

Understanding of caldera-forming eruption from geological and petrological approaches

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Decompression process prior to caldera collapse is one of the key processes for caldera-forming eruption. In many caldera-forming pyroclastic eruptions, precursory eruption decompresses magma chamber and consequently induces the faulting and subsidence of the roof of magma chamber. The eruption of main ignimbrite follows the onset of collapse. Formation of collapse caldera indicates that the magma pressure within a magma chamber drops below the threshold for collapse. Exposing internal structure in many eroded calderas and drilling into a young collapse calderas reveals that the collapse calderas are filled with thick intracaldera ignimbrite more than 1 km in thickness. Existence of such a thick deposit inside collapse caldera strongly suggests that the caldera collapse is simultaneous with the eruption of main ignimbrite. Many large ignimbrites are preceded by smaller pyroclastic eruption. Such precursory eruption can be a large Plinian eruption, smaller ignimbrite, or combination of both. These precursory eruptions withdraw magma from magma chamber to decompress the magmatic pressure within the chamber. The decompression reached to a threshold for collapse when the end of the precursory eruption. Petrological evaluation of decompression within a magma chamber prior to the onset of collapse is crucial to understand the trigger for the main ignimbrite.

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