

Research Update No. 14, September 2020

## **Finite Euler poles for Gondwana reassembly at 182.7 Ma (start Toarcian)**

### **Rotation model CR20AAHK**

The following figure and table supersede those given in Research Update No.9 (March 2019). The work conducted since that time has only changed the configuration of East Gondwana in detail but a new, slightly looser, fit for South America against Africa has been adopted.

The main developments have been in understanding the fit of southernmost South America to Antarctica and Africa. While the reassembly is static, studying the dynamics of the dispersion has led to valuable new insights, addressed in earlier Research Updates and others still in preparation. The definitive path for Antarctica against Africa, as revealed in the Africa-Antarctica Corridor (Mueller and Jokat, 2019), has proved seminal in refining the two plate circuits Africa-South America-Antarctica-Africa and Africa-Antarctica-India-Madagascar-Africa and understanding their interaction in Early Cretaceous times when continental dispersion gathered pace from about 138 Ma. The animation, 300 Ma to present day, launched on 2020 Sept 9 at [www.reeves.nl/gondwana](http://www.reeves.nl/gondwana) attempts to illustrate this succinctly.

The figure on the next page shows the configuration of the fragments at 182.7 Ma (start Toarcian) in a cylindrical equidistant projection with Africa (400) retaining its present position on the globe with coordinates (unlabelled) in light grey at ten-degree intervals. The black, labelled latitude lines show the paleo-latitudes at 10 degree intervals for this time based on the fixed hotspot reference frame we have adopted.

The table that follows the figure lists the finite rotations needed to move the fragments from their present day positions directly to the 182.7 Ma reassembly.

Enquiries are always welcome at [reeves.earth@planet.nl](mailto:reeves.earth@planet.nl).

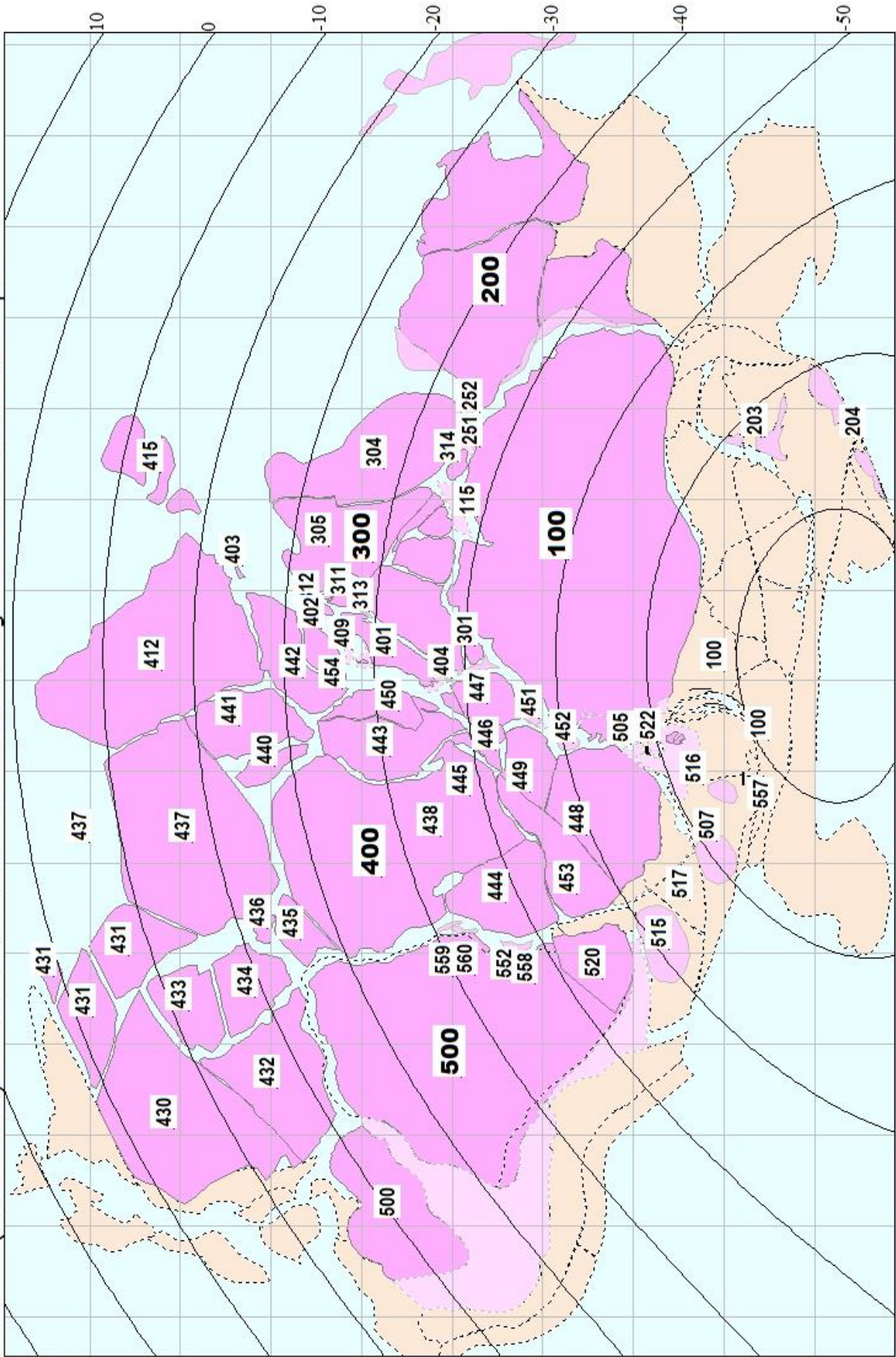
Colin Reeves

*Delft, 2020 September 11*

### **Reference**

Mueller, O.M., and Jokat, W., 2019. The initial Gondwana break-up: A synthesis based on new potential field data of the Africa-Antarctica Corridor. *Tectonophysics* 750 (2019) 301-328.

182.70 Ma (start Toarcian) :: CR20AAHK :: Gondwana Precambrian fragments reassembled :: 2020 Sept 11



## Model CR20AAHK

Finite rotations, 0 to 182.7 Ma

Fragment number / pole lat / pole long / rotation angle\* / identification

\* Positive angles indicate counter-clockwise rotation about the given pole to achieve the reconstruction.

399	90.00	0.00	0.000	fixed reference frame
400	90.00	0.00	0.000	<b>AFRICA</b> fixed to reference frame
438	90.00	0.00	0.000	Congo fixed to Africa
439	90.00	0.00	0.000	fragment not used
445	90.00	0.00	0.000	SE Congo fixed to Congo
100	-9.60	328.59	57.700	<b>ANTARCTICA</b>
101	-9.60	328.59	57.700	fragment fixed to Antarctica
102	-9.60	328.59	57.700	fragment fixed to Antarctica
103	-9.60	328.59	57.700	fragment fixed to Antarctica
104	-9.60	328.59	57.700	fragment fixed to Antarctica
111	-9.60	328.59	57.700	fragment fixed to Antarctica
112	-9.60	328.59	57.700	fragment fixed to Antarctica
113	-9.60	328.59	57.700	fragment fixed to Antarctica
410	-8.39	329.21	29.420	MOR Antarctica-Africa
198	-10.13	328.99	58.479	Reeves (2017) rotn for Antarctica
197	-11.32	329.20	58.582	Reeves (2016) model CR15GSCB
196	-7.96	326.14	56.910	Mueller & Jokat (2019) fit
401	-1.62	269.57	23.120	<b>MADAGASCAR</b>
491	-0.28	270.42	11.460	MOR Madagascar-Africa
493	-3.01	21.49	14.132	MOR Comoros-Africa
300	-28.29	221.52	67.040	<b>INDIA</b>
350	-36.05	276.88	38.537	MOR India-Antarctica
301	-19.92	229.52	83.032	<b>SRI LANKA</b>
354	-24.01	226.16	74.884	MOR Sri Lanka-India
304	-28.29	221.52	67.040	Tibet plateau
305	-28.29	221.52	67.040	Kohistan
311	-27.39	222.75	69.226	Saurashtra
312	-32.77	214.55	52.869	Kutchch
313	-27.97	222.16	66.599	Bombay High
314	-28.29	221.52	67.040	Megalaya

351	-24.80	224.56	34.176	MOR India-Africa
430	3.41	12.32	4.550	<b>North-West Africa</b>
432	3.41	12.32	4.550	Does the same as NW Africa
431	-12.92	40.12	2.300	Western Libya (roughly)
433	3.41	12.32	4.550	Does the same as NW Africa
434	3.41	12.32	4.550	Does the same as NW Africa
435	51.06	275.80	0.700	Cameroon North
436	7.89	10.78	13.018	Hawal Massif
411	-23.33	13.87	0.300	East Africa coastline (only)
443	-6.40	215.80	1.700	Tanzanian craton
450	-82.55	327.15	0.340	East of Tanzanian craton
440	-7.80	32.35	1.300	Sudd block
437	-7.80	32.35	2.500	<b>North-East Africa</b>
441	-7.80	32.35	2.500	Ethiopia
412	-48.01	191.51	6.094	<b>Arabia</b>
415	29.35	68.19	76.680	Iran & Lut block
416	32.33	65.74	83.239	MOR Iran-Africa
442	-16.43	30.54	3.182	<b>Somalia</b>
454	-16.43	30.54	3.182	Bur Acaba
403	-16.43	30.54	3.182	Socotra
398	-8.60	286.10	18.926	Madagascar (David et al)
444	90.00	0.00	0.000	Angola
446	-10.37	28.33	5.142	East Zambia
447	28.40	355.25	0.489	<b>Northern Mozambique</b>
449	51.54	340.70	0.709	Zimbabwe craton
448	25.24	1.58	0.907	<b>Southern Kalahari</b>
453	44.96	355.84	0.700	Sthn Kalahari NW of STASS
451	-23.23	31.97	18.021	Beira High
452	-5.71	312.21	11.454	Limpopia
200	-24.32	296.80	54.996	<b>AUSTRALIA</b>
299	-17.29	313.74	53.779	MOR Australia-Antarctica
353	-30.90	255.16	52.690	MOR Australia-Greater India
251	-59.55	342.57	43.643	De Gonville triangle
252	-49.90	320.13	44.550	Naturaliste plateau
253	-41.93	310.54	45.651	MOR De Gonville-Australia
201	-10.57	298.71	72.828	Lord Howe Rise

202	-13.07	302.84	69.228	not used
254	-6.74	299.60	68.377	MOR east of Australia
204	34.16	300.58	107.931	<b>East New Zealandia</b>
255	33.27	312.82	79.244	MOR in Pacific Ocean
256	15.58	313.17	71.631	MOR Antarctica-East NZ
203	9.49	299.51	92.156	<b>West New Zealandia</b>
214	51.14	300.70	150.472	Tonga-Kermadec hinterland
402	-4.46	236.95	78.344	<b>Seychelles</b>
352	-3.73	245.53	47.560	MOR Madagascar-Seychelles
404	3.01	279.56	27.791	Madagascar Rise
358	0.91	275.03	25.336	MOR Madagascar Rise-Madagascar
409	-6.93	16.02	29.383	Comoro Islands
492	-6.94	322.64	15.266	MOR Comoro-Madagascar
406	-3.60	234.74	73.098	Mascarene fragment
355	-3.19	243.91	45.475	MOR Mascarene basin
407	-8.42	234.39	54.499	Nazareth Bank
357	-6.61	244.99	37.346	MOR sthn Mascarenes-Madagascar
408	-5.60	235.33	61.288	Saya del Malha
359	-4.64	244.84	40.810	MOR Saya del Malha-Madagascar
356	-21.54	227.83	82.738	Laxmi basin
500	46.25	329.43	56.396	<b>SOUTH AMERICA</b>
501	46.25	329.43	56.396	Central America fragment
511	46.25	329.43	56.396	Central America fragment
521	46.25	329.43	56.396	Central America fragment
575	48.90	327.13	55.540	[Independent imported SAM]
550	47.45	333.40	28.273	MOR South America-Africa
552	78.57	287.36	43.771	Rotated fragment in Sth Atlantic
558	39.30	331.66	54.098	Rio Grande Rise
559	46.87	329.10	55.745	fragment off Buzios
560	47.79	328.59	54.817	fragment off Buzios
553	3.85	334.49	59.364	MOR Sth Orkney Is-Antarctica
554	-6.81	332.38	66.607	MOR South America-Antarctica
569	-12.54	335.59	64.994	MOR not used
505	43.53	327.19	57.916	<b>Maurice Ewing Bank</b>
520	46.25	329.43	56.396	Uruguay block
515	40.68	330.07	57.289	First fragment S of Rio de la Plata

517	34.77	330.52	58.402	Second frag S of Rio de la Plat
555	57.36	324.05	56.902	MOR 517-Africa
507	24.27	333.80	64.788	West part of Hoorn
516	24.27	333.80	64.788	East part of Hoorn & Malvinas
519	7.90	325.01	56.709	MOR Antarctica-hoorn
570	70.93	313.68	77.101	not used
571	-8.15	331.14	62.132	MOR nearest to Bouvet triple junct.
572	28.45	314.75	53.408	not used
556	40.13	330.70	51.407	Scotia Arc
562	8.99	325.64	53.264	MOR Scotia Arc
561	16.89	323.32	58.330	Western Scotia Sea
557	74.29	269.76	73.694	South Orkney Microfragment
522	26.45	332.48	53.356	South Georgia
563	54.18	322.66	54.950	MOR east of Maurice Ewing Bank
523	12.01	336.75	65.875	Fragments W of South Georgia
524	4.21	335.60	73.073	South of Magellan fault
068	-11.05	337.91	55.908	MOR Nazca plate-Antarctica
063	-7.19	325.46	59.829	Pacific plate
115	11.04	292.72	51.434	Kerguelen
900	63.66	346.27	76.249	NORTH AMERICA
551	60.71	349.33	38.761	MOR North America - NW Africa
800	59.73	3.71	64.465	Greenland (approximate)
700	48.64	359.81	62.334	Europe (approximate)
600	48.64	359.81	62.334	Siberia (approximate)
727	51.05	0.93	63.012	Porcupine Bank (approximate)
711	50.83	355.42	30.444	Iberia (approximate)
060	43.74	268.78	94.752	Pacific Ocean - not used
064	-18.69	318.67	118.012	Pacific Ocean - not used
065	33.81	293.32	115.987	Pacific Ocean - not used
066	84.33	284.26	143.226	Pacific Ocean - not used
067	41.68	287.30	104.492	Pacific Ocean - not used
062	9.45	317.14	53.074	Pacific Ocean - not used

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