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Santa Maria Island's (Azores Archipelago) geological evolution: new insights from high-resolution marine geophysical data.

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Santa Maria is the oldest island of the Azores Archipelago in the Atlantic Ocean, having first emerged at c.6 Ma (Ramalho et al., 2017). Its geological evolution up to now was constrained only by the knowledge of the subaerial volcanic edifice, since the submerged portion of the island has never been studied.
In this work we used high-resolution multibeam bathymetry and closely-spaced seismic reflection profiles to study the morpho-stratigraphic setting of Santa Maria's insular shelf. In particular the shelf width and the depth of its edge where used as proxies for reconstructing the development of the earlier portions of Santa Maria Island.
Our study suggests that the large insular shelf off the northern coast of Santa Maria is the remnant of an early, now almost completely razed, volcanic edifice likely older than the volcanic sequences exposed onland. We also identified a sequence of submerged marine terraces located at approximately -40/-50 m, -70/-80 m, -85/-90 m, -100/-110 m and -120/-140 m surrounding the island. Similarly a set of ten raised marine terraces are observed onland at elevations comprised between 7-11 m and 210-230 m in elevation (Ramalho et al., 2017), making it an ideal place to study the complex interplay between glacio-eustatic sea-level fluctuations and the island vertical motion trends. In this fashion, we tried to correlate the formation of the different subaerial and submarine terraces with known sea-level stands, starting from a dated subaerial terrace and taking into account the passage zone between submarine and subaerial lava flows. The raised marine terraces were mostly formed during sea-level highstands or stillstands, likely occurred in the last 3.5 Ma, whilst the submerged terraces were probably formed during sea-level lowstands or stillstands from 1.04 Ma to the Last Glacial Maximum (20 ka ago).
Our results demonstrate that Pliocene-Quaternary marine terraces carved during highstands, lowstands, or even stillstands can be preserved also on slow uplifting/subsiding islands, highlighting their potential to constraint the complex history of vertical movements affecting volcanic islands.

References

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