Geophysical Research Abstracts, Vol. 7, 07253, 2005 SRef-ID: 1607-7962/gra/EGU05-A-07253 © European Geosciences Union 2005



Coulomb stress variations around a pressurized magma chamber located within an Icelandic-type crust

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The interaction between volcanic activity and seismicity has been investigated over the past two decades in various studies. However, the effect of volcanic activity on triggering earthquakes on nearby active faults is not fully understood. The Coulomb failure stress variations during volcanic activity have only been investigated following dyke intrusion. Few studies have specifically studied stress modifications associated with cycles of increase and decrease of pressure in a magma reservoir

We chose to treat these issues through a 2D modeling of a visco-elastic Icelandic-type crust using realistic thermal gradient. The viscous behavior is modelled using a creep dislocation law. Different rheologies were tested.

We simulated the interaction between a normal fault and a pressurized magma chamber considering various geometrical characteristics as dimension of the magma reservoir, distance between the fault and the magma chamber, dip of the fault and the depth of the magma chamber.

The model reproduce various features of the expected "real world" as horizontal and vertical surface displacement consecutive to magma chamber pressure variation. The geothermal flux calculated with the model is realistic. The displacement on the fault nearby the chamber is influenced by the pressure variations within the magma chamber. The Coulomb failure stress change during periods of pressure variation have been calculated. We compare these failure stress changes to the seismicity data of real case studies.