Unraveling the eruption dynamics of the complex volcanology at the 5 ka Mt. Gambier Volcanic Complex, south-eastern Australia

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The 5 ka, basaltic, multi-vent and polymagmatic Mt. Gambier Volcanic Complex (MGVC) is a complex of maars, tuff, scoria and spatter cones. It occurs within the late Cainozoic basaltic intraplate Newer Volcanics Province of south-eastern Australia. Field mapping, stratigraphy and facies analysis, component analysis, whole rock geochemistry and electron microprobe and Fourier Transform IR analyses were used to constrain the eruption dynamics of the MGVC. The eruption styles range from magmatic to phreatomagmatic with varying intensities in explosivity. The analyses indicate that the highly variable eruption styles in this complex monogenetic system resulted from a combination of magmatic variables (magmatic effusive vs. magmatic explosive styles) and the dynamics of interaction between the rising magma and the two underlying aquifers (one confined and one unconfined).

Magmatic variables are crystallinity, vesicularity, temperature, density, viscosity, rise rate, pre-eruptive volatile contents and degassing. The aquifer dynamics are related to the aquifer properties - grainsize distributions, permeability, recharge rates, hydraulic conductivity (i.e. horizontal flow rate) - as well as the behaviour of the water itself and how these properties rheologies change with the introduction of rising hot magma. Also the conduit properties related to the aquifers are important (i.e. sealing of the conduit walls and liquifaction). The rising magma, at each eruption point, first interacted with the upper unconfined aquifer and then later with the deeper confined aquifer as the diatreme was progressively excavated deeper.

This poster provides insight in how these variables and dynamics are constrained and what the results are to date of the different methods. It should trigger a discussion about the way hydrodynamics are perceived when studying eruption dynamics.