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Pyroclastic deposits & experimental fragmentation a joint venture in understanding eruption dynamics

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Experimental investigations indicate that parameters such as the melt vesicularity and density almost exclusively control the fragmentation behaviour of magma. To correlate these experimental results and field observations, information on the variability of the ascending magma, were necessary. The only feasible way to acquire data on the ascending magma is the analysis of deposits, as direct observations inside a volcanic dome or conduit during an eruption are not possible. Density distributions of five volcanoes in the circum-Pacific area were analyzed and compared. Densities of $\sim$3000 pyroclast-samples collected on Colima (Mexico), St. Augustine (Alaska), Bezymianny (Kamchatka), Krakatau and Kelut (Indonesia) were measured to provide a basis for the comparative investigation of experimental results and eruption dynamics. The results indicated a bimodal density distribution of the deposits on St. Augustine with maxima at 1 and 1.5 and Bezymianny with peaks at 1.6 and 2.2 g/cm3, respectively, whereas samples collected from the 1883 Krakatau pyroclastic deposits during a campaign in 2005 show a lower density distribution with a density peak of $\sim$0.6 g/cm3 and a second peak at 1.2 g/cm^3 for the most recent eruption products. The fragmentation experiments provide density related numbers for the fragmentation threshold as well as on the speed of the fragmentation wave and consequently allow a closer view into the eruption dynamics. This comprehensive work is part of the BMBF project SUNDAARC, which aims to quantify the potential risk of selected highly-explosive volcanoes by combining field and laboratory investigations.