GEOL 695: Geophysical Geodesy - Day 4

Preliminaries

- Reading questions
- Matlab issues
- New problem set next week

Readings

Altamimi, Z., X. Collilieux, J. Legrand, B. Garayt, and C. Boucher (2007), ITRF2005: A new release of the International Terrestrial Reference Frame based on time series of station parameters and Earth Observation Parameters, *Journal of Geophysical Research*, *112*, B09401, doi:10.1029/2007JB004949.

Blewitt, G. (2003), Self-consistency in reference frames, geocenter definition, and surface loading of the solid Earth, *Journal of Geophysical Research*, *108*, B2, 2103, doi:10.1029/2002JB002082.

Argus, D. F. (2007), Defining the translational velocity of the reference frame of Earth, *Geophysical Journal International*, *169*, 830-838.

(I have .pdfs of each of these)

Reference Frames

Where are you? How fast are you going?

Where is the center of the Earth (to within 1 mm and 1 mm/yr)?

Examples.

Train

Types of Global Frames

CM - Center of Mass of entire Earth System, including atmosphere and oceans. Its everything. Center of CM does not change its trajectory through inertial space. Need Satellite Laser Ranging (SLR) to access the CM. But there are not that many SLR satellites. ITRF 2005 is a CM frame. Accuracy to which the origin of the CM frame is known is on the order of 1-2 mm/yr.

CE - Center of Mass of the Solid Earth (excludes atmospheres and oceans). Loads from fluids on the Earth surface load and deform the solid Earth so these changes

CF - Center of Figure. Geometric center of the outline of the Earth shape. No net translation frame. Does not account for mass distribution in any way since its just based on the outline.

CL - Center of surface lateral figure. Sort of like CF but based mostly on horizontal motions, rather than all three (x,y,z or n,e,u).

CH - Center of surface height figure. The opposite of CL with respect to its relationship to CF. The frame constrained to have no net vertical motion.

No net rotation of the solid Earth (NNR) reference frame.

The International Terrestrial Reference Frame 2005 (ITRF 2005: Altamimi et al., 2007) is a NNR CM frame. Based on GPS, SLR, VLBI, DORIS *combinations*.

ITRF is a product based on a lot of data and a few assumptions. For some it is a product, and for other it is a foundation.

It is essentially a text file with a list of coordinates and rates for GPS and other types of sites. So however we arrive at our own solutions for coordinates we can transform our solution into ITRF.

Types of Velocity Reference frames we sometimes use.

Western U.S. GPS velocity field

wrt ITRF2005

wrt North America

wrt Sierra Nevada

Baselines

SNARF - GIA corrected. Similar to ITRF except different...

Other Reference Frame ideas

Fiducial Frame

Where all the measurements are expressed with respect to certain site (or sites) in a network.