Geophysical Research Letters

Supporting Information for

Months-long crustal deformation driven by aseismic slips and pore pressure transients triggered by local and regional earthquakes

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Figures S1 to S6

Introduction

This supporting information (SI) provides 6 figures, including: **(1)** Pore pressure and strain before and after the 4 April 2010 El Mayor-Cucapah and 7 July 2010 Collins Valley earthquakes (Figure S1), the 11 March 2013 Borrego range earthquake (Figure S2), and the 10 June 2016 Borrego Springs earthquake (Figure S3), **(2)** cumulative static strains at strainmeters produced by the aftershocks of the 10 June 2016 earthquake (Figure S4), **(3)** L-curve analysis for the strain fitting (Figure S5), and **(4)** comparison between the postseismic strains observed at the strainmeters used for qualitative constraint and those produced by the best-fitting aseismic slip (Figure S6).

Figures

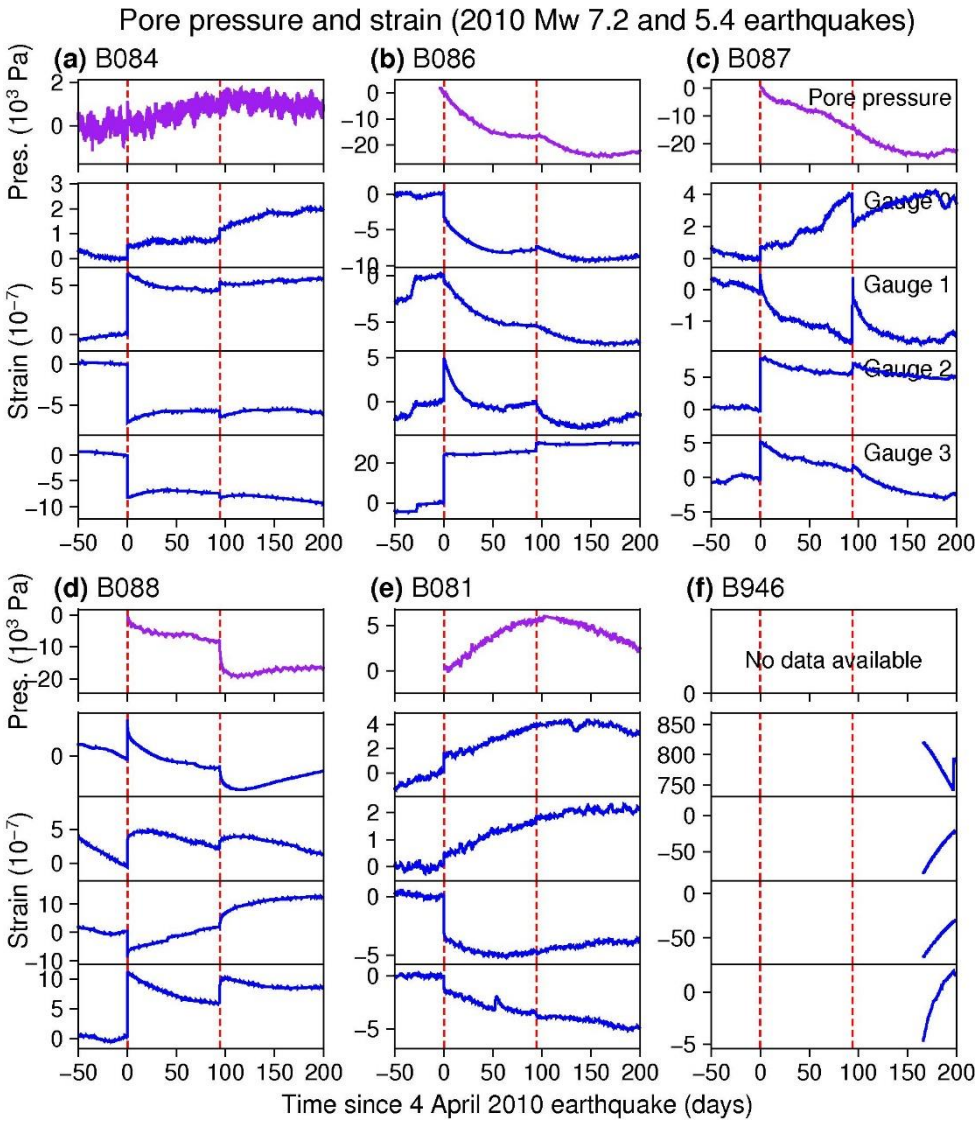
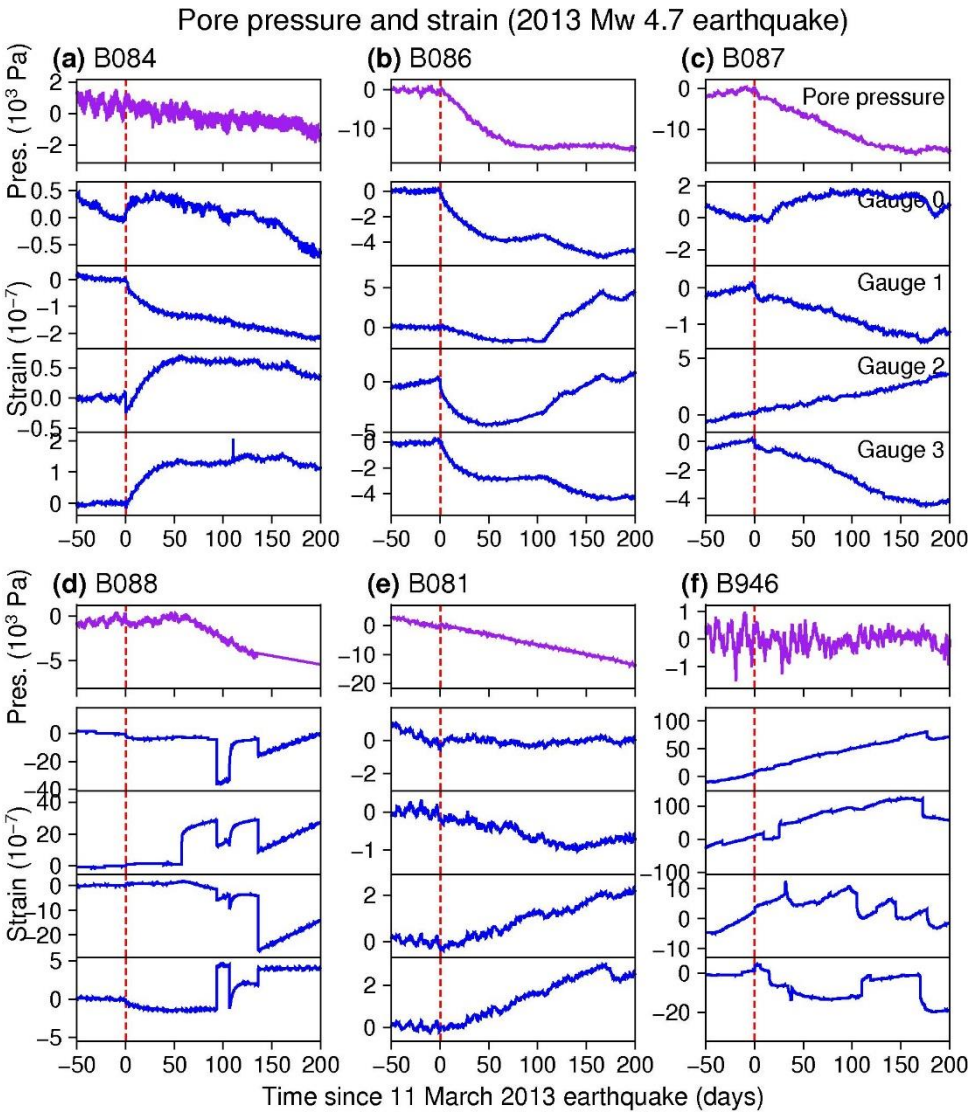


Figure S1. Pore pressure (purple curves) and strain (blue curves) before and after the 4 April 2010 El Mayor-Cucapah (Mw 7.2) and 7 July 2010 Collins Valley (Mw 5.4) earthquakes observed at strainmeters B084, B086, B087, B088, B081 and B946. The vertical dashed lines in each panel mark the occurrence times of the two earthquakes.



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42 **Figure S2. Same as Figure S1, except for the 11 March 2013 Borrego range (Mw**

43 **4.7) earthquake.**

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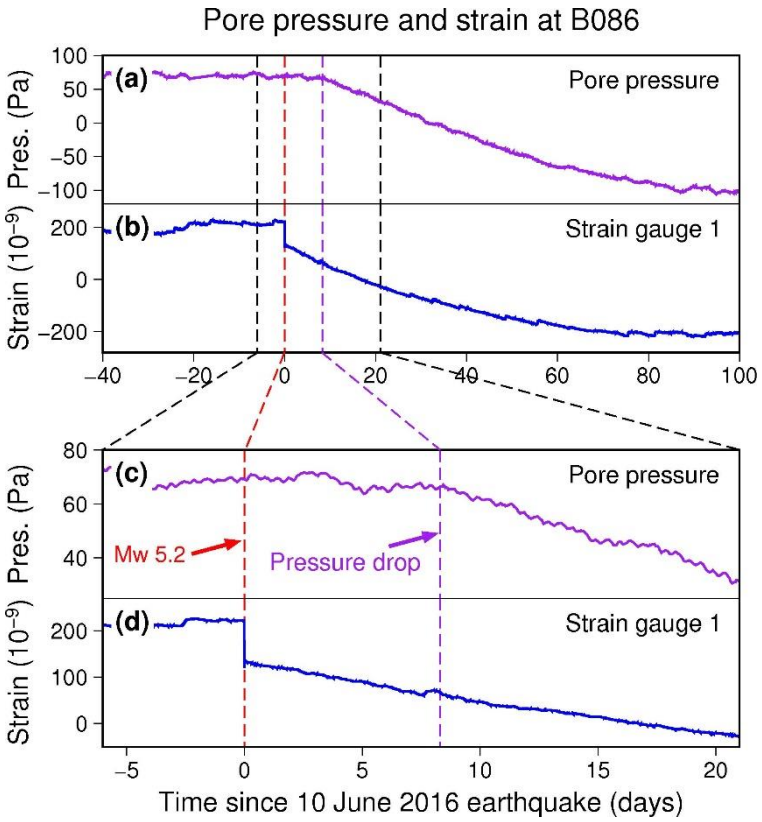


Figure S3. Pore pressure and strain (gauge 1) observed at B086 before and after the 10 June 2016 Mw 5.2 earthquake. Note that the strain changes immediately after the earthquake (red dashed line), while the pore pressure remains at background level for about 8 days after the earthquake before exhibiting a significant decrease (purple dashed line).

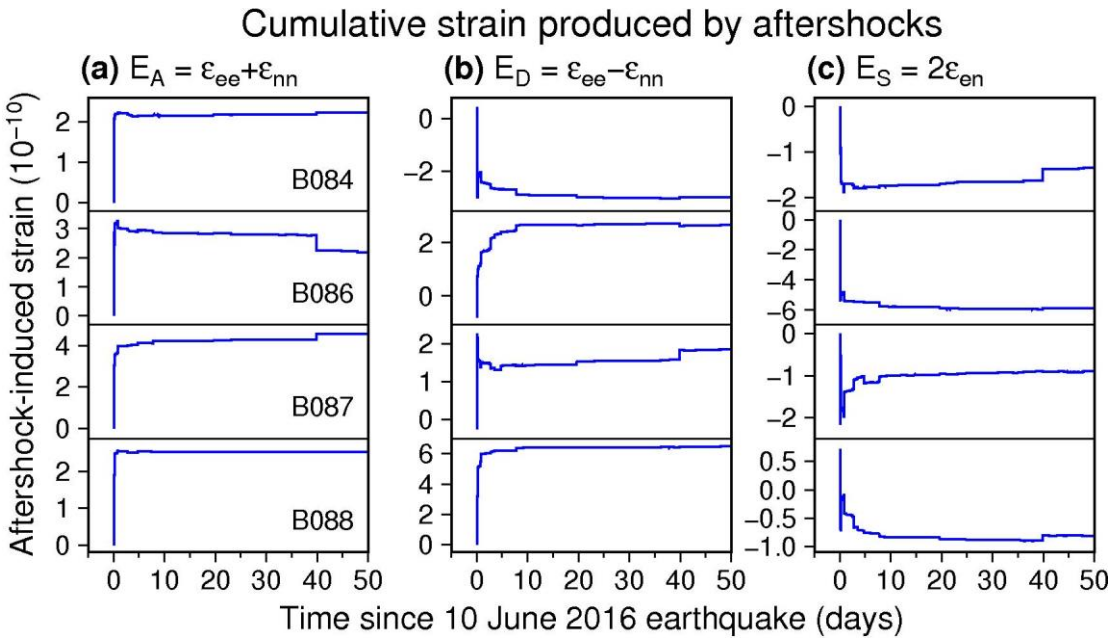
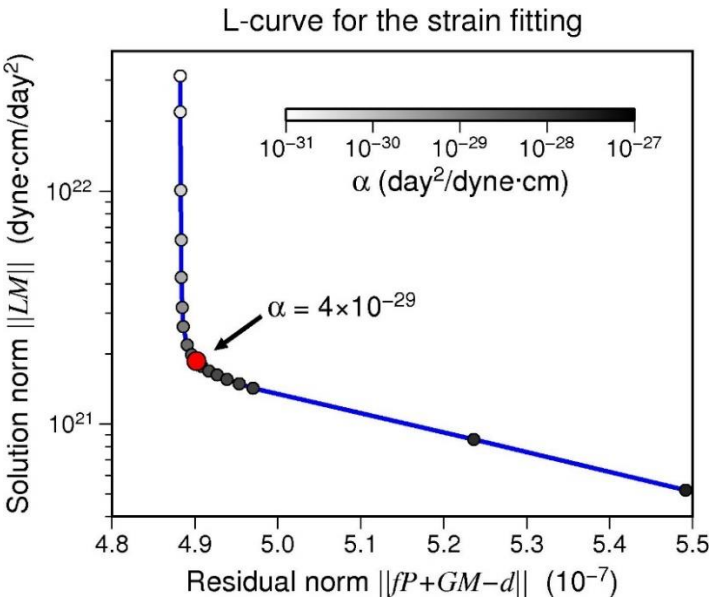


Figure S4. Cumulative static strains at four strainmeters produced by the aftershocks of the 10 June 2016 Mw 5.2 earthquake. The strains are calculated using Okada's method (Okada, 1985) in an elastic half-space Earth model, with the elastic moduli being $\lambda = 37.2$ GPa and $\mu = 36.8$ GPa (Laske et al., 2013). The hypocenters and focal mechanisms of the aftershocks are from the Southern California Earthquake Data Center (https://service.scedc.caltech.edu/eq-catalogs/FMsearch.php), with the focal mechanisms of the aftershocks with FMQ (focal mechanism quality) of C, D or F replaced by that of the mainshock (strike/dip/rake = 306°/68°/179°).



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66 **Figure S5. L-curve analysis for the strain fitting based on Equation (2).** The corner

67 at $\alpha = 4 \times 10^{-29}$ day^2/dyne · cm is used as the smoothing parameter in the strain

68 fitting.

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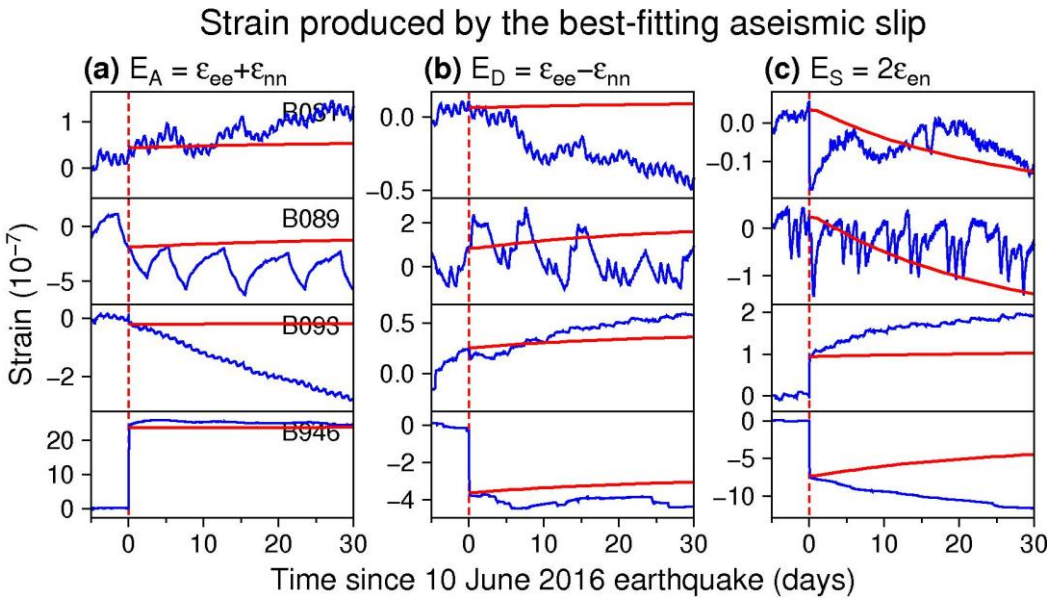

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71 **Figure S6. Comparison between the postseismic strains observed at the**

72 **strainmeters used for qualitative constraint based on Equation (1) (blue) and those**

73 **produced by the best-fitting aseismic slip (red).**

References

Laske, G., Masters., G., Ma, Z., & Pasyanos, M. (2013). *Update on CRUST1.0 - A 1-degree global model of Earth's crust.* Paper presented at the EGU.

Okada, Y. (1985). Surface deformation due to shear and tensile faults in a half-space. *Bulletin of the Seismological Society of America, 75*(4), 1135–1154.