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New Continent on the Block: Zealandia
No, it's Mauritia!

While the solar system lost a planet in Pluto some time back, the continents could run up a bit of luck – adding two new continents!

ZEALANDIA is in the news and for all the right reasons. The news of a probable new continent is spreading like wildfire in the geoscientific world. This possibility has created a buzz and reams of paper and netspace have been dedicated to announcing the arrival of this new 'continent'.

The search for the hidden continent has on for a long with geoscientists working hard and long to identify the signatures that could give clues of its existence. Scientists are now quite confident they have hit the bull's eye. They could find this jackpot by following innumerable and circuitous geological and geophysical clues extolling the presence of Zealandia.

It must be noted that one cannot arbitrarily declare any landmass a continent. The continent needs to fulfill a minimum of four criteria.

- The first criterion pertains to the size of a landmass with respect to its surroundings. A continent needs to be taller than its adjoining region. This parameter is apparently related to the thickness and density of the material making up the oceanic and continental crust. The oceanic crust is thinner, but denser. The continental crust, on the other hand, is thicker, but less dense than the oceanic one. The principle of isostasy states the dense material has smaller roots and the less dense has deeper roots.
- The second criterion is related to the presence of all sorts of geological formations. A continent is expected to have different kinds of rocks ranging from igneous to metamorphic to sedimentary, cutting across timelines from the oldest (Archaean) to the youngest (Recent). Oceanic crust predominantly has only igneous rocks, the basalts.
- The third criterion makes it mandatory for the continent to have a thicker crust than the oceanic.
- Lastly, the continental plate boundaries need to be quite distinct and well defined.

The micro-continents normally fail on this last count. They do not have distinct geological boundaries. Zealandia, the appreciably vast landmass, now hidden under the Pacific Ocean, fulfills all the criteria required of a continent.

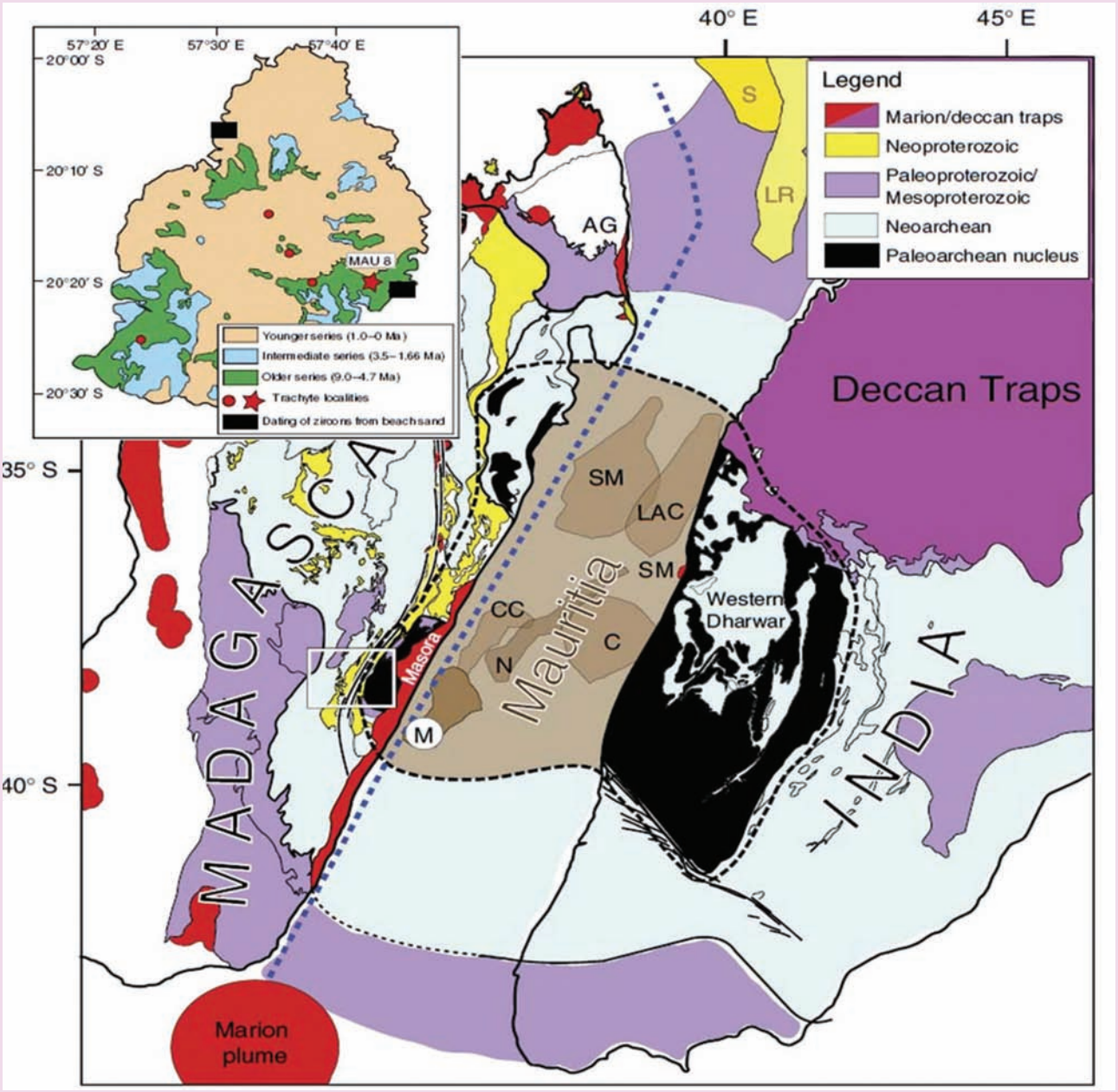
So what if we have a new continent? This piece of information is only of academic importance. Geoscientists will know the configuration of the world more precisely. That's it. Or is it?

The discovery of a new continent is not just of academic interest. It does have economic connotations to it which are very important and have much significance in the context of today's world. This discovery will not just be an addition to the already existing continents, and an extra burden on students. But, it will have far reaching consequences on how the world has shaped up and how it will change in the future.

The continental migration will have to be viewed in a new light. The convection currents that are believed to drive the continents from one place to another and the dynamics involved in this migratory process will have to undergo some overhaul to accommodate the new continent. It will shed light on the deformative processes that change the crustal configuration. This can lead to demarcation of zones, sensitive to disaster causing mechanisms, like volcanoes and earthquakes, or processes that spawn oil and natural gas resources.

Existence of the current world civilization is intricately related to both – natural disasters and resources. Hence, these studies are very important, whose import may not be felt instantly. The discovery will also delineate new zones where the minerals and other natural resources could be found. The exploration strategy for economic minerals will change considerably.

It will also entail redrawing of all



The above figure (from Ashwal et al, 2017) shows the simplified geology of Madagascar and India prevalent around 90 to 85 million years ago. Mauritius, denoted by 'M', has been placed at a likely location just before it broke up. This Mauritia continent contains different entities like Saya de Malha, denoted by SM; Chagos, denoted by C; Cargados-Carajos Banks, denoted by CC; Lakshadweep denoted by LAC; and Nazreth denoted by N.
The blue stippled line indicates the places where the continent was lacerated during the Cretaceous time in the mode of strike-slip faulting containing Analava gabbro, marked AG, of 91.6 million year age; Laxmi Ridge, LR; Seychelles, S; St. Mary rhyolites, SM, all of 91.2 million years of age.
It is estimated that a large lava extrusion event, related to Marion plume, took place between 92 and 84 million years ago.

the existing geological and geophysical maps. The old maps will be outdated. In fact, like the space entities, there is no official body to declare a mass of land to be a continent. However, the constant refrain for upgrading nomenclature of crustal units will help establish such a geological organisation. Pluto's downgrading from a planet to microplanet was effected by an astronomical agency.

With respect to the new physiological and morphological changes in the earth's existing map, it must be said that it will not be just an academic exercise. It has wide geological, geophysical and economic significance.

Zealandia is a stretch of landmass lying between the Pacific and Australian plates. The name Zealandia was first proposed by Luyendykin in 1995 containing a mass of almost 5 m km^2 tucked under the deep waters of the Pacific Ocean. The acknowledgment of this new continent will force the geoscientific community to look at the dynamics prevailing in this region, and elsewhere in the world, differently and innovatively.

Earlier, this continent was 'inferred' to be many different things by many different geoscientists, just

so that the reconstruction of continents could be a smooth and seamless affair. But, from now on, the way in which the tectonic plates will be looked at will differ considerably.

Some of the geological formations identified in west Antarctica are also present in Zealandia, since they were fused together at some point in time. But the same formations are not found in East Antarctica and Australia.

To explain this similarity, and dissimilarity, probably erroneous scenarios were projected earlier by the geoscientists. The plate tectonic dynamics were invoked to explain the thinning of the Zealandia crust, which may have seemed valid then, but now, will be highly contentious. Scientists will have to overhaul their take on the dynamics of this region. The processes that were supposed to have existed here may not be operative the way they were imagined earlier. This vast landmass lies almost completely submerged under the oceanic realm, which was lacerated from its parent body, and is still unfragmented. This is an enigma that needs better explanation.The search for this clarification will open up a new window through which to view the world.

Does anything of this sort exist near our own country? Do we have a continent hidden beneath the Indian Ocean? The Indian sub-continental landmass is engulfed on three sides by large volumes of briny water that has kept hidden some of the complex geology of the area. The Bay of Bengal receives vast amounts of eroded material from the Himalayan terrain. The same is true of the Arabian Sea. It, too, receives eroded material from the Himalayas, but not to the extent that the Bay of Bengal gets. The Arabian Sea, however, is more exciting and diverse off the Bombay–Cochin coastline.

The western Ghat dynamics are tied to the western continental margin of India. In fact, the migratory path of the Indian subcontinent is traced through the tell-tale signs left behind in the form of ridges and basins like the Ninetyeast ridge, Laccadive ridge, Laxmi ridge to name just a few. The elevations and depressions mapped in the Indian Ocean through various geophysical and geochemical means are related to plate tectonic dynamics of the region.

The western continental margin of India is studied vigorously for its natural resources potential. The economic benefits that can accrue have been cashed in by many private and government agencies by harnessing the commercial value of hydrocarbon deposits.

But let us begin from the start. The western continental margin of India has undergone episodic deformation due to tectonic activity. This has been going on right from the time of its formation till date. The deformations caused by the moving landmasses, thinning crust, buoyant magma and other attendant processes have given rise to a complex geometry of elevations and depressions in the Indian Ocean, more specifically, in the area adjoining the western continental margin of India.

The western continental margin of India came into being because of the break-up of the Indian subcontinent, initially from Madagascar, and later from Seychelles. During this pulling apart of rigid plates, in the timeframe spanning from ~80 to 60 million years ago, a number of structural features were newly carved out. This has given rise to diverse structures in the Sea spanning from Bombay to Goa to Cochin.

Beyond and below these places are situated the Lakshadweep islands, that seem to be a continuous chain extending to the Maldives group of islands. Though these sets of islands seem to be continuous, they exhibit different physical and geochemical characteristics, from one place to another. One of the curious features of the Lakshadweep block of landmass is that it is thicker than the surrounding crust. This has led the savants to attribute the origin of Lakshadweep islands to hotspot activity or due to thinning of the continental crust. The debate has been going on for very long.

A team of geoscientists from the Indian Institute of Geomagnetism, Navi Mumbai, set about to find an answer to this long standing problem. They looked closely at the accumulated data over the years with a fresh and novel perspective. They applied advanced statistical and mathematical tools by developing new techniques that had the potential to scoop out latent information from this treasure trove of data.

Through their innovative approach, they found that the Lakshadweep ridge, lying north of 8.5^0N, is continental in nature. They also noticed most of the NE-SW trending geostructures are related to this ridge. These structures had formed due to reactivation of the earlier existing faults when the Indian plate moved over the Reunion plume. They also inferred the Lakshadweep region was a part of the Dharwar group of formations, which later drifted away with Madagascar from India.

This idea has now found support from other independent investigations which have provided direct evidences. They have found basaltic flows and rocks (Deccan basalts) are directly sitting on the basement formations of these islands. Another major study on Zircons of Archaean age (oldest elements found on earth), which were found in rocks formed from hotspot magma, has indicated the presence of very old continental crust beneath the Mauritius Island. This is one discovery that can add one more continent, apart from Zealandia, to the existing pantheon.

Scientists are now confident that there are many different-sized pieces of “undiscovered continent” under the Indian Ocean. This new continent has been christened as “Mauritia”. Our own Lakshadweep ridge is a part of this Mauritia.

So, Zealandia now has a young sister in Mauritia.

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