

The phonolitic Cão Grande Plinian volcanism on Santo Antão, Cape Verde Islands: When, Where, How

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Santo Antão is an ocean island shield volcano in an early post-erosional stage. At this stage, mafic Strombolian volcanic activity had been replaced by Pleistocene highly explosive eruptions of evolved, phonolitic magmas. Two phonolitic tephra successions, Cão Grande Pumice units I and II (CGI and CGII) had been previously identified and described (Holm et al. 2006; Mortensen et al. 2009) but our tephrostratigraphic fieldwork on Santo Antão identified a third, older explosive phonolitic phase (CG 0) and two phonolitic domes. CG 0 comprises eight pumice fallout layers and two ignimbrites.

Using major and trace element glass compositions, mineral compositions and bulk rock analyses, we correlate Cão Grande Group units with ash beds in 14 sediment gravity cores from the ocean floor up to 400 km away from the island. These correlations demonstrate that CG0, CGI and CGII all comprised large magnitude Plinian eruptions that produced tephra blankets dispersed over more than 10⁵ km².

While the exact source-vent locations on Santo Antão for CG0 and CGI remain unknown, we found that the Morro de Figueira dome has the same composition as the CGII tephra and thus marks the source vent of that youngest Cão Grande tephra, an interpretation supported by the observed lateral variations in thickness and grain size of the CGII fallout tephra.

Our combined on-land and marine tephrostratigraphy combined with geochemical and petrological analyses and ongoing ⁴⁰Ar/³⁹Ar-dating of sanidines will allow us to reconstruct in detail the post-shield history of evolved magma evolution and explosive eruptions of Santo Antão.