

Kinematics of the Lithosphere

LAB

Reference frames, Plate motions

File `velo_itrf.comb` contains velocities at GPS in North America with respect to ITRF. Format is (see `psvelo` in GMT): `lon lat ve vn sve svn corr site`

1. Plot the velocities for sites with velocity uncertainty larger than 1 mm/yr.
2. Calculate and plot velocities with respect to North America in 3 different ways:
 - a. Calculate velocities with respect to site ALGO
 - b. Calculate velocities with respect to the North American plate as defined by NUVEL1A (DeMets et al., 1994).
 - c. Calculate velocities with respect to the North American plate as defined by REVEL (Sella et al., 2002).
3. Define your own NOAM frame:
 - a. Use sites located on stable North America to calculate your own NOAM/ITRF angular velocity.
 - b. Calculate residual velocities with respect to your definition of North America.

Make sure you propagate velocity errors.

Plotting looks nicer with GMT, but can also be done in Matlab, see below.

Using Matlab's map tool:

```
scale = 400;
lonlim = [-140 -60];
latlim = [20 60];
load worldlo;
load usalo;
axesm('MapProjection','mercator',...
      'MapLatLimit',[20 60],'MapLonLimit',[-140 -60],...
      'MLabelLocation',20,'MLineLocation',20,...
      'PLabelLocation',10,'PLineLocation',10,...
      'LabelFormat','signed');
framem; gridm; mlabel; plabel
displaym(Poline)
patchm(gtlakelat,gtlakelon,1,[0 0 .75]);
plotm(statelat,statelon,'k');
quiverm(n,e,vn*scale,ve *scale,'b',0);
title('ITRF 2000');
```

