Using deep sounding seismic data to image water mass – sedimentation interaction at the Demerara plateau (Surinam and French Guyana).

Walter Roest[1], Thomas Lesourd-Laux*[2], Frauke Klingelhoefer*[3], Lies Loncke[4], David Graindorge[3], Christophe Basile[5], Ivane Pairaud , Philippe Schnurle[3], and Paul Blin[4]

[1]Laboratoire Géosciences Geo-Ocean – Ifremer, UMR6538 Geo-Ocean, ALMA-Geological Geohazards, UMR6538 – France
[2]Laboratoire Géosciences Geo-Ocean – UMR6538 – France
[3]Laboratoire Géosciences Geo-Ocean – UMR6538 – France
[4]CEFREM, Univ. Perpignan Via Domitia – UMR 5110 – France
[5]Univ. Grenoble Alpes – CNRS, IRD, IFSTTAR, ISTerre – France

Résumé

The Demerara Plateau is a submarine transform marginal plateau (TMP) located along the South American continental margin offshore Surinam and French Guyana at the boundary between the Central and Equatorial Atlantic. The Demerara plateau separated from its conjugate, the Guinea plateau, during the rifting of the Equatorial Atlantic (mid Cretaceous).
Because of their typical morphologies and their remote position from the continental sedimentary input, these TMPs are archives of sedimentary and oceanographic processes. They influence ocean currents by inhibiting ocean-wide circulation before the break-up and by accelerating coast parallel currents after the opening, The interaction between sedimentary processes and oceanographic processes, combined with the steep morphology of Demerara caused abundant landslides in the past and a prominent slope failure headscarp that separates the upper from the intermediate domain.

During the recent MARGATS cruise a network of 8 deep sounding wide-angle and reflection seismic profiles was acquired spanning the Plateau with the underlying geological stratigraphy as main objective. However, these data image the different water masses as well. The marine seismometer data were used to invert the water column seismic velocities and image the different water masses using a tomographic inversion approach on the direct water wave arrivals. Direct measurements of the seawater temperature and salinity from CTD probes were used to calibrate the seismic data.
The transition from surface to midlevel water masses is marked by a high amplitude reflection package and increasing water velocities. Oceanographic data, bathymetric and seismic profiles allow to compare the water mass boundaries to morpho-sedimentological structures on the seafloor. At the date of seismic data acquisition the sea surface height measured by satellites is indicating the formation of an eddie along the northern slope of the Demerara plateau. A clear correlation exists between the slope failure headscarp and the boundary of the high amplitude reflection package. A high reflective seismic body seems to be correlated

*Intervenant

to the base of the eddie. This work from the Demerara Plateau illustrates how seismic data from the water column help to image water masses that contribute with deep sea currents and internal waves to shape the sea floor.

Mots-Clés: Demerara Plateau : seismic methods, current sediment interaction