With the aim to better understand the solidification process of igneous intrusions, we develop a numerical model for computing crystal size distributions in an under-cooled magma. Assuming a magma chamber that consists of a well-mixed bulk, capped by a thermal boundary layer, we simulate crystal nucleation, growth, and settling, hence sediment formation within the system. The model is endowed with realistic, temperature-dependent crystallization kinetics, and incorporates complex dynamics of inertial particles in a convecting fluid, i.e. crystal settling, in a parametrized form. We developed a custom-made numerical code in *Python 3* and performed a series of simulations studying the imprint of convection vigor in the resulting distributions, and compared some basic aspects of the obtained microstructure with observations. Finally, we outline a theoretical concept of how to couple the presented model with a self-consistently computed thermal evolution of the temperature inside the chamber.