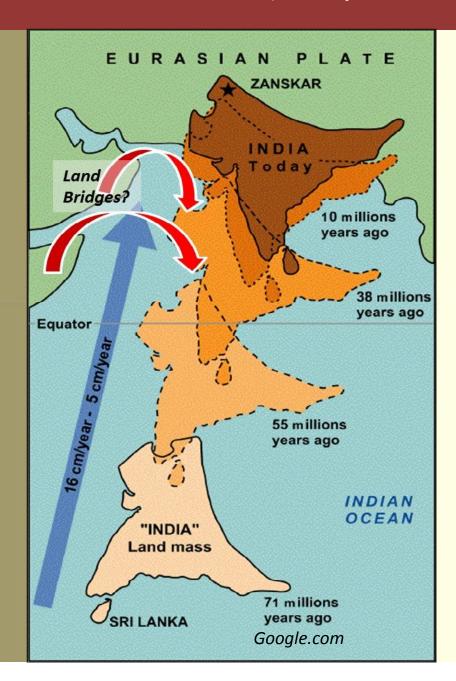
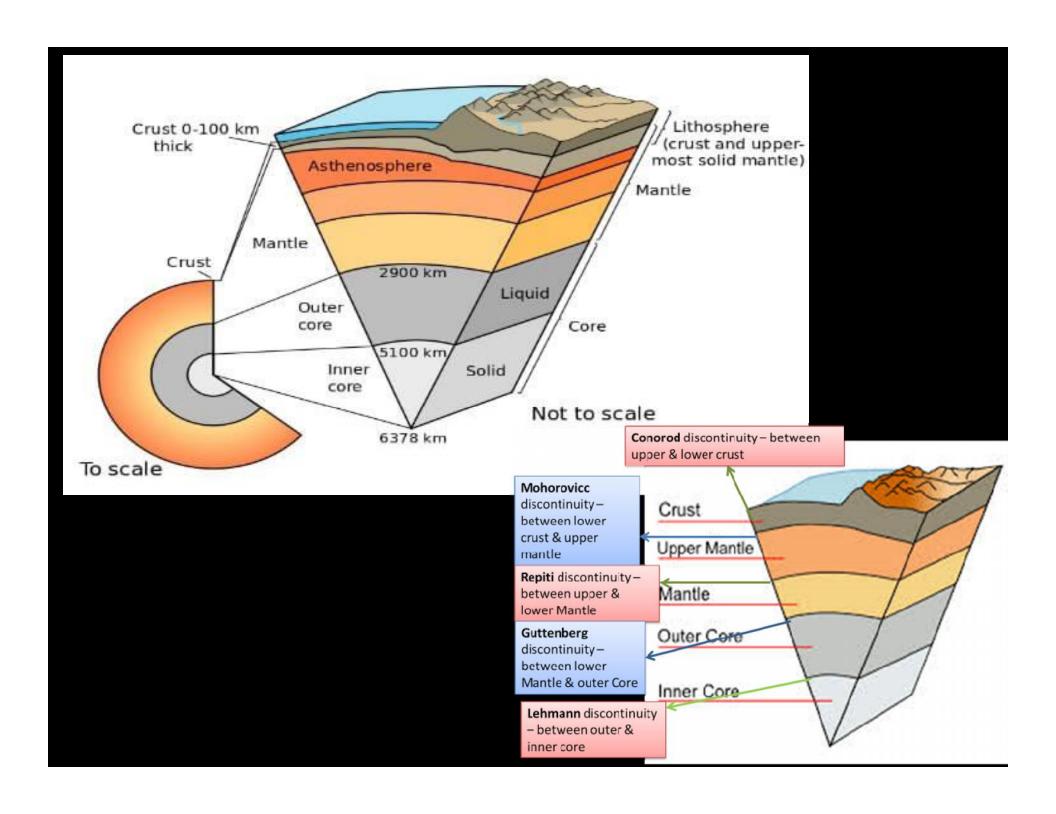
## Tectonic journey of Indian Plate through time



#### Nivedita Chakraborty.

Department of Geology Kabi Jagadram Roy Government General Degree College

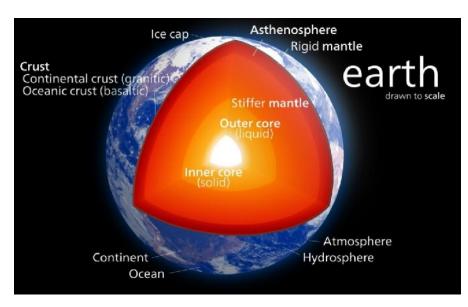


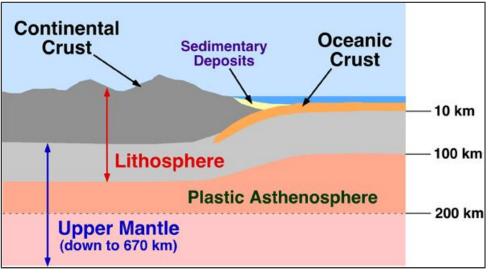
#### **CONCEPT OF PLATE**

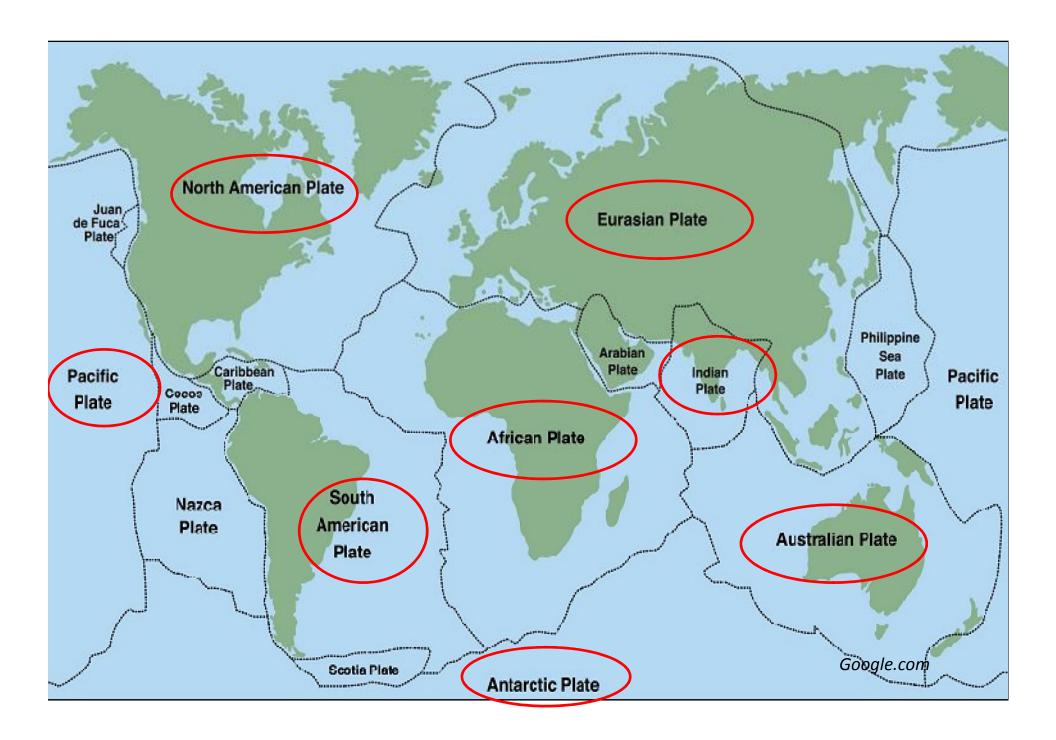
### Images for plate



## Homophonic confusion!







#### **CONCEPT OF CONTINENTAL DRIFT**

- Alfred Wegener, a German geophysicist and meteorologist, proposed the hypothesis of "Continental Drift" to the German Geological Society on 6th January, 1912.
- Continental Drift —a hypothesis which proposed that the continents had all been joined together to form one "supercontinent", the supercontinent broke into pieces and drifted apart forming the modern continents.



**Alfred Wegener** 



Lets see a few snapshots of continental drift taken from Geological Time Machine!!



# INTERNATIONAL CHRONOSTRATIGRAPHIC CHART

www.stratigraphy.org International Commission on Stratigraphy

v **2018**/08



Con	Eramom/	V System /	Series / Epoch	Stage / Age	GSSP	numerica age (Ma)
	Cenozoic	Quaternary	Holocene M	Meghalayan Northgrippian Greenlandian	3	present 0.0042 0.0082
			Pleistocene	Upper		0.0117
				Middle		0.781
				Calabrian	1	1.80
				Gelasian	3	2.58
		leogene	Pliocene	Piacenzian	1	3.600
				Zanclean	0000	5.333
			Miocene	Messinian	- 93	7.246
				Tortonian	1	11.63
		90		Serravallian	9	13.82
		Ne		Langhian		15,97
				Burdigalian		
				Aquitanian	3	20.44
				Chattian	0	23.03
			Oligocene		-	27.82
		Ф		Rupelian	1	33.9
			Eocene	Priabonian		37.8
		e		Bartonian		41.2
Š		Paleogene		Lutetian	3	47.8
Phanerozoic				Ypresian		
au			Paleocene	Thanetian	20	56.0 59.2
H				Selandian	3	61.6
				Danian	3	66.0
	Mesozoic	Cretaceous	Upper	Maastrichtian		72.1 ±0.3
				Campanian		72.1 20.2
				Santonian	3	83.6 ±0.2
				Coniacian	0	86.3 ±0.5
						89.8 ±0.3
				Turonian	3	93.9
				Cenomanian	3	100.5
			Lower	Albian	4	
				Aptian	0	~ 113.0
				Barremian		~ 125.0
						~ 129.4
				Hauterivian		~ 132.9
				Valanginian		~ 139.8
				Berriasian		

4	Eran I	System / En	Ser	ries / Epoch	Stage / Age	numerical O age (Ma)
				Upper	Tithonian	152.1 ±0.9
			Ž		Kimmeridgian	157.3 ±1.0
					Oxfordian	
		o			Callovian	163.5 ±1.0 166.1 ±1.2
		SSI	Middle		Bathonian Bajocian	168.3 ±1.3 170.3 ±1.4
		IIa			Aalenian	174.1 ±1.0
		₹			Toarcian	a
	<u>0</u>			10.00		102.7 20.7
	020		Lower			190.8 ±1.0
	esc				Sinemurian	199.3 ±0.3
	ž			_	Hettangian	201.3 ±0.2
					Rhaetian	~ 208.5
				Upper	Norian	
		sic				~ 227
		rias			Carnian	<b>√</b> ~ 237
S		-		Middle Ladinian	~ 242	
ō						
r namerozoic				Lower	Olenekian Induan	247.2 251.2
Ē					Changhsingian	251.902 ±0.024 254.14 ±0.07
Ĕ			L	opingian	Wuchiapingian	S 259.1 ±0.5
1					Capitanian	S 265.1 ±0.4
		_	Guadalupian		Wordian	S 268.8 ±0.5
		Permian			Roadian	S 272.95 ±0.11
					Kungurian	2005.00
			0	icuralian	Artinskian	283.5 ±0.6
	O		Ci	isuralian	Sakmarian	290.1 ±0.26 293.52 ±0.17
	Paleozoic				Asselian	
	eo		an	Unana	Gzhelian	200.0 10.10
	Pal		anii	Upper	Kasimovian	303.7 ±0.1 307.0 ±0.1
	_	SI	sylv	Middle	Moscovian	12.37.32.40.33
		erous	Pennsylvaniar	Lower	Bashkirian	315.2 ±0.2
		nife		Upper	Serpukhovian	323.2 ±0.4
		94	piar	Oppor	Scipaniovidii	330.9 ±0.2
		Car	diss	Middle	Visean	
			SSI			346.7 ±0.4
			89		Tournaisian	100 St. 100 St

\$ 0 0

Egypth	Erally IE	System / Era	Series / Epoch	Stage / Age	GSSP	numerical age (Ma) 358.9 ± 0.4	
		Devonian	Upper	Famennian	7	372.2 ±1.6	
				Frasnian	3	382.7 ±1.6	
			Middle	Givetian	3	387.7 ±0.8	
			Middle	Eifelian	3	393.3 ±1.2	
				Emsian	3		
			Lower	Pragian	3	407.6 ±2.6 410.8 ±2.8	
				Lochkovian	3		
			Pridoli		4	419.2 ±3.2	
		<u>_</u>		Ludfordian	3	423.0 ±2.3 425.6 ±0.9	
			Ludlow	Gorstian	3	427.4 ±0.5	
		Ţ,	Wenlock	Homerian	5	430.5 ±0.7	
		Silu	TTOTHOOK	Sheinwoodian	1	433.4 ±0.8	
	ပ္		Llandovery	Telychian	1	438.5 ±1.1	
0				Aeronian	3	440.8 ±1.2	
ŏ.				Rhuddanian	3	443.8 ±1.5	
70	20	Ordovician	Upper	Hirnantian	1	445.2 ±1.4	
Phanerozoic	Paleozoio			Katian	3	453.0 ±0.7	
na L				Sandbian	3	458.4 ±0.9	
7			Middle	Darriwilian	3		
				Dapingian	3	467.3 ±1.1 470.0 ±1.4	
			Lower	Floian	3	470.0 ±1.4	
				20,00	Tremadocian	3	485.4 ±1.9
		Cambrian			Stage 10		
			Furongian	ongian Jiangshanian	0	~ 489.5	
				Paibian	3	~ 494	
			Miaolingian	Guzhangian	2	~ 497	
				Drumian	1	~ 500.5	
				Wuliuan	77	~ 504.5	
				Stage 4	1	~ 509	
			Ca	Series 2	Stage 3		~ 514
				Stage 2		~ 521	
				Terreneuvian	Fortunian		~ 529
					1	541.0 ±1.0	

	them Eon	Erathem / Era	System / Period	GSSP	numerical age (Ma) 541.0 ±1.0
	Proterozoic	Neo- proterozoic	Ediacaran Cryogenian	8	~ 635
			Tonian		~ 720
		Meso- proterozoic	Stenian	0	1000
			Ectasian	0	1200
			Calymmian	9	1400
П		Paleo- proterozoic	Statherian	9	1600
an			Orosirian	0	1800
Precambrian			Rhyacian	0	2050
eca			Siderian	9	2300
<u>a</u>	Archean	Neo- archean		9	2500
		Meso- archean		0	2800
Н		Paleo- archean		0	3200
				ð	3600
		Eo- archean		2	4000
		Hade	ľ	4000	
atri	hila	hiddalala	latetatatata	d	~ 4600

Units of all ranks are in the process of being defined by Global Boundary Stratotype Section and Points (GSSP) for their lower boundaries, including those of the Archean and Proterozoic, long defined by Global Standard Stratigraphic Ages (GSSA). Charts and detailed information on ratified GSSPs are available at the website http://www.stratigraphy.org. The URL to this chart is found below.

Numerical ages are subject to revision and do not define units in the Phanerozoic and the Ediacaram, only GSSPs do. For boundaries in the Phanerozoic without ratified GSSPs or without constrained numerical ages, an approximate numerical age (-) is provided.

Ratified Subseries/Subepochs are abbreviated as U/L (Upper/Late). M (Middle) and L/E (Lower/Early). Numerical alges for all systems except Quatemany, upper Paleogene, Cretaceous, Triassic, Permian and Precambrian are taken from 'A Geologic Time Scale 2012' by Gradstein et al. (2012). Nose for the Quatemany, upper Paleogene, Cretaceous, Triassic, Permian and Precambrian were provided by the relevant ICS subcommissions.

Colouring follows the Commission for the Geological Map of the World (http://www.ccgm.org)

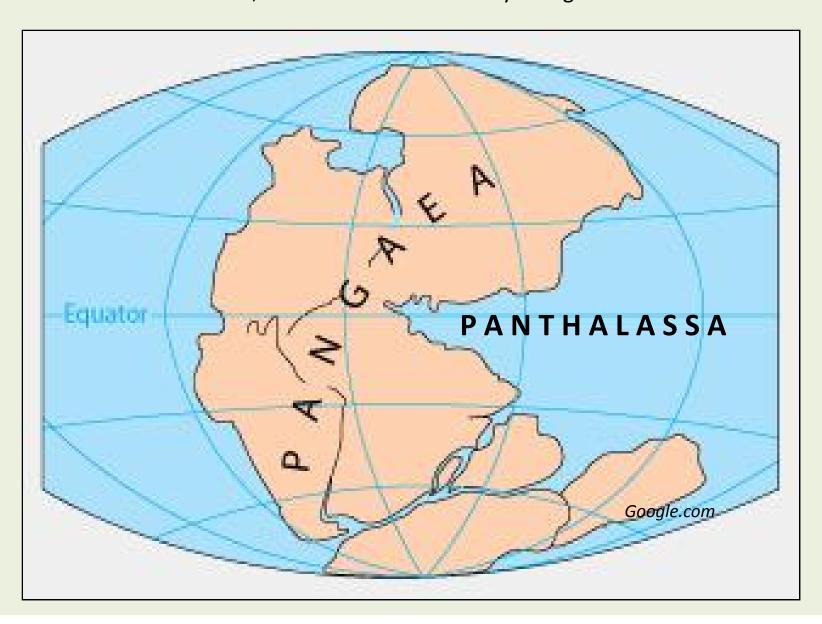
Chart drafted by K.M. Cohen, D.A.T. Harper, P.L. Gibbard, J.-X. Fan (c) International Commission on Stratigraphy, August 2018

To cite: Cohen, K.M., Finney, S.C., Gibbard, P.L. & Fan, J.-X. (2013; updated) The ICS International Chronostratigraphic Chart. Episodes 36: 199-204.

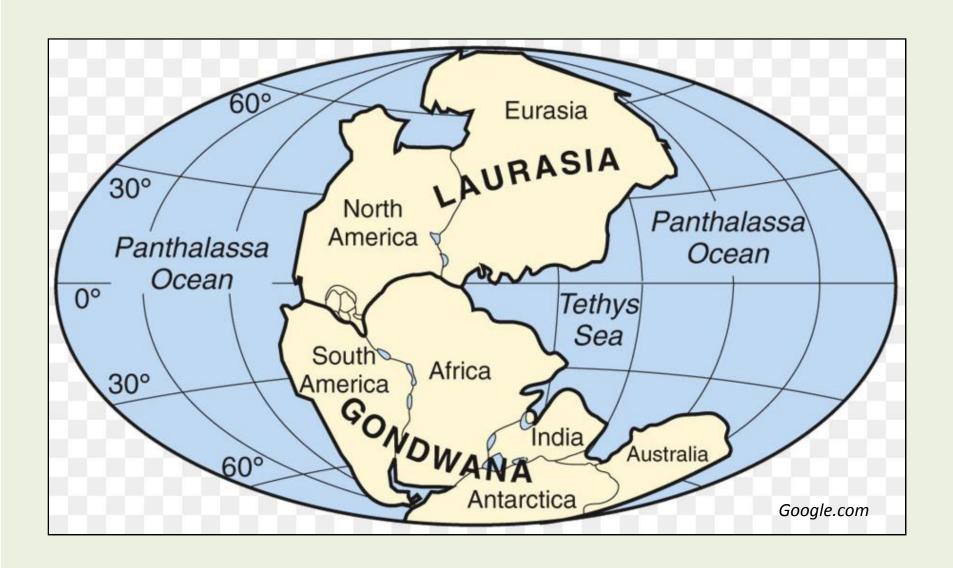
URL: http://www.stratigraphy.org/ICSchart/ChronostratChart2018-08.pdf

CCGM

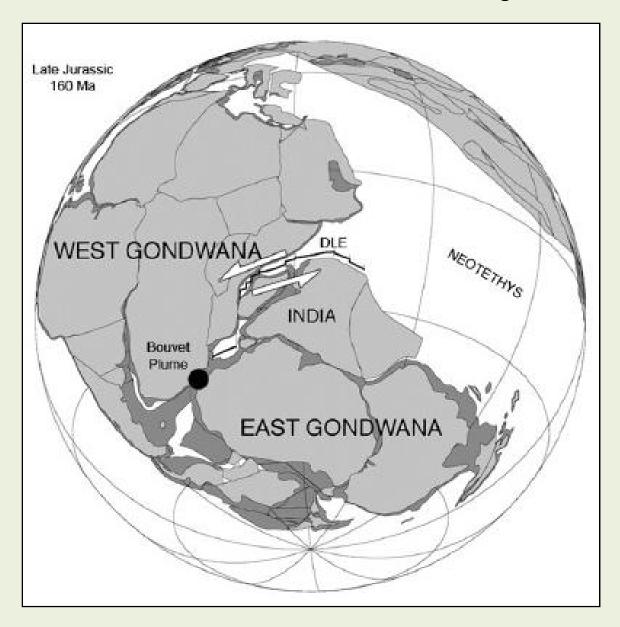
**About 300 million years** ago, Earth didn't have seven continents, but instead one massive supercontinent called *PANGAEA*, which was surrounded by a single ocean called *PANTHALASSA*.



## By Late Triassic time (~235 Ma) Pangaea began to break apart into LAURASIA and GONDWANA

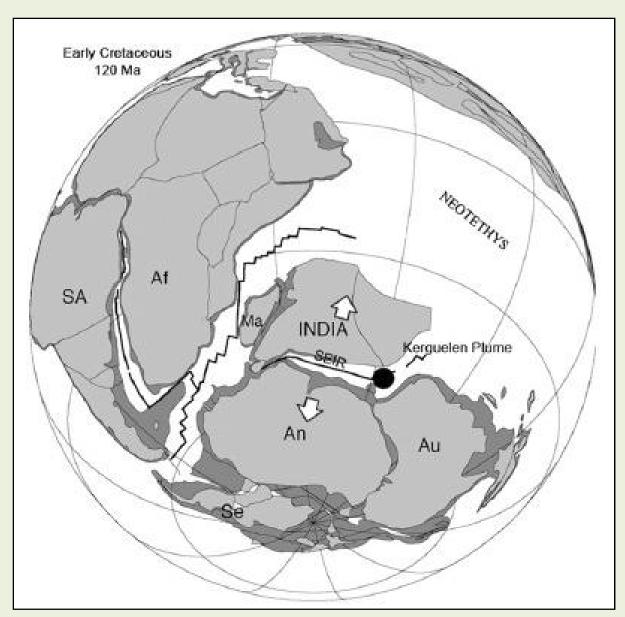


## Separation of **EAST GONDWANA** from **WEST GONDWANA** during **Late Jurassic time (~160Ma)**



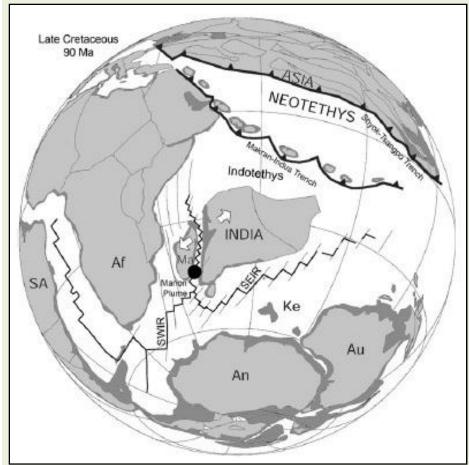
Chatterjee et al. (2013)

## Separation of *INDIA* from *ANTARCTICA-AUSTRALIA* during the Early Cretaceous (120Ma)

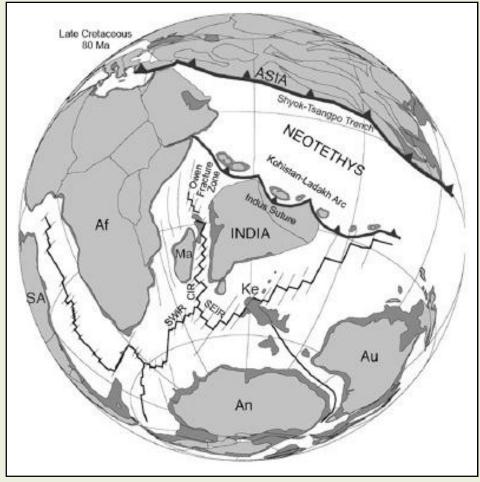


Chatterjee et al. (2013)

## Separation of *INDIA* from *MADAGASCAR* during the Late Cretaceous (~90Ma)

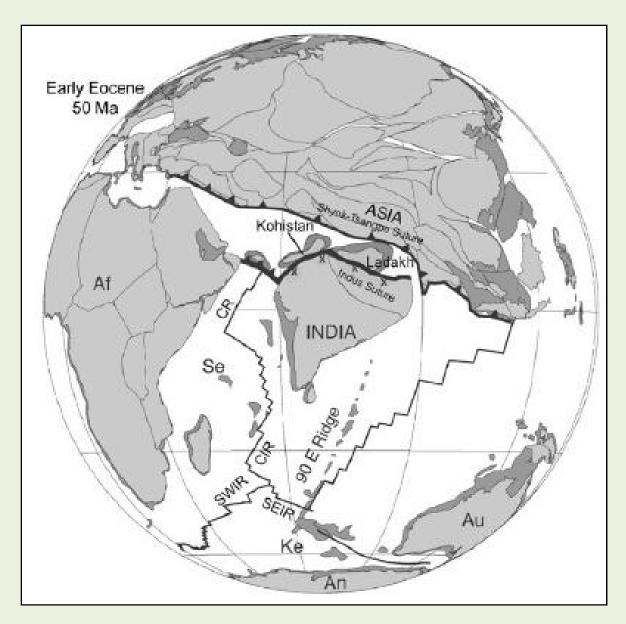


Collision of the *Indian plate* with the *Kohistan–Ladakh island arc* during the Late Cretaceous time along the Indus Trench (~80 Ma)

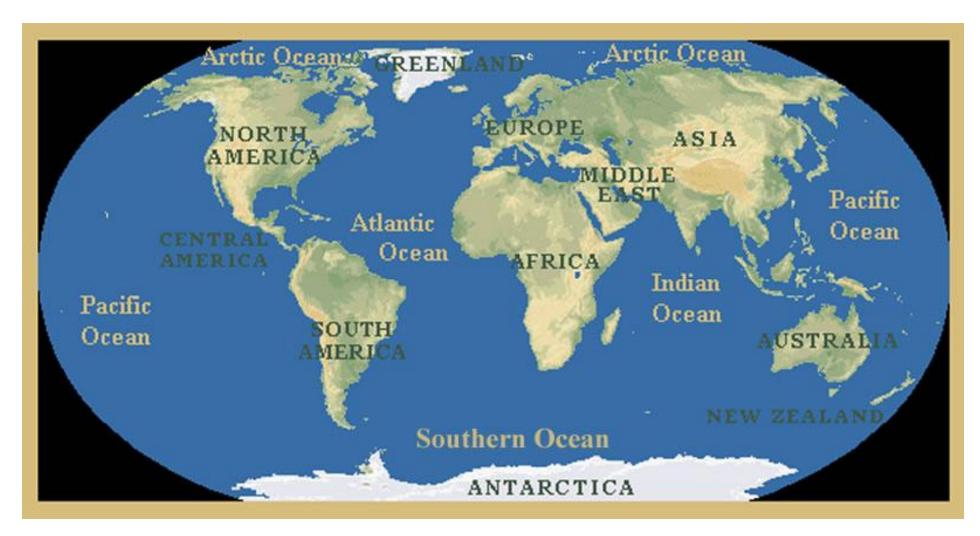


Chatterjee et al. (2013)

## INDIA—ASIA COLLISION with the closure of the Neotethys during Early Eocene (~50 Ma)



#### **CONTINENTS AND OCEANS AT PRESENT DAY**



Google.com



#### **TECTONIC JOURNEY OF INDIAN PLATE**

One of the most complex and remarkable journeys of all the continents .

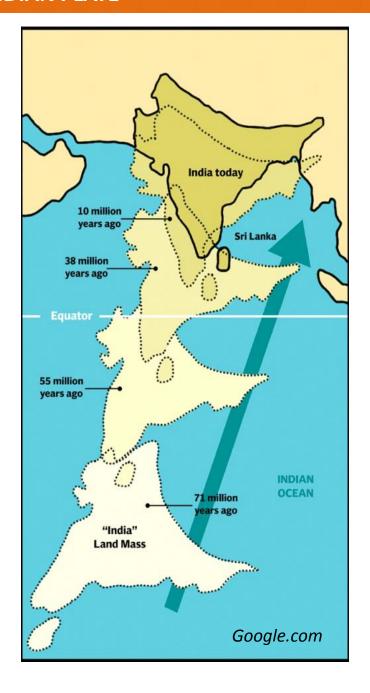
~ 9000 KM IN 160 MILLION YEARS!!

#### **Indian Plate velocity:**

- Starting northward at a rate of 3–5 cm/year (Mesozoic)
- Sudden acceleration of 20 cm/year (from Late Cretaceous (~67 Ma) at the KT boundary):
  MAXIMUM!
- Slowed down considerably at **5 cm/year** (Early **Eocene**, ~**50 Ma**) during its convergence with Asia and the closure of the Neotethys .

https://youtu.be/uLahVJNnoZ4

https://youtu.be/UvIDxu7twpc



# THE INDIAN PLATE IS STILL ACTIVE TODAY AND DRIFTS AT A VELOCITY OF ABOUT 5 CM/ YEAR!



Thank you!

