UNIVERSITÉ DE GENÈVE

Magma density and viscosity

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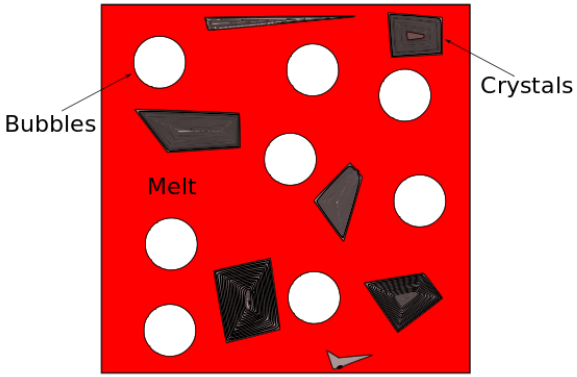
Magma density



Bulk density depends on volume fraction of crystals and bubbles

$$\rho = \rho_{\mathrm{m}} \left(1 - \sum_i \phi_i \right) + \sum_i \rho_i \phi_i$$

ρ_{m} = Melt density

- Depends on $T, P, \mathbf{X}$

i = quartz, hornblende, plagioclase etc. and H_2O, CO_2 bubbles etc.

ρ_i = Density of phase i

- Depends on T, P for bubbles
- Depends on composition for crystals

ϕ_i = Volume fraction of phase i

Melt density

$$\rho_m = \sum_i X_i M_i \left(\sum_i X_i V_i \right)^{-1}$$

M_i = Molar mass of component i

- Mass of 1 mol of i

V_i = Partial molar volume of component i

- Change in mixture volume when 1 mol of i is added