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Vertical cross section of a phreatomagmatic explosion crater exposing on Miyakejima 2000 caldera, Japan

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A vertical cross section of a phreatomagmatic explosion crater, throughout its feeder dike to the tephra ring, is exposed on the wall of Miyakejima 2000 AD caldera. The Miyakejima 2000 AD caldera truncated an explosion crater named Suoana, possibly formed during the 9th-century's fissure eruption and exhibits the sub-surface structure of Suoana crater. Suoana crater has an oval plain view with about 450 m across and about 60 m deep. The subvertical caldera wall crosses at the point about 150 m from the center of the crater. Root of Suoana crater exposing on the caldera wall is an upward-opening diatreme reaching approximately 250 m depth from the rim of Suoana crater. In the upper part of the diatreme shallower than 130 m deep, the width of the diatreme increases with altitude. The both walls of the diatreme incline inward with 45 – 60 degrees. The upper part of the diatreme is filled with a stratified breccia dipping steeply toward the center of the diatreme. Dip of the beds increases toward the center of the diatreme and partly exceeds 60 degrees. The lower part below 130 m deep, the both walls of the diatreme are subvertical and the width of the diatreme is 60 – 70 m. The lower part of the diatreme is filled with chaotic breccia without remarkable bedding. Subsided blocks consisting of the host rock develops along the eastern wall of the lower part of the diatreme. No major fracture is observed in the host rock surrounding the diatreme. The bottom of the diatreme is located at the top of the hydrothermally- altered layer. A feeder dike with 3.5 meters thick connects at the bottom of the diatreme and partly intrudes into the diatreme.

Vertical structures of Suoana show the development of the diatreme formed by phreatomagmatic explosion. The depth of the diatreme shows that the explosions took place at the point ca 250 m deep from the original ground surface. The fact that the bottom of the diatreme coincides to the top of the hydrothermally-altered zone suggests that the magma – water interaction took place inside the perched water layer developed on the local impermeable layer. The tephra produced from Suoana crater contains dense and glassy basaltic bombs with cooling structures and angular lithic fragments indicating the magma – water interaction.

The inward-inclined breccia inside the diatreme indicates that the continuous subsidence of the diatreme-fill materials by the repeated explosions at the bottom of the diatreme. Phreatomagmatic explosion at the bottom of the diatreme discharged the pyroclastic materials and formed a cavity. The overlaying materials consisting of the host rock and the fall-back deposit collapsed into the cavity and the inward – tilting structures ware formed. Larger collapse sometimes involved the wall-rock of the diatreme and consequently increased the horizontal width of the diatreme. The internal structure of the Suoana diatreme shows that the horizontal size of the diatreme could be controlled by the landslides induced by the subsidence of the central portion of the diatreme.