

The Outcropping Basement of the Demerara Marginal Plateau (French Guiana-Suriname): Results from DRADEM Dredges

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ABSTRACT

At the connection between the Central and the Equatorial Atlantic, the Demerara marginal plateau is a continental margin that resulted from both Jurassic and Cretaceous rifting. The northern edge of the plateau is a steep transform margin, where the basement was expected to outcrop. The DRADEM cruise (2016) dredged this continental slope on seven sites from 4700 to 3500 m depths.

Three dredges recovered magmatic rocks, six dredges recovered sedimentary rocks. All samples were analysed using optical and electronic microscope and X-ray diffraction. Magmatic rocks were also analysed for major and trace elements. Zircons were separated from three sedimentary rocks, in order to date their crystallisation from U/Pb isotopes and their cooling from fission tracks.

In two adjacent dredges, magmatic rocks correspond to fresh basalts and rhyolites belonging to a calc-alkaline, Ti-rich suite. Zircons in rhyolites were dated at $173,4 \pm 1,6$ Ma. In a third dredge, magmatic rocks are trachy-basalts and basaltic trachy-andesites. All samples share similar patterns in trace elements. They are Light Rare Earth-enriched, and present positive anomalies in Nb, Ta, Zr and Hf, indicative of Ocean Island Basalt magmas, and consequently an hot spot-related magmatic origin.

The trachy-basalts were altered, eroded, and sedimented in a carbonate platform forming clasts in a bioclastic and lithoclastic rudstone. Large aragonitic shells were dissolved, and the moldic porosity is partially filled by vadose silts, indicating post-sedimentation outcropping above sea-level. The other sites recovered sandstones : either coarse, or from a delta shoreface, or from an oolitic platform.

Cooling ages of detrital zircons from three sites indicate in each site three main peaks dated lower Cretaceous, Trias to lower Jurassic and Paleozoic (ranging from 101 to 145, 190 to 242 and 288 to 434 Ma, respectively). Those peaks are interpreted as cooling ages of the detrital sources. They roughly coincide with, respectively: (1) the lower Cretaceous Equatorial Atlantic rifting, (2) the Central Atlantic Magmatic Province event at the Trias-Jurassic boundary and the subsequent Central Atlantic Rifting and (3) the Panafrikan exhumation, possibly in the Hercynian orogen. Crystallisation ages inferred from $^{206}\text{Pb}/^{238}\text{U}$ dating of detrital zircons are mainly distributed around 650 Ma and may indicate detrital source from the Panafrikan belt in West Africa, prior to the opening of the Equatorial Atlantic.

These findings allow to discuss the subsidence of the northern edge of the Demerara plateau, and to propose new relationships between the formation of the Demerara Plateau and the Central Atlantic Magmatic Province, based on a magmatic nature and Mesozoic age of the Demerara basement.