Geophysical Research Abstracts
Vol. 19, EGU2017-11564, 2017
EGU General Assembly 2017

Phreatomagmatic explosive eruptions along fissures on the top of mafic stratovolcanoes with overlapping compound calderas

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On near summit flank eruptions on stratovolcanoes it is commonly inferred that external water to have little or no influence on the course of the eruptions. Hence eruptions are typicaly “dry” that form spatter-dominated fissures and scoria cones. This assumption is based on that in elevated regions - especially on steep slopes - the hydrogeological conditions are not favourable to store large volume of ground water that can have effect on the eruptions. However there is some controversial trend of eruption progression from an early dry eruption below the summit that later turn to be phreatomagmatic as the eruption locus migrates toward the summit. The Suoana Ccrater on top of Miyakejima Island’s mafic stratovolcano is a fine example to demonstrate such process. Suona Crater is the topmost crater of the $\sim$ 3 km long fissure aligned chain of small-volume volcanoes that formed in the 7th century flank of the summit region of the Miyakejima mafic stratovolcano. The oval shape crater of Suona (400 x 300 m) is surrounded by a tuff ring that developed over lava flows and epiclastic deposits accumulated in an older caldera forming about a tuff ring that is about 25 m in its thickest section with a basal consistent lava spatter dominated unit gradually transforming into a more scoria-dominated middle unit. A caldera-forming eruption in AD 2000 half-sectioned the Suona Crater exposing of its internal diatreme – crater in-fill - tephra rim succession providing a unique opportunity to understand the 3D architecture of the volcano. Toward the top of the preserved and exposed tuff ring section a clear gradual transition can be seen toward more abundance of chilled dark juvenile particles providing a matrix of a coarse ash that commonly hold cauliflower lapilli and bomb. This transition indicates that the eruption progressed from an early dry explosive phase such as lava fountaining to be a more Strombolian style explosive eruption that later on turned to be heavily influenced by external water producing debris jet dominated phreatomagmatic tephra and radially expanding pyroclastic density currents to deposit their load around the growing crater. This 3D architecture can only be explained if we infer that the original lower fissure-fed eruptions gradually allow melt to move toward the summit region where they hit ground water accumulated in an older caldera infill that hosted a succession of lava flows intercalated with lava foot and top breccias as well as abundant pyroclastic and reworked porous deposits capable to harvest water from rain and let them ponded along aquitard horizons in the caldera structure. We infer that such eruption mechanism is probably a common eruption style especially associated with volcanic islands with mafic stratovoclanoes that contain some summit caldera structures and located in humic and/or tropical climate.