

**THE KALAHARI IMPACTS HYPOTHESIS FOR MOON GENESIS
- DID THE MOROKWENG METEORITE IMPACT (145MA) BREAK UP
THE GONDWANALAND AND LET CONTINENTAL FLUID BASALT (CFB)
DISCHARGE TO FORM THE MOON?-**

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Abstract: The Morokweng Meteorite Impact of 145 Ma (Million years ago), which constitutes chronological J/K (Jurassic/Cretaceous) boundary, seems to have broken up the Gondwanaland, whose broken edge in the southern coast of South Africa incubated the oldest modern human sites. The north-south separation of Karoo and a vast flat surface of the Kalahari Desert indicate that the basin was filled with the discharge of Continental Fluid Basalt (CFB) from upper mantle. The author surmises that the ejected CFB reached the outer atmosphere and generated the Moon.

Africa forms the key. --- Alex. du Toit (1937)

1. Background: How did I get this Hypothesis?

It took me for seven years to conceive the Kalahari Impacts Hypothesis for Moon Genesis. I became interested in the break-up of Gondwanaland at my first visit to the Klasies River Mouth Caves, which is known as the oldest Modern Human site in the Eastern Cape Province of Republic South Africa, in 2007. I read “The Origins of Continents and Oceans (4th edition)” of Wegener as well as relevant documents on Plate Tectonics and Mantle Convection/Plumes. As the break-up edge is thick and hard sandstone, I concluded that Gondwanaland must have been broken up by several Gigantic Meteorite Impacts. (Tokumaru, 2009; Oberbeck, 1993)

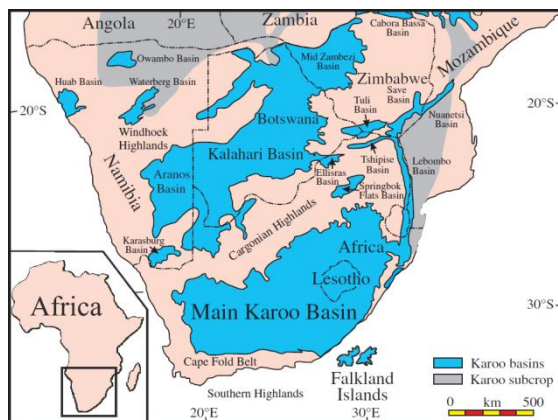


Fig.-1 The Distribution of Karoo basins. (Isbell, 2008)

Although this map may not be accurate and does not correspond fully to regional Topology Map (Fig. 8& 12), it gave me an idea that Morokweng Impact blew up the center of Karoo and separated it into two: Main and Kalahari basins.

After my second visit to the caves in 2012-2013, I was watching a geological map of Karoo basins separated into Botswana Kalahari and Main Karoo. (Fig.1:Isbell, 2008) All of a sudden, I got an idea that the separation was caused by the Morokweng Impact. When Karoo was formed 180Ma with Kgagodi Impact, originally it should be a single body. It is plausible that Morokweng Impact (145Ma) blew up its center and separated it. But where is the ejecta from Morokweng Impact? Did it become the Moon? Then I found there is no hypothesis on the genesis of the Moon. The Kalahari Impact Hypothesis that the Moon was discharged from the Great Kalahari was born this way.

Since then, the more I study and think, the more I was convinced with the hypothesis. And if it is correct, Modern Humans and the Moon share hometown in Southern Africa, and their genes are closely related to the Morokweng Impact and Gondwanaland break-up. Isn't it interesting?

2. The Break-up of Gondwanaland, and the Genesis of Moon and Modern Human

2.1 The existence of Moon accelerated life evolution and fostered human culture on the Earth.

The radius of Moon, 1737km, is bigger than one fourth of that of Earth, 6378km. Its mass is about one eightieth of the Earth. The Earth and its satellite, the Moon, orbit in the same direction and in the same orbital plane, around their barycenter which represents the center of mass of the Earth-Moon system. The both Earth and Moon revolve around this barycenter once every 27.3 days. The current distance between two is about 380,000 km and it is becoming bigger 3~4 cm a year.

No other planet in the Solar system has such a big satellite than the Earth. The mass of Moon provides significant gravitational influence to the Earth such as prolonged period of rotation as well as ocean tide and currents. The moon is responsible for the tilt of the Earth's axis in 23.4 degree and its stability. It is possible that the mechanism of Moon genesis was the cause of the tilt.

Without Moon, the evolution of living creatures should have been greatly different, and *homo sapiens sapiens*, or *modern human*, in my definition “*human with laryngeal descent for vocalizing vowels and language with grammatical modulation*”, might not have appeared. Month was generated with the Earth/Moon cycle, and we still use lunar calendar and organize traditional events. The Moon has been the major theme of our poems since ancient times.

2.2 Gondwanaland was broken-up NOT with Plate Tectonics NOR with Mantle Convection

The geological continuity between South America, Africa, Antarctica and Australia is evident in maps (Fig.2, 3) and they had constituted a single continent before the break-up.

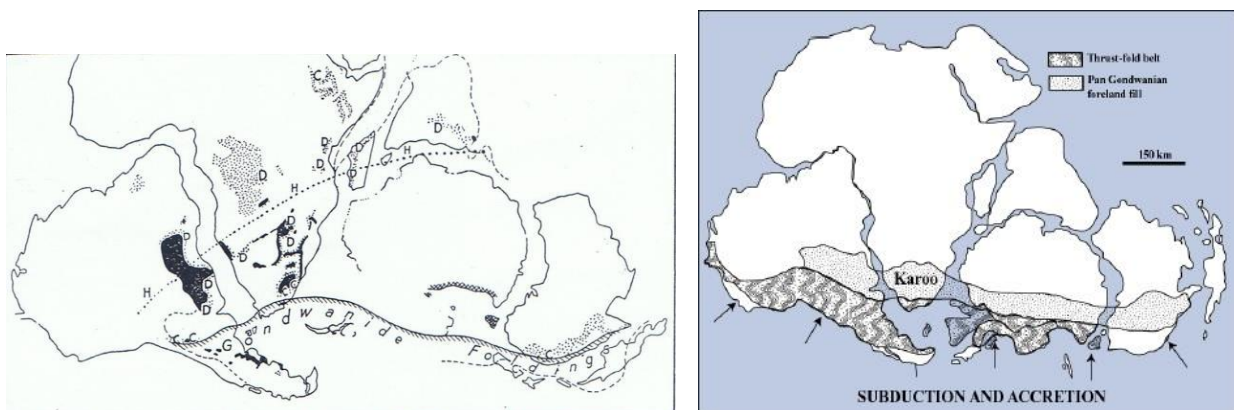


Fig-2, 3 Gondwanaland and distribution of Karoo (left:du Toit, 1937, right Bordy et al., 2010)

I visited the oldest Modern Human site, Klasies River Mouth caves, in the southern coastline of African continent in mid-2007 and end-2012, where *Howiesons Poort* Neolithic techno-complex flourished 66Ka – 58 Ka (Lombard et al., 2012). The break-up edge consists of thick (9 km) and hard sandstone, and there is no trace of igneous intrusion. (Fig.4, 5) It seemed to me that the both Plate Tectonic and Mantle Convection theories are not appropriate and cannot explain the break up. We have to reconsider totally and fundamentally the mechanism of

Gondwanaland break-up (Tokumaru, 2009).



Fig. 4, 5 The Klasies River Mouth Cave No.3 at the Break-up Edge of Gondwanaland (Photo by the Author)

Oberbeck (1993) stated that "Continental crustal plate are rigid and of high strength; some mechanism is required to initiate continental breakup," and suggested that "prolonged impact cratering preceding breakup of Gondwanaland could have extensively fractured the lithosphere and would have facilitated the final continental fragmentation." Vredefort Dome, Highbury and Kgagodi are preceding impacts located within several hundred kilometers from Morokweng impact site, which seems to be center point for the continental fragmentation.

2.3 The Kalahari Impact Hypothesis for the Moon Genesis with a specific origin site and timing

To date, there are several very rough stories for the genesis of Moon such as (i) Fission (Parent), (ii) Capture (Stranger), (iii) Coaccretion (Brother) and (iv) Giant Impact(s), none of which has plausible procedural explanations, nor identification of specific site(s) of origin. All of them take it as granted that the Moon was born 4.5 Ba (Billion years ago) based on its geochemical properties. According to Saiki (2014), the most popular story as of today is the Giant Impact(s). However computer simulation of a collision of two celestial bodies concluded that, in that case, the Moon should consist of the fragments of extraterrestrial body, not of the Earth. Thus it does not comply with the facts that (a) geochemical properties of the Moon are similar to those of Earth mantles and (b) the oxygen isotope ratio of the Moon is same with that of the Earth.

Here I propose the Kalahari Impacts Hypothesis: the Moon was formed with Continental Fluid Basalt (CFB) discharged from Upper Mantle of the Earth by a meteorite impact which took place 145Ma. This hypothesis satisfies the above facts (a) and (b).

In the southern Africa, there are several giant Meteorite Impacts, namely Vredefort Dome (2023Ma), Highbury (1034Ma) and Kgagodi (180Ma), followed by Morokweng (145Ma). Kgagodi and Morokweng are located at the edge of the Kalahari desert. Although studies on those impact craters have not yet been sufficiently implemented, they seem to have contributed to the Break-Up of the Gondwanaland and the Genesis of the Great Rift Valley, as these impact sites and the geological structure of the continent are closely correlated.

It is visible that South African/Namibian coastlines constitute a hemicycle with Morokweng impact site in the center. It is plausible that Morokweng impact was responsible for the coastline generation of South Africa.

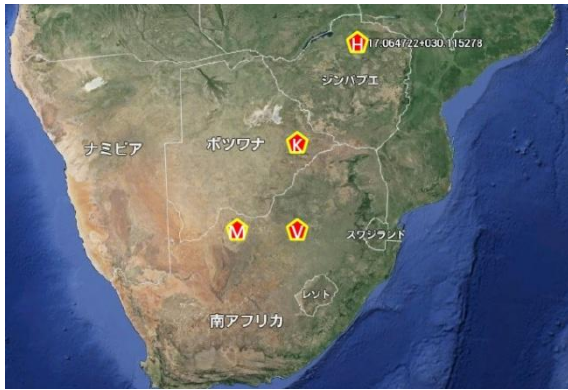


Fig.6/Table.1 Location of Highbury, Vredefort, Kgagodi and Morokweng – Google Earth, Earth Impact Database 2014 & Koeberl 1994

	Lon.	Lat.	Ma
Vredefort	27° 30' E	27° 0' S	2023
Highbury	30° 07' E	17° 04' S	1034
Kgagodi	27° 35' E	22° 29' S	180
Morokweng	23° 32' E	26° 28' S	145

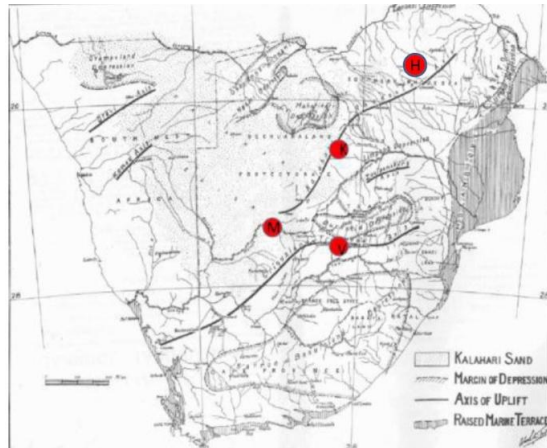


Fig.7 Geology Map (du Toit, 1933).

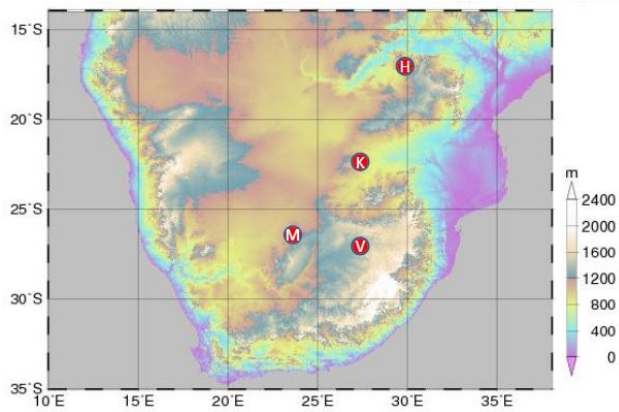


Fig.8 Topology of the Region(<https://lta.cr.usgs.gov/GTOPO30>)

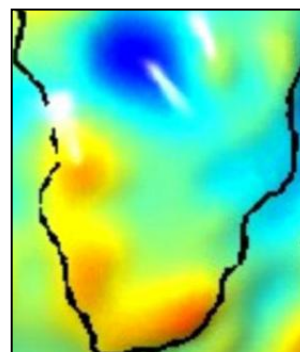
3. The Great Kalahari and the Mega Kalahari: Unknown Formation Process

3.1 No consideration given to the extensive flat plateau of the Great Kalahari.

To our surprise, “in-depth studies dedicated to the development of the Great Kalahari Basin are lacking,” and “the stratigraphy of the Kalahari Karoo Basin remains largely unknown and sedimentological studies, especially of the upper part of the succession, are virtually non-existent in the published record.” (Bordy Segwabe Makuke, 2010) And, to date, there is not a single study which has taken Gigantic Meteorite Impacts in this region, namely Vredefort, Kgagodi, Highbury and Morokweng, into consideration.



Fig.-9 “Inselberg” (Island Mountain) du Toit (1926)



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Fig.-10 Gravity Anomalies in Southern Africa

According to du Toit (1933), even the word “basin” is not appropriate. “By quite a number of geographers it is usually referred to as a ‘basin,’ but in the light of the foregoing description such a designation is not quite correct. It has been moulded, it is true, by warping out of a marvelously extended plain, but the deformation has not led to a common central dip. Comparison can more properly be made with a warped gramophone record unaffected

at its centre but crinkled along its margins. (Fig.-9) These crinkles are, however, not radially disposed, but oriented roughly in a north-east south-west direction.”

A gramophone record like plateau extending 900,000 km² of the Great Kalahari is probably unique in the world. Du Toit interpreted that the warpings in this area of 1.5 million square miles (= 3.88 million km²) owe their origin to one and the same controlling set of tectonic forces. Save for their milder development, they agree in their nature, with the similarly-oriented, relatively-recent warpings and fracture zones ... known collectively as the “Central African Rift System.” A correlation with the latter is unescapable, and such would accordingly extend that already lengthy arc of crustal movement ---which commences in 37° of N. Lat. ---almost to the 33rd parallel of S. Lat – a total distance of just 5,000 miles!” I surmise that the last in the series of Gigantic Meteorite Impacts, Morokweng impact, can be the one and the same controlling set of tectonic forces that du Toit predicted.

3.2 The Kalahari Desert is a part of the Mega Kalahari

“The ‘Great Kalahari’ is perhaps better termed the ‘Mega Kalahari’ to avoid confusion and to emphasize its great size. This region is a downwarped basin, or series of contiguous sub-basins, into which continental sediments have been deposited since the Jurassic. The most common surface unit of the Kalahari Group of sediments is the Kalahari Sand, which extends from latitude 1°N to 29°S. This represents an area of over 2.5 million km² of central southern Africa (Figure 11), and makes it the largest continuous sand sea, or erg, on earth.” (Thomas, Shaw, 1991)

The “Mega Kalahari” is visualized in Fig.12 as the topology of the region drawing 200m contours. There is just one single contour line of 1000m in the Mega Kalahari, which separates the Mega region into the Great Kalahari and Orange River watershed of 800-1000m zone and the rest, 1000 – 1200m extending from Kenya to South Africa. Both the Great Kalahari and the Mega Kalahari are astonishingly flat. How were they formulated?

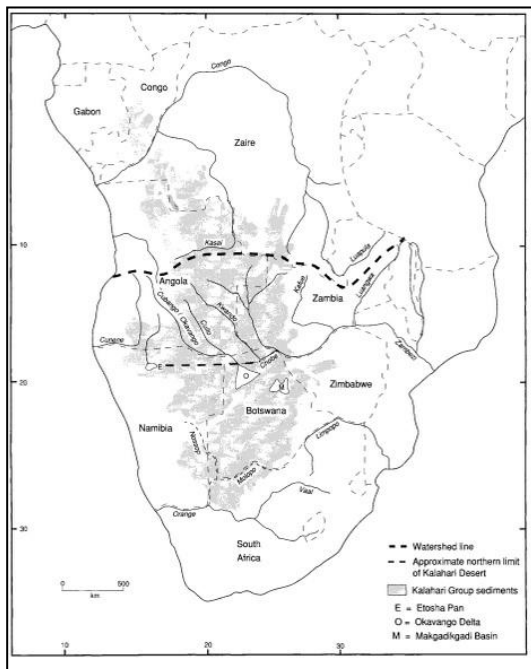


Fig.11 the Mega Kalahari(Thomas, Shaw, 1991)

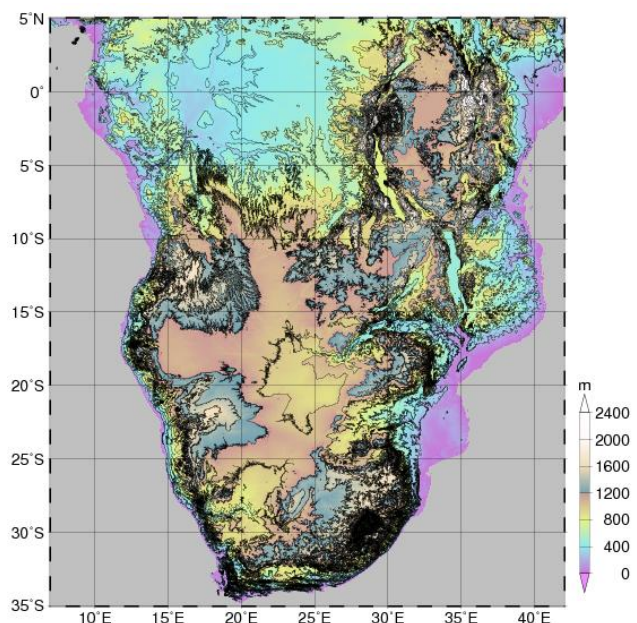


Fig.12 Topology with 200m Contours (GTOPO30)

Karoo CFB highlands surrounding the Mega Kalahari are supposed to be formed around 185-177Ma by a magmatic event occurring prior to the southern Gondwana break-up and the opening of the Indian Ocean. It is plausible that Kgaladi impact (180Ma) triggered Karoo formation, and that Morokweng impact (145Ma) separated

the Karoo structure as well as broke up Gondwanaland. From the crater fissured by Morokweng impact, CFB with high temperature and less viscosity was ejected into the atmosphere and outer space. And in the terminal phase, CFB filled the extensive zone of Mega Kalahari. I surmise that this CFB ejection tilted the Earth rotation axis and generated the moon. Although there is no evidence to my hypothesis, the physiography and geology of the Mega Kalahari are unique enough to be nominated as the currently exclusive candidate for the Origin site of the Moon.

4. Conclusion: Significance of the Coincident Geneses of the Moon and the Modern Human

The Kalahari Impact Hypothesis is new. It should be carefully read and understood. Then, it should be examined and evaluated. If this Hypothesis is confirmed, it turns out that the Moon and the Modern Human were born in the same region on this planet related to the same Giant Meteorite Impact of 145Ma, coincidentally. I cannot predict the exact meaning of this coincidence for the moment. However, it should be an encouraging coincidence and worth celebrating for us. Therefore, I would like to appeal interdisciplinary scientific support for this Hypothesis, and funding to organize research projects to explore and investigate the sacred Kalahari further.

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