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A world In A Grain of Sand..." What Crystal Records Reveal About Magma Reservoirs

Understanding the conditions of magma storage in crustal reservoirs is important for understanding the development and evolution of continental crust, for interpreting the signals of mantle processes that are carried by mantle-derived magmas, and for understanding volcanic hazards. Crystals have long been used as records of the conditions and processes within magma reservoirs, yet making full use of this information requires integrating different kinds of information derived from the same crystals and comparing them to other types of studies of magmatic processes. Challenges include relating information at the crystal- or sub-crystal spatial scale (micrometers to millimeters) to the scale of a magma reservoir (tens of meters to tens of kilometers), and relating processes occurring over years to decades to processes occurring over millennia to hundreds of thousands of years. I will discuss some successes and outstanding debates in using crystal records to investigate magmatic processes, including 1) crystal records of the life span of volcanic systems and of secular changes in magma composition within them, 2) records of the thermal conditions of magma storage, and in particular examining the durations over which magmas are stored in a high-temperature, relatively mobile state compared to a colder, crystal-dominated environment, and 3) potential avenues for coupling crystal-scale information with other methods of studying magmatic systems in order to advance our understanding of crustal magma reservoirs.