

## Spatial analysis of GPS plate-motion data to determine an actual rotation pole for the NAP

Actual plate-rotation poles were calculated for the North American tectonic plate using a custom ArcView GIS Avenue script.

The script calculates the normal ray path to the horizontal direction of plate motion at each GPS site, and then intersects each ray path with all other ray paths determined for a selected set of GPS stations.

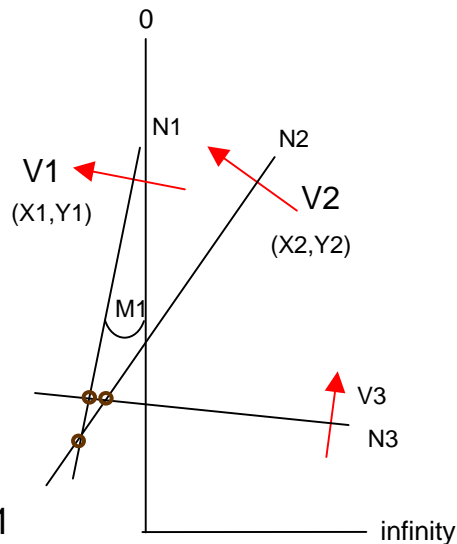
Plate-rotation poles are assumed to correspond to the densest clusters of resulting intersection points, determined using the ArcView GRID program, a cell-based spatial analysis program. This approach assumed that GPS plate-motion data reflect plate rotation about a pole.

Using the slope-intercept equation:  $Y = MX + B$  (or  $B = Y - MX$ )  
 Calculate B1 for a vector-normal line ( N1 ) with known slope ( M1 )  
 at the location of the GPS station (X1 and Y1)

RadBearing = Bearing \* Radian  
 $M1 = \text{RadBearing.Tan} * -1$   
 $B1 = Y1 - (M1 * X1)$   
 where M1 is the SLOPENORMAL

and similarly for each other vector:

$Bn = Yn - (Mn * Xn)$   
 $B\text{Minus} = Bn - B1$   
 $X\text{intercept} = B\text{Minus} / X\text{Minus}$   
 $Y\text{intercept} = (\text{SlopeNormal} * X\text{intercept}) + B1$



Loop through the calculation of Bn... and Mn.. for the remainder of the stations, calculating point of intersections for N1 and all other vector-normal rays.

Run successive loops for N2 to Nn...