

How quickly are we moving?

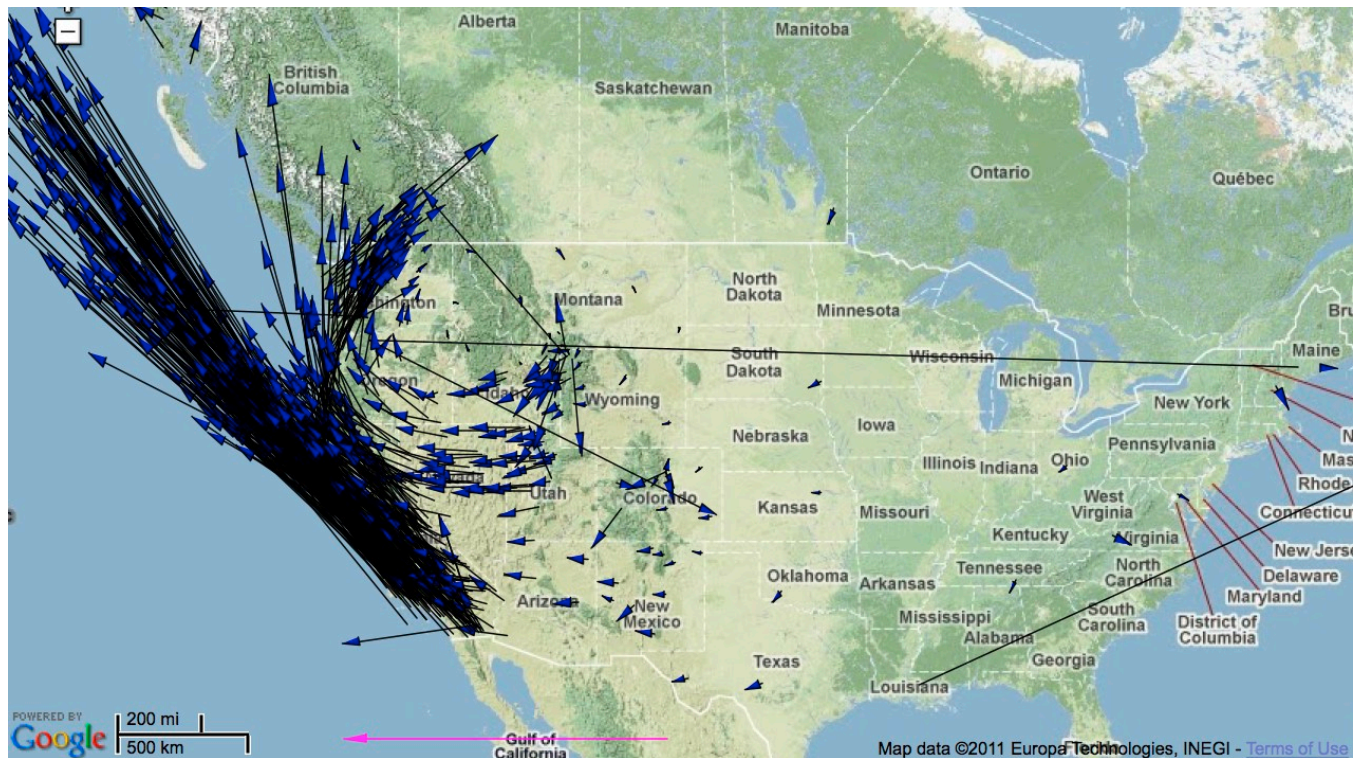
A quick guide to finding EarthScope Plate Boundary Observatory GPS station(s) near you

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Quick look: On the maps below, find the closest GPS velocity vector arrow to your school, park, or favorite location.

- Each vector arrow shows the velocity of a single GPS station installed permanently to the ground. If the Earth moves, the GPS stations record this movement.
 - The GPS **vector's tail** is the starting location of the GPS monument.
 - The **direction the vector points** is the direction the GPS station is moving.
 - The **length of the vector** shows how fast the GPS station is moving.
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- Keep in mind that there might be faults, such as the San Andreas fault, between your school and nearby GPS stations.

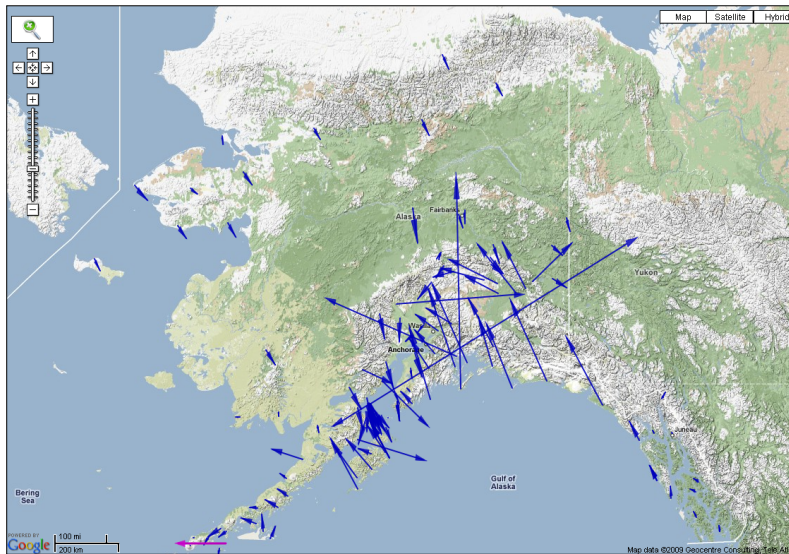
Explore further using the GPS Velocity Viewer use a Google Search for *UNAVCO Velocity Viewer*.



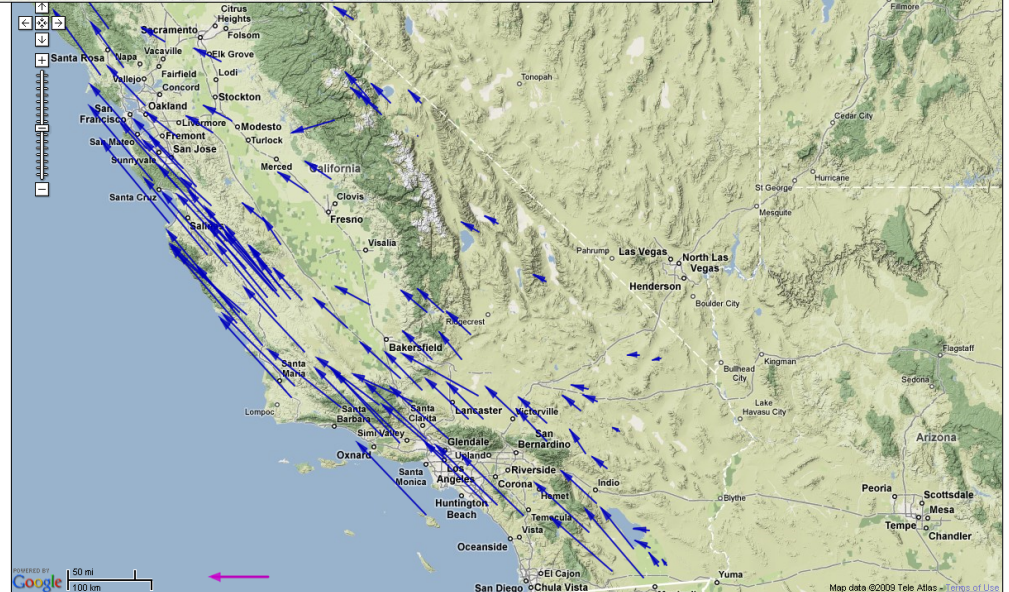
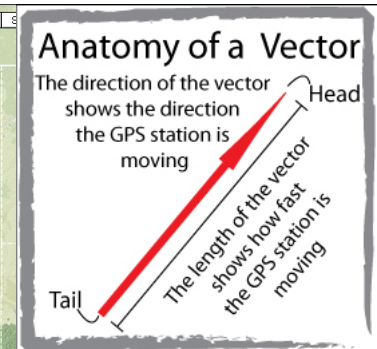
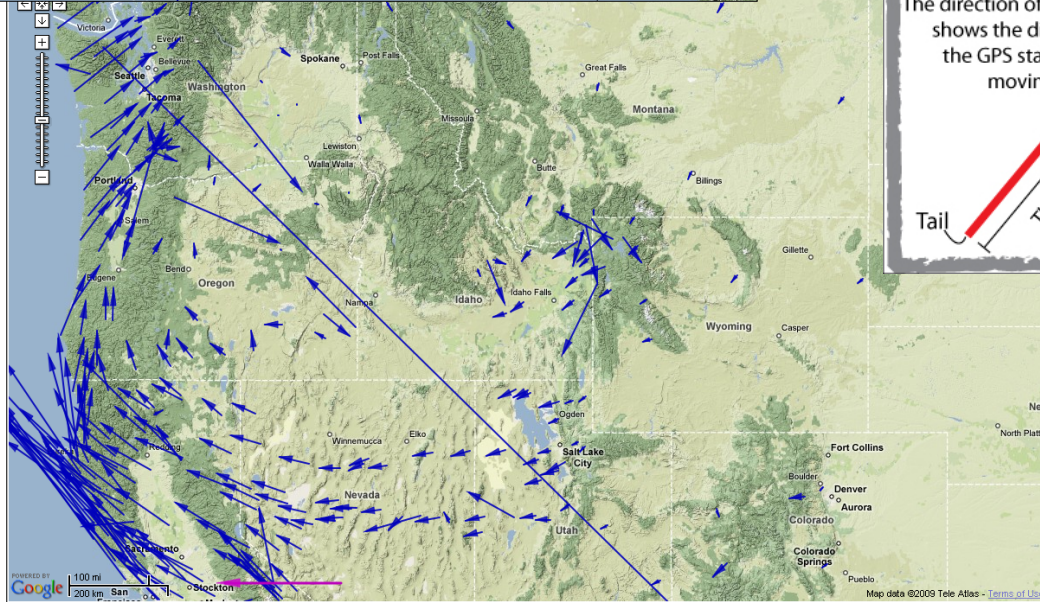
Version: May 2014

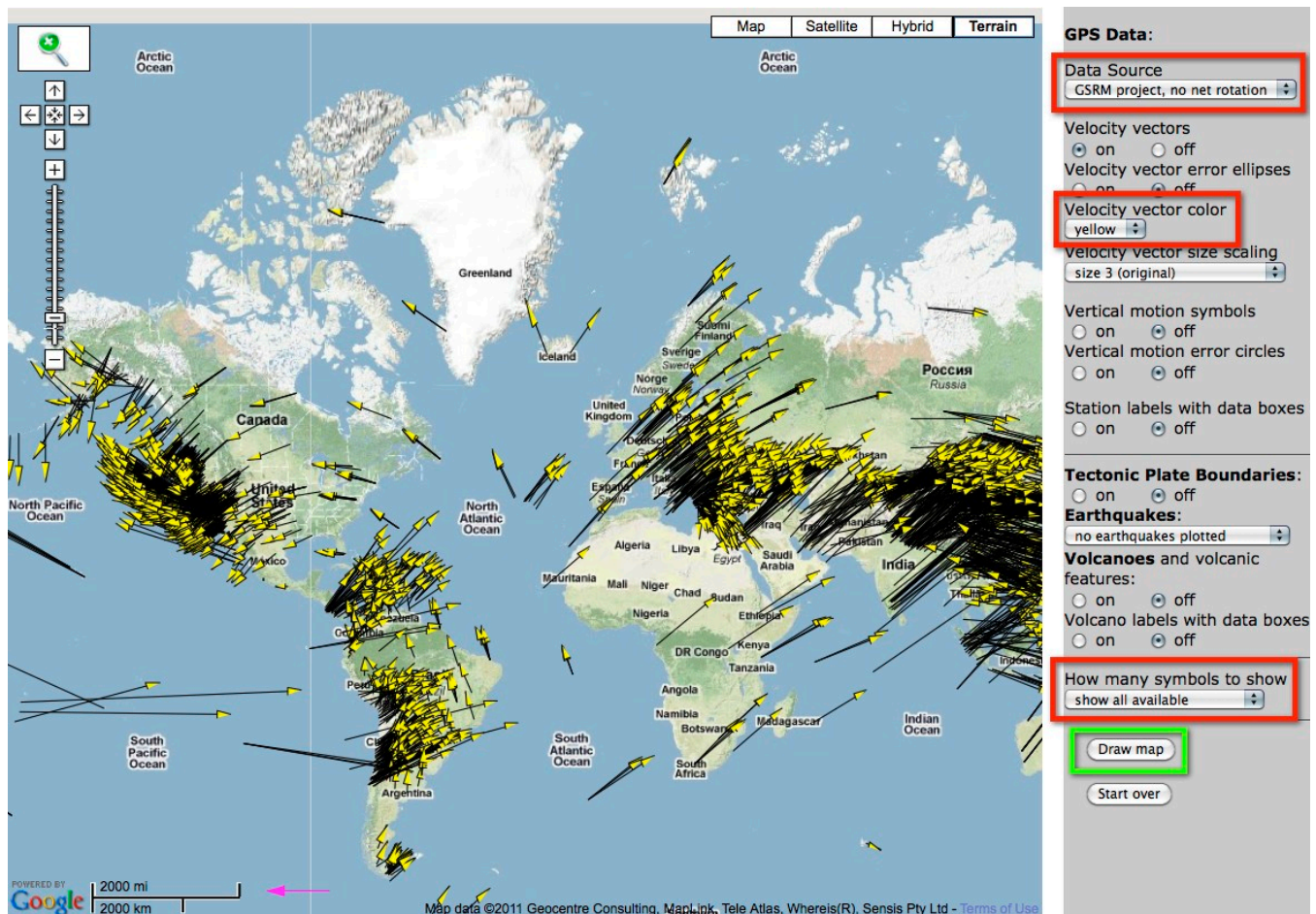


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Note: Every tectonic plate on Earth is in motion. Scientists compare the motion of one tectonic plate or region relative to another tectonic plate to view the differences in motion. The maps on the first two pages use the North American Reference Frame where the interior of the North American plate is stable, e.g. not moving.





I. Five easy steps to make a world map showing the divergent motion in the mid-Atlantic:

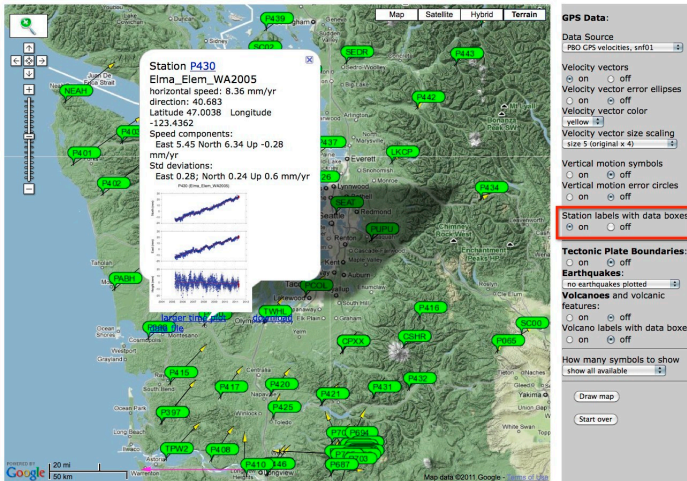
- **Go to the GPS Velocity Viewer, to explore the GPS velocity vectors** – use a Google Search for *UNAVCO Velocity Viewer*. The viewer starts with a zoom on the western United States and shows the overall velocities measured at each GPS station in the PBO network
1. **Zoom out** on the map (there's a quirk with the international date line – sometimes the vectors do not display... in Beta testing.)
 2. Under *Data Source*, choose **no net rotation**.
 3. Under *vector color*, choose **yellow**.
 4. Under *Sites displayed*, select **show one in ten**.
 5. Click on “**Draw map**”.

II. To explore the plate motion by viewing the GPS velocity vectors near a favorite place:

1. Change the **Data Source** to *UNAVCO GPS velocities, NAM08* to change into the North America Reference Frame.
2. Change *Sites displayed*, select **show one in ten** to help the map display more quickly.
3. **Zoom in** to a favorite area (for example, the state or region of interest.) If you don't see any vectors, zoom out.



4. Display more vectors using *Sites displayed*, such as *show one in five*.
5. **Are the vectors very short?**
 - In the mid-continent, the North American plate is not moving much in the North America Reference Frame - try changing the **Data Source** UNAVCO GPS velocities igs05.
 - The scale can be changed by selecting choices under *Velocity display scale*.
6. Learn more about one GPS station:



a. Click the *checkbox* button for **Station labels** to see more information for each GPS station.

b. Click the **green bubble** of a station. The information box displays:

- The GPS station 4-character id.
- Horizontal speed - indicates how quickly the ground and that GPS station is moving.
- The direction of motion in degrees from North.
- GPS time series plot with a link to a large printable plot (for UNAVCO GPS

stations).

- A link to download the data into a spreadsheet program (for UNAVCO GPS stations).

7. Further customize your map by using the controls at the side of the map.

- The **GPS Data Source** – look at the velocity vectors keeping a tectonic plate fixed as the reference frame
 - UNAVCO GPS velocities Nam08 uses a North American Reference Frame – there are more than 1460 GPS stations primarily from the United States.
 - UNAVCO GPS velocities igs05 uses IGS reference frame.
 - Tectonic plate based reference frames use more than 5000 stations around the world. Shows the velocities compared to keeping that tectonic plate fixed (not moving).
- Change the *Velocity display scale* and *Velocity vector color*.
- Show error ellipses – this shows the relative accuracy of the GPS data.
- View the *tectonic plate boundaries*, recent *earthquakes*, and locations of *volcanoes* by turning their symbols on and off.

8. To learn more about graphing this data, see a step-by-step tutorial:

http://serc.carleton.edu/eet/platemotion/all_parts.html

9. Now that you have explored the plate motion for one location, roam the world and discover what you can find! Where can you find where plates collide, split apart, and slide past each other? How about the plate boundaries – where are they narrow? Where are they wide boundary zones?

