README

**PorcupineModel\_DistanceWeightedInversions.txt**

Updated SHmax and Aɸ model following the procedure of Levandowski et al. (2018; Figure 2C).

Purpose

This model provides an overview of stress variations across the continental U.S.

It is intended to be an automated and objective view of patterns at scales of ~100+ km

It is not intended to be an authoritative estimate of stress at any specific location.

Format (compatible with GMT psxy):

Longitude Latitude APhi SigmaHmax 0.5 APhi\_uncertainty SH\_uncertainty

*The fifth column—0.5—is the length.*

*Uncertainties are 1 standard deviation, as derived from Monte Carlo-style stress inversions (see below).*

Method

The continental U.S. is divided into four mutually exclusive stress provinces with statistically significant differences, often with sharp stress changes at the boundaries:

Central and Eastern U.S. - Atlantic Ocean to Rockies

Western U.S. - Basin and Range through onshore California and southernmost Oregon

Northern Rocky Mountains - Yellowstone to southern Alberta

Pacific Northwest - onshore Oregon and Washington

Stress is not necessarily uniform within these provinces, yet intra-province variations are generally gradual.

Stress in the Eastern Tennessee Seismic Zone, New Madrid Seismic Zone, and in Oklahoma differs from that in the surrounding central and eastern U.S.

These three areas are carved out as separate, inlying stress provinces in this modeling.

This model attempts to honor the gradual variations across stress provinces, the sharp boundaries between them, and the presence of these anomalous stress zones.

For each of the seven provinces,

for each of N evenly spaced points within the province (where N is also the number of focal mechanisms),

the nearest 25 focal mechanisms that lie within the same province are selected.

The 25 mechanisms are inverted 100 times.

The weight of each mechanism is inversely proportional to its distance from the point in question.

Each inversion jackknife-downsamples, adds noise, and selects a random coefficient of friction.

The result of the inversion is assigned to the weighted-average location of the 25 data used.

Redundant results are merged, so there are fewer than N results for most of the provinces.

Then, the next province is considered.

The approach is far from perfect.

It is not intended to precisely define stress at a given location.

That requires a bespoke stress inversion and careful review of any nearby in-situ observations.

However, this approach is objectified and automated, and

-retains sharp boundaries between provinces,

-captures spatially gradual changes in stress across provinces

-avoids mixing focal mechanisms from the major inlying anomalous areas with surroundings,

-meets boilerplate criteria for stress inversions (25 mechanisms in the same stress field)

**APhiGridVector.txt**

Purpose

This model provides a continuous estimate of the style of deformation (via the stress ratio and thus Aɸ) across the continental U.S.

This model is sufficient in most areas to aid in seismotectonic interpretations but not for precise fault slip modeling, for example.

It is a derivative of the model in PorcupineModel\_DistanceWeightedInversions.txt so has all the same problems.

Format (compatible with GMT nearneighbor, triangulate, etc):

Longitude Latitude APhi

Method

The inverse-distance-weighted stress inversions across the seven provinces are interpolated to a 0.125x0.125-degree grid. Places like central Tennessee

Some manual changes are made to guide the interpolation, particularly in southern Georgia and the northern Midwest where data are sparse or absent.