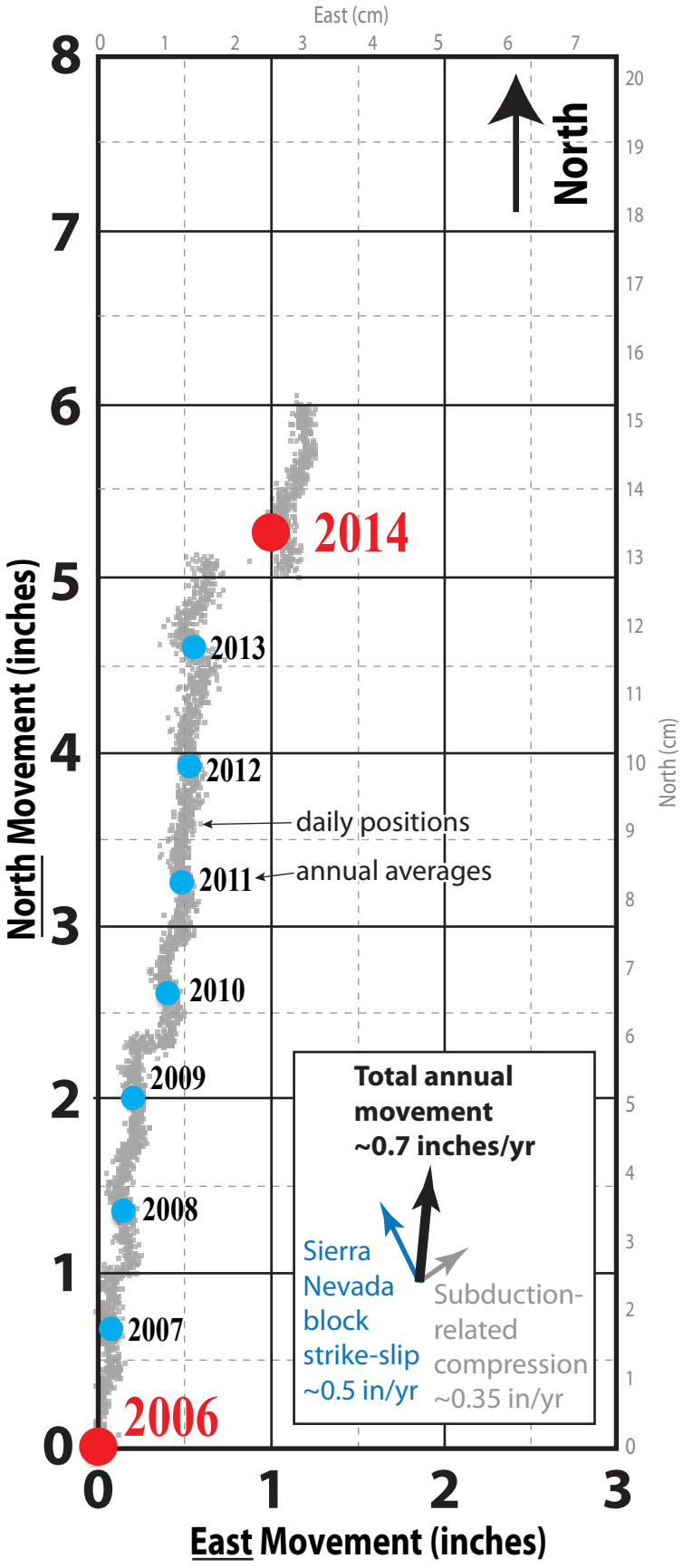
Arcata, California GPS Station

Yearly Movement, 2006 - 2014

(Referenced to North America's stable east)



Cut Here

The dots on this card show motion of the Arcata GPS station since 2006. Because the station is anchored into hard rock beneath the soil, the large dots represent the year-to-year movement of the Arcata region toward the north-northeast.

Orient this graph toward the north, tape it to the floor, and think about the questions below.

1. How far has the Arcata region moved since the year 2006? At what rate (inches per year) is the region moving in total? How much of this movement is due to Sierra Nevada block strike-slip motion?

2. How much of this movement (inches per year) is due to subduction-related compression? The last Cascadia subduction-zone earthquake occurred in the year 1700. **What will happen to the Arcata region when the next big subduction earthquake occurs?**

3. Why do the daily timeseries have a sudden offset in early 2014? How much movement was measured? What direction was the movement?

Station P058 from the EarthScope Plate Boundary Observatory (**http://pbo.unavco.org**). GPS time series data provided by UNAVCO (**http://www.unavco.org**). Data as of August 14, 2015. Position offset -0.06 inches east and -0.5 inches north from the NAM08 P058 .cvs file to bring 2006 average to zero.

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Answers:

1. *Arcata is moving ~0.7 inches/year towards the north-northeast.*

   Arcata moved ~5.6 inches towards the north-northeast between 2006 and 2014.
   (2014-2006) x 0.7 inches/year = 5.6 inches

   Of this total motion, ~0.5 inches/year toward the northwest is from strike-slip motion from the motion of the Sierra Nevada block as it is dragged northwestward by the Pacific Plate.

2. *Of this total motion ~0.35 inches/year towards the northeast is from the subduction-related compression.*

   During the next subduction zone earthquake we expect the Arcata region to move ~9 feet towards the southwest.
   (2015-1700) x 0.35 inches/year = 110 in. = ~9 ft.

3. *The offset in the time series in early 2014 came from movement associated with a Mag 6.8 earthquake that occurred about 45 miles offshore of Eureka on March 10, 2014. The rupture was a strike-slip quake within the Gorda Plate.*

   In Arcata, the offset from the earthquake was about 0.5 inches towards the east.