Geophysical Research Abstracts
Vol. 14, EGU2012-9758-1, 2012
EGU General Assembly 2012

Evolution of the Grenada and Tobago basins and the onset of the Lesser Antilles subduction zone

T.A.C. Zitter and C. Rangin
CEREGE, CNRS UMR7330, EGERIE, Europole de l'Arbois, BP80, Aix-en-Provence, cedex 4, France

The Lesser Antilles active island arc marks the eastern boundary of the Caribbean plate, where the Atlantic oceanic crust is subducted. Geodynamic history of the Grenada and Tobago basins, accepted as both the back arc and fore arc basins respectively for this convergent zone, is the key for a better understanding of the Antilles arc subduction onset.

Still, recent studies propose that these two basins formed as a single paleogene depocenter. Analysis of industrial and academical seismic profiling supports this hypothesis, and shows these basins are two half-graben filled by 15 kilometers of cenozoic sediments. The seismic profiles across these basins, and particularly the Geodinos Bolivar seismic profiles, indicate that the Antilles magmatic arc develops in the midst of the previously-extended Grenada-Tobago basin from Miocene time to present.

The pre-cenozoic basement of the Grenada-Tobago basin can be traced from the Aves ridge to the Tobago Island where cretaceous meta-volcanic rocks are cropping out. Therefore, this large basin extension has been initiated in early Paleocene time during stretching or subsidence of the great cretaceous Caribbean arc and long time before the onset of the lesser Antilles volcanic arc. The question arises for the mechanism responsible of this intra-plate extension.

The Tobago Ridge consists of the backstop of the Barbados prism. The innermost wedge is particularly well imaged on seismic data along the Darien Ridge, where the isopach paleogene sediments are jointly deformed in latest Oligocene. This deformation is starved with the early miocene piggy-back basin. Hence, we conclude the innermost wedge in contact with the butresss is late Oligocene in age and can be considered as the onset of the subduction along the Antilles arc. This 30 Ma subduction onset is also supported by the 750 km long Atlantic slab, imaged in tomography, indicating this subduction was active with constant velocity of 2.5 km/yr.

Consequently, another mechanism, than the Atlantic subduction, has to be invoked for the formation of the Grenada-Tobago depocenter prior to 30 Ma.

These results are part of a cooperative research-industry programm conducted by CEREGE/EGERIE, Aix-en-Provence and GeoAzur, Nice, with Frontier Basin study group TOTAL S.A., Paris.