Geophysical Research Abstracts
Vol. 20, EGU2018-6937, 2018
EGU General Assembly 2018

The role of subsidence in shelf widening around ocean island volcanoes: Insights from observed morphology and modeling

Rui Quartau (1,2), Alan Trenhaile (3), Ricardo Ramalho (2,4,5), and Neil Mitchell (6)

(1) Instituto Hidrográfico, Geologia Marinha, Lisboa, Portugal (rui.quartau@hidrografico.pt), (2) Instituto Dom Luiz, Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal, (3) Department of Earth and Environmental Sciences, University of Windsor, Windsor, Canada, (4) School of Earth Sciences, University of Bristol, Bristol, UK, (5) Lamont-Doherty Earth Observatory at Columbia University, New York, USA, (6) School of Earth and Environmental Sciences, University of Manchester, Manchester, UK

On reefless volcanic islands, insular shelves are thought to have formed essentially by the combined effects of wave erosion and glacio-eustatic sea-level oscillations. Subsidence, however, has always been recognized as having an important role in the development of these morphologies. Yet, few studies have quantified the relative contribution of subsidence to shelf generation and development, particularly to shelf width. We explore this issue by comparing shelf bathymetric profiles from Faial and São Jorge islands in the Azores with predictions of a numerical model of coastal erosion that has been calibrated previously against other field data. Our aim is to assess quantitatively the role of subsidence in shelf development by comparing real cross-shore shelf elevation profiles with modeled profiles using varied rates of subsidence. The first set of model runs were made to calibrate the model by determining the values that produced shelves with break depths, widths, and profile shapes that were similar to those observed. The second set of runs, which served to evaluate the contribution of subsidence to shelf widening, revealed that subsidence may have been responsible for increasing shelf widths by almost 2.5 times relative to shelves formed only by wave erosion during glacio-eustatic oscillations. Modeling shelf formation on the same islands but with increased subsidence rates up to 2.2 mm/year resulted in modeled shelves up to 19 km wide. Our study therefore reinforces the idea that subsidence plays an important role in the generation of broad island shelves, and that in the Azores the shelves are erosional rather than constructional in origin.

Acknowledgments
This work is funded by FCT–Fundação para a Ciência e a Tecnologia through the PLATMAR project (PTDC/GEO-GEO/0051/2014)