



## Quantifying pressure variations from petrographic observations

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The existence of grain scale pressure variations has been established over the last decennia. Mineral reactions are often accompanied by volume and shape changes in a system where much heterogeneity in material properties exists. This gives rise to internal stresses and pressure variation during metamorphic reactions. The residual pressure in inclusions can be measured by Raman spectroscopy, but is restricted to a narrow range of minerals that (potentially) have a well calibrated Raman shift with pressure. Several alternative methods to quantify pressure variations from petrographic observations are presented. We distinguish equilibrium and non-equilibrium methods. Equilibrium methods are based on a newly developed method to predict phase equilibria and composition under a given pressure gradient. The pressure gradient can be found by iteratively matching predicted phase assemblages and composition with petrographic observations. Non-equilibrium methods involve the estimation of pressure variation in initial stages of reaction in which the system may still be isochoric. It then results in the potential pressure buildup for a given unreacted rock for example in the initial stages of dehydration of serpentinite in subduction settings.