

Crystal preferred orientation of a lava flow. The case of LC1 lava flow in Izu-Oshima.

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Lava flows containing less than 60% of solid phases may be defined as partially melted rocks moving on the earth's surface. In these flows rotation and translation of crystals may occur. Crystals in lava flows are embedded in a glassy matrix which deforms as a viscous fluid and concentrates the strain during flow. In a simple shear model deformation acts in solid or magmatic states when no volume loss occurs in the deforming body. Therefore, crystal orientation studies allow the flow lines as well as the sense of shear to be defined. We determined the sense of shear and the relative strain in different zones of the flow through measuring crystal preferred orientation data from 1986 LC1 lava flow on Izu-Oshima.

Crystal preferred orientation have been measured on samples representative of the base, middle and top of the massive unit sections which contain the flow direction and perpendicular to the earth's surface. The data allow zones with different deformation patterns to be identified. In the base and top of the flow, deformation leads to the development of discrete preferred orientation of the plagioclase crystals. The sense of shear is the opposite at the base and the top of the flow. Random orientation of crystals in the middle zone supports the presence of plug flow. We conclude that the observed crystal alignments may be related to a plug flow moving between two non-deforming walls. The basal wall is represented by the solidified, broken crust of the flow. Besides Lava tunnels may play an role in the upper wall in case of LC1 streamed along the valley. Shear strain can be also estimated by the analysis of crystal preferred orientation. Deformation increase from the flow inner to the outer. Crystal preferred orientation may be related to the occurrence of velocity gradients existing between the inner zone of the flow and outer margins.