CONTROL ID: 1817060

TITLE: Uplift in Iceland observed with 20 years of GPS data: Impact on models of plate motion and volcanic unrest

AUTHORS (FIRST NAME, LAST NAME): Peter C La Femina[1], Halldor Geirsson[1], Thora Arnadottir[2], Bjorn Lund[3], Erik C Sturkell[4], Freysteinn Sigmundsson[2], Sigurjon Jonsson[5]

INSTITUTIONS (ALL): 1. The Pennsylvania State Univ., State College, PA, United States.
2. Nordic Volcanological Center, Institute of Earth Sciences University of Iceland, Reykjavik, Iceland.
3. Department of Earh Sciences, University of Uppsala, Uppsala, Sweden.
4. Department of Earth Sciences, University of Gothenberg, Gothenberg, Sweden.
5. Department of Earh Sciences and Engineering, King Abdullah University of Sceince and Technology, Thuwal, Saudi Arabia.

ABSTRACT BODY: Iceland provides a unique and dynamic environment to investigate the geodynamics of a mid-ocean ridge, including ridge-transform and magma-tectonic interactions and the role of central volcano – fissure swarm systems in accommodating plate spreading. In addition, Iceland is home to Europe's largest icecap, Vatnajökull, as well as several smaller ice caps. The combination of the elastic and viscous responses of glacio-isostatic adjustment, related to historical mass loss from the Icelandic ice caps, results in extensive uplift across Iceland. We present a new vertical velocity field based on GPS data from 1994 to the present. This vertical velocity field indicates, 1) broad uplift across all of Iceland, except in the northwest fjords where there is subsidence; 2) up to 3 cm/yr, but on average 2 cm/yr, uplift west and southwest of Vatnajökull; and 3) a decrease in uplift with distance away from Vatnajökull. The position time series also suggest an increase in vertical velocities starting around 2004, suggesting an increase in mass loss. This extensive uplift signal impacts our estimation of secular plate motions and long-term volcanic deformation. We investigate the effects of the uplift signal on estimating plate motion models and volcano deformation in south Iceland using a finite element model for glacial mass loss (e.g., Arnadottir et al., 2009). Residual vertical velocities indicate, 1) subsidence at less than 5 mm/yr along the two main ridge segments in south Iceland; 2) constant subsidence of the Torfajökull caldera at up to 8 mm/yr over the last two decades; and 3) continuous uplift of Hekla volcano of 5 mm/yr since its last eruption in 2000.

KEYWORDS: 1225 GEODESY AND GRAVITY Global change from geodesy, 1209 GEODESY AND GRAVITY Tectonic deformation, 1243 GEODESY AND GRAVITY Space geodetic surveys.

(No Image Selected)

(No Table Selected)

Additional Details

Previously Presented Material:

Contact Details

CONTACT (NAME ONLY): Peter La Femina

CONTACT (E-MAIL ONLY): plafemina@psu.edu

TITLE OF TEAM:
