The ICEARRAY and the Extreme Near-fault Strong-motion of the M_w6.3 Ölfus earthquake of 29 May 2008 in South Iceland

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The M_w6.3 Ölfus earthquake of 29 May 2008 in Iceland occurred in the District of Ölfus in the western part of the South Iceland Seismic Zone [1]. The earthquake rupture took place on two parallel and vertical right-lateral strike slip faults, separated by ~4 km, with the second fault rupturing shortly after the first. The town of Hveragerdi, being in the extreme near-fault region of the earthquake, suffered the heaviest damage. The strong motion in the town was recorded on 11 instruments of the ICEARRAY [2], a new small-aperture strong-motion array. These unique recordings all exhibit prominent long-period velocity pulses along both the strike-normal and strike-parallel horizontal directions. The linear response spectra indicate that the long-period energy of the velocity pulse seen along the strike-normal direction is not present in the strike-parallel direction. Furthermore, the period of the pulse is shorter along the strike-parallel and it is more narrow-banded in the elastic response spectrum than the pulse seen on the strike-normal component [3]. The acceleration time histories have been baseline corrected using a new method and integrated to velocity and displacement. The corrections confirm that both the strike-normal and strike-parallel components are associated with considerable permanent tectonic displacement [4]. The results of tectonic translation using this method agree with geodetic measurements near Hveragerdi, but the displacement estimates show some variability across the array. Finally, we show how the salient features of the near-fault ground displacement can be captured through kinematic modeling when adopting static slip distributions for the causative faults, and assuming uniform rise times and spreading rupture fronts. The results indicate that rupture on the second fault initiated ~2 s after the initial rupture on the first fault.

References

[1] Sigbjörnsson, R., J.Th. Snæbjörnsson, S.M. Higgins, B. Halldórsson, S. Ólafsson (2009). A note on the M6.3 earthquake in Iceland on 29 May 2008 at 15:45 UTC. *Bulletin of Earthquake Engineering*, **7**(1), 113-126.
[2] Halldorsson, B., R. Sigbjornsson and J. Schweitzer (2009). ICEARRAY: the first small-aperture, strong-motion array in Iceland. *Journal of Seismology*, **13**(1), 173–178
[3] Halldórsson, B. and R. Sigbjörnsson, 2009. The M_w6.3 Ölfus Earthquake at 15:45 UTC on May 29 2008 in South Iceland: ICEARRAY strong-motion recordings. *Soil Dynamics and Earthquake Engineering* **29**, 1073-1083.
[4] Rupakhety, R., Halldorsson, B. & Sigbjörnsson, R. (2010). Estimating coseismic deformations from near source strong motion records: methods and case studies. *Bulletin of Earthquake Engineering*, **8**(4), 787-811

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