



Volcano monitoring with cameras

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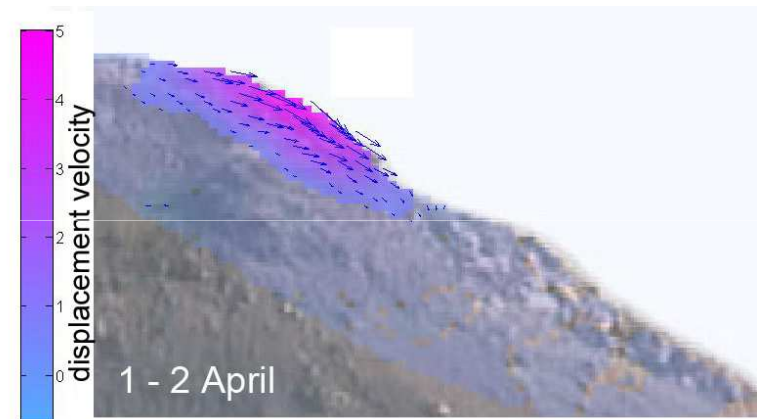
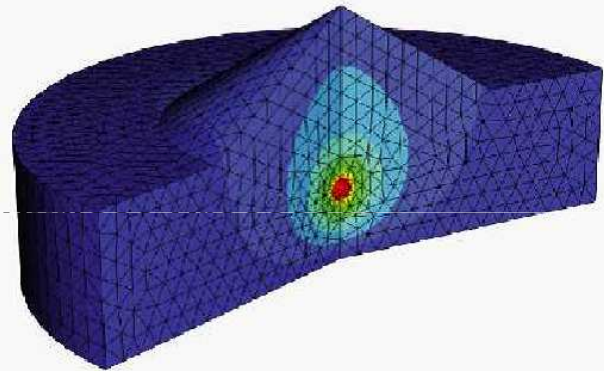
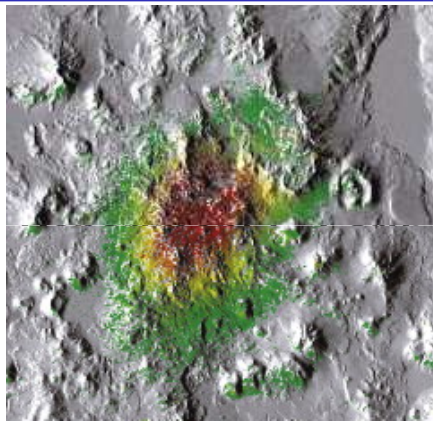
GFZ

Helmholtz Centre
POTSDAM

Department 1: Geodesy and Remote Sensing
Champ, GRACE, GOCE, GPS/GALILEO, GNSS...

Department 2: Physics of the Earth

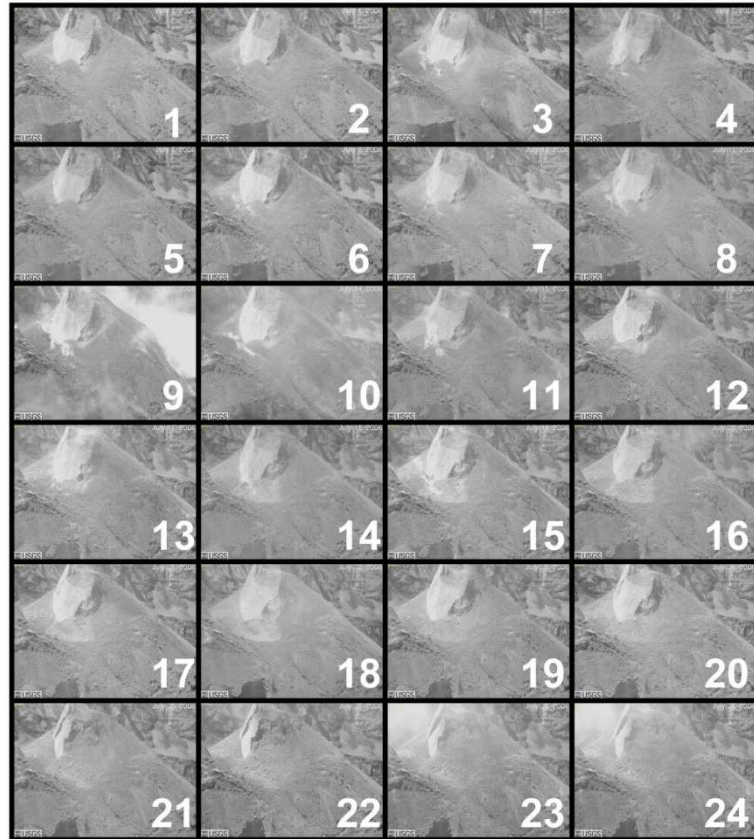
Earthquake and volcano physics, GEM, GSHAP, Global world stress map...



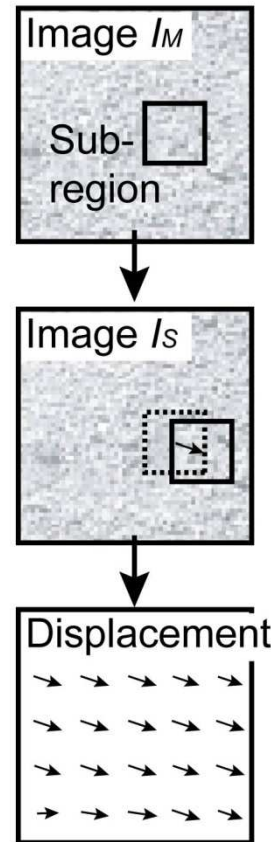
VOLCANOTECTONICS.DE

The digital image correlation concept in a nutshell

(A) Raw web cam images



(B) DIC



Intensity function

$$I(x, y, t) = I \left(\begin{matrix} x + u, \\ y + v, \\ t + \delta t \end{matrix} \right)$$

Distance between the two sub-regions

$$d^2(u, v) = \sum_{x=-n}^n \sum_{y=-n}^n \left(\begin{matrix} I_M(x, y) - \\ I_S(x + u, y + v) \end{matrix} \right)^2$$

Pixel offsets (deformation) and particle trajectories are determinable

Contribution of GFZ camera monitoring team:

WP7. Determination and evolution of eruption source parameters

Our task: Cameras will be installed for study of ground deformation and plume dynamics of 3 selected volcanoes. Static IPs allow configuration changes in times of increased activity.

Milestone: Tool development for determining particle trajectories

WP8. Distribution of eruptive products and ash dispersion

Our task: Quantify the height and paths of eruptive products and the time dependent changes in an eruptive cloud through near real-time camera monitoring

Milestone: Algorithm development and improvement for cameras.

