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Present-day deep marine tectonic, mud diapirism and sedimentary processes at the south-eastern edge of the Barbados Ridge (Lesser Antilles Active Margin) and north-eastern edge of South America (eastern margins of Trinidad and Venezuela)

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The Barbados Ridge is a mature accretionary prism that has developed since at least Eocene time in front of the Lesser Antilles active margin (eastern Caribbean) as the result of the subduction of the Atlantic oceanic lithosphere of late Jurassic (?) - Cretaceous age below the eastward moving Caribbean plate. To the south, a complex area of E-W dextral shearing disconnects this active margin from the South America margin (north-eastern Venezuela, Trinidad and Tobago) that formed in 2 steps:1/ in late Jurassic time by transcurrent movements when South America start separating from North America; and 2/ in early Tertiary to present time as a result of the eastward displacement of the Caribbean plate with respect to South America. Farther South, The Orinoco passive margin (eastern Venezuela) is a still preserved segment of the late Jurassic-Cretaceous South American margin.

A multibeam and seismic survey (Caramba survey) has been conducted from December 27th, 2001 to January 19th, 2002, on board O/V ATALANTE between 13°N and 09°20´N from the south-eastern edge of the Barbados Ridge to the North down to the middle slope of the Orinoco margin. We present the resulting bathymetric and backscatter intensity maps of the surveyed area. Selected seismic sections and piston core data are shown as well.

Over the whole surveyed area several morpho-structural area can be distinguished:
- to the east, the Atlantic abyssal plain shows a regular deepening from south to north. The more prominent features are the distal channels of the Orinoco deep sea fan with a broader distribution than previously thought. They show a variety of individual shapes related to the local slope gradient and the dominant transit or depositional processes.
- this plain is abruptly bound to the west by the front of deformation and the lower slope of the Barbados prism. Significant differences can be observed from north to south. To the north (13°-12°20N), the morphology is rough and it is difficult to recognise individual thrusts and folds except for the deeper and more recent ones. Farther south (12°20-10°50N), the front of deformation is characterised by a regular pattern of N-S linear and regularly spaced anticlines. Finally the southernmost area shows a complex arrangement of irregular folds which progressively vanishing out to the SW. This morphology of tectonic origin is considerably disturbed by the occurrence of numerous mud volcanoes and by the course of the Orinoco channels and canyons, while, in other places, the present-day sedimentation in piggyback basins tends to flatten the initial topography.
- Folds and thrusts progressively vanished to the southwest (eastern margin of Trinidad and Tobago) due to the thick sediment supply and deposition from the upper segment of the Orinoco fan channels, but also as a result of a radical change in stress and strain regime. As a matter of fact the occurrence of N-S oriented normal faults and related roll-overs suggest an E-W oriented extensive regime possibly induced by the slope of the margin and gravity, although deeper lithospheric processes can not be completely ruled out. Numerous scattered mud volcanoes are present.
- the Orinoco margin to the south show a regular slope locally disturbed by the present-day reactivation of Mesozoic crustal faults. This margin also show evidences of localised slope failure and related deep marine sedimentary processes

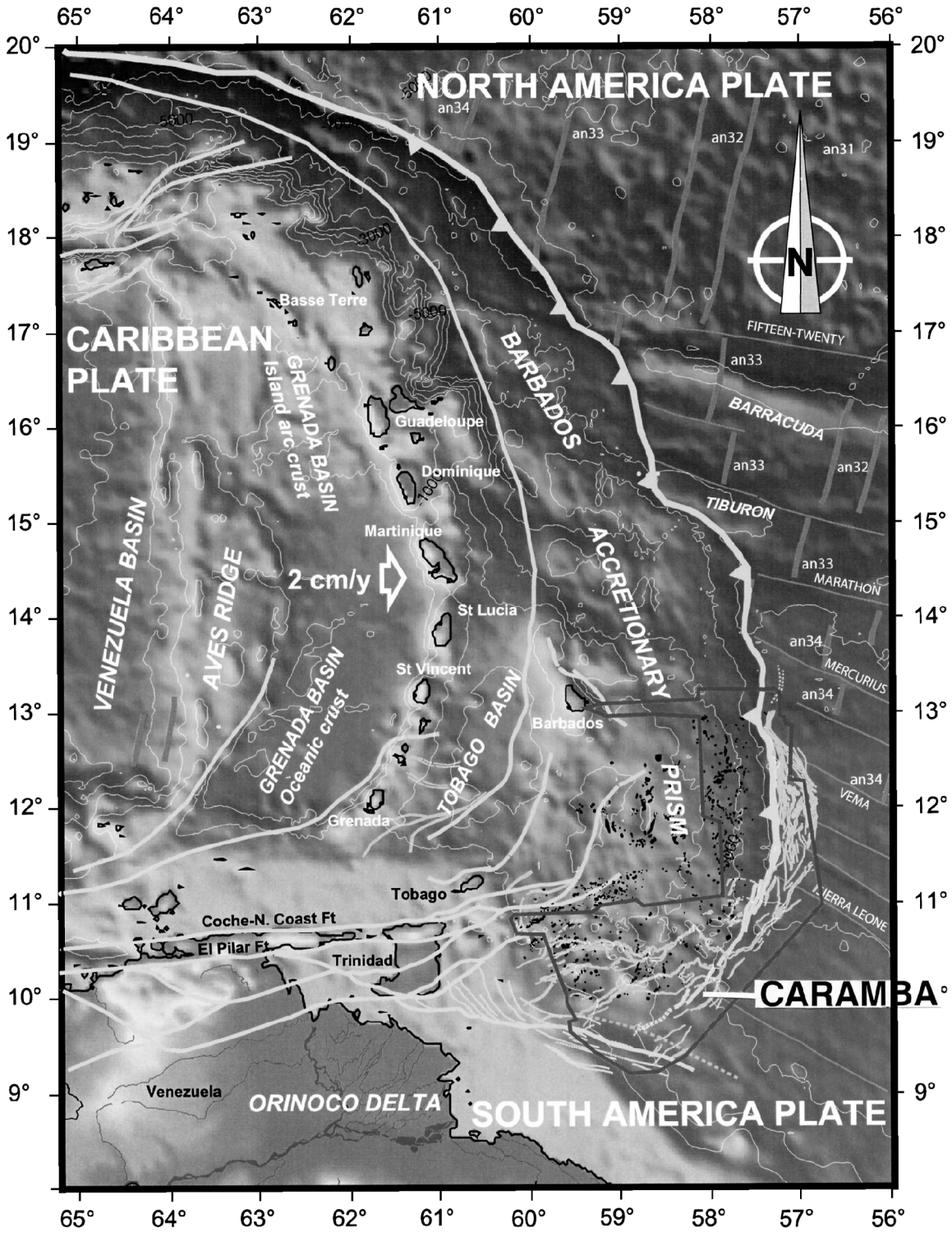

Figure 1

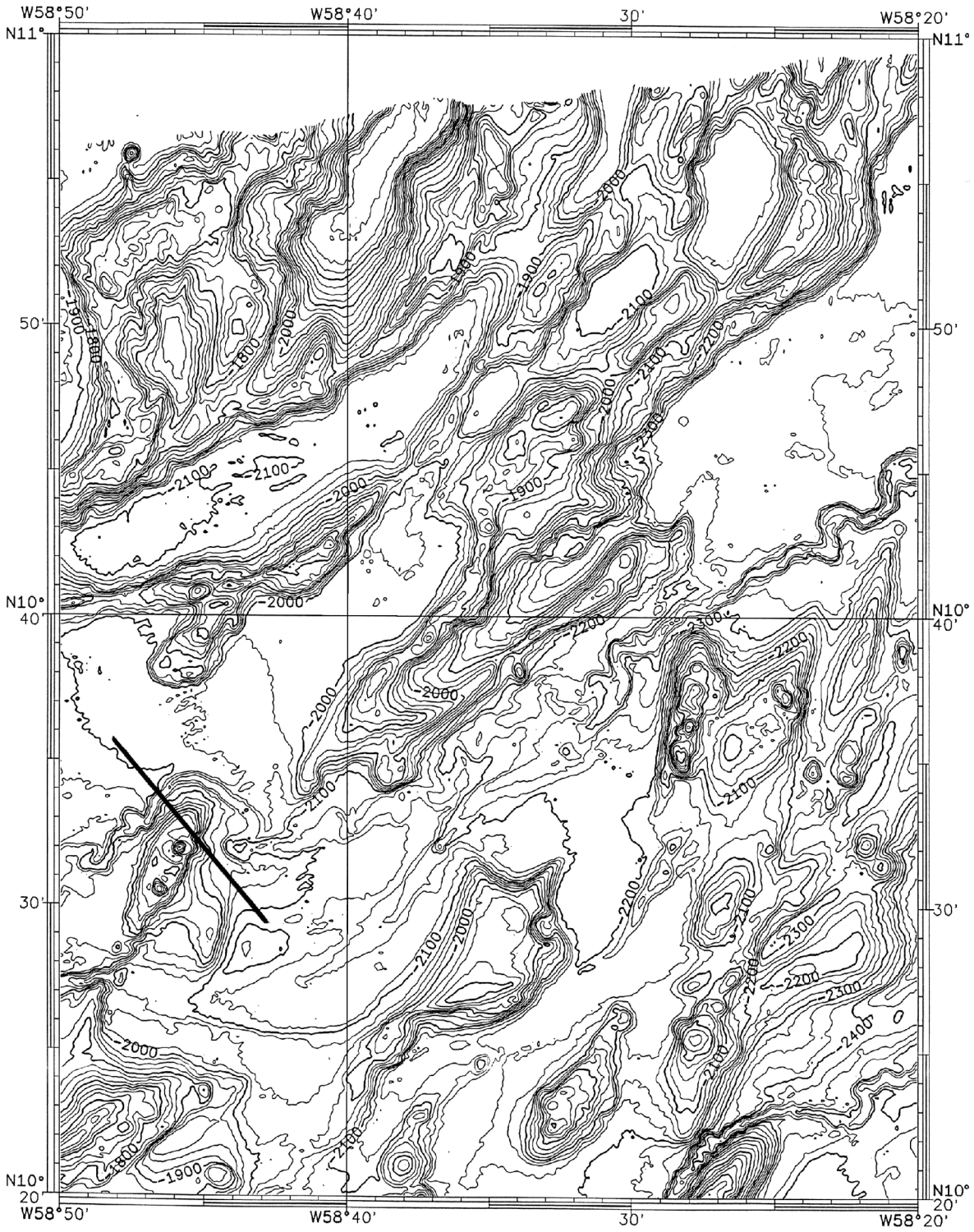

Fig. 2. EM 12 bathmetric map ; depths in meters; location of seismic line (Fig 3)

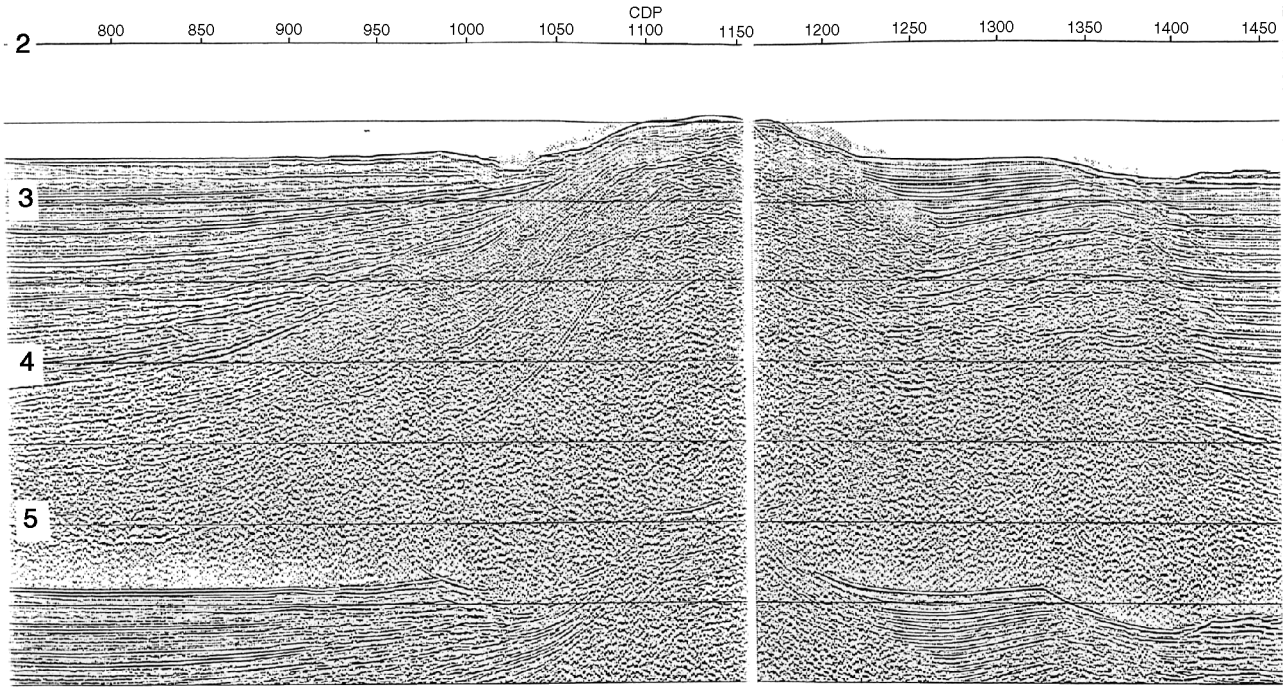

Fig. 3. Seismic profile across presently developing ramp anticlines and related piggy back basins