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Sediment deformation, submarine landsliding and carbonate mounds offshore Costa Rica: high-resolution images using deep-towed sidescan sonar

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During two cruises onboard RV Sonne offshore Costa Rica in 2002 and 2003 high-resolution deep-towed sidescan sonar data have been acquired with the DTS-1 system operated by IFM-GEOMAR. The DTS-1 uses Chirp signals with 75 and 410 kHz centre frequencies for a maximum range of 750 and 150 metres, respectively. Towing speeds of 2.5 knots allows processing the data with pixel sizes of 1.0 and 0.25 metres, respectively. Most of the collected datasets, however, are made up of 75 kHz data. The DTS-1 high-resolution sidescan sonar data from offshore Costa Rica show spectacular images of many of the features associated with subduction zones. These features include styles of sediment deformation due to the subduction of seamounts, different types and styles of landsliding, normal faulting on the continental slope, intense gullying and other sediment-transport features, and various types of cold fluid vents. Most cold vents offshore Costa Rica are associated with carbonate mounds ranging in size from a few hundred metres across and less than 25 metres relief height to large mounds that are more than 1 km across and reach over 100 metres in relief height. Most of the larger mounds have already been identified in the bathymetry, but only high-resolution sidescan sonar allowed to determine the distribution of authigenic carbonates on top of the mounds. Five different types can be clearly distinguished: 1. Domes of several hundred metres in diameter and with smooth flanks and apparent backscatter anomalies concentrated only at the summit of the mound. This type shows strong resemblance with a strato-volcano (although much smaller) and composes the Hongo mound field. They could also represent mud mounds, but signs for mud flows are not present. 2. Within the Hongo mound field larger (up to 1 km across), circular structures are visi-

ble without apparent relief and with only faint backscatter anomalies related to small depressions. This type could represent a different stage of evolution of the domes of type 1. 3. Crater-like structures with a clear outer rim and high-backscatter anomalies within the crater. 4. Mounds of various size but always with strong relief. The relief appears to be related to the presence of massive authigenic carbonates resulting in a relatively smooth surface (on both 75 and 410 kHz sidescan sonar records). 5. Small mounds with little relief height, but with a rough surface on both 75 and 410 kHz sidescan sonar records. The rough surface is the result of individual, metres-sized blocks of carbonates that show a patchy distribution.