Supplementary Data

Rudolph, M.L., Lekic, V., and Moulik, P. (2020) Bayesian inference of mantle viscosity from whole-mantle density models. Geochemistry, Geophysics, Geosystems.

This data archive contains files needed to reproduce the figures from our 2020 G-Cubed paper. The output from inversions for the radial viscosity profile of Earth's mantle are contained in the subdirectory `ensembles/`. Within the `ensembles` subdirectory, files are named like `ensemble_ME160_PT_Hierarchical_1.0_diag_2+4.txt`. Note that the ensemble files are zipped. You will need to gunzip them before working with them.

- `ME160` indicates that the model was run with Moulik and Ekstrom (2016) density model 160 (Table 1 in Rudolph et al. 2020).
- `PT` indicates that parallel tempering was used
- `Hierarchical` indicates that the hierarchical parameter was enabled
- `1.0` is the value of the density scaling factor $d \ln V_S / d \ln \rho$.
- `diag` indicates that a diagonal covariance matrix was used. `covmat` would indicate that a covariance matrix based on sampling the posterior of the tomographic models was used.
- `2+4` indicates that the inversion used only spherical harmonic degrees 2 and 4 as constraint. `2-3` would indicate degrees 2-3 and `2-7` would indicate all degrees between 2 and 7.

The subdirectory `postprocessing/` contains various MATLAB post-processing scripts. The postprocessing was carried out using MATLAB versions R2019b and R2020a.

- `postprocessing/plot_ME_ensemble.m` - this script reproduces figures equivalent to Figure 3 and Figure S4 and Figures S3 and S5 from Rudolph et al. 2020. The script also produces diagnostic plots showing the number of control points in the models and the convergence of the Markov chains.
- `postprocessing/load_ensemble.m` - this script can be used to load the ensembles, returning a MATLAB data structure that can be used for further plotting and analysis.
- `postprocessing/geoid_kernels/calculate_geoid_kernels_ensemble.m`

will calculate geoid kernels for the ensemble solution using numerical differentiation and generate figures equivalent to Figure 5 in Rudolph et al. (2020). Calculating the kernels requires a working installation of HC (https://github.com/geodynamics/hc).

Some MATLAB functions require Fabio Crameri's scientific colormaps. They can be downloaded here: MATLAB File Exchange

Some functions use the export_fig package, available here: MATLAB File Exchange