

EARTHSCOPE SEMINAR

Discussion Summary

February 26, 2007

Presenter: Kevin Eagar

Note-taker: Lauren Mattatall

Title: Uplift, thermal unrest and magma intrusion at Yellowstone caldera

Authors: Charles W. Wicks, Wayne Thatcher, Daniel Dzurisin, and Jerry Svarc

The authors of this paper observe a deformation pattern of the Yellowstone caldera that includes uplift of the north rim and subsidence of Mallard Lake and Sour Creek domes. It is likely that these events of deformation and inflation are linked. They use a forward modeling approach to account for the surface displacement and deformation sources. The authors use a joint inversion of GPS and InSAR data to verify the results of the forward model. They find that a model of an inflating sill beneath the north rim and a deflating sill beneath each of Mallard Lake and Sour Creek domes fits the observed deformation. It is proposed that the changes in flux of magma into and out of the system are the cause of uplift and subsidence (i.e. decreased flux into the system causes subsidence and increased flux into the system causes uplift).

The authors present interferograms recorded by an ERS-2 satellite as evidence for uplift and subsidence. Some of the group thought this was not an effective way to illustrate the data because it was difficult to differentiate between subsidence and uplift. It was explained that reading of the interferograms is easier if one treats it as a contour map.

The group also expressed dissatisfaction in the fact that the authors do not specifically address the issue of where the magma would go during a period of flux out of the system.

It is also suggested by group members that the authors should have included seismic data as an additional support to the suggested results. In theory, the mass movement of magma should display tremors that would be detectable by seismometers. Also, it is pointed out that seismometers can be monitored for tilt to help constrain the uplift and subsidence.

In addition to seismic data, it is suggested that additional support for the model could include:

- age dating of the volcanoes
- magnetotellurics and electrical conductivity measurements to look at changes in magma flow
- multiple gravity measurements over a span of time
- Heat flow measurements to find changes over time (including hydrothermal systems)

It is suggested that another logical location to conduct similar studies would be Long Valley. Most of the group expressed the opinion that the model may have been too simple or not yet developed enough to present in a paper.