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# Magmatic constraints on a Holocene continental back-arc volcano: The Santa Maria volcano

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The Payún Matrú Volcanic Field (PMVF) located in central west Argentina, is characterised by abundant Quaternary basaltic volcanism and concentrates the majority of the Patagonian Holocene basaltic volcanism. Several investigations have dealt with this volcanic field, however the recent (<10 ka) basaltic volcanic activity has been long overlooked. The Santa Maria volcanic cone and corresponding basaltic flow constitute one of the most recent eruptions from the PMVF. It is one of the few volcanoes in which the cone and lava flow has not been obscured by posterior Holocene volcanic activity, hence constituting an appropriate setting to study the recent volcanic history of this volcanic field. We present results from major- and trace- element analysis, $^{238}$U-$^{230}$Th-$^{226}$Ra disequilibria as well as two surface exposure ages. The geochemical evidence suggests that the Santa Maria magmatic source has a composition similar to the local ocean island basalt (OIB), with some lower crustal assimilation and not influenced by slab-related metasomatic fluids, agreeing with previous studies from the area.

Furthermore, the $^{266}$Ra-$^{230}$Th disequilibrium among samples of the Santa Maria volcano has a linear trend with increasing Th (ppm) concentration suggesting a differentiation trend in the volcano's magmatic chamber, which modified the $^{226}$Ra/$^{230}$Th activity ratios but is not responsible for the observed $^{226}$Ra excess. The U-series analysis indicates that the $^{226}$Ra excess over $^{230}$Th in these basalts is associated with a deeper magmatic process.

The surface exposure dating, applying $^{3}$He and $^{21}$Ne cosmogenic isotopes, resulted in poor age resolution due to the low concentration of the isotopes, and hence, is associated with large errors. Nevertheless, using the maximum calculated error, the lavas of this volcano are less than 4000 years old. The inferred maximum age of the basalts in combination with a high Ra excess indicates that the magma ascent rates were relatively rapid, possibly associated with a channelized flow. According to the modelled melting conditions, we infer that the melting occurred at intermediate pressure directly below the continental crust.