Structure of the pyroclastic flow deposit of Kumano acidic rocks observed in the Kumano drilling core

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A continuous drilling core sample of the welded tuff of the Kumano acidic rock has been recovered and this core sample well exhibits a good example of internal structure of a caldera-filling pyroclastic flow deposit. Lower part (464.25m - 580.00m) of the Kumano drilling core consists of a welded tuff. Although the borehole did not reach the basement of the welded tuff, horizontal bedding plane in the core sample indicates that the thickness of the welded tuff is more than 116 m at the drilling site. Displacement of the basement of volcanic tuff layer suggests a subsidence of caldera floor during the igneous activity. At the bottom of the drill hole, about 500 m below sea level, the basement of the tuff layer did not expose. By contrast, basement of the tuff layer distributes almost flat at the ground surface 2-3 km south of the well about 400 -500 m a.s.l. This relationship indicates more than 1000 m of vertical displacement of the tuff layer between these two areas. This displacement could be explained by the existence of caldera wall between two areas, which associates the eruption of the welded tuff. Granite porphyry intruded after the formation of the caldera structure.

Welded tuff in the cone sample consists mainly of well-sorted coarse-grained volcanic ash of crystal fragment and lithic fragment. Pumice fragment more than 10 cm across are scattered. Pumice consists of porphyritic biotite rhyolite, with plagioclase, quartz, orthopyroxene and garnet phenocryst. Though most part of the welded tuff in the core sample is massive as the surface samples, some parts show remarkable bedding structure. Pumice-fragment-concentrated layer is also recognized between 501 - 503 m depth. These structural characters suggest that the welded tuff is a pile of many flow units with several 10s meter thick each, which consists of basal pumice-concentrated bed, main massive tuff, and upper bedding part. Concentration of large-grained pumice block at the base of the flow unit indicates dilute grain flow in which large block could condense to the bottom of flow layer. Bedding part at the uppermost of a flow unit could be explained by increasing of flow velocity during the settlement of a flow unit. Detailed observations of the structure of the caldera-filling pyroclastic deposit are scarce in the literature and Kumano drilling core could be an important example to explain the dynamics of the pyroclastic flow during the large caldera formation.