3D mapping of Quaternary coral reef terraces on Curacao Island, Southern Caribbean Sea

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Detailed geological field mapping is essential for the study of Relative Sea Level (RSL) indicators, that are in turn the only direct proxies to assess paleo sea level changes and long-term land movements. In the last decades, traditional mapping methods started to be complemented by small Remotely Piloted Aircraft Systems (RPAS, a.ka.a. drones) and high-resolution remote sensing datasets.

In this contribution, we show the results of geological mapping in the island of Curaçao (Netherlands Antilles). Here, we mapped a staircase sequence of coral reef terraces. In particular, we used TerraceM-2 Maptools (a Matlab\textsuperscript{\textregistered} interface for mapping marine terraces) to extract wide-scale marine terrace elevations from TanDEM-X Digital Elevation Models (DEMs) (German Aerospace Center, DLR and Airbus). We detail the elevation information available for each single terrace with RPAS data processed with Agisoft Metashape, that allows obtaining as final products DEMs and orthophotos of selected sites at the inner margin of reef terraces. We then use land-based photogrammetry coupled with traditional facies analysis to identify geological discontinuities on the lower terrace.

The facies analysis allowed to precisely map the unconformity between the Hato (MIS 5.5) and Cortalein (MIS 7) Units (as identified by Muhs et al., 2012). The top of the Hato Unit forms the so-called “Curaçao Lower Terrace”. The top of the Hato Unit, extending few kilometres from the coast, has been mapped with both TanDEM-X and RPAS data up to the paleo-cliff of the Middle Terrace (formerly attributed to MIS 11), where a well-defined notch is preserved. We attribute this notch to the maximum sea ingression during MIS 5e. We compare its elevation with the RSL predicted by Glacio-Isostatic Adjustment (GIA) models.

We discuss the new data and models for Curaçao in terms of long-term tectonic uplift and eustatic sea level.

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