TJ-boundary-characterization-PA-JF.nb

(Development of a module to characterize a plate boundary at a triple junction, given an appropriate Euler vector)

Coded in *Mathematica* v. 11.2.0 by Vince Cronin
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Introduction

The purpose of this *Mathematica* notebook is to build and test a module to quantitatively describe a plate boundary at a triple junction, given an appropriate Euler vector and the assumption that Earth is spherical.

Assumptions

We assume that Earth is a sphere of unit radius in all but one part of this analysis. Of course, Earth is not really a sphere. Earth has an irregular surface with deep ocean basins and tall mountains. The average radius of Earth is around 6,371.01±0.02 km (Yoder, 1995, p. 8). The deepest part of the ocean basins, called the Challenger Deep in the Mariana Trench, is ~11.0 km below sea level (that is, ~0.2% of Earth's mean radius), and the summit of Mt. Everest is ~8.848 km above sea level (~0.1% of Earth's mean radius). Earth's polar radius (6356.7530 km) differs from its mean equatorial radius (6378.1363 km) by only ~21 km, so Earth's shape is different from a sphere by about 1 part in 300 or about 0.3 % (*e.g.,* Cazenave, 1995, p. 36).

Assuming that Earth is a sphere of unit radius makes the mathematics we use in this problem much simpler than if we used either an ellipsoid or the geoid. For just one example, the radius of a sphere is the same measured at any point on the sphere's surface, and this is not true for either the reference ellipsoid or the geoid. Although Earth is a little wider at its equator than along its spin axis, we do not generate serious errors in our calculations by assuming Earth's radius is the same in all directions -- that it is a sphere.

When we say that Earth is assumed to have unit radius, that means that we set Earth's radius to 1 unit of length. The one part of this analysis in which we must use the actual size of the Earth in kilometers is in the determination of the circumferencial distance between the reference point