

## Electronic Supplement Files

### What you need

To use this supplement you will need to install a public domain visualization package called paraview available at <http://www.paraview.org>. Paraview is relatively easy to use and there are now numerous tutorials on the internet describing how to use this tool. Paraview is built on a library called the Visualization Tool Kit commonly called vtk (<http://www.vtk.org>) and most of the files in this supplement are vtk format files or the newer XML-based version defined in the vtk documentation. The former have names ending in ".vtk" while the later have names ending in ".vts". Larger files are generally vts format as that format is faster to read because the object data are binary with an XML header.

### Overall Organization

The data files of this supplement are organized into four directories: (1) Animations, (2) ImageVolumes, (3) MapData, and (4) SourceCode. Each directory has a simple ascii text README file with one line descriptions of each file in that directory.

The names are in intended to be self explanatory, but some additional clarification follow:

*Animations* – contains three mpeg movies that are extensions of Figure 12 of the paper.

*ImageVolumes* – contain data files of all the 3D imaging volumes described in the paper

*MapData* – contains geographic line data that are essential to provide an anchor to reality. The geographic data are derived from the line data used by the Generic Mapping Toolbox (<http://www.soest.hawaii.edu/gmt/>) using the “-M” option of pscoast passed through a conversion program to turn these into Visualization Tool Kit (VTK) compatible files native to paraview.

*SourceCode* – contains C++ code that implements the coordinate transformation used to create all of these graphical objects. The code is not a complete application, but a library C++ object that implements the forward and inverse transformation between geographic coordinates and the Cartesian system used to create all of the graphical objects in this supplement.

### The Coordinate System

All of the 3D objects these data files in this supplement use a common, Cartesian coordinate system. This was an intentional choice because paraview internally operates strictly in a Cartesian coordinate system. The SourceCode directory contains code for a C++ object called RegionalCoordinates that abstracts the conversion between actual geographic locations and the Cartesian system used to build the scene files for paraview. The mathematics of the transformation are described in the following paper:

Fan, C., G. L. Pavlis, and K. Tuncay (2005). GCLGRID: A three-dimensional geographical curvilinear grid library for computational seismology, *Computers in Geosciences*, **32**, pp. 371-381.

The following parameters are required to completely define the transformation:

*Origin:* 41°N, 109.05°W at radius 5470.935 km (base of the PWMIG image volume)

*Orientation:* 0 degree. This means the  $x_1$  axis of the Cartesian system points eastward at the coordinate system origin. The  $x_2$  axis points north and  $x_3$  points upward at the origin point.