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The Lomba Lake sedimentary record over the last 23.5 ky: implications for the Holocene volcanic history of Flores Island (Azores)

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Lake sedimentary archives from volcanic regions frequently contain a rich and continuous record of tephra layers, providing a critical source of information to reconstruct a most complete eruptive history of neighbouring volcanic centres. Lake sediments from volcanic islands are particularly useful as the typical small size of these islands and their steep subaerial and submarine slopes lead to a lower preservation potential of primary pyroclastic deposits. Here we study the volcano-sedimentary record of Lagoa da Lomba (Lomba Lake), an old crater lake located in the central upland area of Flores Island (Azores), to gain insight into the recent volcanic history of this island. The strategic location of Lagoa da Lomba, half distance between the two clusters of recent volcanic activity of the island, together with its 23.52 cal kyr BP record, makes this lake a privileged site to investigate the Holocene volcanic history of Flores. We conducted a detailed characterization of the sedimentary facies from a transect of three cores to differentiate primary from reworked/redeposited tephra deposits, which was complemented by glass shard geochemical analysis and radiocarbon dating.

We recognized four eruptive events taking place between 6.28 and 2.36 cal kyr BP, demonstrating that the Holocene volcanic activity at Flores Island may have lasted longer than previously reported. Glass shard geochemistry from the different tephra layers suggests three populations, ranging from basaltic to trachybasaltic in composition, where the last eruption is the least evolved endmember. Two of the four eruptive events correlate geochemically and stratigraphically with

subaerially-exposed pyroclastic sequences. The most recent event recorded at Lagoa da Lomba was constrained to 3.66 – 2.36 cal kyr BP and associated with an eruption sourced from Lagoa Comprida Volcanic System. The second most recent eruptive event was sourced from Lagoa Funda Volcanic System and dated at 3.66 cal kyr BP. Our observations show that Flores Island experienced vigorous volcanic activity during the Late Holocene. Therefore, contrary to what was previously assumed, the possibility of future eruptions should not be underestimated, and the volcanic hazard here should be properly assessed. Moreover, our results highlight the importance of tephrostratigraphy in recent lake sediments to reconstruct past volcanic activity in those contexts where outcrops exposure is limited.

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