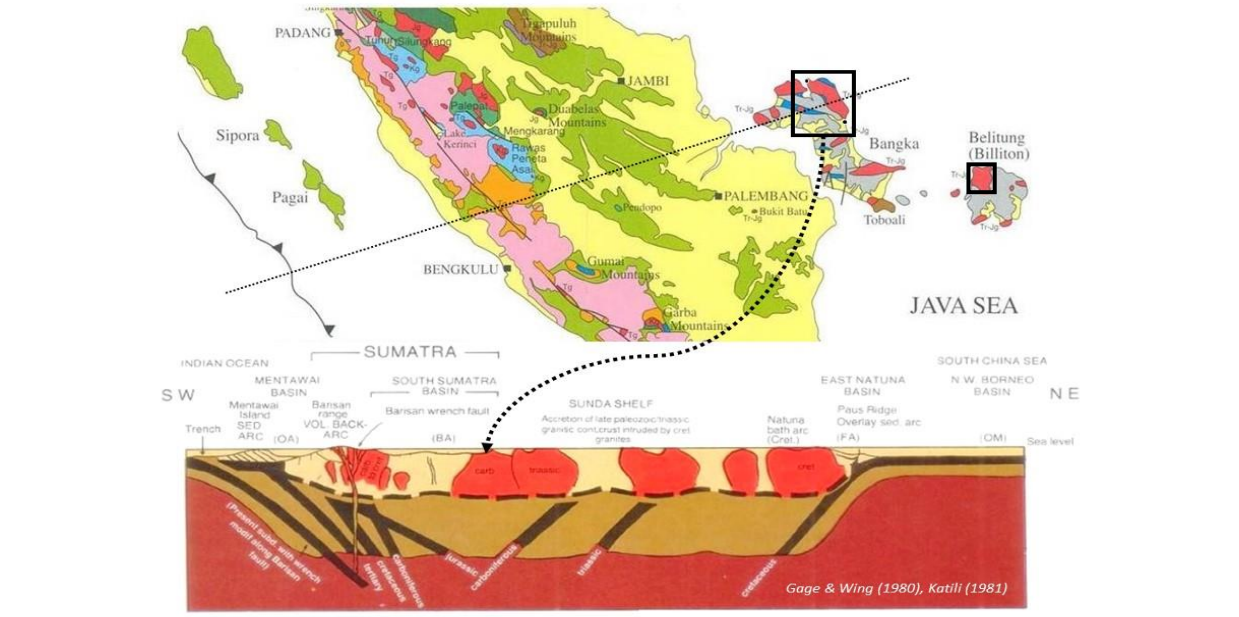
Merangin Jambi, fosil flora 300-275 Ma

- Awang Satyana, June 2021

Belitung



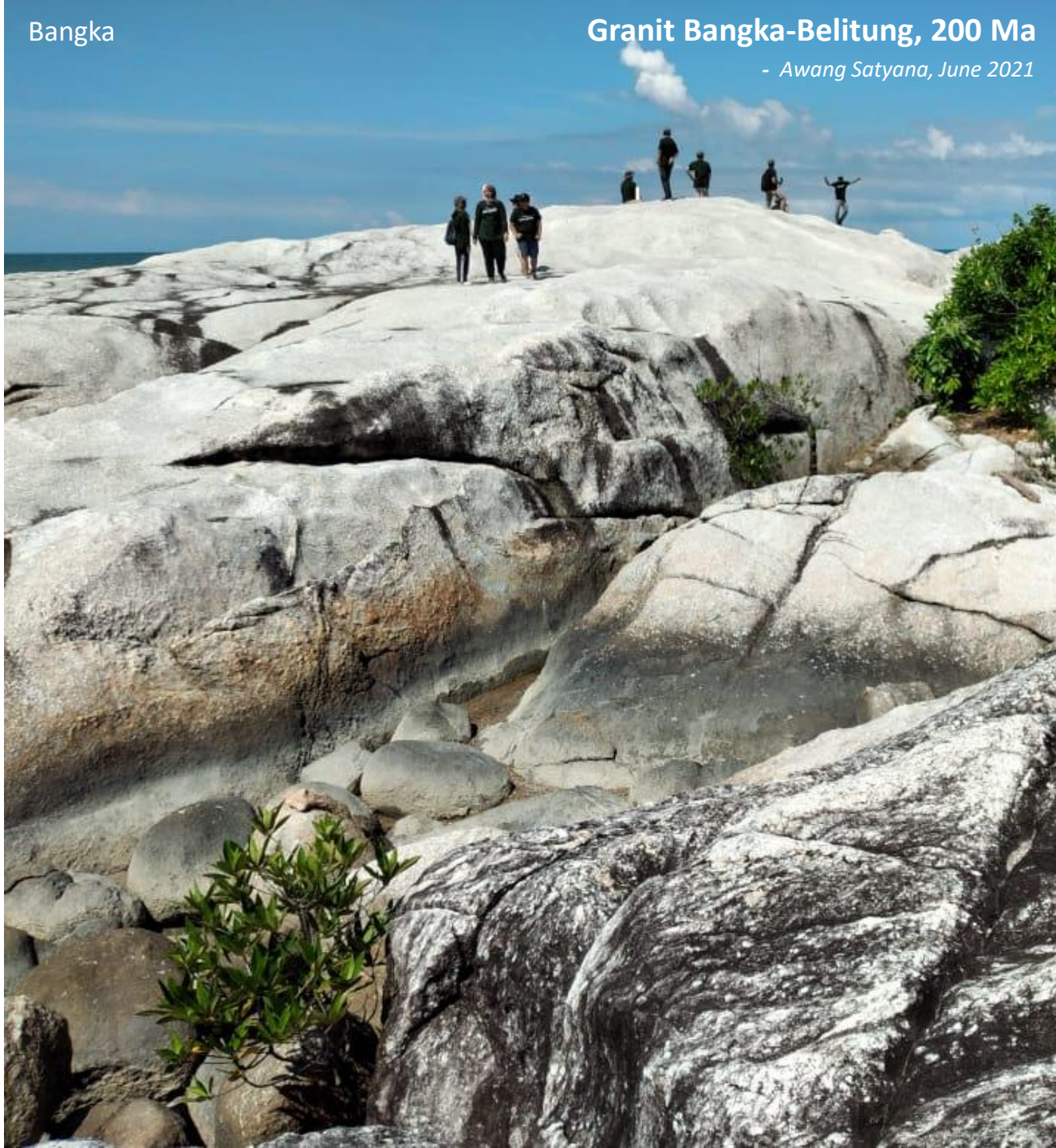
Travel Kompas



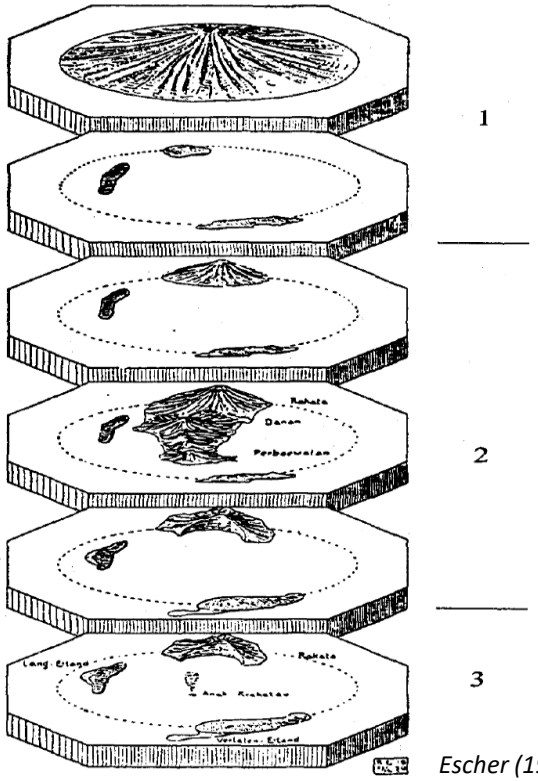
Bangka

Granit Bangka-Belitung, 200 Ma

- Awang Satyana, June 2021

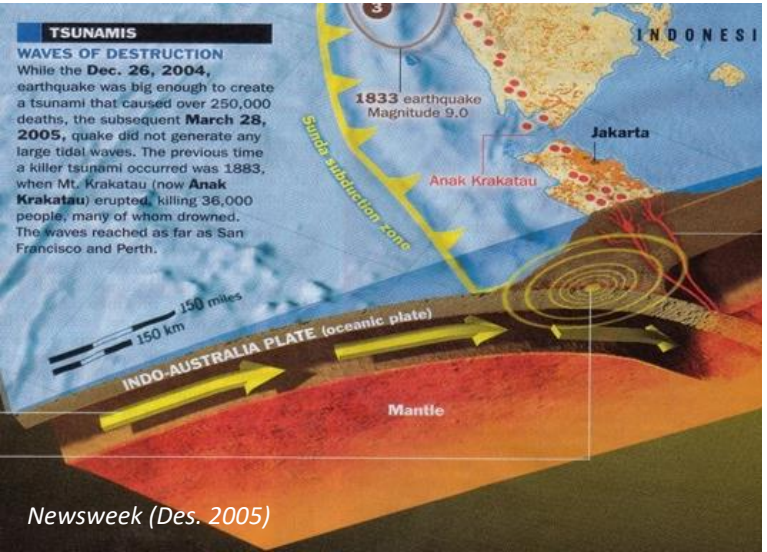


Gn. Krakatau - *Awang Satyana, June 2021*



Escher (1919, 1948)

Ferry Yustiana

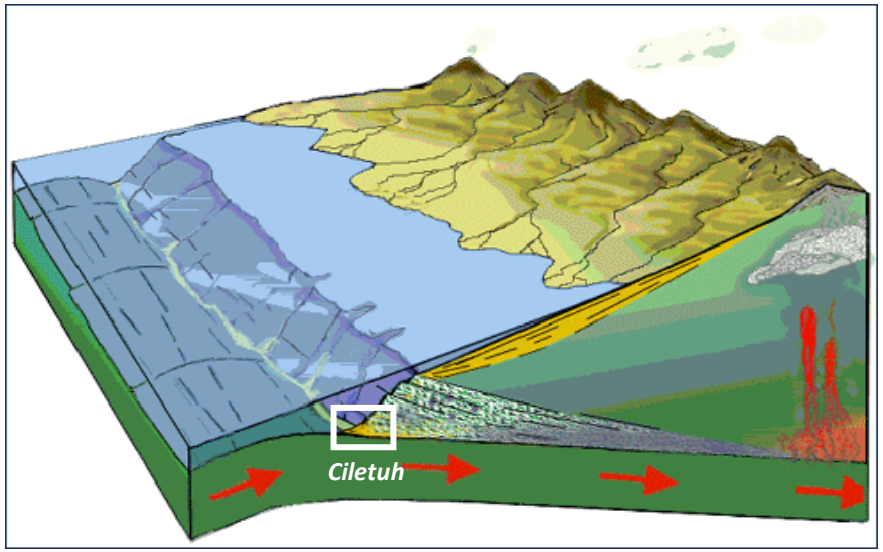


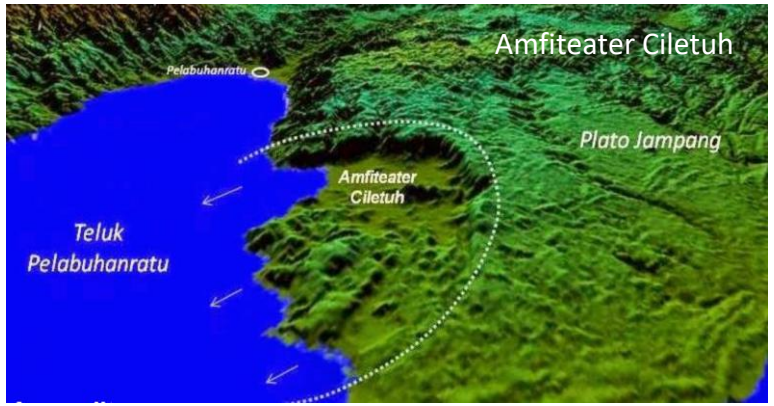
Newsweek (Des. 2005)

Ferry Yustiana

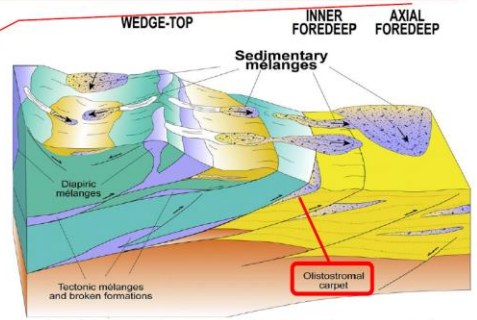
Kompleks Subduksi Purba Ciletuh, Sukabumi

- Awang Satyana, June 2021

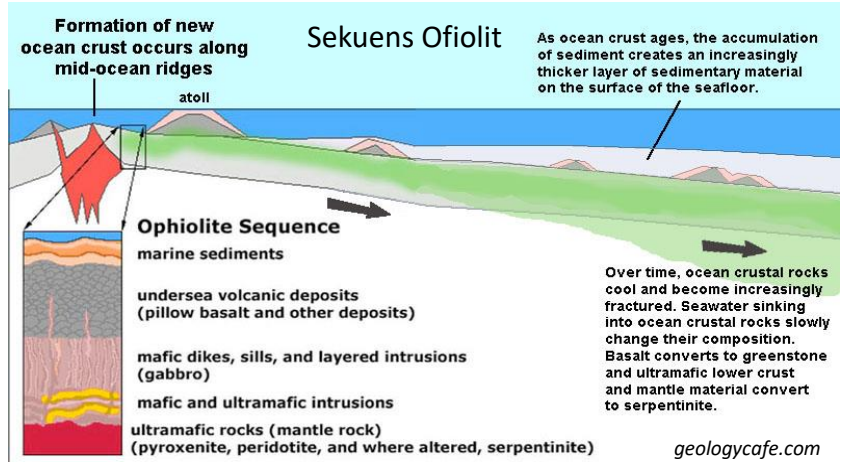




Amfiteater Ciletuh



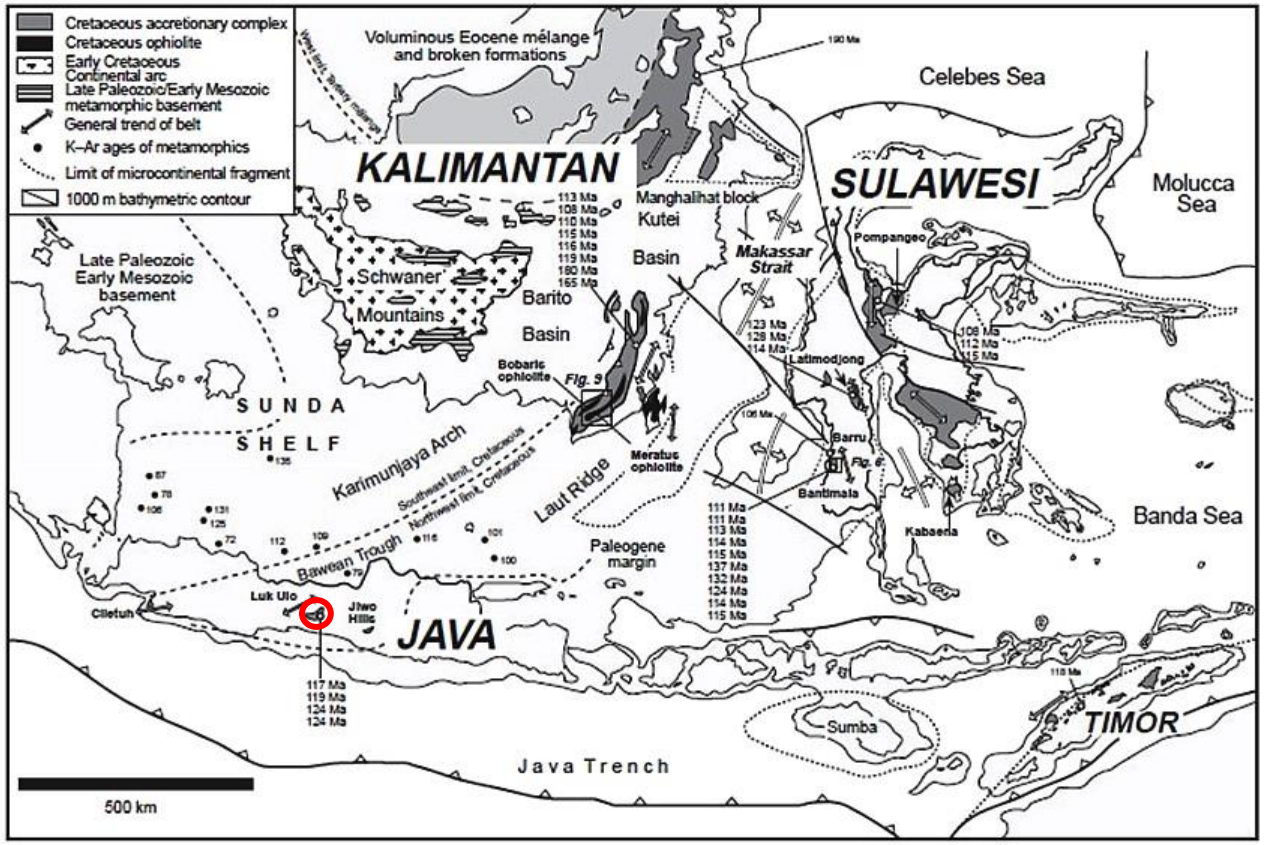
An olistostrome is a sedimentary deposit composed of a chaotic mass of heterogeneous material, such as blocks and mud, known as olistoliths, that accumulates as a semifluid body by submarine gravity sliding or slumping of the unconsolidated sediments. (WIKIPEDIA)

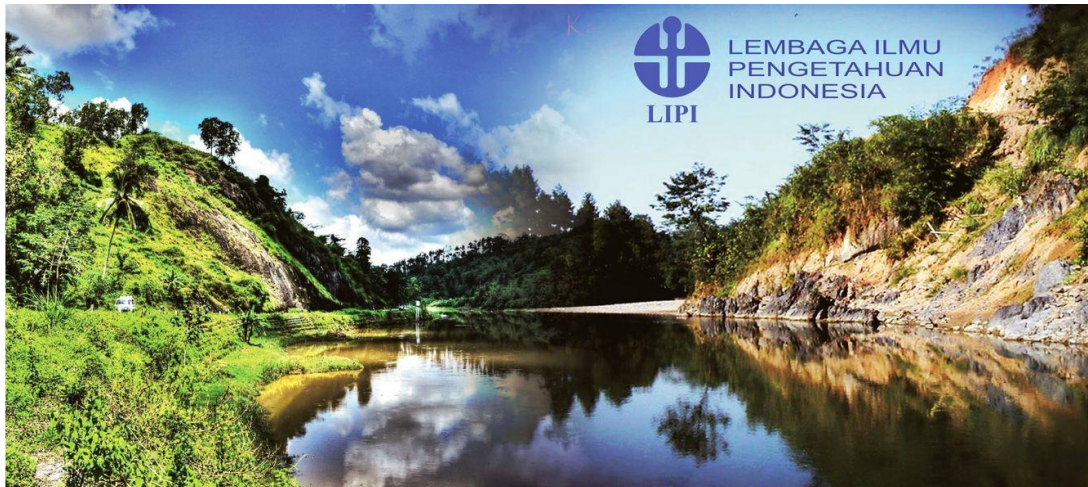


Geotrek Indonesia

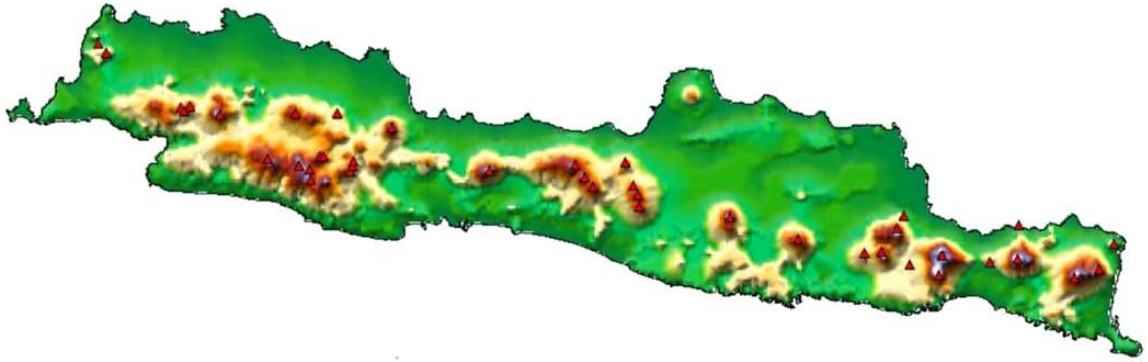
Kompleks Subduksi Kapur Bawah Luk Ulo/Karangsambung

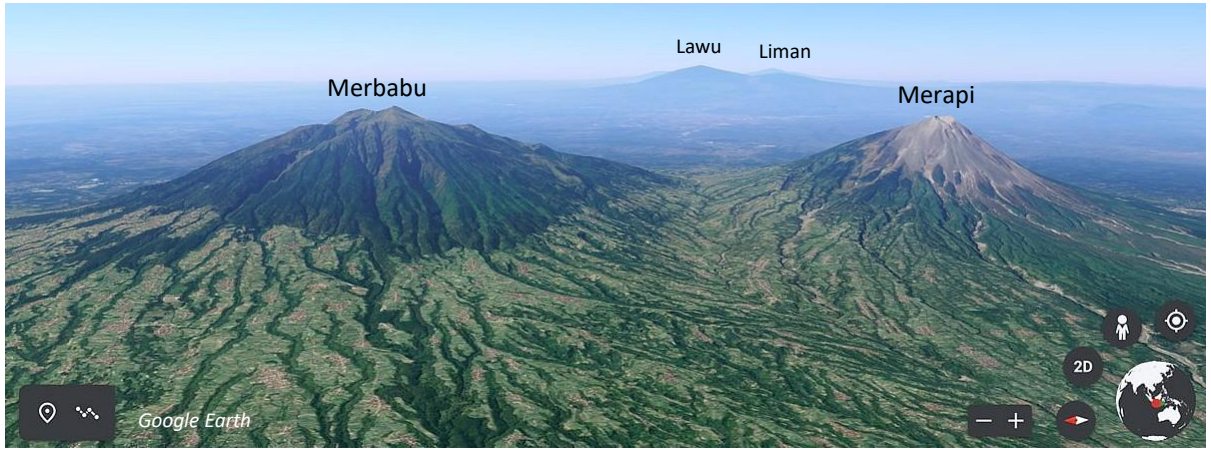
- Awang Satyana, June 2021

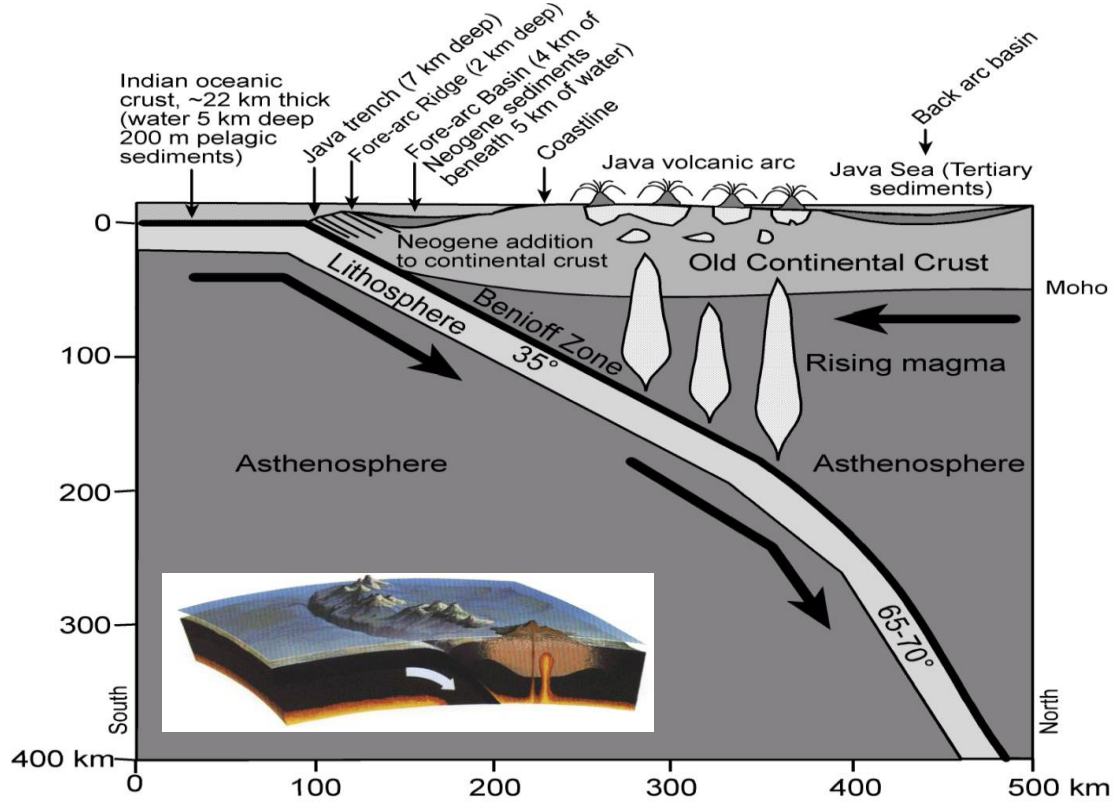




Jalur Gunungapi Kuarter Jawa - *Awang Satyana, June 2021*

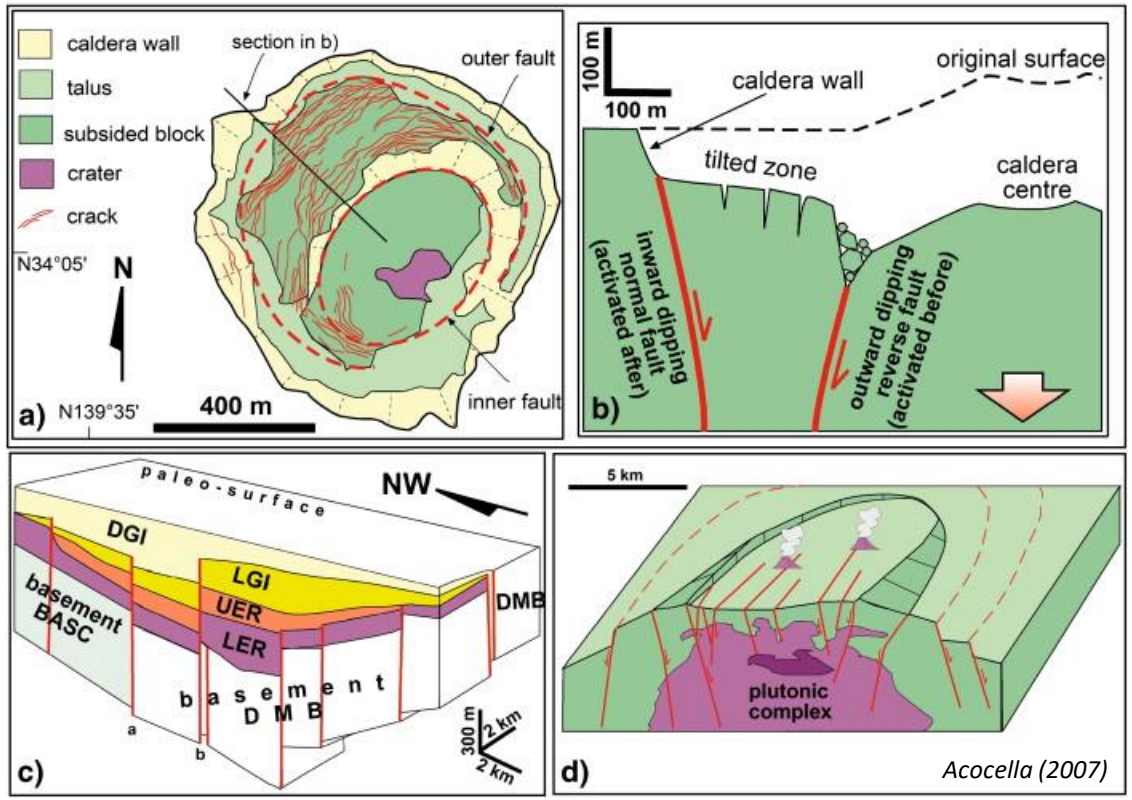




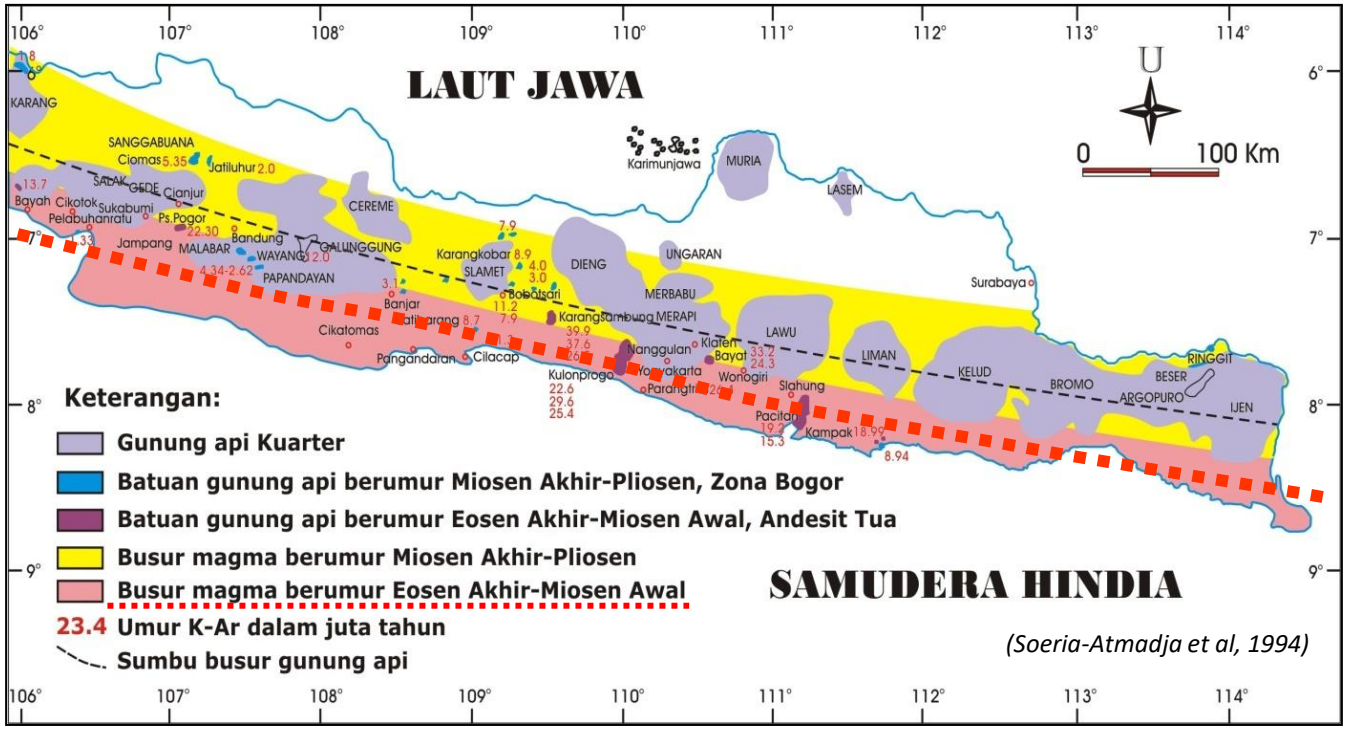


A generalised cross section depicting the relationship of the tectonic and magmatic zones to the Benioff Zone in central Java along the 111° meridian (adapted from Hatherton and Dickinson, 1969; Katili, 1972; 1975; Hamilton, 1973; 1979; Tjia, 1978; Hutchison, 1989; SEATAR, 1981; Koesoemadinata *et al.*,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

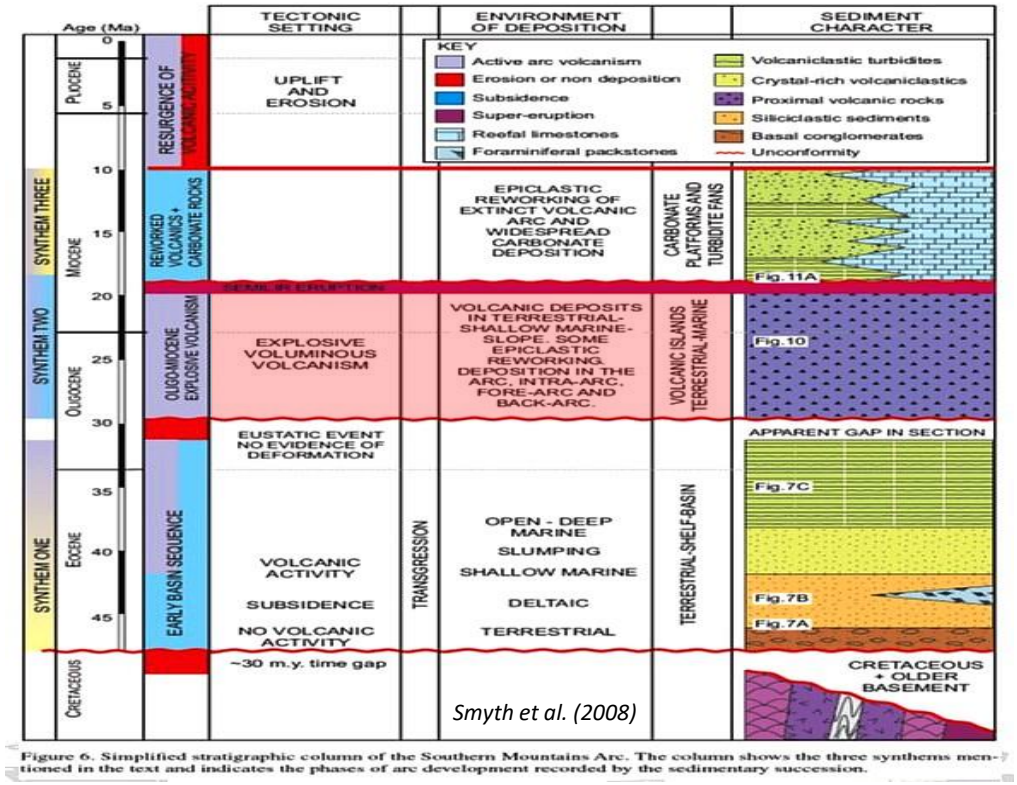
Kaldera Bromo-Tengger - *Awang Satyana, June 2021*



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



(Soeria-Atmadja et al, 1994)

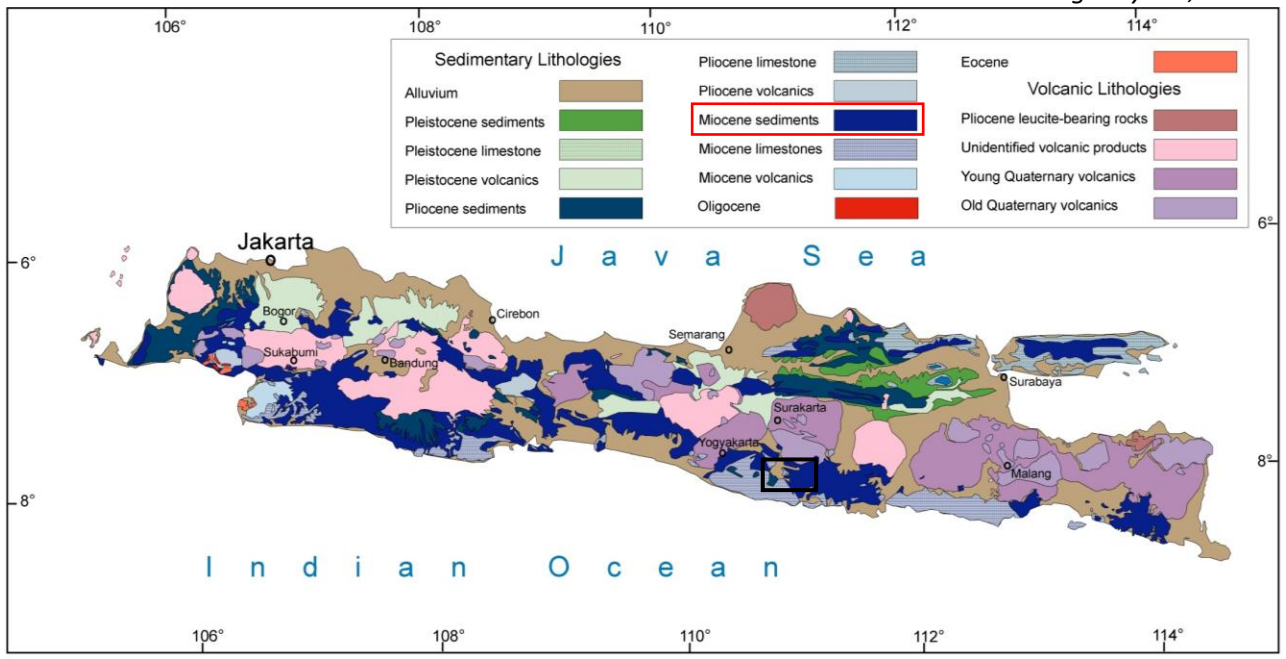


Smyth et al. (2008)

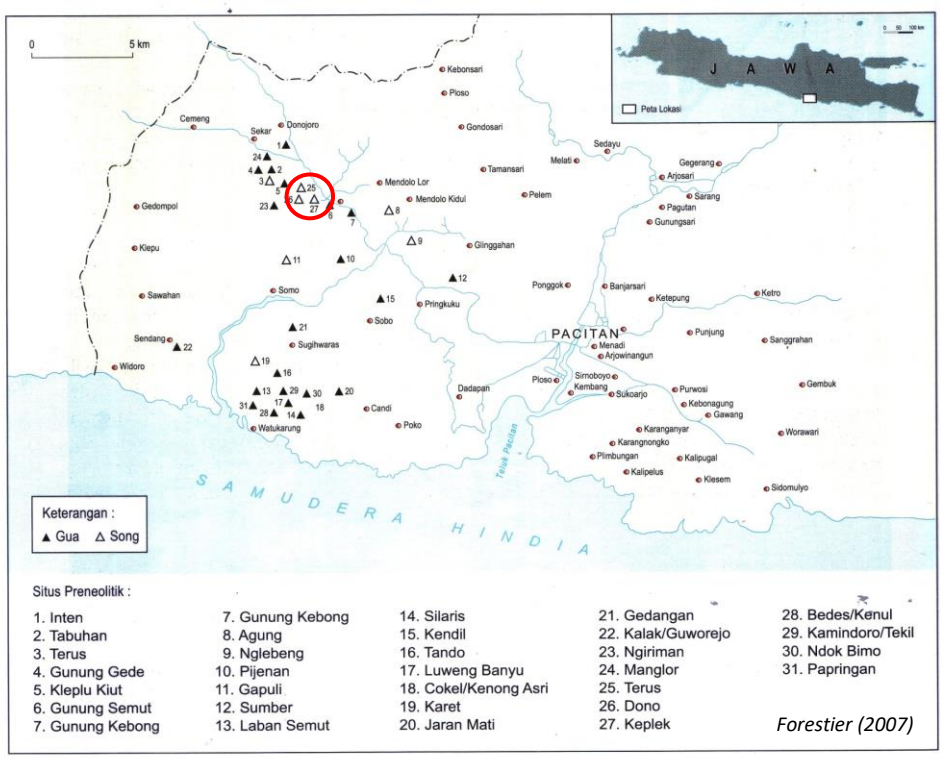
Figure 6. Simplified stratigraphic column of the Southern Mountains Arc. The column shows the three synthems mentioned in the text and indicates the phases of arc development recorded by the sedimentary succession.

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).

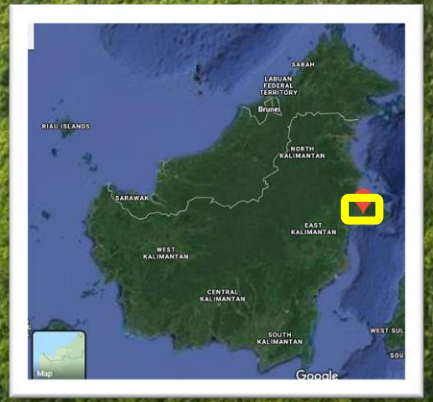


Forestier (2007)

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

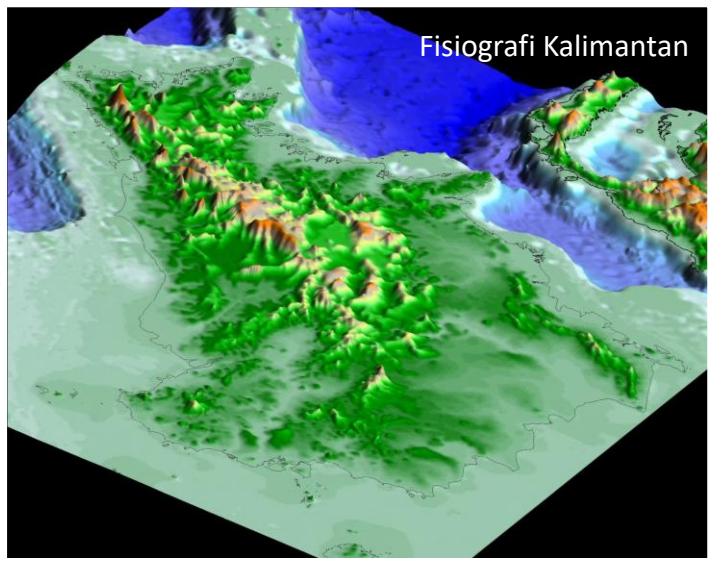
- Umur gambar cadas: 40 ribu tahun yl.
- Mengindikasi aktivitas masyarakat purba.
- Jenjang perubahan iklim:
  1. Iklim benua: ketika paparan Sunda masih daratan (40.000-21.000 SM),
  2. iklim sabana tropis dan kepulauan (12.000- 7.000 SM),
  3. Iklim hutan hujan tropis (1.000 SM).
- Secara korelatif,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

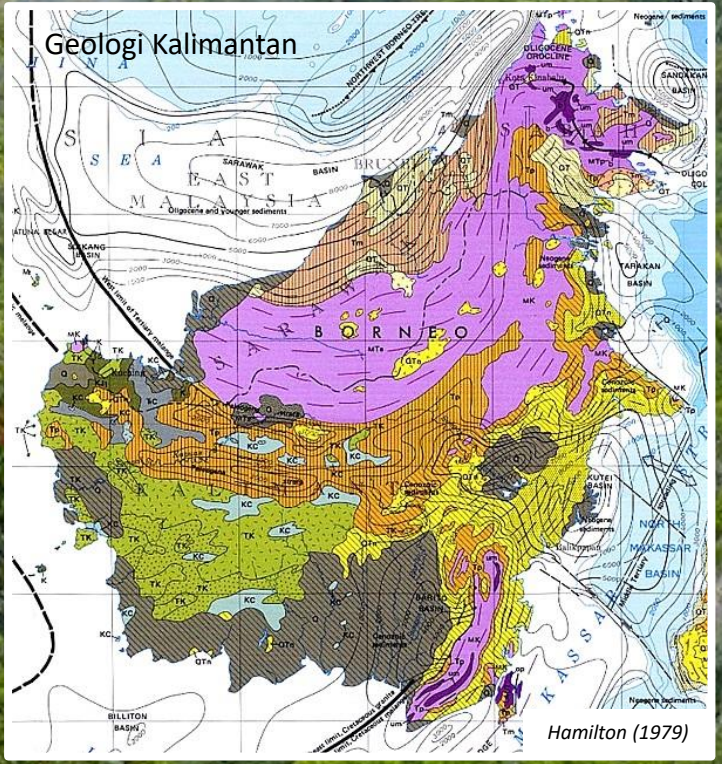
Alam (2020)

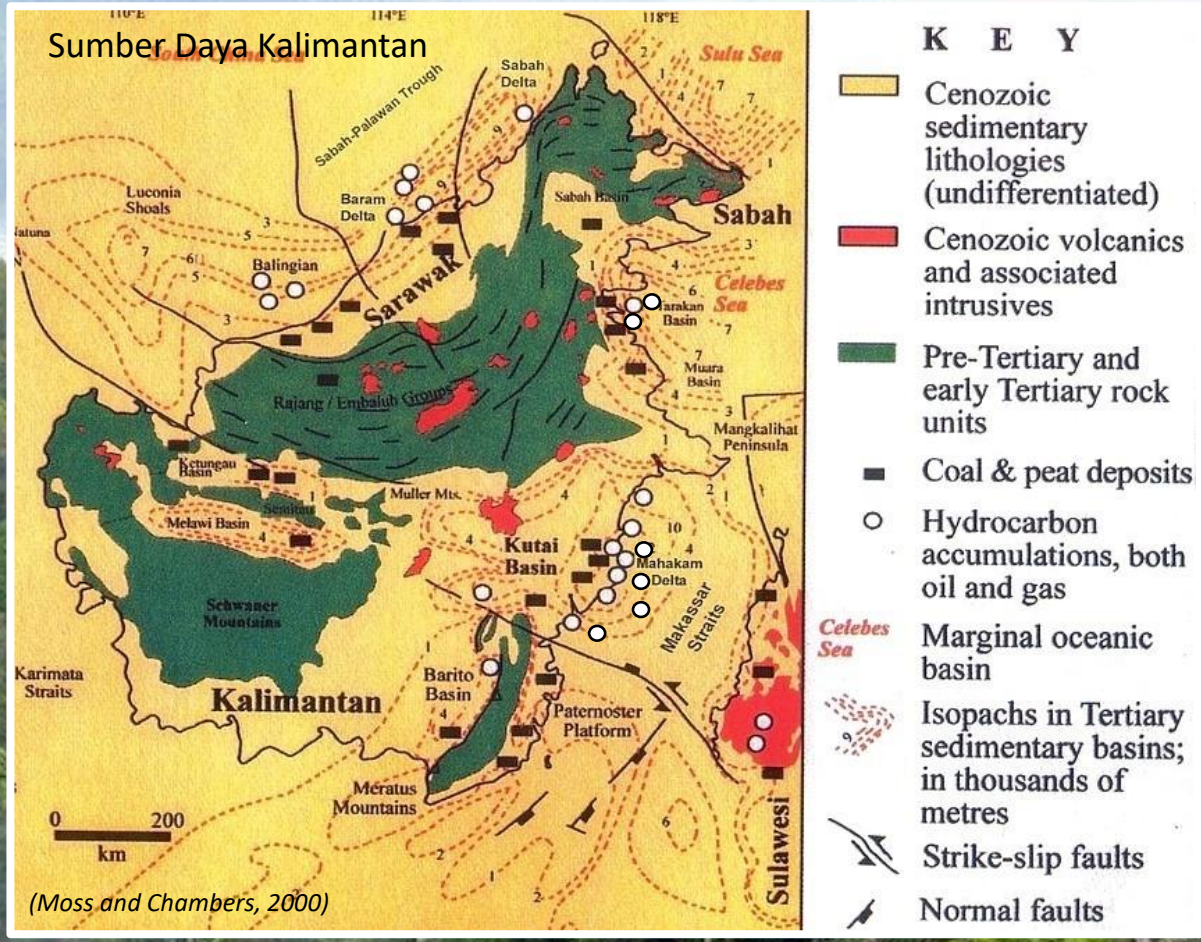


Prabowo (2020)

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

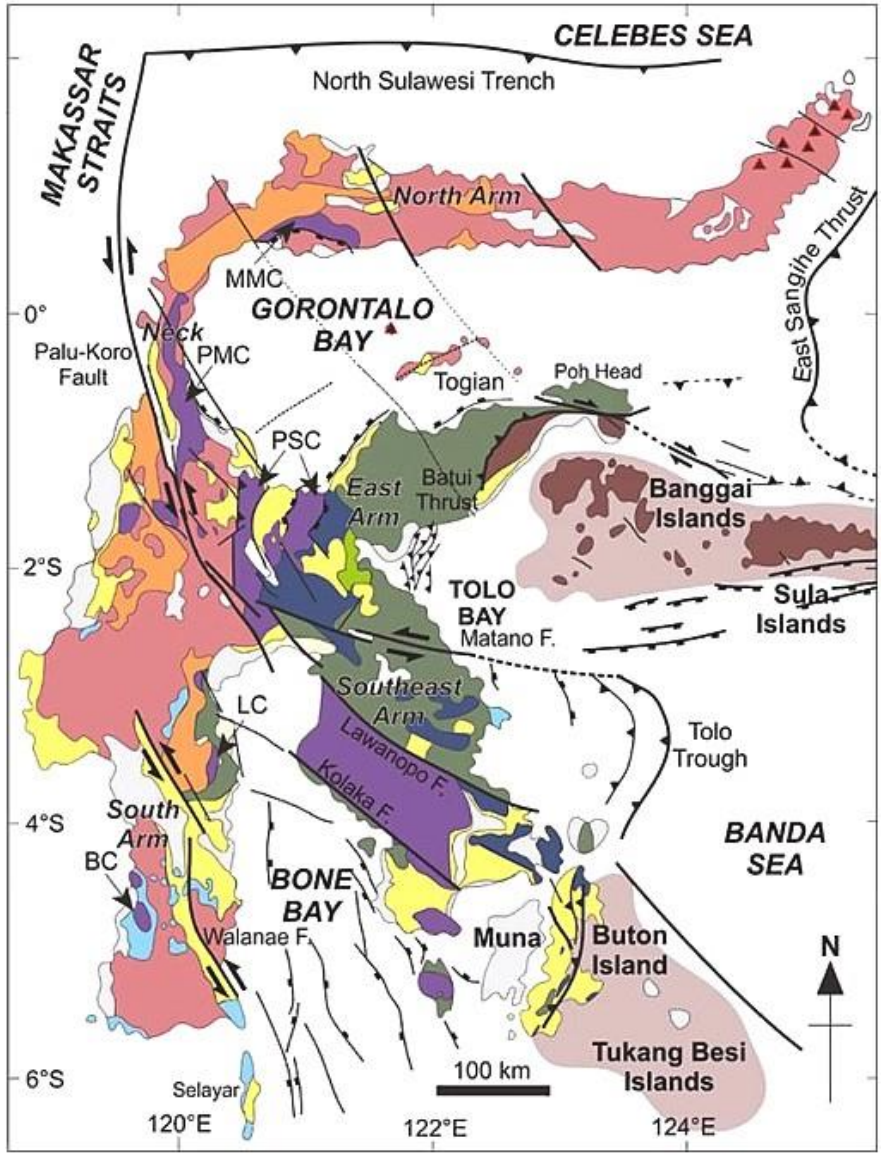


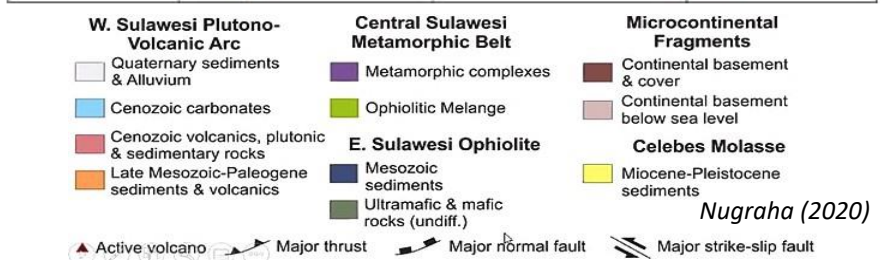




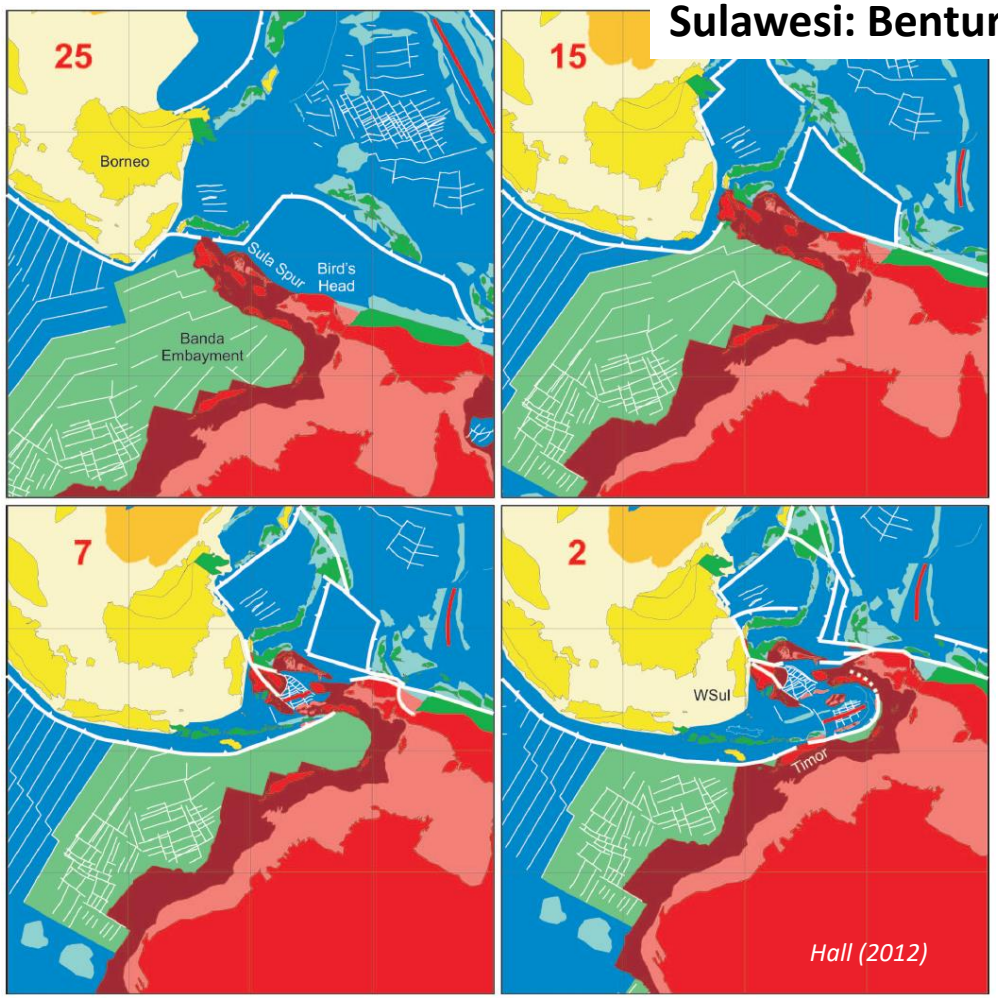
Sulawesi: Benturan *Sundaland* vs. *Australian*

- *Awang Satyana, June 2021*

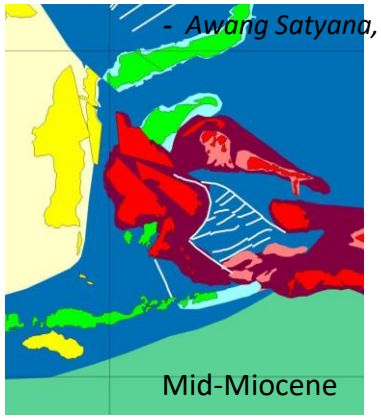


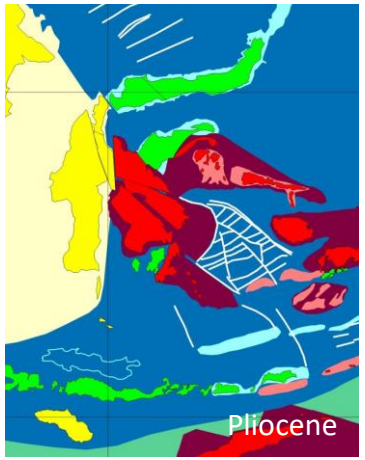


Nugraha (2020)

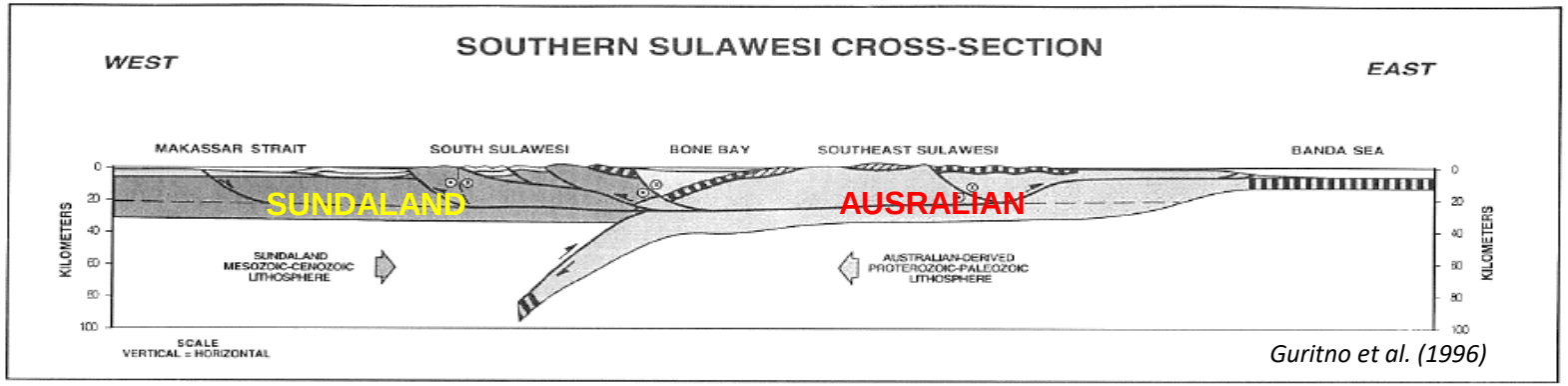


Hall (2012)





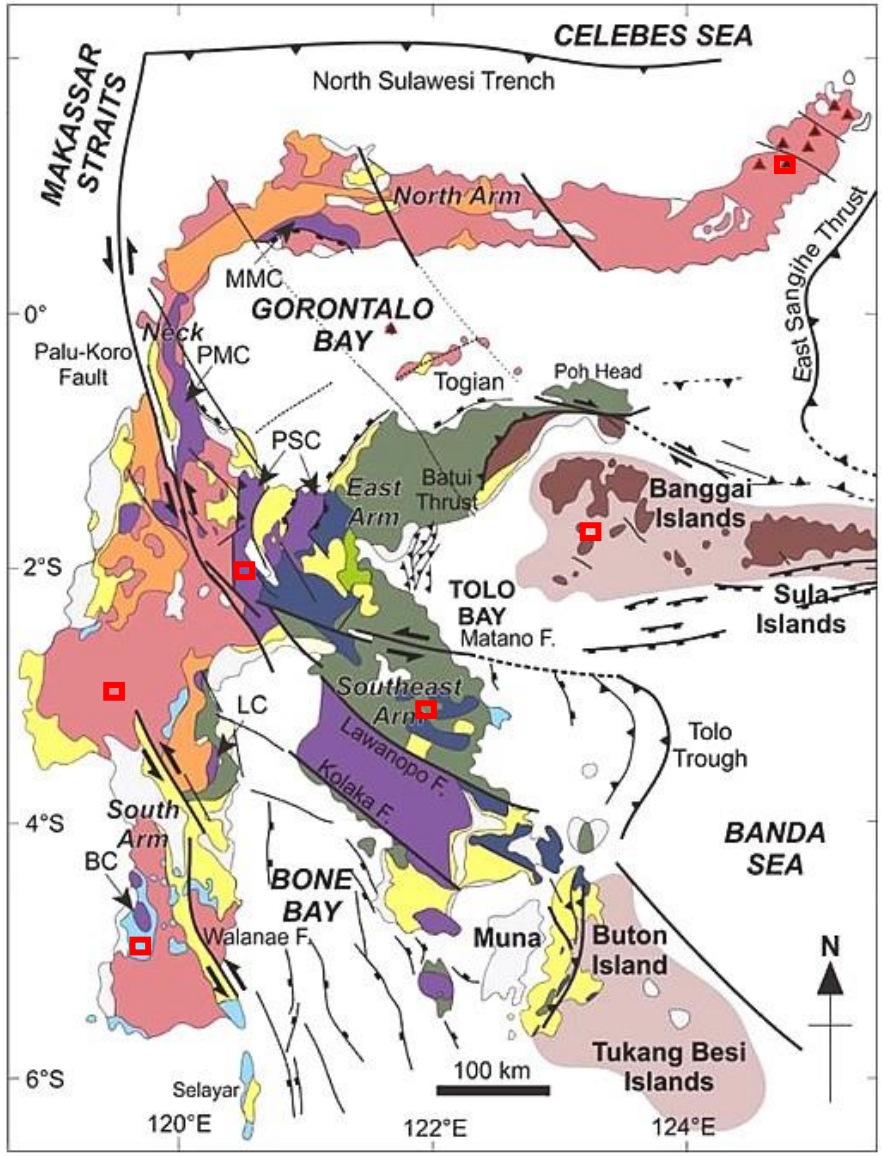
Hall (2014)



Guritno et al. (1996)

Sulawesi: Aneka Topografi dan Batuan

- Awang Satyana, June 2021



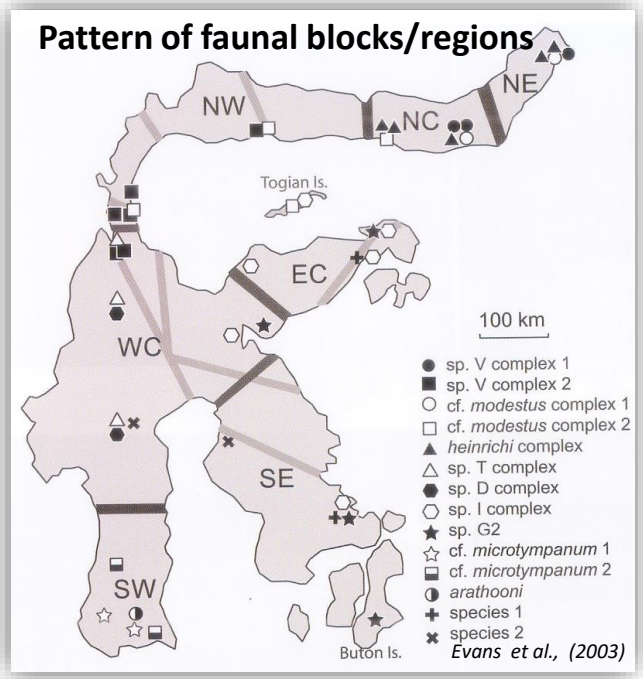
Nugraha (2020)

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

Pattern of faunal blocks/regions

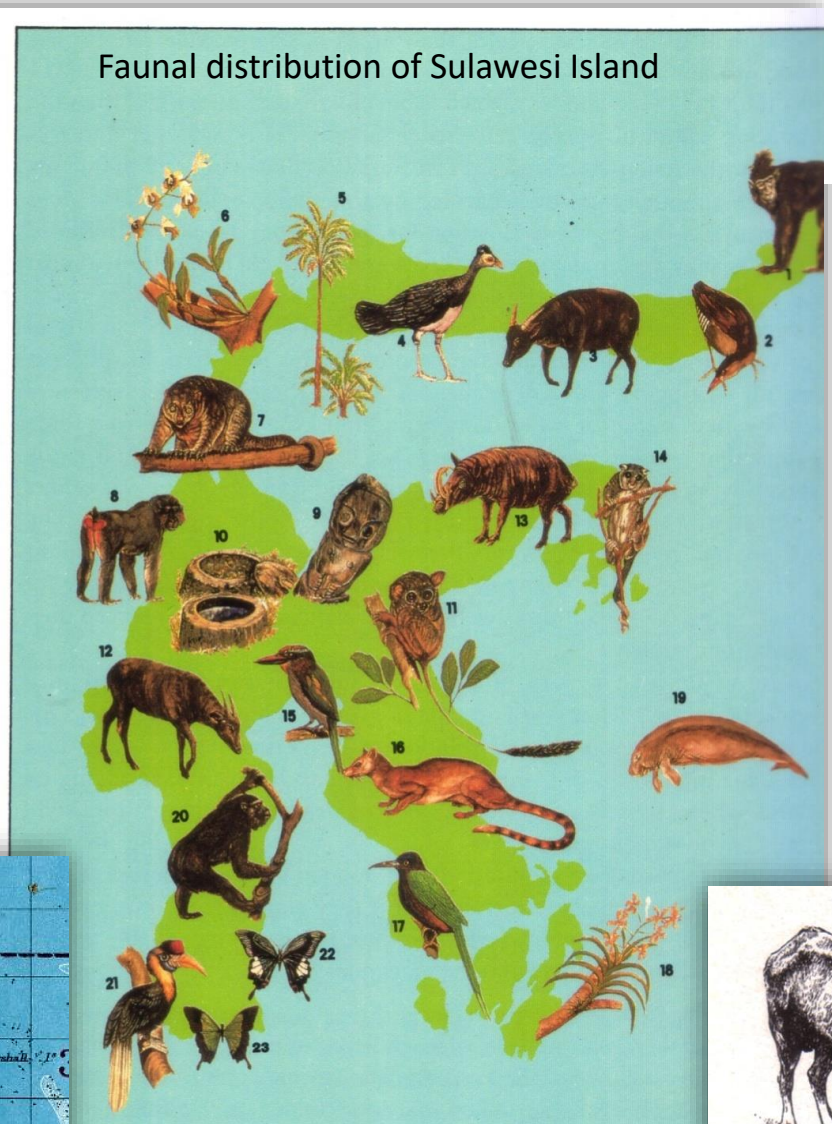


Evans et al., (2003)

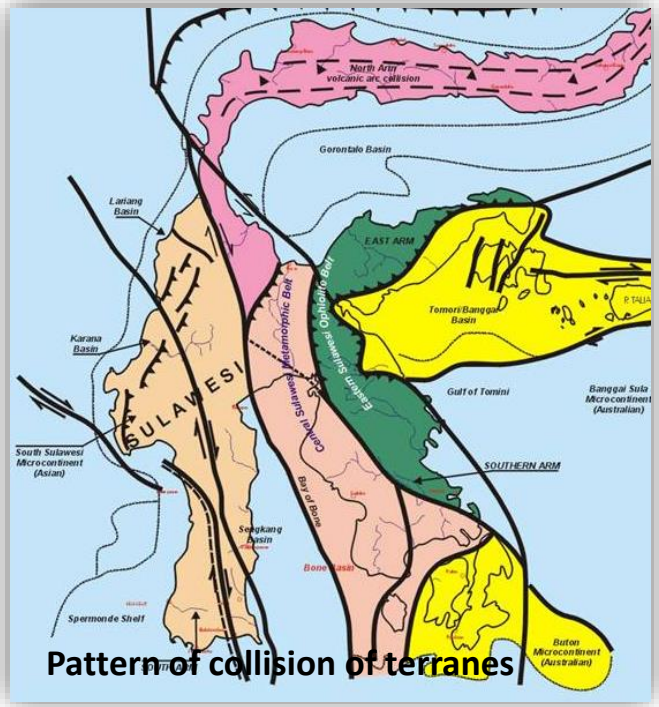
Distribution areas of monkeys, frogs and tree geckos in Sulawesi, once lived in separated islands, now due to island collision assembling Sulawesi, live in together in island of Sulawesi.

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 (*Babyrousa babirussa*)
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

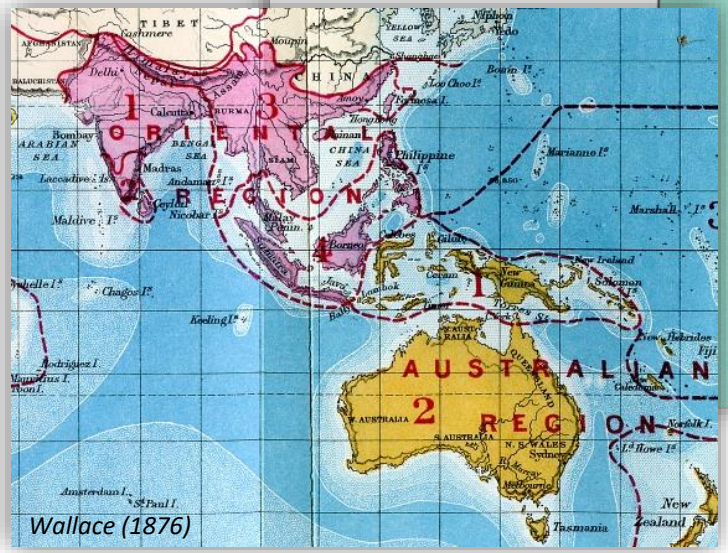


MacKinnon (1992)



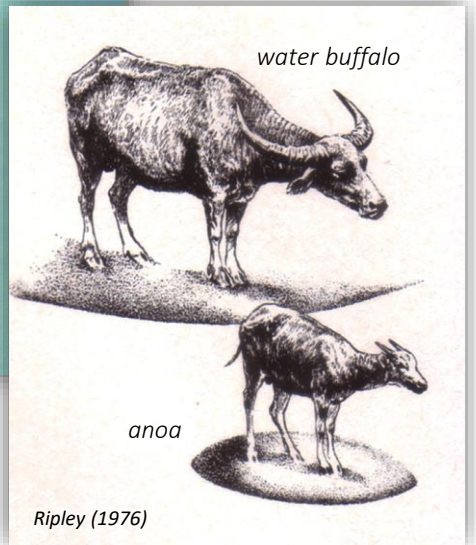
Pattern of collision of terranes

Zoogeographical Regions of Indonesia



Wallace (1876)

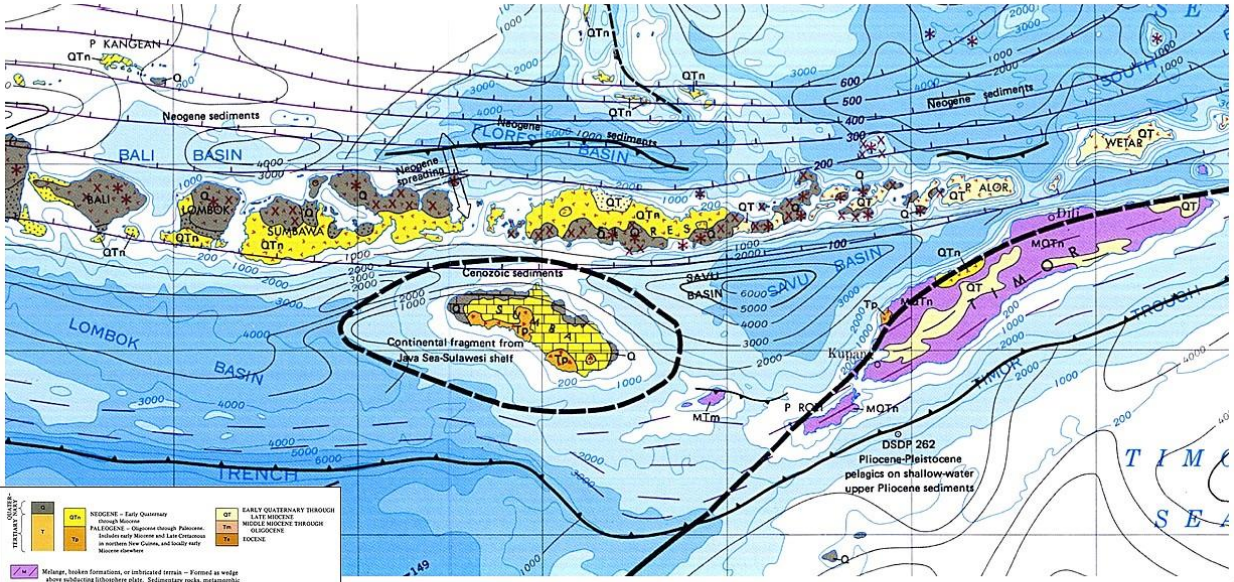
Island dwarfism

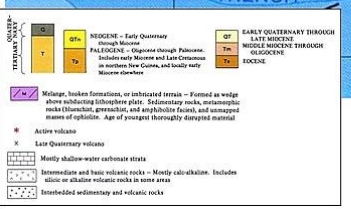


Ripley (1976)

Bali-Nusa Tenggara, gunungapi purba dan gunungapi Kuarter

- *Awang Satyana, June 2021*

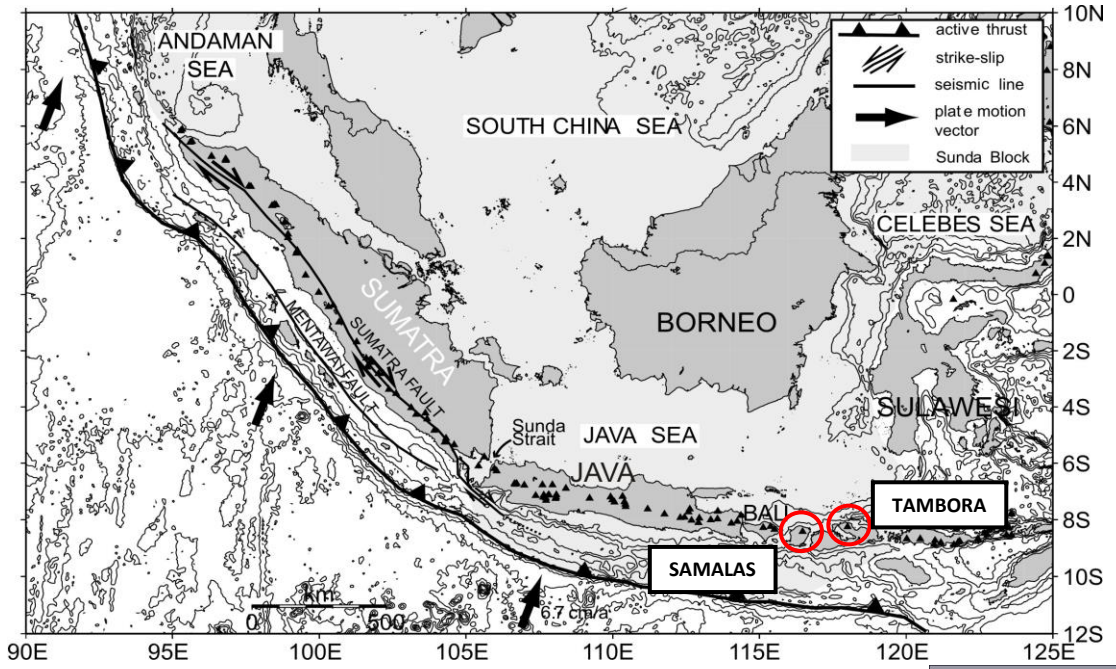




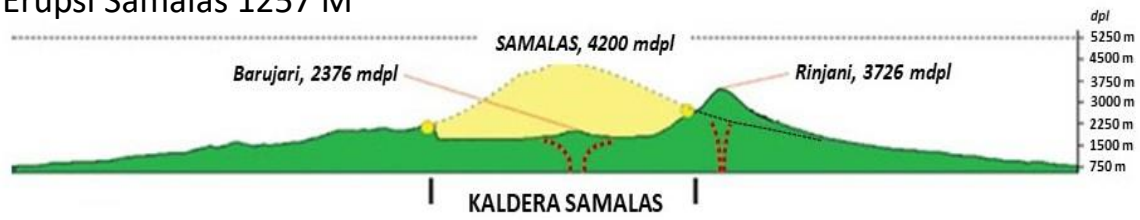
Geologi Bali-Nusa Tenggara

Hamilton (1979)

Erupsi Katastrofik Samalas dan Tambora - *Awang Satyana, June 2021*

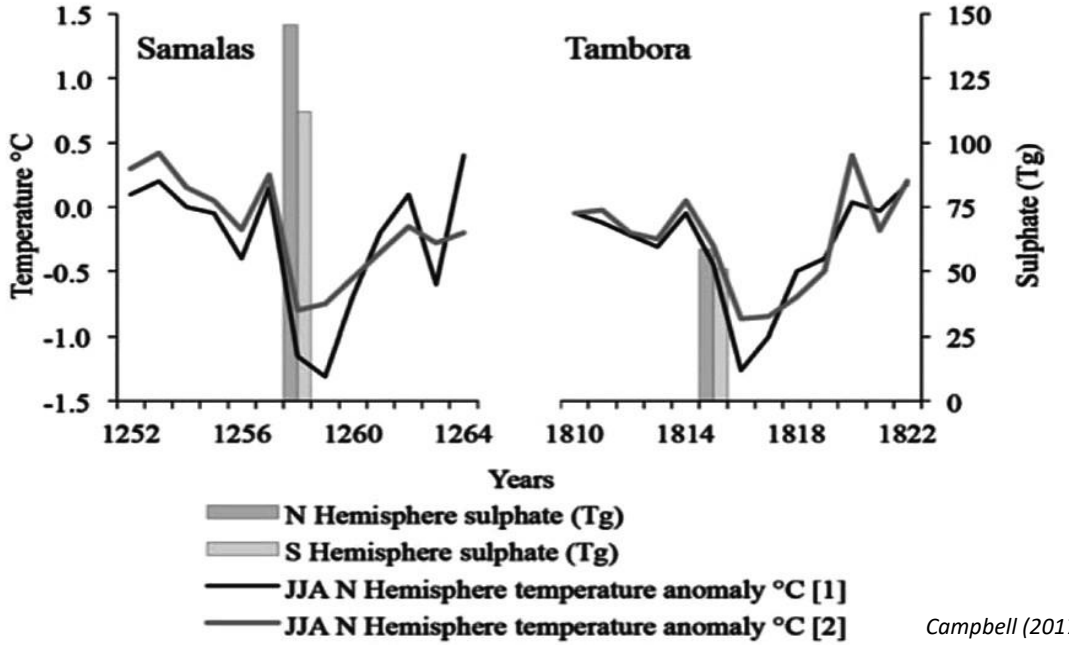


Erupsi Samalas 1257 M



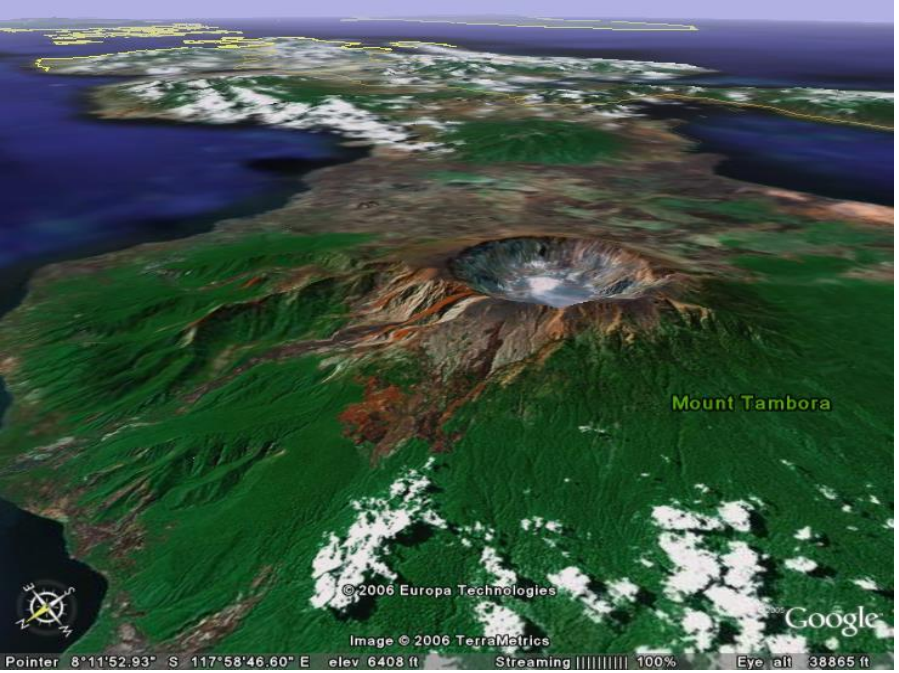
Rachmat (2016)

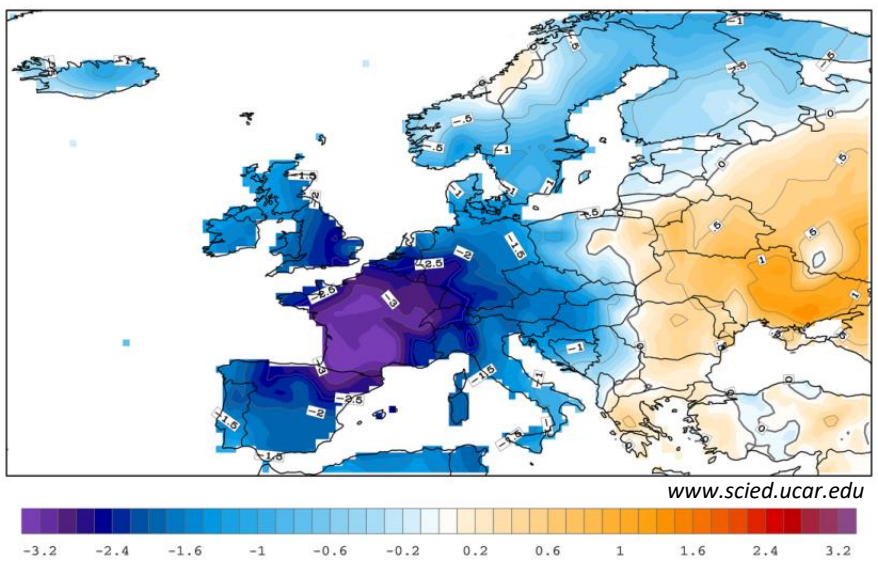
Sulfate content of volcanic eruption and temperature drop



Campbell (2017)

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





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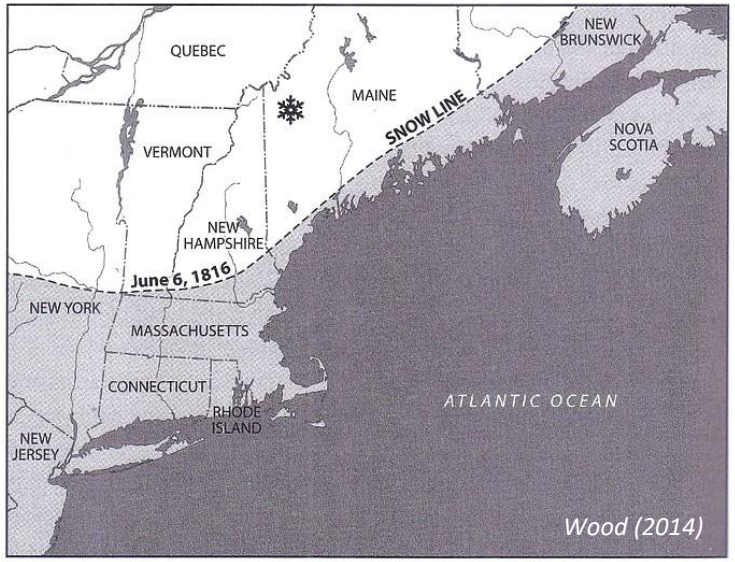
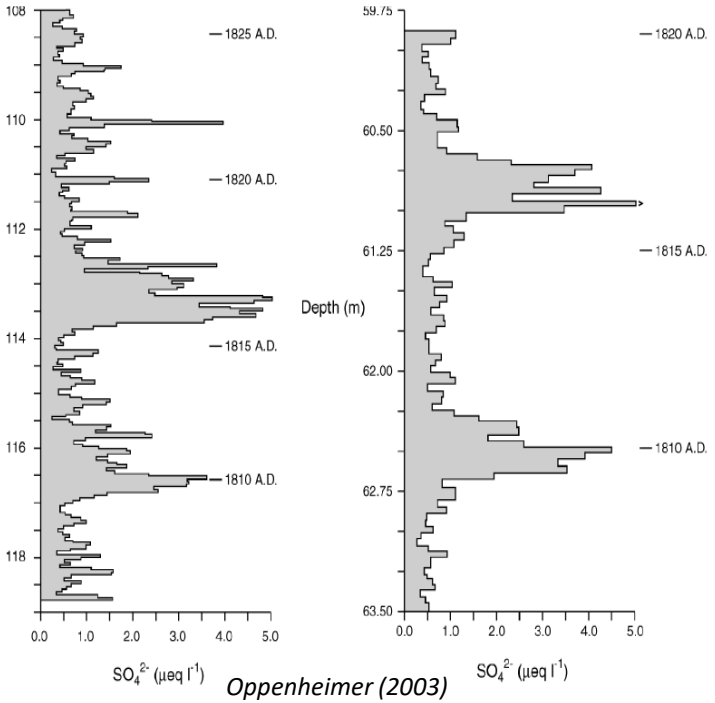
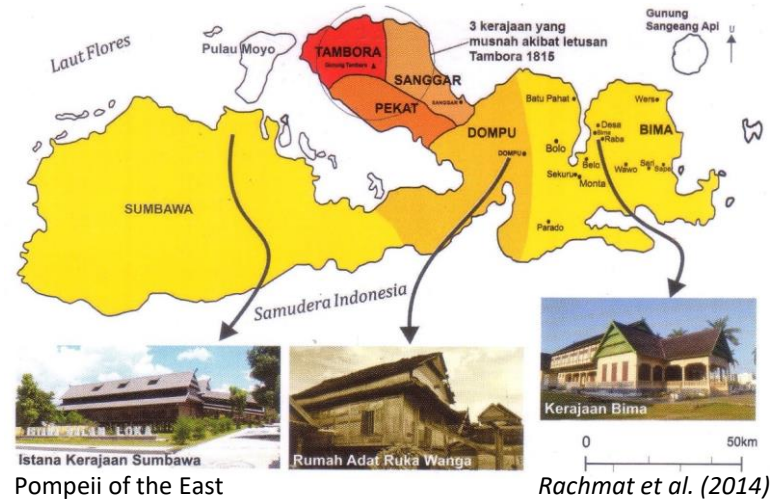


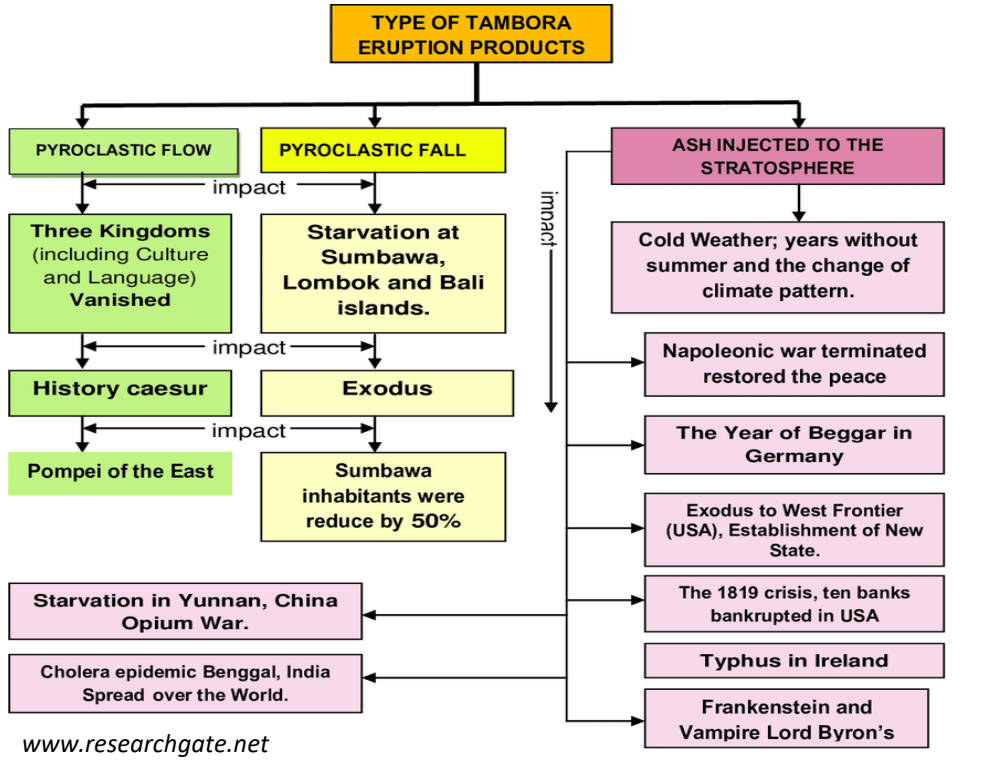


Oppenheimer (2003)



Pompeii of the East

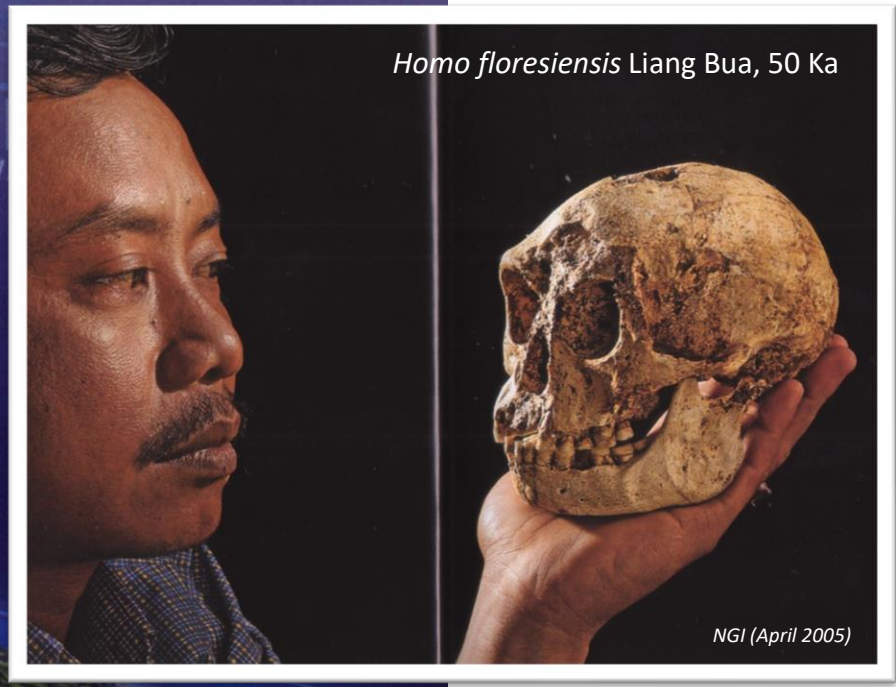
Rachmat et al. (2014)

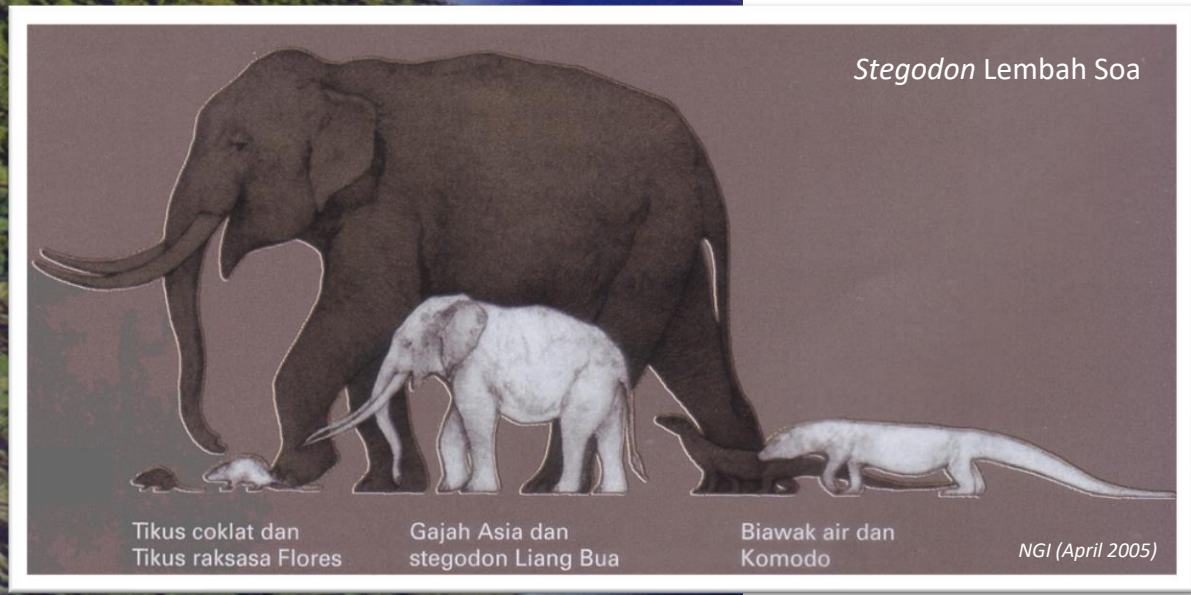


www.researchgate.net

Flores, NTT: *Land of Gigantism & Dwarfism*

- *Awang Satyana, June 2021*





Jawa

Bali

GARIS W

Sumbawa

Komodo

Utara

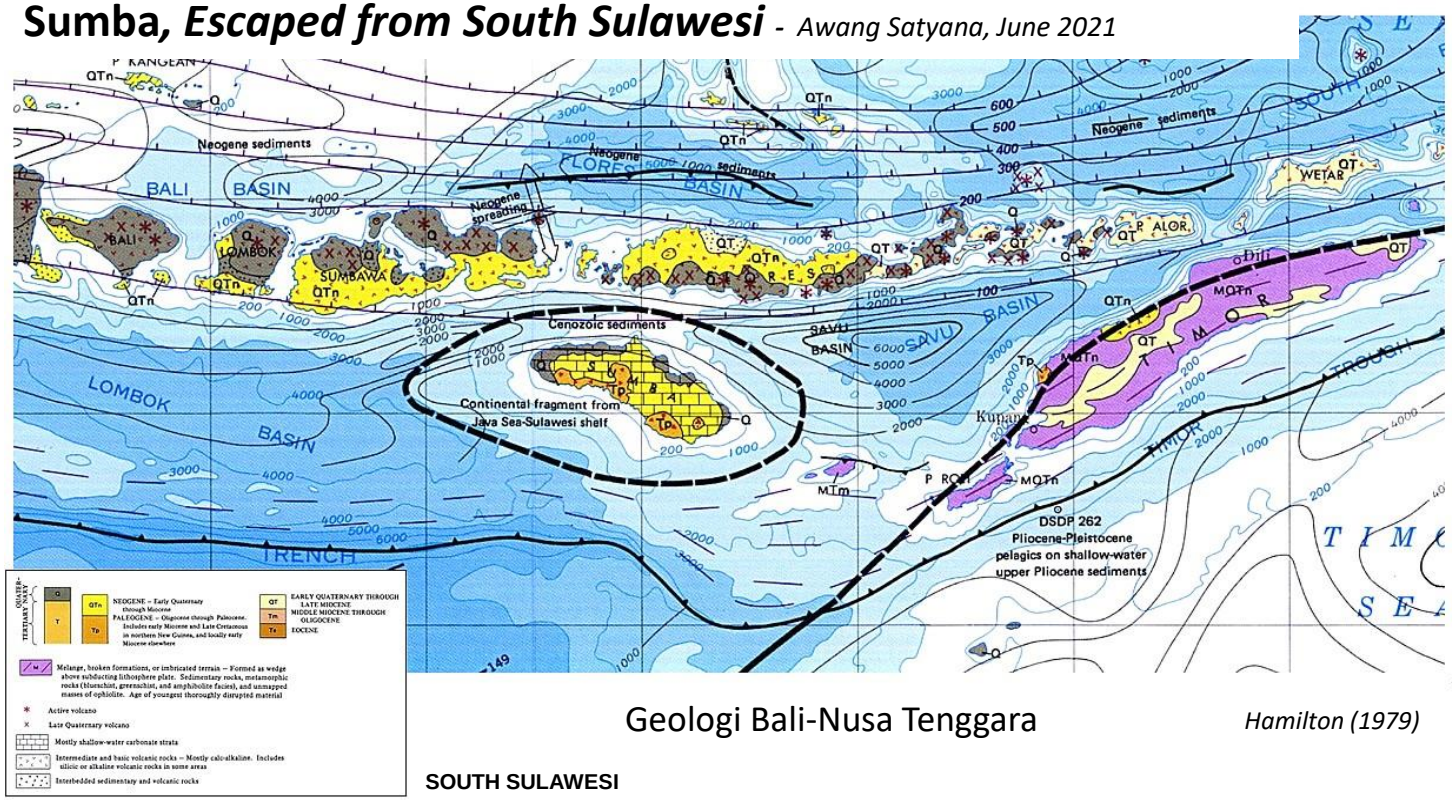
Garis Pantai Purbakala

Liang Bua

Flores

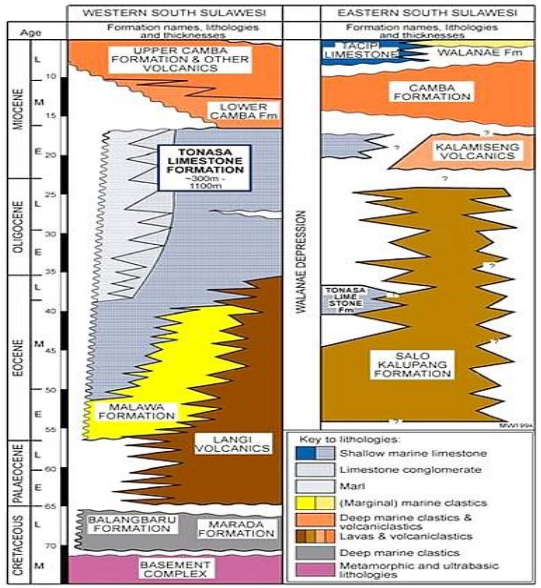
Lembah Soa

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

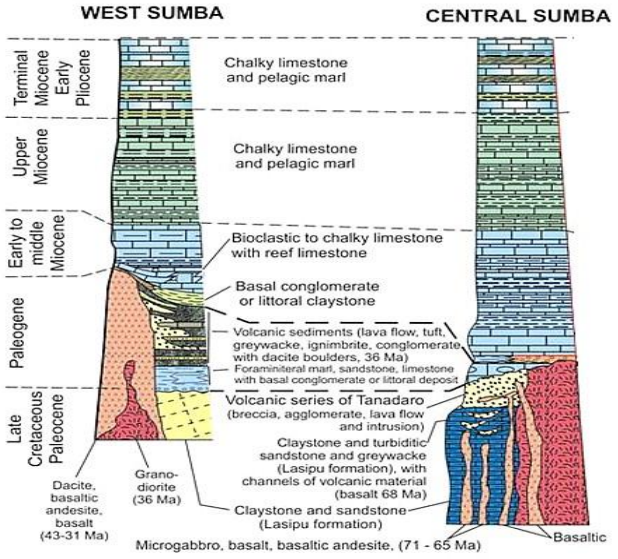


Geologi Bali-Nusa Tenggara *Hamilton (1979)*

SOUTH SULAWESI

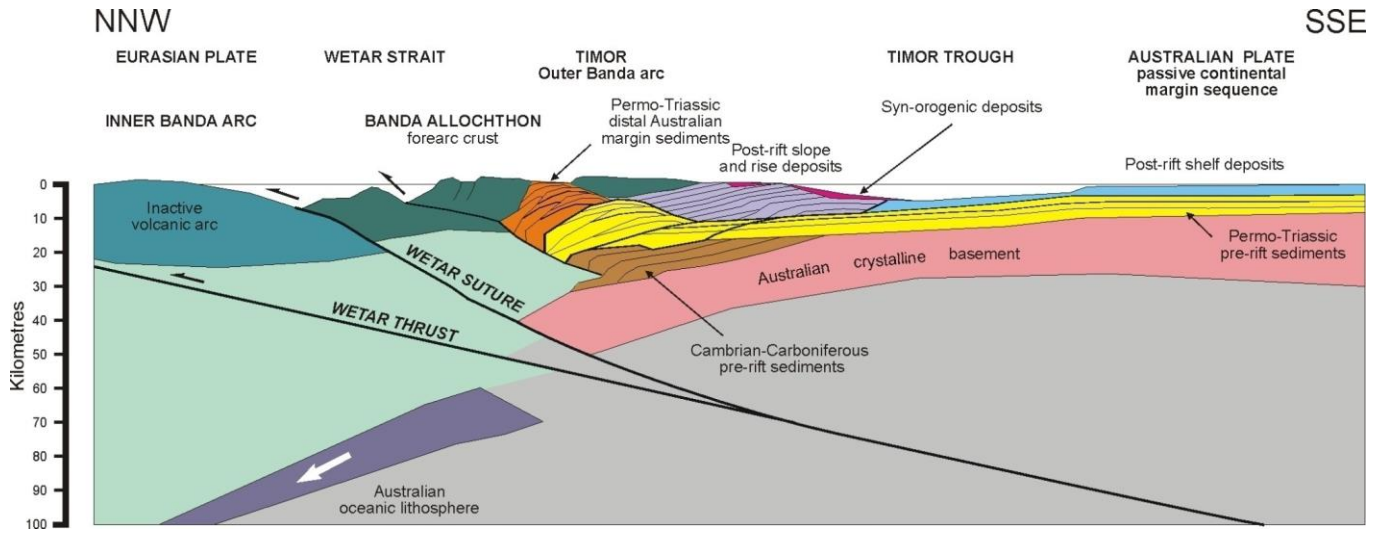


Wilson et al. (1996)



Abdullah (1994)

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

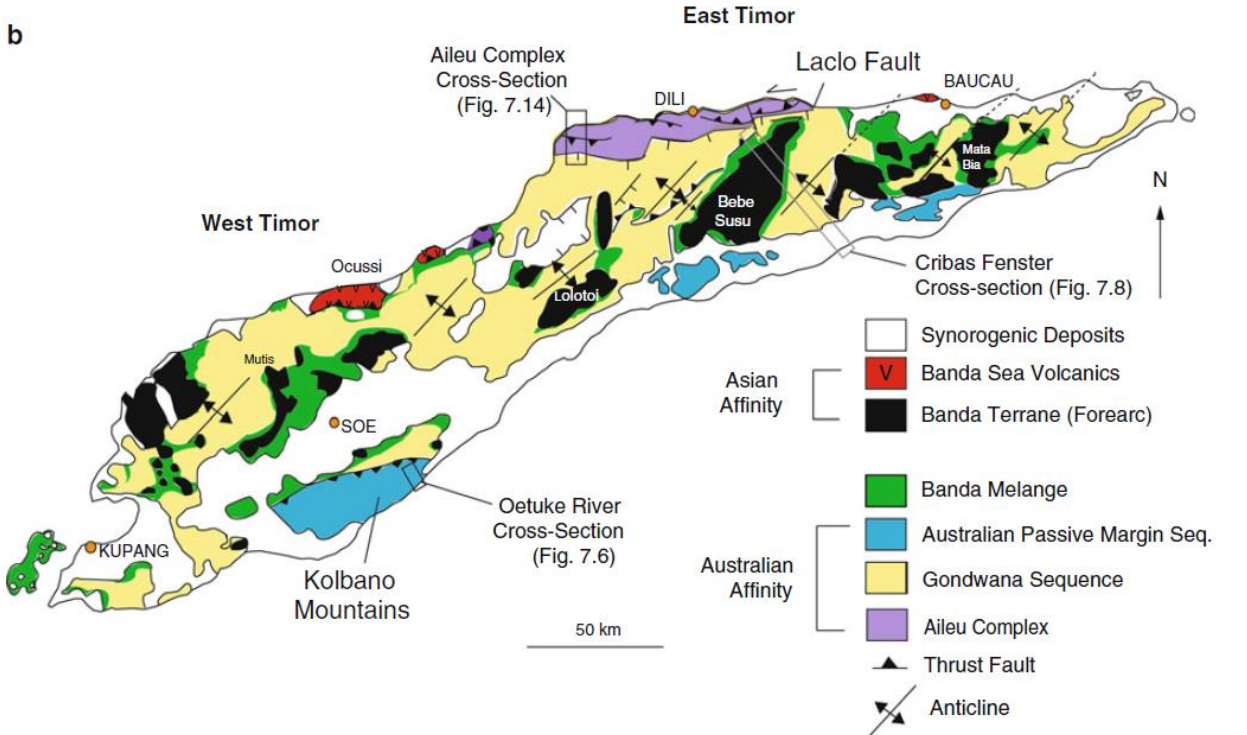


Model of collision of Timor & Australia

Hall and Wilson (2000)

Strongly deformed Lower Cretaceous deepwater deposits of Nakfunu radiolarian shales, north of Soe.

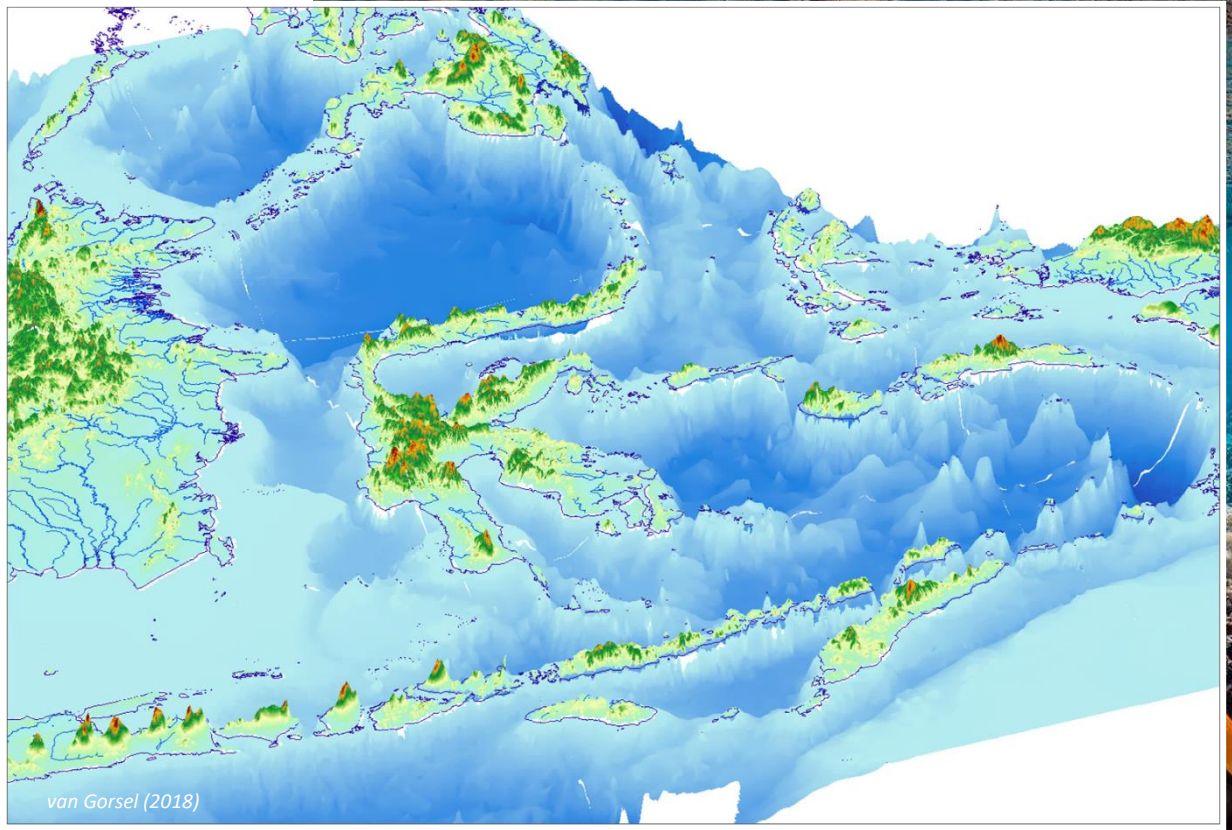
Steeply dipping Triassic Aitutu outer shelf limestones, north of Soe.



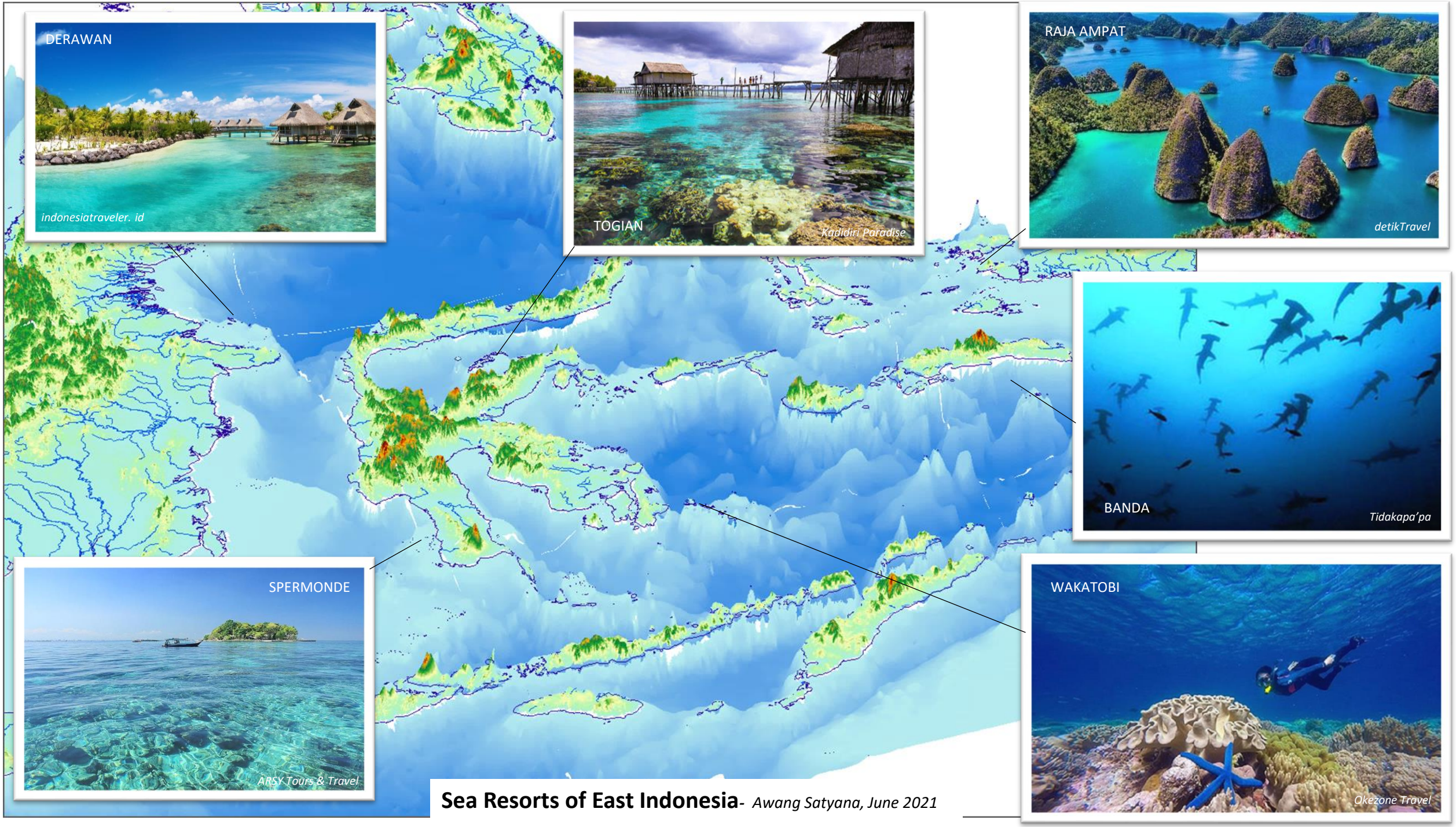
POTENSI WISATA BAHARI

http:///visi-maritim-indonesia-bagaimana-dengan.html

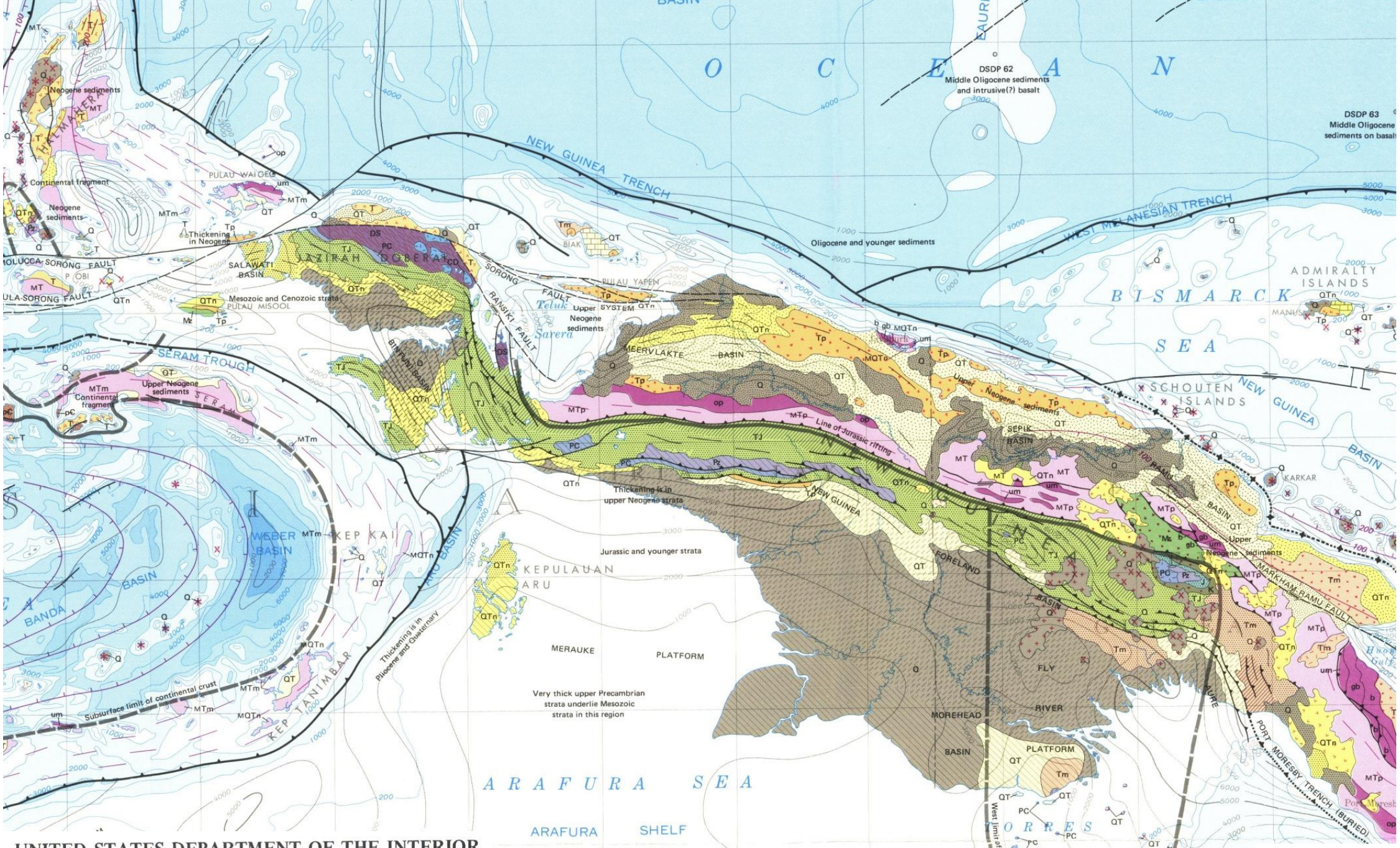
Coral Triangle Ecoregions: East Indonesia - *Awang Satyana, June 2021*



Rainforest Cruises

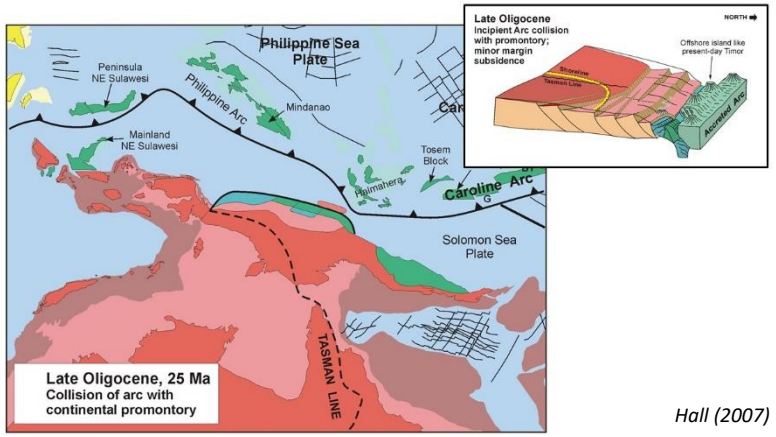


Sea Resorts of East Indonesia- *Awang Satyana, June 2021*

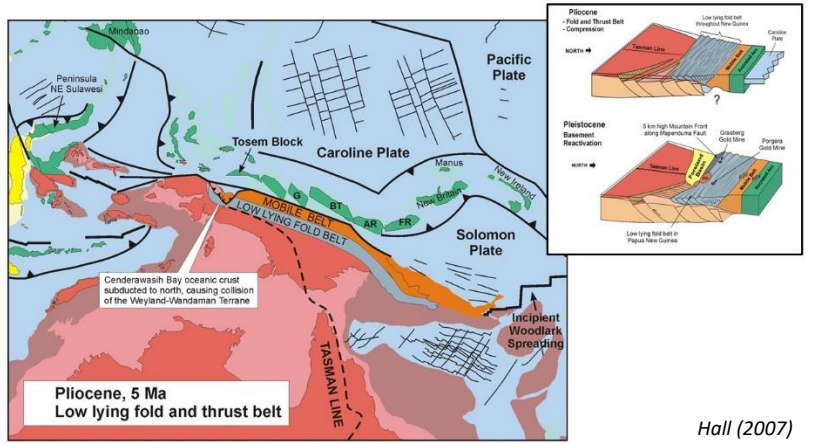


UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Hamilton (1979)



Hall (2007)



Hall (2007)

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

Pegunungan di tepi Lembah Baliem, batugamping dolomitan.

foto: Johannes Karundeng

Wamena, perkampungan.

foto: Johannes Karundeng


Wamena, perang.
foto: Johannes Karundeng

Terima kasih atas perhatian Anda.

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