# Density of magmas at depth

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Silicate liquids play a key part at all stages of deep Earth evolution, ranging from magma ocean evolution billions of years ago to present-day volcanic activity. Quantitative models of these processes require knowledge of the structural changes and compression mechanisms that take place in liquid silicates at the high pressures and temperatures in the Earth's interior. In particular, density measurements of silicate melts are much sought after because density is the primary factor controlling the evolution of magmas at depth. However, obtaining such knowledge has long been impeded by the challenging nature of the experiments. Different methods used to obtain the density of melts at high pressure will be presented, the angle chosen being that of in situ experiments using x-ray synchrotron radiation facilities. The choice of the method depends on the targeted pressure-temperature range, and on the composition of the magma; pros and cons of each method will be discussed.

Density will be reported for both natural but complex compositions and for some simple end-member compositions, using large volume presses (10 GPa range) and diamond-anvil cells (100 GPa range). Density data be discussed in the light of coordination number changes with pressure for major elements (Si, Fe, Al) as tracked by in situ x-ray diffraction.

Besides implications for early magma oceans, the results illustrate the importance of density traps in planetary interiors. Such melt layers, some evidenced today by geophysical observations, could prove more widespread than previously thought both in time and space and must have exerted a strong control on the structure, geochemistry and dynamics of planetary silicate mantles.