Surface deformation of Bezymianny volcano, Kamchatka, recorded by GPS: The eruptions from 2005-2010 and long-term, long-wavelength subsidence.

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Bezymianny Volcano in Kamchatka reactivated after a roughly 1000 year hiatus in 1956 with an eruption that culminated into a directed blast removing about 0.6 km^3 of material from the edifice. Today eruptive activity occurs roughly every 6 months with a violent explosion lasting for 2 – 20 minutes that creates lava flows and pyroclastic flows.

In 2005 the volcano was instrumented with an array of 6 campaign and 8 continuous GPS stations, none of which are telemetered. The campaign sites have been measured during annual summer field work during which we also recovered data of the continuous sites. The first eruption recorded by a partial continuous GPS network was the December 24, 2006, event. Between then and the last data recovery in the summer of 2010 six additional eruptions occurred.

We analyze the data in the International Terrestrial Reference Frame (ITRF) using the GIPSY/OASIS software and find a relatively uniform network wide subsidence of about 7-9 mm/yr for the observation period from 2005 to 2010. This could be induced by continuous depressurization of a deeply seated magma reservoir, likely beneath Kluichevskoy volcano to the North of Bezymianny. Other possible sources could be a regional surface loading effect, or a combination of loading and volcanic signal. Surface load effects could be induced by the new dome growing inside Bezymianny's horseshoe shaped crater and other material emplaced during the regular eruptions. Loading effects due to Kliuchevskoy, the tallest mountain in Asia, should also be taken into consideration.

Preliminary analysis of pre-eruptive displacements shows little to no inflationary signal in the near field prior to the explosive events, which suggests either a very deep or a very shallow magma source. We invert the GPS time series for a variety of deformation sources including magmatic source models and surface loads to infer a detailed interpretation of the volcanic system and its evolution during over time. By employing a kinematic GPS processing strategy we are able to investigate short-term co-eruptive deformation dynamics.