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Tracking magma dynamics at Mount Etna from plagioclase textures and compositional zoning

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The complex volcanic structure of Mount Etna makes ascending magmas able to interact with the crust, differentiate and mix at several levels of the feeding system. Dealing with data on the resulting rocks, it is therefore difficult to assess the relative role of AFC or mixing processes in differently evolved magmas. However, several Authors have pointed out that textural and chemical zoning particularly of plagioclase may be an efficient tool for constraining the dynamics and kinetics of magmatic processes, chiefly due to its high sensitivity to changes in pressure and volatile contents of the system. We present a first systematic study of textural features and An%-Fe zoning in plagioclase phenocrysts of dated historic (pre-1971) and recent (post-1971) Etnean lavas through high-resolution backscattered electron images and microprobe analyses. The considered textures include oscillatory zoning and several types of dissolution/resorption and growth textures at phenocryst cores and/or rims. This presentation is aimed at illustrating how all the available data allowed us to constrain ascent rates, magma recharge and storage modes in the feeding system as well as eruption triggering mechanisms, highlighting their possible variations through time. Understanding the mechanisms and changes of magma ascent dynamics and evolution in the feeding system becomes, in our opinion, a relevant factor for assessing volcanic hazard in densely populated areas, such as the Etnean one.