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The Malvinas Islands: Did the rotated Lafonian Microplate collide in the Palaeozoic with the South American continental margin?

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The Malvinas (Falkland) Islands are located within the Argentine continental platform, 500 kilometers away of the Patagonian coast in the South Atlantic Ocean. However, their Palaeozoic position on the southern Gondwana margin is still matter of debate. Three main hypotheses were advanced: i) Du Toit in 1927-1937 [1] placed the Malvinas Islands between South America and South Africa; ii) Adie in 1952 [2] located the islands up-side down with an important rotation east of South Africa along the Natal province; iii) and the most conservative hypothesis advanced by Borrello in 1962 [3], which supported that the islands were in a similar position relative to South America in the Paleozoic, as they are in Present times.

In order to evaluate the three hypotheses U-Pb and Lu-Hf isotopes were used as detrital zircon tracers in the Palaeozoic cover of the Malvinas Islands. The new isotopic data, together with the present knowledge of the different sedimentary basins developed in the continental Malvinas Plateau, as well as the tectonic evolution of the southern end of South America, indicate a simpler geological history for the islands.

The proposed rotation based on poorly constrained paleomagnetic data and the dike orientation of different sets of mafic dikes, are better explained by the known rotation of the tectonic regime during the Mesozoic. It is well established by the development of Early to Middle Jurassic rift system in Patagonia that a north-south extensional stress was dominant during early – middle Jurassic at the time of the opening of the Weddell Sea. A subsequent rotation of the stress field was associated with the opening of the South Atlantic Ocean at 132-130 Ma. As a result the Middle Jurassic dikes have a different orientation that the Early Cretaceous sets of basaltic dikes.

When the new dataset of detrital zircons are integrated with the age of the exposures of Patagonian basement, a close link to the Deseado Massif arises. This is reinforced by the crustal elastic thickness between the Malvinas Plateau and the Deseado Massif, which indicates a continuous continental basement among the two domains.

The new U-Pb and Hf data sets point out that the early and late Palaeozoic igneous zircons were derived from the adjacent Deseado Massif, and the age of frequent distribution peaks have a pattern that does not fit with a position near Natal in the southern-eastern Africa as previously proposed. As a concluding remark the Borrello's hypothesis that the Malvinas Islands were part of the continental platform of southern South America is still the most plausible interpretation.

References:

[1] Du Toit A.L. (1937) Our wandering continents. London, Oliver and Boyd, 366 p.

[2] Adie RJ. (1952) Geol Mag 89:401–10
[3] Borrello A.V. (1962) Sobre la Geología de las Islas Malvinas, Dir Nac Cult, Buenos Aires, 70 p.