Crystal-size distribution and micro-textural variation of Holocene volcanic products from the last 2000 years eruption of Kelud Volcano, Indonesia: an approach to understand the conduit dynamics.

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The Kelud volcano has become one of the most active volcanoes Java which had produced several eruption sequences during the past several decades. It is located on eastern part of Java Island and developed as part of bigger volcanic chain, the Sunda arc. The pre-historic activity of Kelud has started since the development of the volcano above the older volcanic basement in late Pleistocene. Although most products of Kelud came from compositionally similar magma (basaltic andesite to andesite), it was recorded that the Kelud volcano had showed explosive activities which mostly preceded by lava dome formation. The eruption sequence as well as the petrological features that caused the changes of eruption behavior are not yet well documented. This study serves discussions about the evolution of syn-eruptive ascent of magma related to the decompression- and degassing-induced crystallization. The investigation of the conduit process in terms of change in eruption style focuses the observation on textural and geochemical variations from groundmass microlite.

The volcanic products mostly composed by the alternation of pyroclastic density currents (PDCs) deposits along the tephra fallout products. It is widely distributed along the eastern through the southern flanks of the Kelud. 1.) The PDCs are characterized by massive successions of block and ash flow deposits with the presence of the fine-grain rich degassing pipe and the low-angle cross stratification. The componentry of these deposits is mainly dominated by the dome fragments and often contain juvenile materials. 2.) In contrast, the fallout deposits show the mantle bedding structures and are identified by the abundance of the juvenile materials as the dominant component. Time-controlled samples were collected from the designated interval, linked to eruption sequence and style of activity. The samples include scoria, pumice and dense lithic from both effusive activity of dome-forming event and explosive activity. Microscopically, phenocryst and groundmass have similarity in mineral assemblages. The mineral assemblages of the Kelud volcanic products show relatively proportional through the time which consist of plagioclase, clinopyroxene, orthopyroxene and Fe-Ti oxide.

The textural analysis focused the observation and textural quantification of feldspar microlite as a dominant phase in groundmass glass. Quantitative textural analysis of feldspar microlites within the groundmass, including measurement of areal number density (NA), microlite mean size, crystal aspect ratio (S/L), crystallinity of groundmass (ϕ), and crystal size distribution (CSD) show indication of the shallow processes contribution in changing the eruption style of different eruption sequences. The feldspar shows variation in size, occurrence and especially crystal habits, which varies from acicular to rectangular prism and dominated by swallowtail, hopper and box-work/skeletal shape. A wide range of anorthite content (25 - up to 85 mol%) of analyzed samples trough different eruption sequences indicates that most likely the feldspar composition is affected by H2O activity in terms of dry solvus condition. Furthermore, the progressive changes in feldspar morphology from skeletal to swallowtail inferred the variations in decompression rate during magma ascent.

The CSDs of feldspar microlite showed slightly difference in number of crystal population with decreasing of crystal size. This trend is then interpreted to emerge that both crystallization regime of growth-dominated and nucleation-dominated occurred during feldspar microlite crystallization. The

variation in both crystallization time and nucleation rate suggested that the generation of products with different eruption style is influenced by the style of ascent path resulted from changes in state of undercooling (ΔT).

Keywords: Kelud, tephra, eruption style, feldspar microlite, CSD analysis

