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Seismic Activity offshore Martinique and Dominique islands (Lesser Antilles subduction zone)

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In the framework of the European project Thales was Right, two seismic surveys (Sismantilles II and Obsantilles) were carried out to better constrain the lithospheric structure of the Lesser Antilles subduction zone, its seismic activity and to evaluate the associated seismic hazards. Sismantilles II experiment was conducted in January, 2007 onboard R/V Atalante (IFREMER). A total of 90 OBS belonging to Géoazur, INSU-CNRS and IFM-Geomar were deployed on a regular grid, offshore Antigua, Guadeloupe, Dominique and Martinique islands. During the active part of the survey, more than 2500 km of multichannel seismic profiles were shot along the grid lines. Then the OBS remained on the seafloor continuously recording for the seismic activity for approximately 4 months. On April 2007 Obsantilles experiment, carried out onboard R/V Antea (IRD), was focused on the recovery of those OBS and the redeployment of 28 instruments (Géoazur OBS) off Martinique and Dominica Islands for 4 additional months of continuous recording of the seismicity.

This work focuses on the analysis of the seismological data recorded in the southern sector of the study area, offshore Martinique and Dominique. During the two recording periods, extending from January to the end of August 2007, more than 3300 seismic events were detected in this area. Approximately 1100 earthquakes had enough quality to be correctly located. Station corrections, obtained from multichannel seismic profiles, were introduced to each OBS to take in to account the sedimentary cover and better constrain the hypocentral determinations.

Results show events located at shallower depths in the northern sector of the array, close to the Tiburon Ridge, where the seismic activity is mainly located between 20 to 40 km depth. In the southern sector, offshore Martinique, hypocenters become deeper, ranging to 60 km depth and dipping to the west.

Focal solutions have also been obtained using the P wave polarities of the best azimuthally constrained earthquakes (Gap smaller than 90°). Focal mechanisms also reveal some differences between the northern and southern sector of the array. Whereas in the southern sector most of the analysed events show purely reverse fault solutions, in the northern area events present strike slip and normal fault solutions and could be related to intraplate deformation.