This folder contains the Matlab scripts necessary to recreate the synthetic model inversions in the paper.

**Setup:**

**MakeReferenceModel\_Deformed** and **MakeReferenceModel\_Flat**: These make reference fault models in the deformed and restored states based on information in the ForwardModel folder.

**MakePriorEnsembles**: This makes the prior ensembles and data realizations for the dense data case and stores them in the PriorEnsembles folder. It should be run before running the inversions for these cases.

**Make SparseDataRlzts:** This makes the data realizations for the sparse data case. It should be run before running either of the sparse data inversions.

**Running Inversions:**

**RunInversion:** This runs a single inversion and makes some plots of the results. Switch between the different options files by uncommenting one of lines 6-9 and commenting out the rest. Change these options files to make changes to the setup (e.g. to change the number of ensemble members).

**Run\_All\_Inversions\_forward** and **Run\_All\_Inversions\_Restoration:** These scripts run the inversions for all different ensemble sizes and with and without inflation and localization for either the forward modelling method or the restoration method. Results are saved in the four \_Results folders.

**RunInversion\_scattered:** This runs a single inversion using the scattered data and saves the results. Comment or uncomment one each of lines 6-7 and 11-12 to switch between the forward modelling and restoration methods.

**Plotting Results:**

**CompareMethodsFigure:** This script makes Fig. 2.

**MakeParameterKDEPlots:** This script makes Fig. 3.

**MakeParameterKDEPlots\_Scattered:** This script makes Fig. 6A.

**PlotMeanFields\_Forward:** This script makes Figs. 4 and 5.

**PlotMeanFields\_Restoration:** This script makes Figs. S1 and S2.

**PlotMeanFields\_Scattered\_Forward:** This script makes Fig. 6B.

**PlotMeanFields\_Scattered\_Restoration:** This script makes Fig. S3B.