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Towards refined rheological laws to understand magmatic flows.

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Most of volcanic eruptions exhibit transitions in style during a single eruption. The most relevant example is probably the cyclic eruptive style of lava domes. The application of numerical tools on a volcanic system and its surrounding population became the most reliable way to estimate the risk level areas. However, in order to have the most accurate results and the better view of the potential hazard for each site these tools have to improve in many ways.

One of the most important improvements needed is a constrained rheological law. Newtonian and power laws remain the most common backbone that run the numerical codes. If those approximations can be justified in some cases, experiments on natural samples have shown a more complex behavior due to the interaction of the melt, crystals and bubbles together.

In this survey we present the parameters affecting natural magmas such as their brittle onset. We generalize all these observations into a new model that can be used for magma flow simulations. In the conclusion we apply this new law on the dome lava of Mt Unzen volcano.