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Magmatic and volatile evolution prior to the Avellino ($\sim$3.55kaBP) and Pollena (AD 472) explosive eruptions of Somma-Vesuvius: insights from EPMA and SIMS analysis of phonolitic melt inclusions.

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We have focussed on characterising the shallow ($\sim$1 – 2 kbar) magmatic evolution of two contrasting explosive events in Somma-Vesuvius' more recent history – the sub-plinian / vulcanian AD 472 ('Pollena') eruption ($\sim$0.3 km^3 DRE) and a larger plinian eruption at $\sim$3.55 ka BP ('Avellino'; $>$ 0.5 km^3 DRE). Approximately 400 homogeneous, non-crystallised melt inclusions (MI) and re-entrant embayments (visibly connected to matrix melt until eruption) were selected for analysis by EPMA and SIMS from a range of host minerals, separated from pumice samples spanning the stratigraphic range of the reverse-zoned fall deposits for each eruption. Their major, trace and volatile contents have been compared with whole rocks and with more primitive, mafic MI (within olivine and diopside) analysed by previous studies. The MI analysed comprise tephri-phonolite, trachy-andesite, foidite and phonolite liquids. Pollena and Avellino MI indicate distinct liquid lines of descent for the two eruptions and very different pre-eruptive volatile contents. We suggest, on this basis, that the differing eruptive style and bulk-geochemistry of erupted products of the two eruptions *primarily* reflect differences in the volume, composition and volatile contents of the most evolved, 'shallowly' stored (ie $\leq$ 2 kbar) phonolitic magmas, rather than significant differences between the most mafic batches feeding these levels. Maximum pre-eruptive water contents for both eruptions are found in evolved phonolitic MI, hosted by minerals such as sanidine, nepheline, ferro-augitic cpx and garnet. Avellino MI contain significantly more water ($\sim$3.5 – 5.7 wt%) and less Cl ($\sim$0.4 – 0.6 wt%) than Pollena MI ($\sim$1.5 – 4 wt% H_2O, $\sim$0.7 – 0.9 wt% Cl). H_2O & Cl con-

tents of Avellino MI from this study overlap almost completely with those reported for sanidine-hosted MI from the AD 79 ('Pompeii') white and grey pumices by previous studies. Cl appears buffered with respect to variable water and F contents as well as indices of fractional crystallisation. This is consistent with pre-eruptive saturation with vapour $\pm$ hypersaline liquid phases for both eruptions. Water and S are almost completely degassed during both eruptions, while Cl and F contents are retained. Maximum water and Cl contents of MI from the two eruptions imply *minimum* storage pressures of $\sim$ 2 kbar for Avellino and $\sim$ 0.5 kbar for Pollena. The MI data are consistent with a shallower stored, smaller volume of less evolved magma feeding Pollena than in the case of Avellino or AD 79 – in good agreement with recent experimental work. We propose that the lesser explosivity of the sub-plinian Pollena eruption is also connected with the significantly lower pre-eruptive water contents of the magmas feeding it. Pre-eruptive magmatic and volatile evolution, as sampled by melt inclusions, *does* therefore correspond with eruptive style at Vesuvius.