Supporting Information for "Rheologic constraints on the upper mantle from five years of postseismic deformation following the El Mayor-Cucapah earthquake"

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1. Figures S1 and S2

Introduction

This document contains additional information about the inversion in Section 3.2 of the main text.

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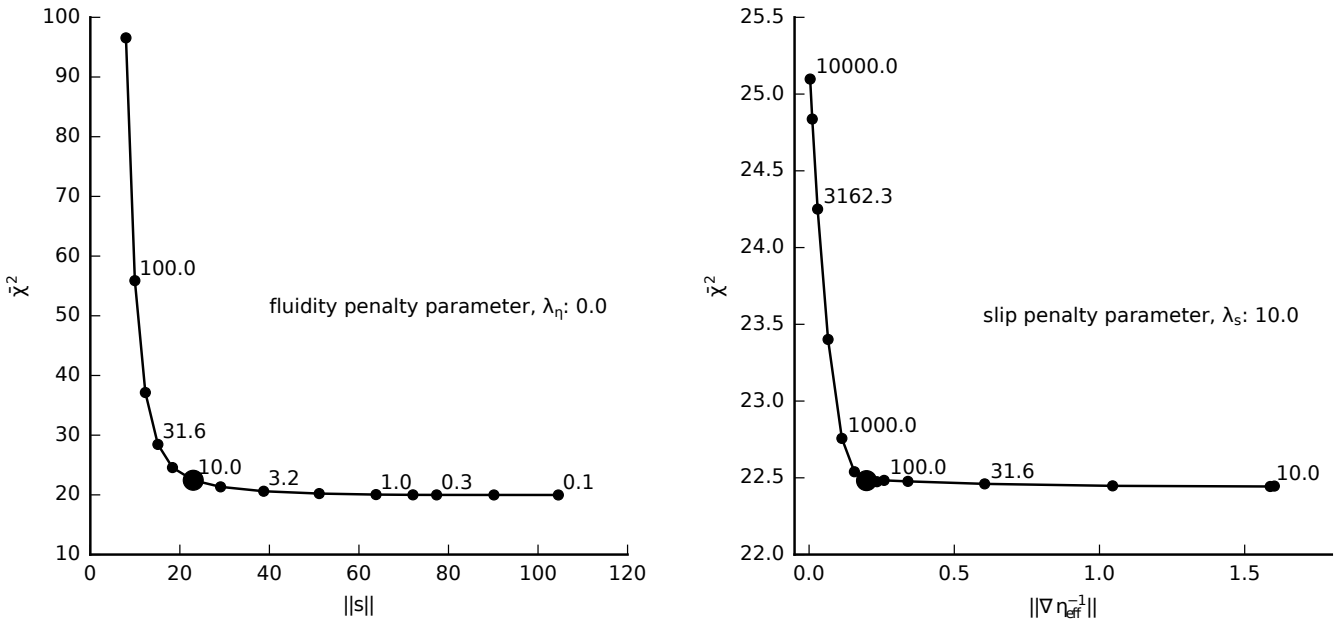

Figure S1. Trade off curves used to determine the damping parameters λ_s and λ_η in eq. (15) of the main text. The left panel shows the trade-off curve for the fault slip penalty parameter, λ_s. We pick λ_s while keeping the penalty parameter for fluidity, λ_η, fixed at zero. The right panel shows the trade of curve for the λ_η, where we fix λ_s at the chosen value from the left panel. Chosen values are indicated with the larger marker. When picking λ_s, we try to find a good balance between the mean chi squared value, $\bar{\chi}^2$, and the size of the slip parameters, $||s||$. Our choice of λ_η is a balance between $\bar{\chi}^2$ and the size of the Laplacian of fluidity $||\nabla \eta_{\text{eff}}^{-1}||$.

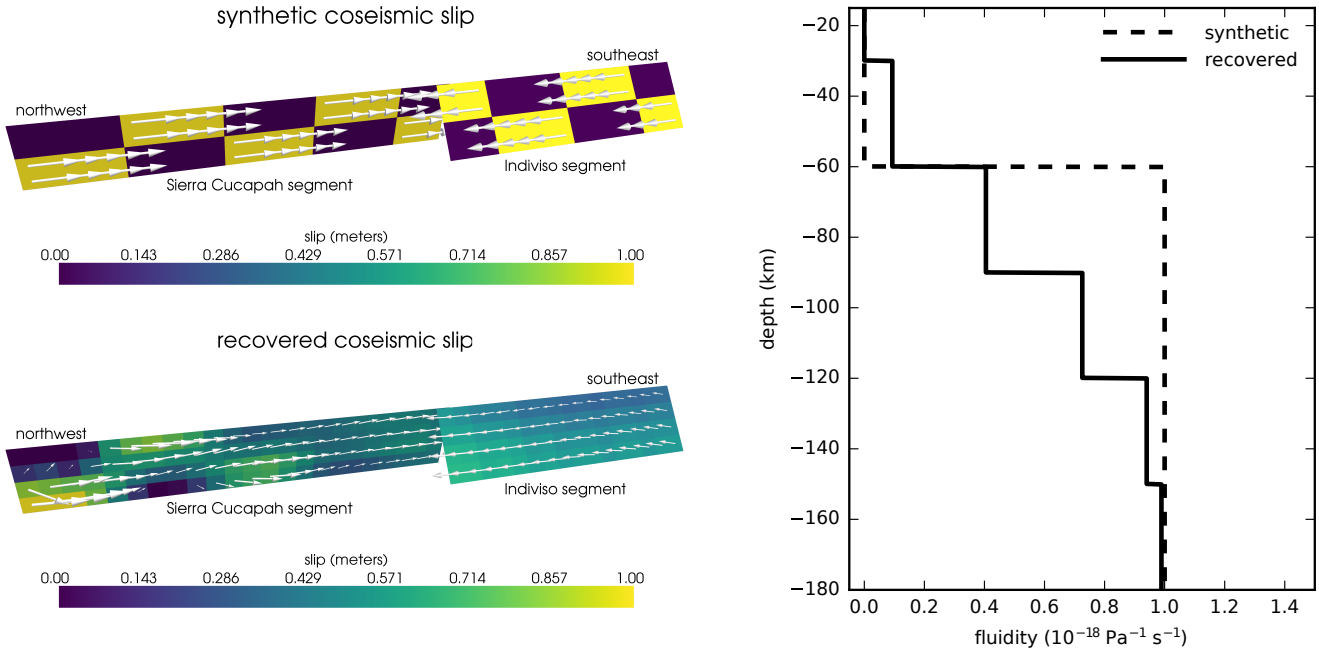

Figure S2. Checkerboard test used to asses the resolving power of the inversion in Section 3.2 of the main text. We create synthetic data by evaluating eq. (14) with the above coseismic slip distribution and fluidity distributions. Our fluidity model has a jump from 0.0 to 10^{-18} Pa^{-1} s^{-1} at 60 km depth, which corresponds to a viscosity jump from infinity to 10^{18} Pa s. Our synthetic model does not include afterslip although we estimate afterslip along with coseismic slip and fluidity in this test. We estimate these values in the same way as described in the main text and we also use the same penalty parameters. We do not add any noise to our synthetic data meaning that the recovered model just indicates how much the regularization is influencing the solution. Note that our ability to recover slip decreases towards the south where there is less data available. Also note that the smoothing constraint on fluidity largely obscures the jump in the synthetic model.