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Reconstructing modalities of magma storage in the crust by thermo-rheological modelling

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During my PhD I worked under the supervision of Luigi Burlini studying the rheological behaviour of magma. Luigi was not only a great teacher and friend but he was also able to project the science he was performing beyond the obvious applications. This aspect of Luigi's approach shaped my approach to research and brought me to think to ways of applying the studies we performed together to unravel the complexity of nature that impassioned and inspired him.
This contribution comes from the motivation and interest that Luigi created in me during the short, but truly memorable journey we shared together.

This study combines petrology, thermal modelling and magma rheology to characterise timescales and modalities of magma emplacement in the Earth's crust. Thermal modelling was performed to determine the influence of magma injection rates in the crust on the temperature evolution of a magmatic body. The injected tonalitic magma was considered to contain dioritic enclaves, common in plutons. The contrast in chemical composition between host and enclaves leads to different crystallinities of these magmas during cooling and produce a rheological contrast that permits reciprocal deformation only in restricted temperature ranges. Characterising the thermal and rheological evolution of host magma and enclaves, we traced the evolution of strain recorded by these inclusions during the construction of an intrusion, showing that the strain recorded by enclaves distributed in different portions of a pluton can be used to constrain thermal evolution in time, magmatic fluxes and timescale of assemblage of magmatic bodies in the crust.