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Precision of Tilt-Leveling On Active Volcanoes in Iceland

PRECISION OF TILT-LEVELING ON ACTIVE VOLCANOES IN ICELAND

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The activity of a volcano comes from its interior and processes that precede eruptions may be at work for extended time before the activity is obvious at the earth's surface.

Laws of physics predict that all subsurface processes which involve volume changes or mass displacements must cause displacements of the earth's surface, and if this surface displacements are observed in details, then the source of the deformation can be determined. Usually, the ground deformation is small and distributed over large areas, which requires extensive and accurate measurements.

Tilt-leveling (dry-tilt) (optical leveling tilt) is a technique which has been applied widely to determine the vertical component of ground deformation. This technique uses stations, consisting of an array of permanent bench marks. Repeated observation of the relative elevation of these bench marks allows a determination of the ground tilt between times of observations. We will discuss briefly how this technique has been applied in Iceland.

The Krafla rifting episode of 1975-1984 offered excellent opportunity to observe wide range of ground tilt. The tilt leveling observations used mostly circular stations, consisting of 5 permanent markers. This allows a crude estimate of the accuracy of tilt observations. The precision of observed tilt depends heavily on the actual tilt which means that the precision depends more on the relative stability of the bench marks, than on the accuracy of optical leveling.