Supplementary Information
Coseismic deformation obtained from surface ocean currents in a flat bottom ocean

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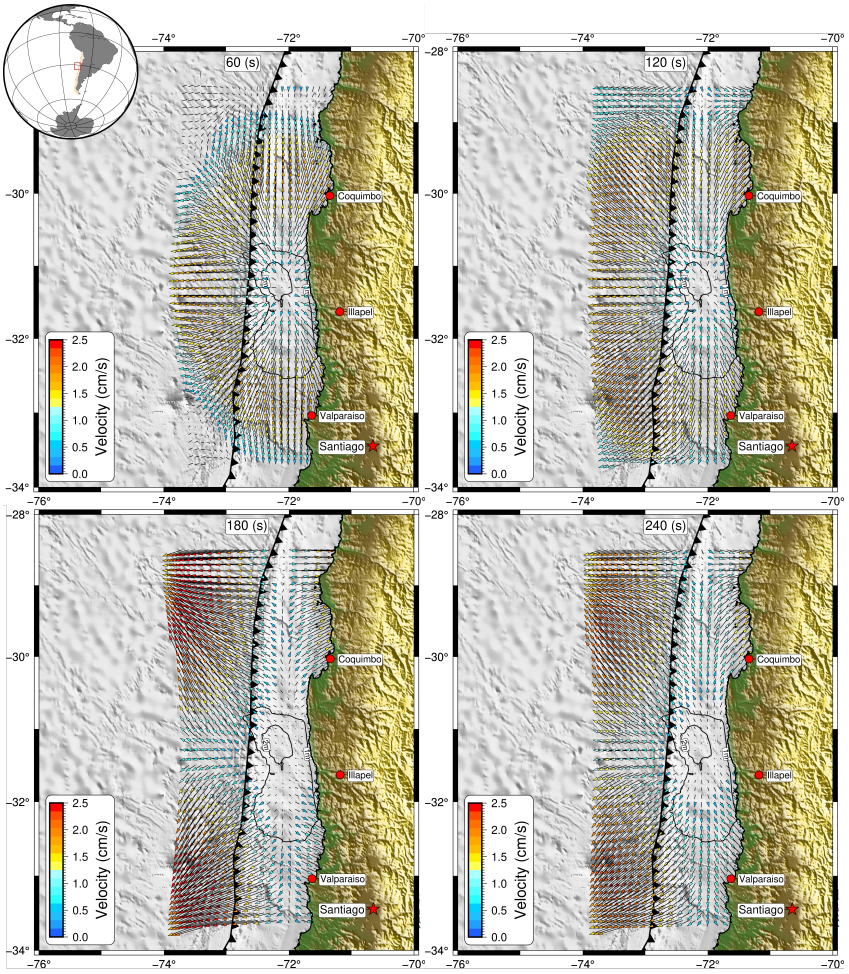

Fig. S1 Examples of surface currents induced by the instantaneous deformation of the uplift model B.1 after 1, 2, 3 and 4 minutes

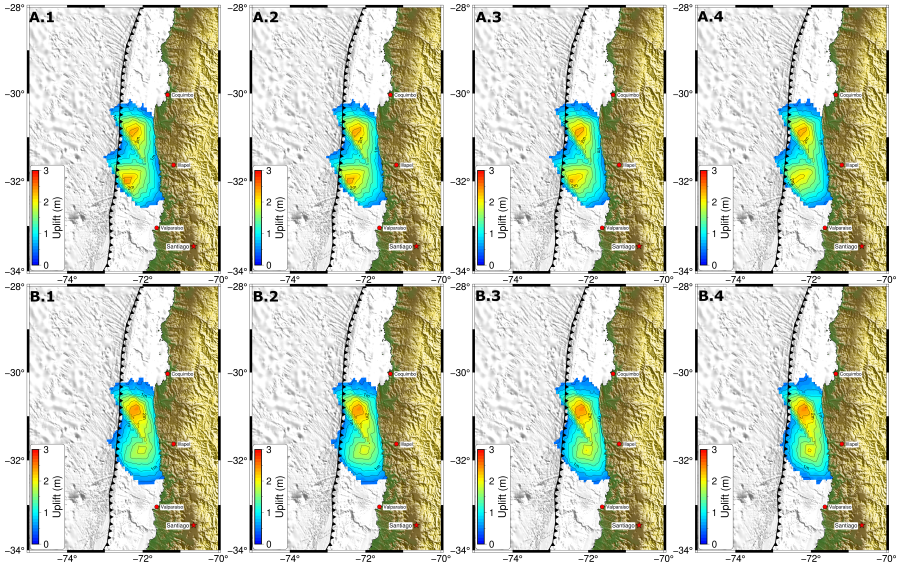

Fig. S2 Uplift models used in the Illapel 2015 earthquake tests

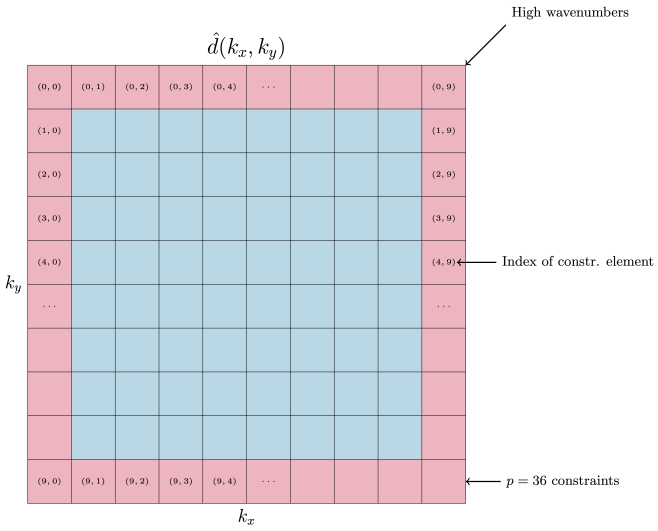

Fig. S3 Example of a 10×10 deformation field in the wavenumber domain $\hat{d}(k_x, k_y)$. The border related to the biggest magnitudes of wavenumbers is highlighted. In this example, it will be forced to be 0 with the linear constraints equation $\mathbf{H}\hat{\mathbf{d}} = \mathbf{h}$.

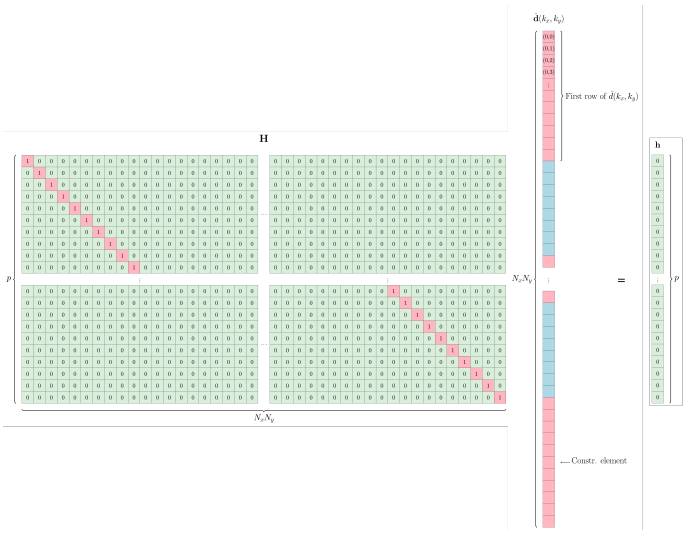

Fig. S4 Examples of the construction of the linear constraint matrices $\mathbf{H}$ and $\mathbf{h}$ to force the outer ring of the inverted $\hat{d}(k_x, k_y)$ to be zero. More elements, if wanted, can be set to zero. Each row of matrix $\mathbf{H}$ affects one entry of the target $\hat{\mathbf{d}}$, setting to zero said entry if the row contains a value one or not if it's comprised of all zeros

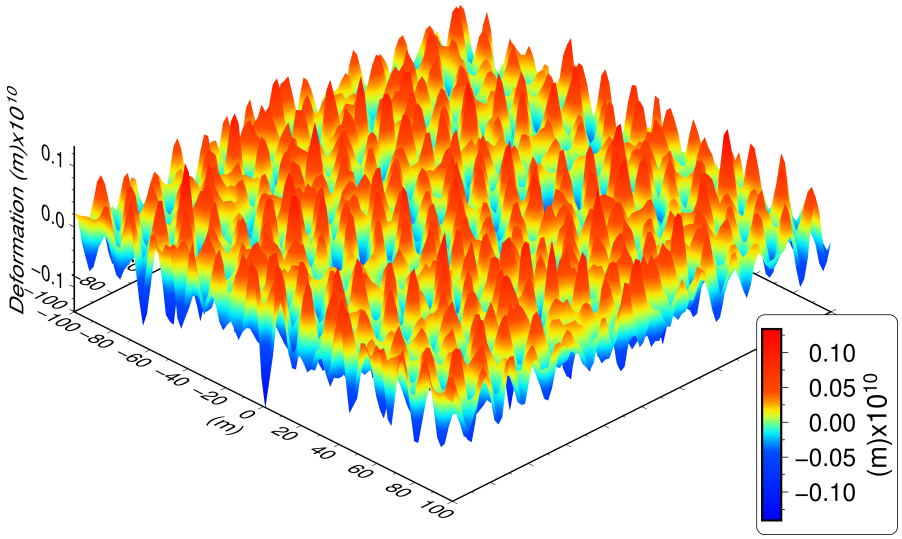

Fig. S5 Example of inversion of the Gaussian Bell using a generalized Moore-Penrose inverse with a SVD truncated at the rank of the matrices rank $(\mathbf{G_x}) =$ rank $(\mathbf{G_y}) = 615$. The regularization given by neglecting more smaller singular values doesn't allow to recover the original input deformation