



## **Modeling the origin and development of a volcanic island shelf: Faial Island in the Azores archipelago**

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A mathematical model derived from basic wave equations was used to investigate the origin of the shelf around volcanic Faial Island in the Azores Archipelago. This work was supplemented by bathymetric data from single beam echo-sounding and sediment thickness from Chirp and Boomer high-resolution seismic profiles. A composite sea level record was used to represent glacially induced oscillations, and corresponding variations in the elevation at which the waves operated through time. Wave regimes were site-dependent, according to the orientation of the coast. Model runs were made for periods ranging from a maximum of 800 000 years to a minimum of 10 000 years, depending on the age of the various coastal sectors. The model suggested that some coastal sectors are almost entirely erosional, some may be largely depositional, and others combined elements of erosion and deposition. Therefore, the model provided support for the contention that the shelves of volcanic islands develop through competition between waves and other erosive mechanisms and volcanism and other constructional mechanisms that fill in and rebuild erosional spaces. Faial Island also provides

support for the proposition that the width of the shelves of volcanic islands increases with age, although the relationship may not be linear on islands with more resistant rocks, given the tendency for wave-cut surfaces to trend towards an equilibrium state. Although subsidence continues today, it played only a fairly minor role in the development of the shelf of Faial Island.