The Mt Pilato-Rocche Rosse eruptions in Italy evolve from explosive to effusive, and the nature of the clasts evolved from relative water-rich pumice (~1.0 wt % H2O) to water-poor dense obsidian (0.1 wt %). Water measured on the glass of erupted material defines a general and gradual trend of decrease from ~1 to < 0.1 wt %. Healed fractures are recorded in numerous types of erupted material. The textures and water content profiles, derived from detailed synchrotron Fourier transform infrared analysis, preserved in the rhyolitic rocks of the explosive and effusive deposits indicate that syn-eruptive degassing through magma autobrecciation was a pervasive process during eruption. Fractures provided low pressure sites and escape pathways for water. We suggest that repetitive and pervasive fracturing and healing is responsible for magma degassing events due to increased permeability. This leads to a progressive magma dewatering controlling magma rheology leading to the formation of obsidian, and explaining the temporal evolution towards effusive eruptions. We found also that water content in obsidian varies considerably at sub-millimetric scale. This causes significant viscosity variations, impacting on the nature of magma flow and on how we infer and interpret pressure from the water contents of silica-rich melts.