This document describes the workflow for generating a prior covariance matrix and prior mean for use in data-space inversion by MARE2DEM, including uncertainty quantification via ‘randomize-then-optimize’ (RTO). This workflow uses three code repositories:

1. modelViewing
2. dataViewing
3. CovarianceConstructor

In part 1, modelViewing, a 2D slice through a 3D subsurface resistivity model is extracted. A portion of this slice is then marked for inversion (the ‘reservoir’) and imported into MARE2DEM format. Next, this model (which includes only the region near the receivers and transmitter) must be extended to the lateral edges of the model using Mamba2D. This part is the only non-automated portion of the workflow. All of the preceding steps occur using Matlab scripts and functions.

In part 2, the 3D data to be inverted are rotated and relocated to the 2D profile. This portion is still under construction but should be done in a few days.

In part 3, a series of scripts and functions written in Julia are run to take the MARE2DEM model produced by part 1 and generate a prior model mean, standard deviation, and correlation length. Together, these comprise the prior. The covariance matrix doesn’t explicitly include the prior mean, since the former is a matrix and the latter is a vector, but both will be used to generate prior models during RTO.

Part 1

1. Obtain the modelViewing code repository from <https://github.com/danblatter/modelViewing>.
2. Call extract\_KI\_slice.m
   1. You can also call extract\_emgeo\_slice.m. Each function has an example at the top showing how to use it
   2. This script produces an output file called fout\_##.dat, where fout is the file path and name you provide, while ## is the rotation angle in degrees that you specify