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Permeability of Campi Flegrei magmas and comparison with rhyolites and basalts

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We performed permeability measurements on trachy-phonolitic pyroclastic products from the Campanian Ignimbrite and Monte Nuovo, two explosive eruptions from the active Campi Flegrei caldera, Southern Italy. Viscous permeability spans a wide range between 1.22×10^{-14} and 9.31×10^{-11} m². Inertial permeability follows the same trend as viscous permeability and increases as viscous permeability increases, highlighting the strong direct correlation between these two parameters. We observe that vesicularity does not exert a first order control on permeability: the Monte Nuovo scoria clasts are the most permeable samples but not the most vesicular; pumice clasts from the Campanian Ignimbrite proximal facies, whose vesicularity is comparable to that of Monte Nuovo scoriae, are instead the least permeable. In addition, sample geometry exhibits permeability anisotropy as, amongst oriented sample cores, those parallel to clast elongation are more permeable. Finally, we compare our results with permeability values of rhyolitic and basaltic explosive products, and provide a link between permeability and melt viscosity and crystallinity.