Strain Anomaly History of Yellowstone National Park Constrained by PBO cGPS Measurements

Huiyu Yang, Meredith Kraner, Heather Turnbull, James Davis, and William Holt
Stony Brook University

By analyzing the continuous operating PBO horizontal GPS data in Yellowstone area from mid-2013 to the present, we have quantified the development and migration of a large transient strain anomaly. The anomaly begins in August 2013, centered in Norris Geyser Basin (NGB), with the development of a large dilatational strain. The dilatational strain anomaly reached a peak in April, 2014, of 1.05*10^-6 in the NGB. Peak periods of dilatational strain were accompanied by significant swarms of seismicity, including the largest event since 1980, a magnitude 4.8 on March 30, 2014. In the period following April, 2014 the NGB anomaly began to deflate and a pulse of anomalous positive dilatational strain began to develop within the Yellowstone caldera. On January 6, 2015 the strain in Yellowstone caldera reached a peak anomaly of 0.55*10^-6, which persists to the present. The present strain anomaly in Yellowstone Caldera appears to be similar in spatial distribution to the 2004-2006 inflation period described by Chang et al. (2007), but magnitudes are about 50% of the 2004-2006 event.

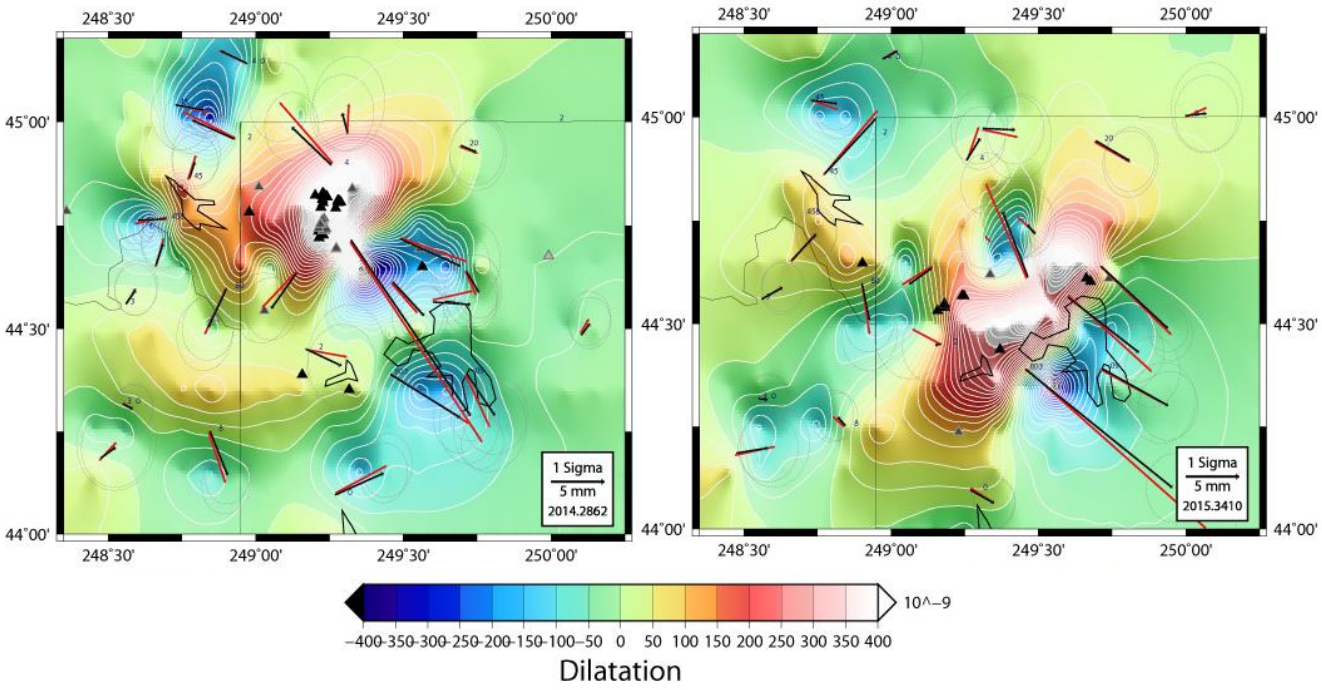

FIGURE: Horizontal dilatational strain anomaly of *(left)* peak strain in the Norris Geyser Basin in April, 2014 (defined by the interval of motion between June, 2013 – April, 2014) and *(right)* the strain anomally at present within Yellowstone Caldera (defined by the interval of motion between June, 2013 – Present). Triangles show earthquakes and depth (black 0-6 km, dark gray 6-12 km, and light gray 12-18 km) that occurred during the two weeks prior to the anomalous strain snapshot.