MICROSTRUCTURES IN MAGMATIC SYSTEMS AND THE CRYSTAL SIZE DISTRIBUTION ANALYSIS. 3D TECHNIQUES AND INNOVATIVE APPROACHES

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Crystal Size Distribution (number of crystals N(L)- of size L in the unit volume vs size L) are obtained from volumetric crystal number densities in different size bins. CSDs reflect the processes of nucleation, growth, accumulation and depletion of crystals in a given system, thus a plot of N(L) vs size L, is a dynamic description of rock textures which contains temporal information due to time dependence of crystal sizes . Examples and modelling will be shown for magmatic and mantle rocks. (Less. 1 and 2)

Crystallization influences the rheological properties of the products of an eruption and develops on a time scale (from hours to months) prevalently associated to the eruption event, affecting its style. Recent developments allowed to simulate the kinetics of the processes and to define the time frame of crystallization events. To fully exploit this advances we need to obtain the rates at which a magmatic system evolves , assigning an “age” to crystals whose nucleation and growth laws are known, together with the intensive variables that accompanied their appearance in the system. (Less 3)

If an intensive property (P,T,Xi) of the system is known as a function of size of crystals to which we can assign an age t, the time derivatives of these variables can be easily obtained. For a set of products of the recent activity of Mt Etna , it will be shown how experimental data on kinetic of Nucleation and Growth, can be related to CSD data to quantify the complex relationships among nucleation and crystal growth hidden in lava textures. The method will be applied to the evaluation of relevant thermodynamic data, like the wet angle of olivine in basaltic melts. (Less 4)