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Processing and visualization of mantle convection data with Paraview and VTK

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Visualisation techniques are an effective means to reduce large and complex datasets in such a way that they can be understood more easily. Here we present new results on the visualisation of mantle convection simulations, which produce large volumetric datasets. A major challenge is the rendering of cross sections and isosurfaces from models with over 10 million grid points, which is difficult to accomplish on standard PCs. We succeed in processing our data with the open-source software packages Paraview and VTK; these packages accommodate a wide range of architectures, and can be used in different setups. For interactive processing, we run Paraview on a large-scale cluster, where the data is distributed over the cluster nodes and displayed either on a normal PC, or on a Geowall. Geowall rendering places high demands on the rendering hardware, since the rendering effort is doubled. For non-interactive display modes, when the processing parameters are known in advance, the processing can also be done on a single PC. This is accomplished through the use of scripts in different high-level languages. They are also applied for the preprocessing steps to convert ASCII data files from various sources and formats; we will present results on how to group this repetitive tasks into an efficient and flexible toolchain.