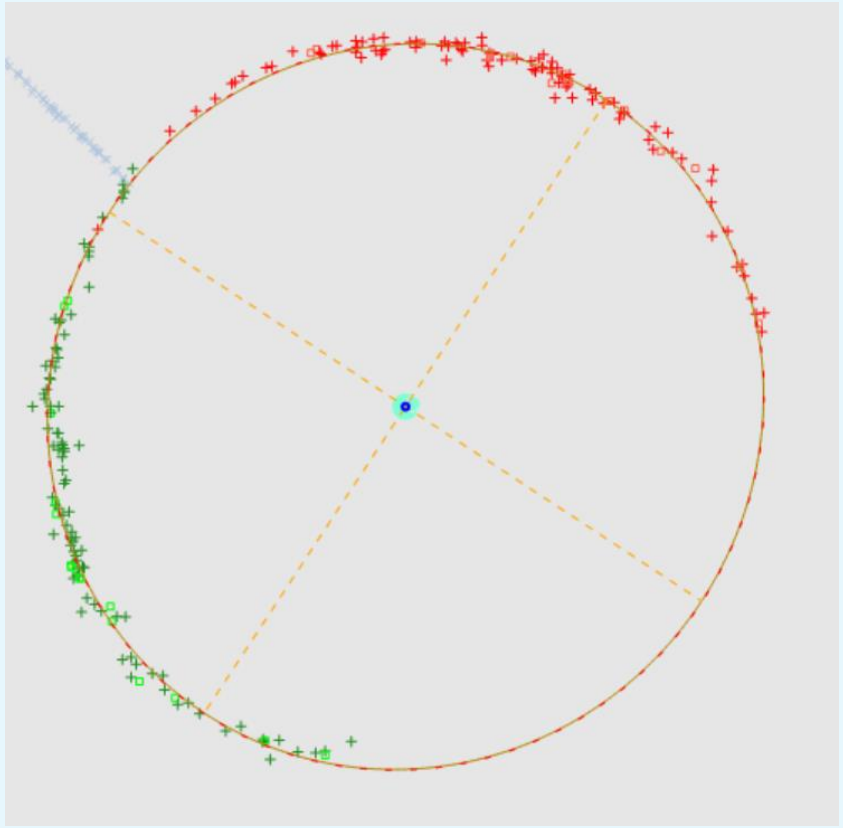
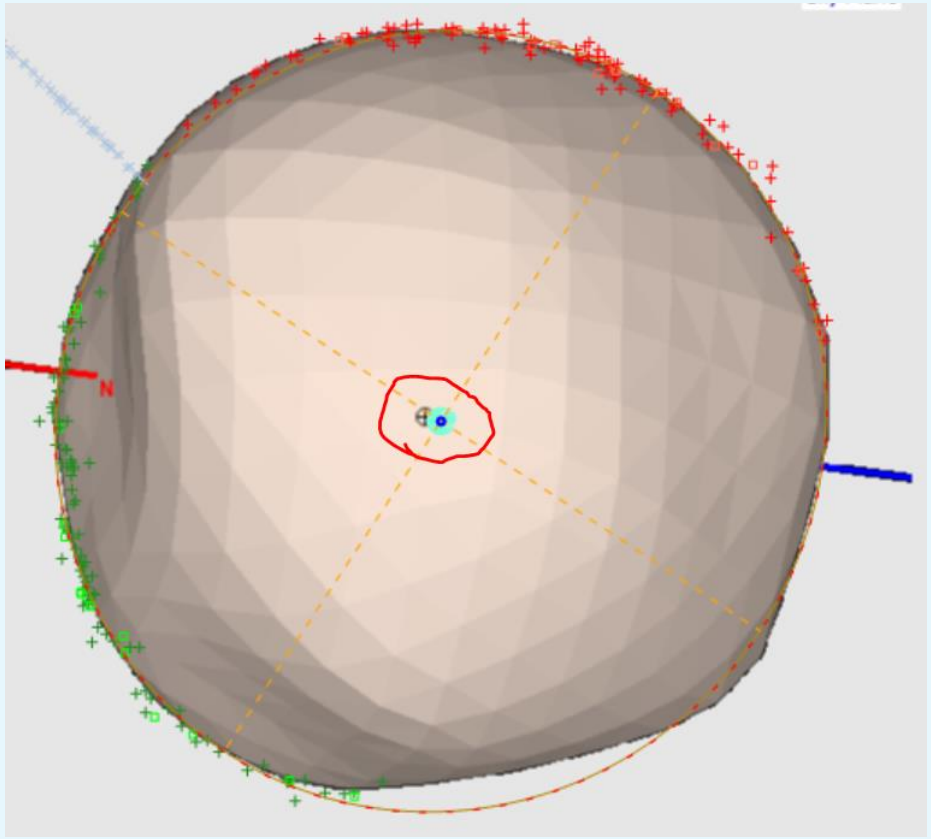
Accuracy and Occultations

Occult has a complex uncertainty model to estimate the total uncertainties in the astrometry derived from an observation

This presentation hopes to illustrate some of the issues involved with obtaining accurate and reliable results from occultations

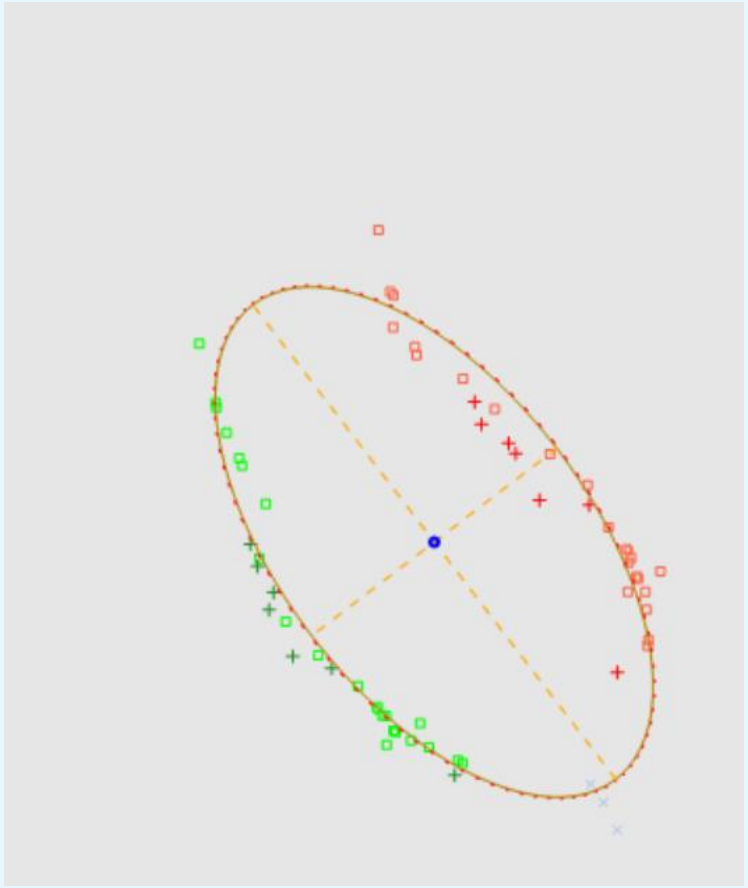
Pallas 1983 May 29
Ellipse fit & Shape model fit. Different centers

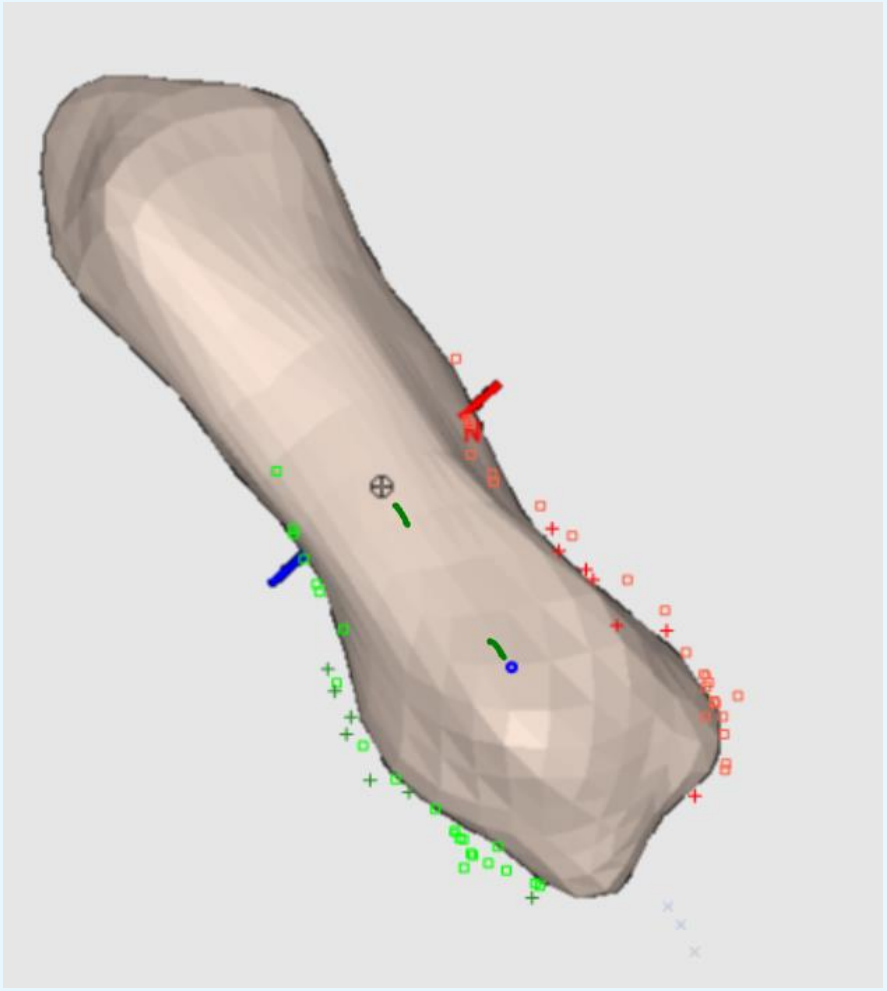




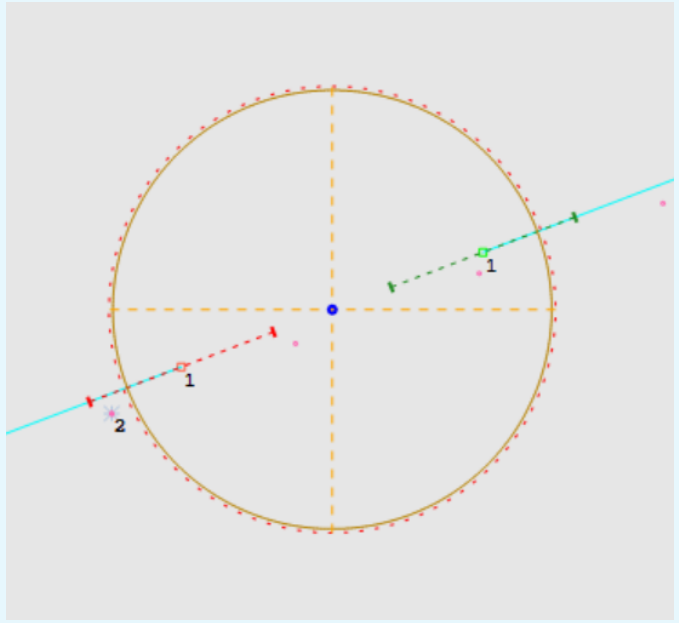
Difference between center of Mass,
and Centre of Figure

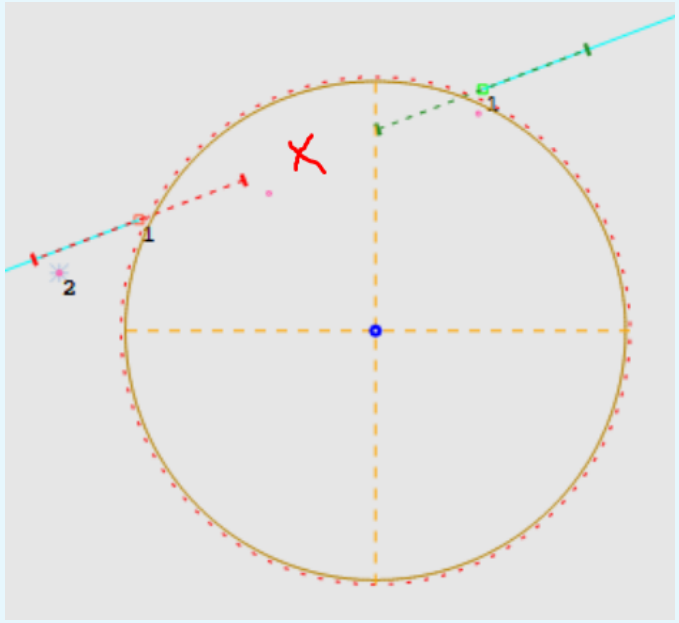
Kleopatra

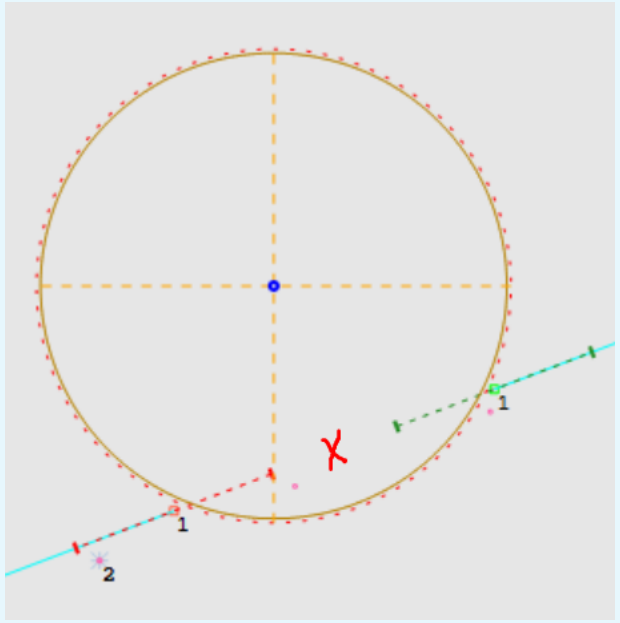




An asteroid with unknown profile single chord

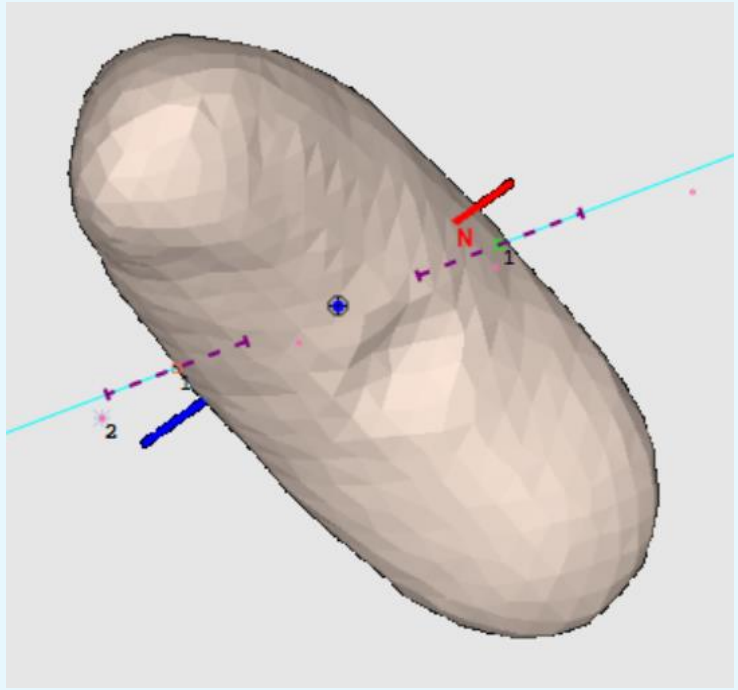


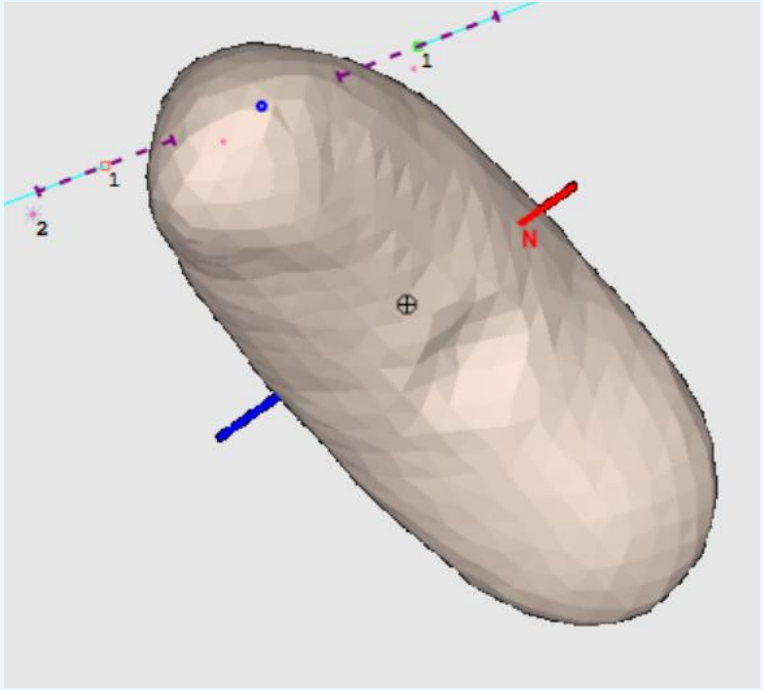


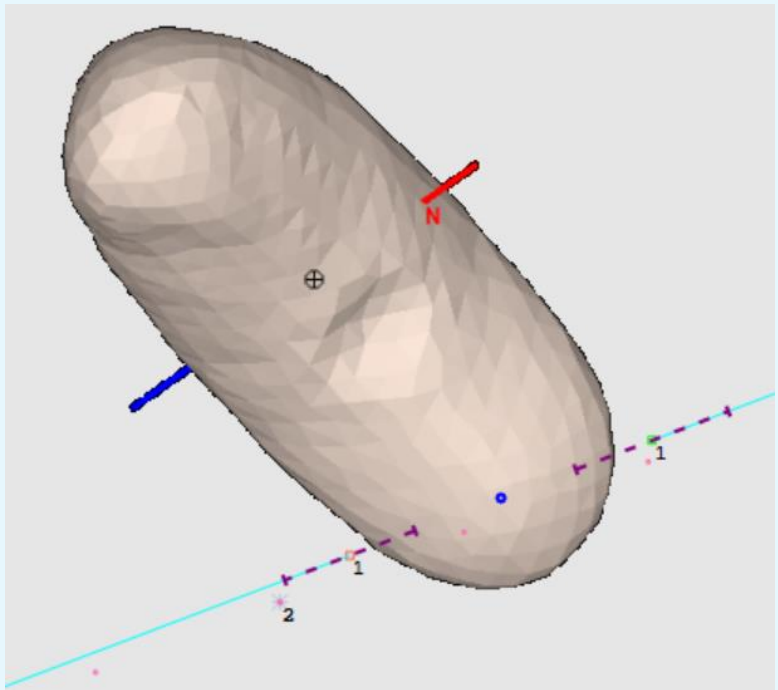


Across-path uncertainty ±40% of asteroid RADIUS

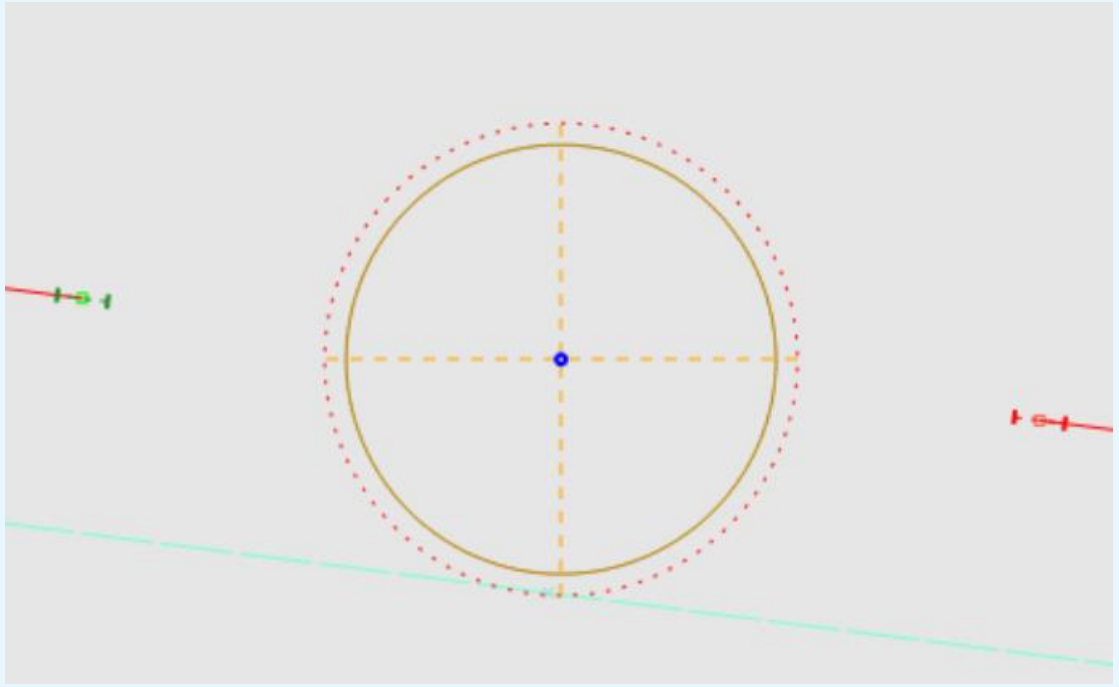
Same asteroid & chord
Chord can be located anywhere along the asteroid

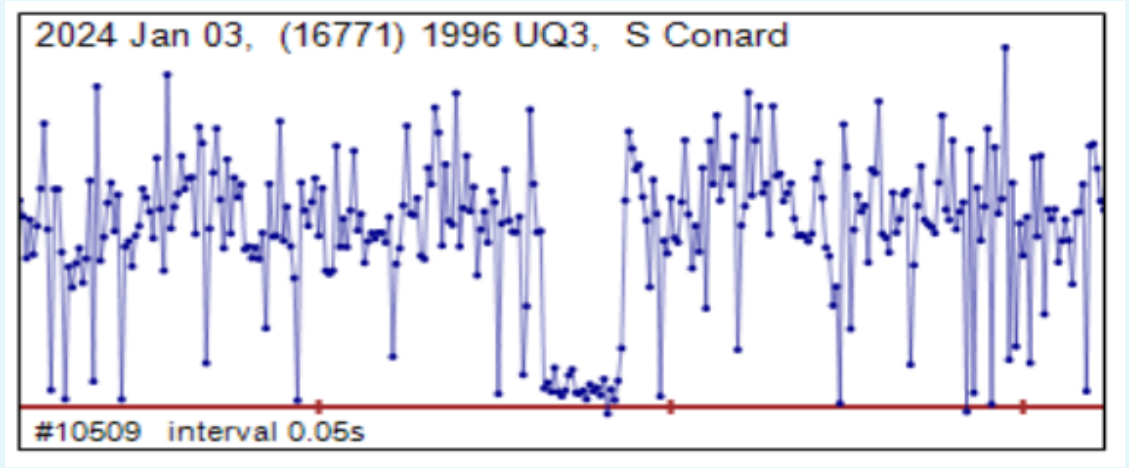


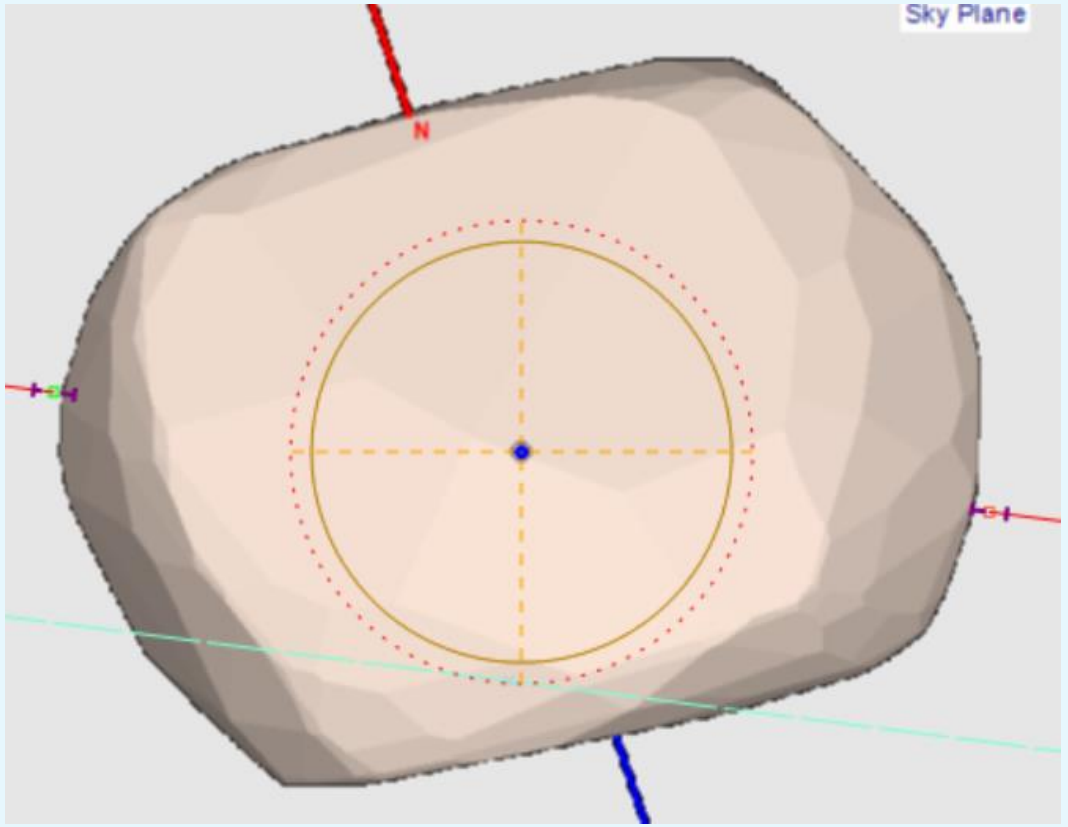




Is the observation reliable ?

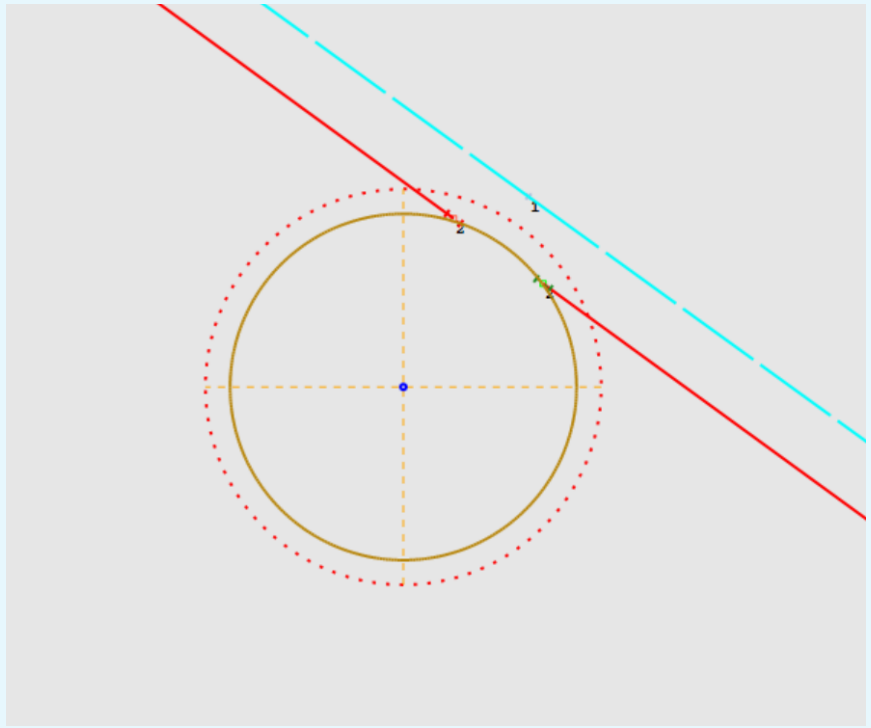


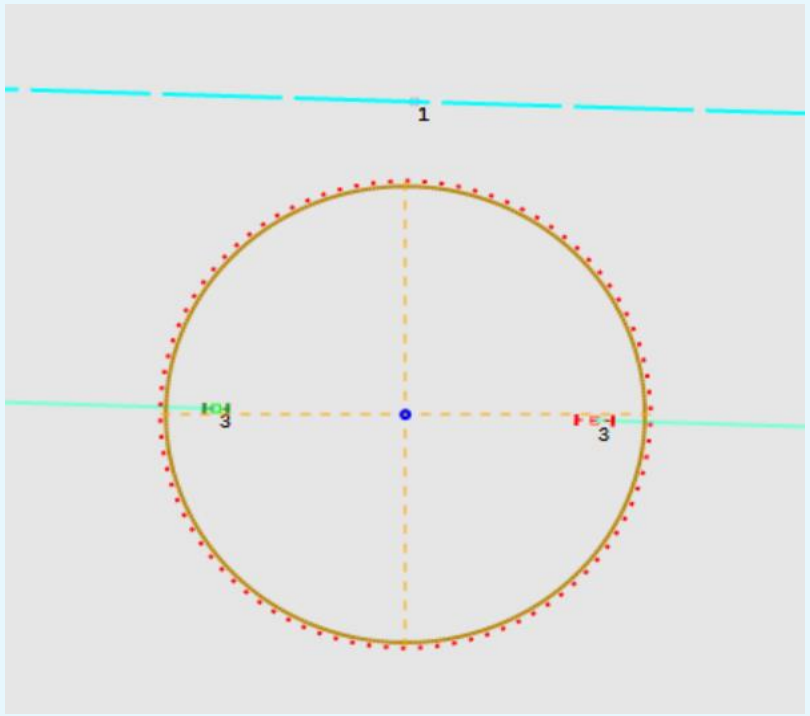


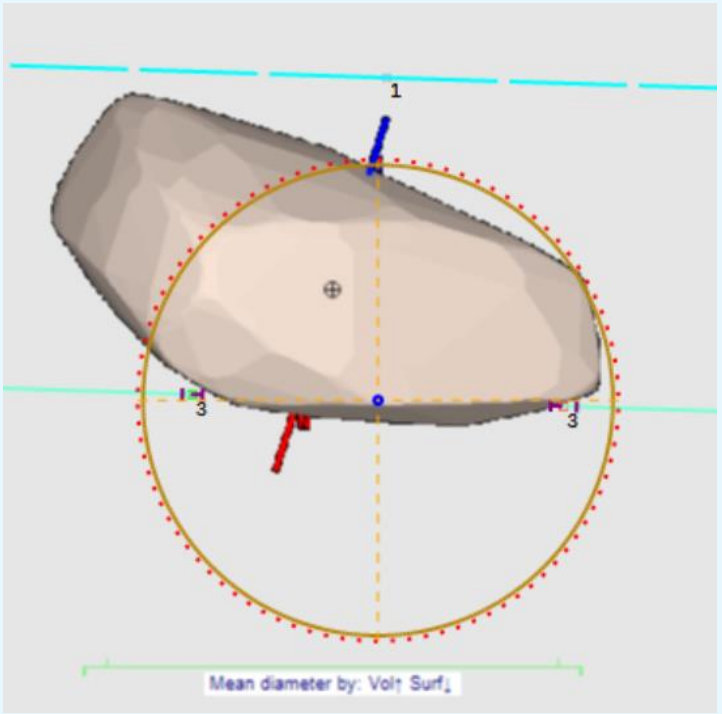


Diameter 13km, instead of 7km. Asteroid must be a very dark asteroid

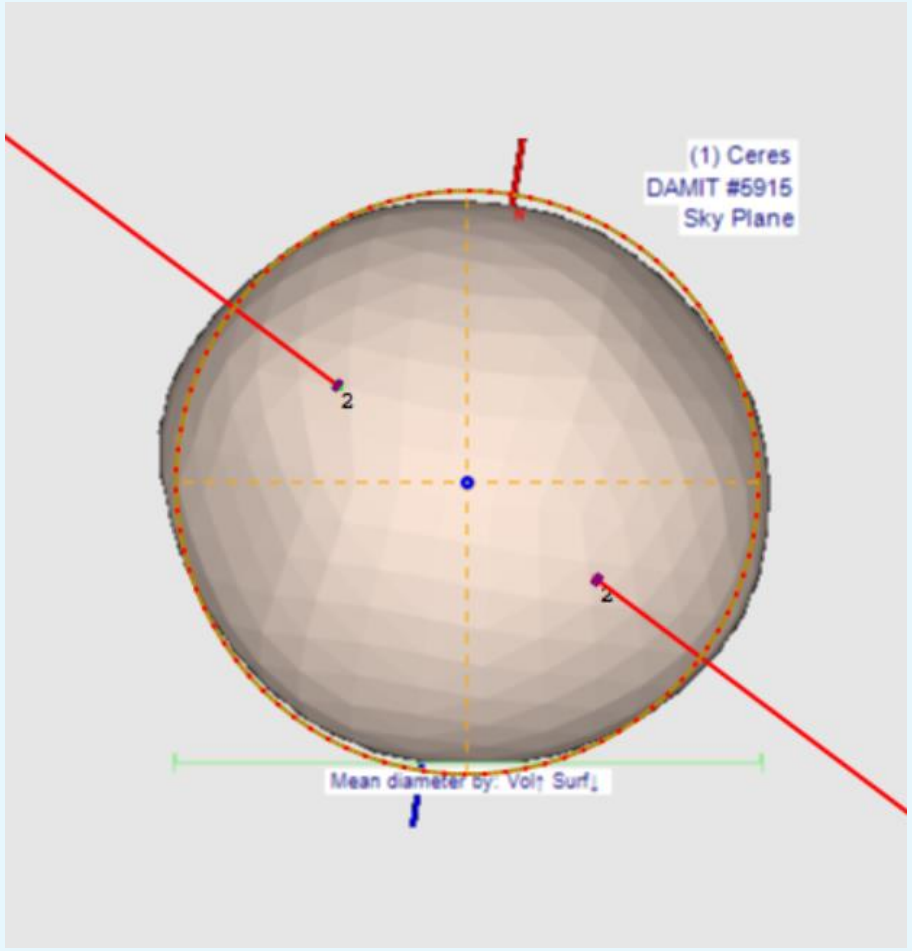
How a Miss chord can increase accuracy





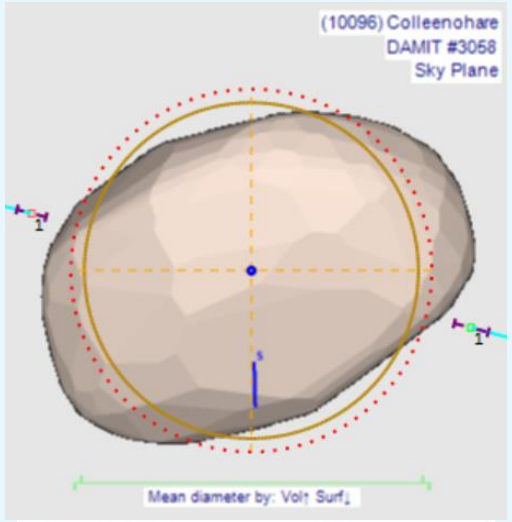


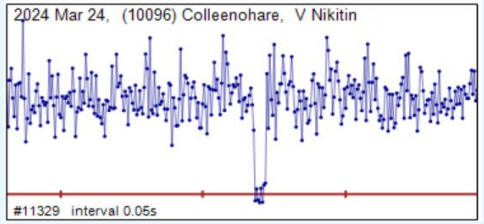
Value of single-chord observations
Across-path uncertainty ±40% of diameter



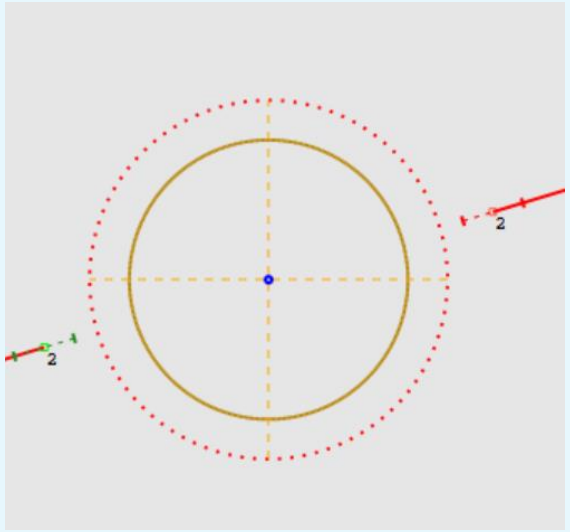
- Ceres, 2015 July 5
- Diameter 952 km, 662 mas
- Total uncertainties:
  RA ±188.62 mas
  Dec ±228.22 mas
- Usefulness?
  For this asteroid, insignificant.
  A waste of the observer's time

Astrometric uncertainties, small asteroids with a single chord

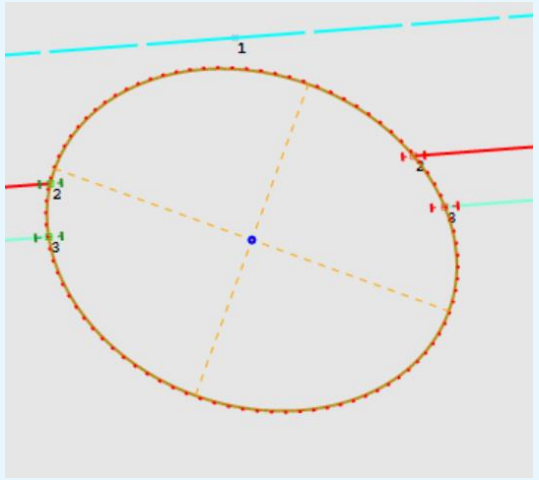




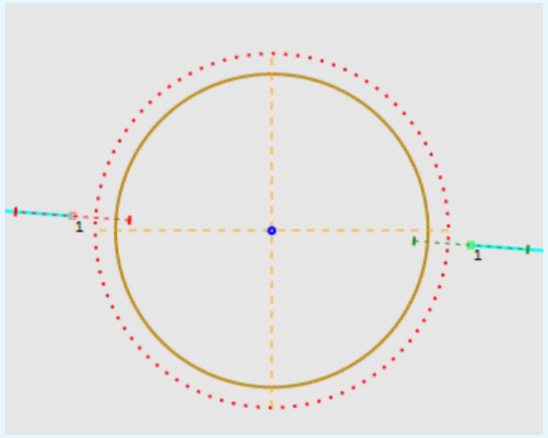
(10096) Colleenohare
Diameter: 11km, 4.4 mas
Total uncertainties:
RA ± 0.59 mas,
Dec ± 1.73 mas
Very useful!

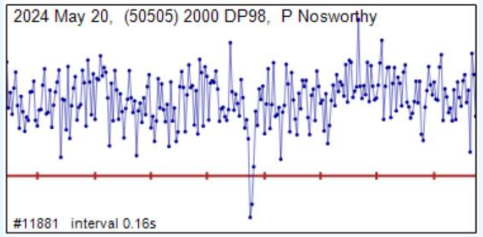


(261535) 2005
Diameter 2.3km, 1.7mas
Total uncertainties:
RA ± 0.36 mas,
Dec ± 0.68 mas
Very useful!



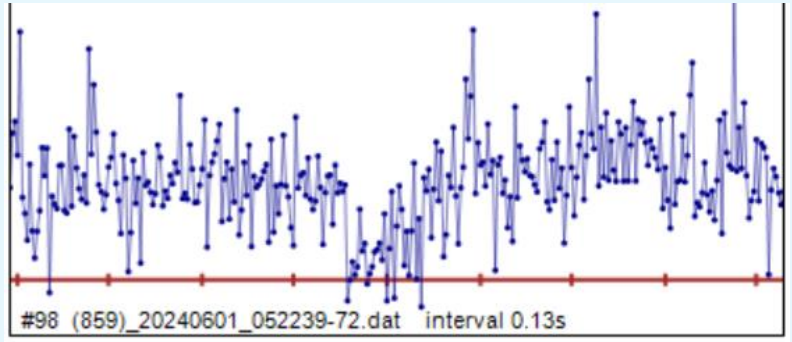
(612533) 2002 XV93 {a TNO}
Diameter 363km, 13.5 mas
Total uncertainties:
RA ± 0.94 mas,
Dec ± 2.71 mas
Very useful!

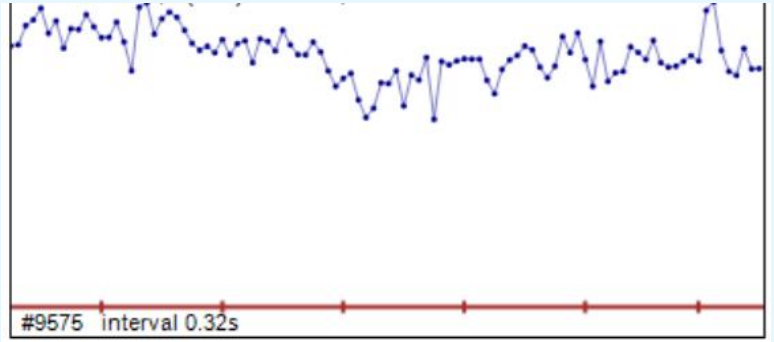


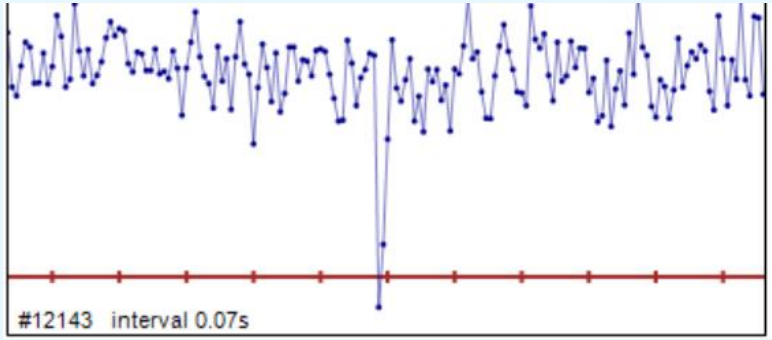


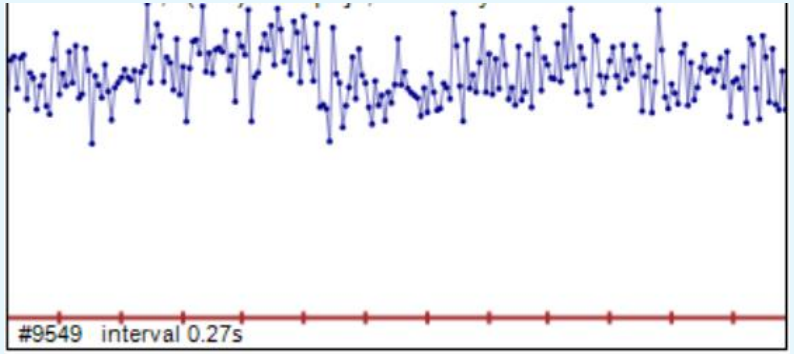
(50505) 2000 DP98
Diameter 5.6km, 3.4 mas
Total uncertainties:
RA ± 0.67 mas,
Dec ± 1.36 mas
Very useful!

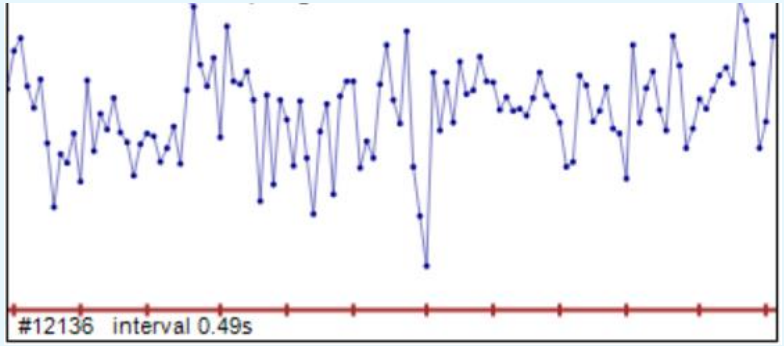
Light curve issues

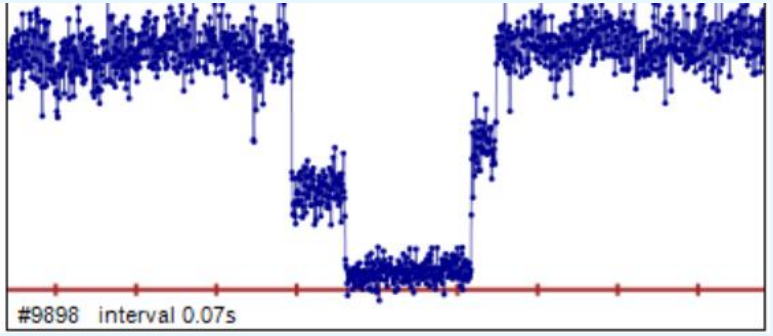


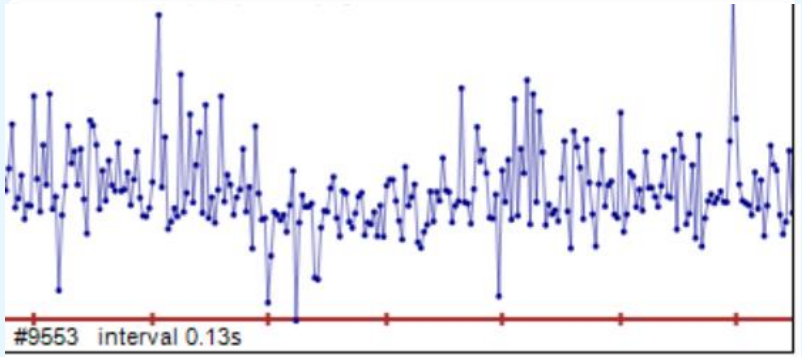


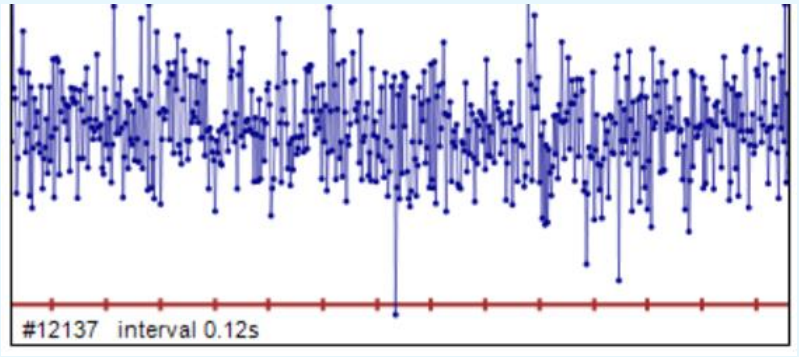


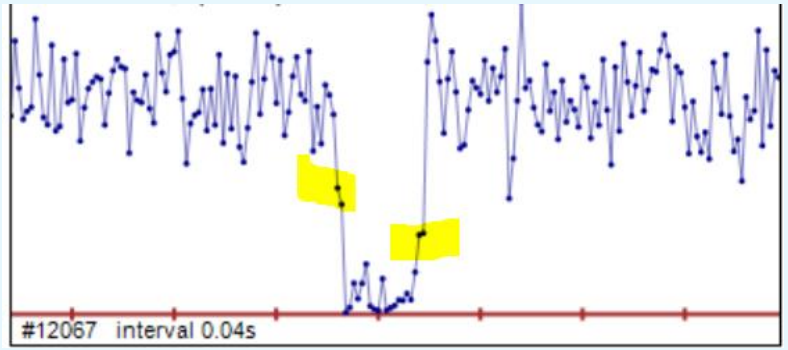












What to observe

- **Main belt asteroids with a large diameter**:
  - main value is multiple cords to measure the diameter, particularly in conjunction with shape models
  - Astrometric accuracy requires multiple, spaced chords covering both sides of the asteroid
  - Single chord observations have low value
- **Small asteroids** : <20km, and especially <10km
  - Difficult to get multiple chord observations
  - High astrometric accuracy from a single chord observation
  - *The smaller the asteroid, the greater the astrometric precision!*

Questions?