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The crustal deformation field of southwest Iceland derived from GPS surveys: 1992 through 2004

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We use GPS campaign measurements from 1992–2004 in SW Iceland to generate a map of the crustal deformation field on Reykjanes peninsula and in the south Iceland seismic zone (SISZ). The period is divided into pre-seismic (1992- June 2000), co-seismic (June 2000), and post-seismic (June 2000-2004). We estimate coseismic crustal deformation signals due to two Mw=6.5 earthquakes that struck the SISZ on June 17 and June 21, 2000, and three triggered (Mw$>$5) earthquakes on the Reykjanes peninsula. A large variation in the horizontal surface velocity field is observed due to the June 2000 earthquake sequence. During the pre-seismic period, the velocity field is perturbed by the inflation period at Hengill volcano (1993-1998). The large station velocities we observe in the vicinity of Hengill can not be entirely explained by a simple mogi source of inflation at $\sim$7 km depth, as proposed by *Feigl et al.* [2000] based on modeling of radar interferograms (InSAR) data. The pre-seismic strain rate is highest on Reykjanes Peninsula and in the center of the SISZ. This is the pattern we would expect since strain is concentrated in the SISZ prior to the June 2000 earthquakes. However, we do not find evidence of earthquake precursors in the strain field.

A simple screw dislocation model is used to fit the pre-seismic velocity field in the SISZ and Reykjanes Peninsula. In general the models suggest a greater locking depth for the SISZ ($\sim$ 15 km) than for the Reykjanes Peninsula ($\sim$8 km), if we assume the same deep slip rate in both regions ($\sim$ 18 mm/yr). However, there is a strong trade-of between the locking depth and the deep slip rate. This is in general agreement with previous studies indicating that the brittle crust is thicker in the SISZ than on Reykjanes peninsula.