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**TITLE:** Increased volcanic unrest at Katla volcano, Iceland?

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**ABSTRACT BODY:** The subglacial volcano Katla beneath Mýrdalsjökull ice cap has had twenty confirmed major eruptions breaking the ice cover in the past 1100 years, the most recent one in 1918. Recently, Katla has been showing some signs of increased volcanic unrest. Katla is one of the most seismically active volcanoes in Iceland. It shows an annual cycle in seismic activity. Deformation of the volcano has been studied by use of GPS, InSAR and levelling. The observed deformation field appears to be a complex mixture of signals originating from different sources, that may include plate movements, gradual thinning of the overlying ice cap, annual cycle in vertical and horizontal movements due to ice/snow load variations, and pressure changes in the geothermal and magma plumbing systems. From 1999 to late 2004, GPS measurements including stations on nunataks within the ice cap, showed uplift and outward movement from the caldera, interpreted as inflation of the volcano due to magma inflow. InSAR time series analyzes spanning 2003-2009 show, however, no signs of detectable inflation signal around Katla. In spring 2010, two continuous GPS stations were deployed on nunataks of Katla in addition to a continuous site that has been operated since 2006. In the middle of June, 2010, a complex deformation signal started, revealing a pattern of transient deformation at the sites. Correlated fluctuations in the movements of the three GPS sites are suggested, due to a process originating from within Katla caldera. Possible explanations being explored are: i) magma chamber processes such as mixing of magma residing in volcano roots and newly arriving magma, ii) slope instability and creep causing local instability, iii) crustal stress variations imposed by ice flow at a variable rate within the overlying Mýrdalsjökull ice cap, iv) changes in water and pore pressure at the base of the ice cap, v) possible dome extrusion responding to pressure changes in the geothermal/magmatic systems in the Katla caldera. In 2011, the seismicity shows some signs of increased activity from previous years with larger events, the largest one being M3.8. A jökulhlaup, sudden glacial outburst flood, occurred 9 July 2011 was accompanied by low frequency tremor. It has been interpreted as being due to drainage of geothermal water, triggered or related to either variation in water flow conditions at the base of the ice cap, or a small

magmatic event, eruption or boiling in the geothermal systems due to pressure decrease. Presently, rates of crustal deformation and earthquake activity are considerably less than observed between 1999 and 2004; nonetheless, the past year, Katla volcano has been showing some signs of increased activity.

**KEYWORDS:** [1240] GEODESY AND GRAVITY / Satellite geodesy: results, [8419] VOLCANOLOGY / Volcano monitoring, [8488] VOLCANOLOGY / Volcanic hazards and risks, [8485] VOLCANOLOGY / Remote sensing of volcanoes.

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