

Astro 25: “Field Astronomy in the California Mountains” – Spring ‘20

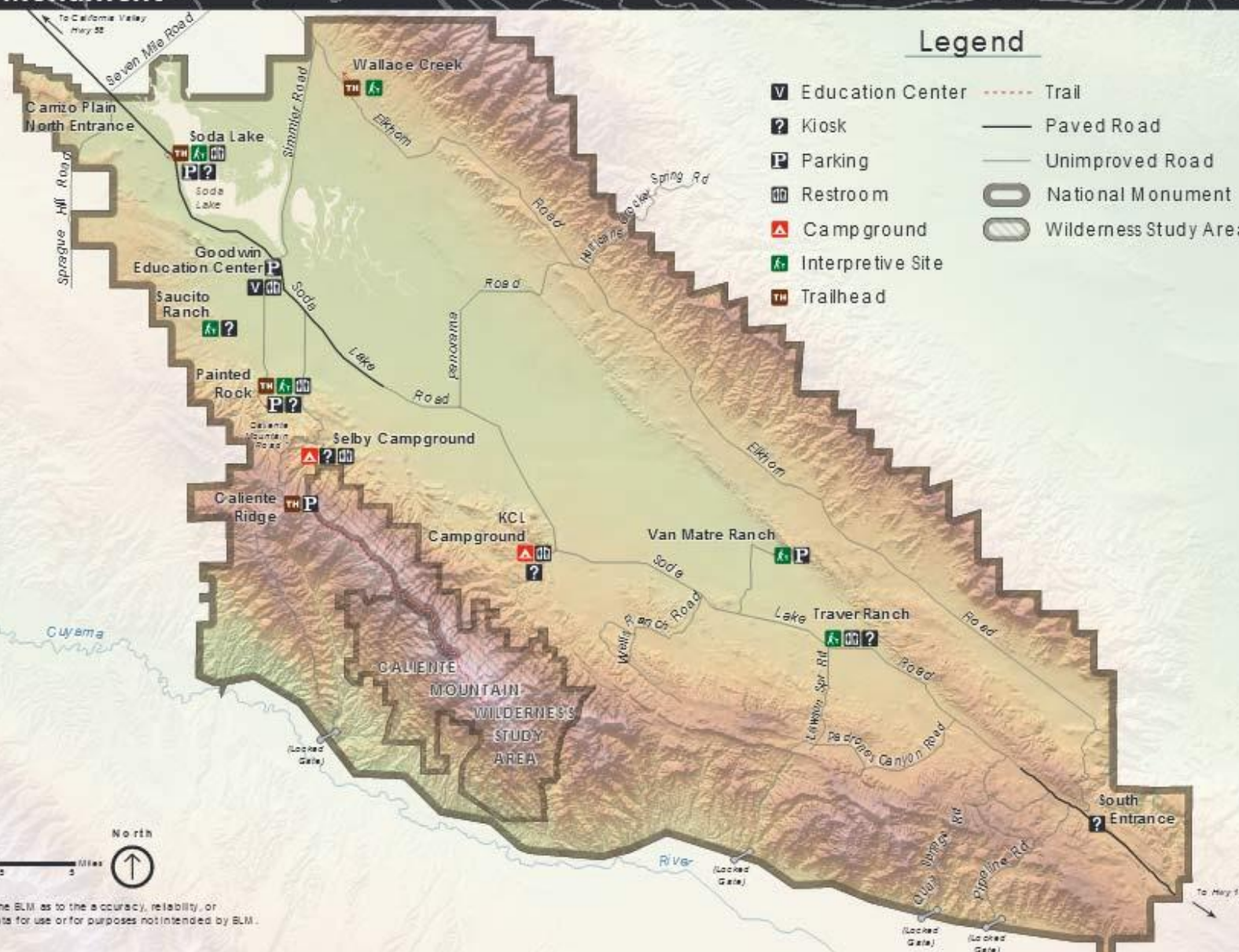


This is one of my Favorite places in all of California





Carrizo Plain National Monument



Legend

- Education Center
- Kiosk
- Parking
- Restroom
- Campground
- Interpretive Site
- Trailhead
- Trail
- Paved Road
- Unimproved Road
- National Monument
- Wilderness Study Area



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To Hwy 100

Saturday Pre-Trip Meeting On Campus

- Explain on-line plan for the class
- Give PPT on Carrizo Plain and Asteroid Occultations
- Explain next weekend's modified plan – weather permitting.
- Take Questions
- Explain pro's con's of Astro 25 registration for Spring '20

A Unique Study Location

- It is the last and largest of the tracts of land preserving the native California Plains, such as once, 200 years ago, used to be the Central Valley.**
- It is also the best site in North America to see and study tectonic faults, such as we are finding now on not just Earth, but also Mercury and Jupiter's moon Europa, and which are critical to the carbon cycle creating a long term stable climate for planets**

The San Andreas Fault Makes a very obvious scar down the length of Carrizo Plain



- *“This remote monument, traversed by the **San Andreas Fault** which has carved valleys, created and moved mountains, and yet up close, is seen in subtle alignment of ridges, ravines and normally dry ponds. Prominent features on the monument include the white alkali flats of Soda Lake, Painted Rock, vast open grasslands, and a broad plain rimmed by mountains. When conditions are right, numerous wildflowers can carpet the valley floor; although short lived it can be breathtaking.*
- ***Soda Lake**, normally a dry lake bed, is one of the dominant geographic features of the Carrizo Plain. It is the largest remaining natural alkali wetland in southern California and the only closed basin within the coastal mountains. As its name suggests, Soda Lake concentrates salts as water evaporates, leaving white deposits of sulfates and carbonates that look like baking soda.”*

We're a few miles off the paved road, at 3,000 ft elevation



Caliente Ridge Rd

Selby Rocks

Gate

←Selby Ranch

←Our camp

Selby Ranch

© 2016 Google

Google

Our camp is 1.14 miles up from the gate at Selby Ranch

r Guide

1994

Imagery Date: 10/1/2016 35°07'59.89" N 119°50'39.31" W elev 2521 ft ey

Selby Rocks, you'll see as you drive in approaching Selby Ranch and the gated road up the mountain



Here's where our Campsite would have Been!





Venus would
have been a
beautiful thin
crescent.... If we
could have
looked at it, that
is. Sigh....





Orion and Canis
Major setting
over the west in
Spring evenings,
and our camp
area lit by red
headlamps

Our campsite from the knoll above it



San Andreas fault scarp in the distance





**Here's a view Saturday morning from our planned
campsite, with Soda Lake in the distance. A
panoramic view of the sky and surrounding plains**





Breakfast: My famous French Crepes batter, given an extra bit of attention for the photo by one of my Astro 28K students

Focus! Concentration is required for good crepes!





Becky enjoying her
crepe, sweetened
with lemon curd!

After breakfast, we would have caravanned down the ~7 miles to the Goodwin Visitor's Center



It's an EPIC wildflower place during rain years, and a month later the Monument will be packed with photographers. This photo taken April.



Saturday late morning micro-lectures in the wildflowers down on the Plain



We'll have to get out and look close at the road along Soda Lake, it can be too sloppy and might require a detour to get to Wallace Creek



We'll explore Soda Lake, its origin and parallels with dry lake beds on Mars and Titan (but Soda Lake might not be so dry!)



Tectonic movement creates offset and also “beheaded” streambeds along the San Andreas Fault. We’ll walk along those you see below, at Wallace Creek



My Astro 28K class standing on the San Andreas Fault trace near Wallace Creek



If we have time, we may drive south to search for evidence of a comet impact 13,000 yrs ago in this depositional location





Measuring the depth of a possible dark Comet Impact layer from 12,900 years ago.



**A beautiful gopher snake, pausing for
it's close up.**



Saturday late afternoon, back at camp



We'll all carve together, come dinner time Saturday!





We'd have stoked
up a campfire to
eat dinner around,
and listen to plans
for Saturday
night's special
events

“My God, It’s Full of Stars!”





**Occultations of
stars by the
moon are
valuable and
happen every
night.
Occultations by
asteroid rarer
and much more
valuable these
days**

That's me, getting the video gear going

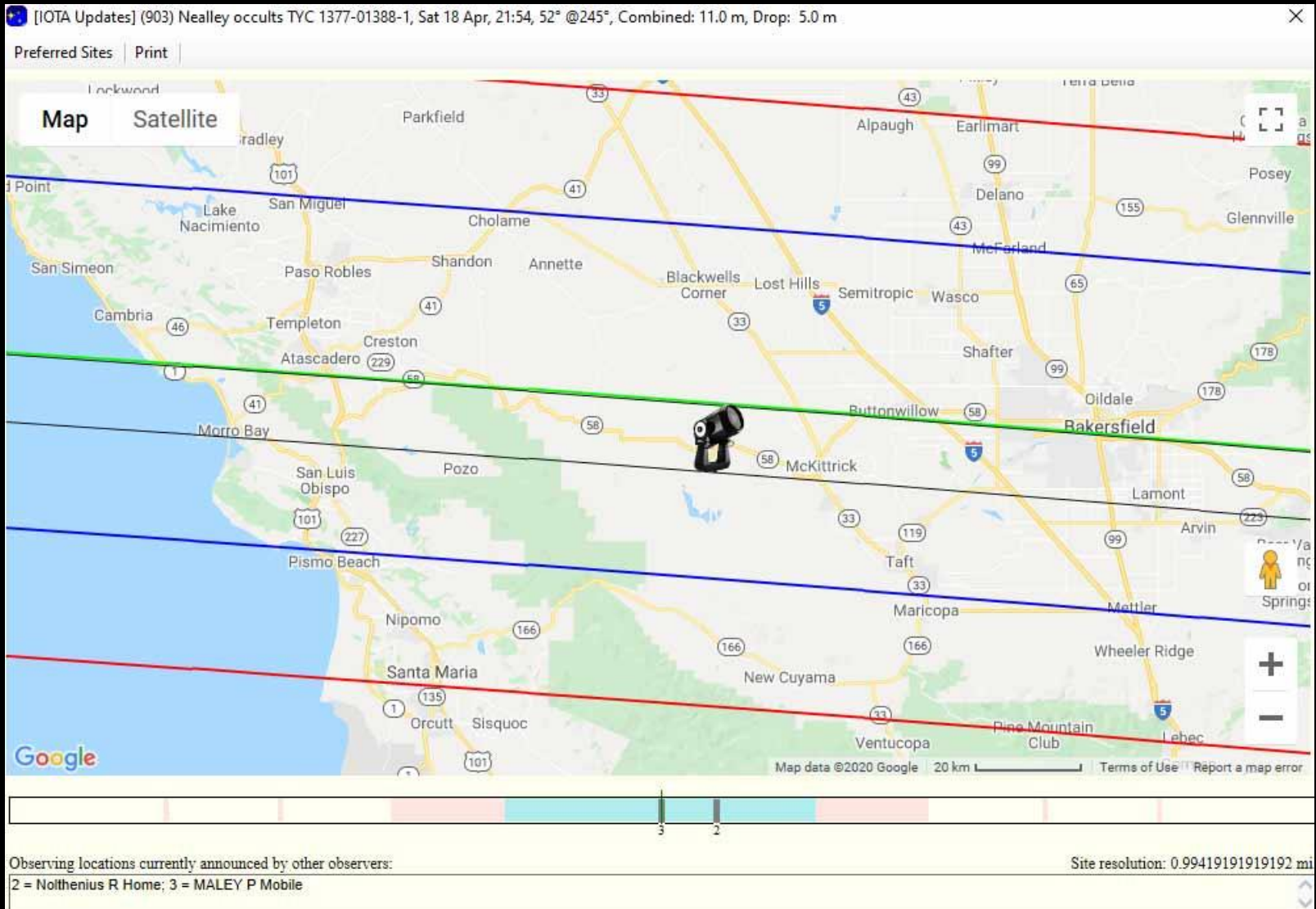


Happy students and the stars. That
(would have been) us!





Now – the Occultation by The Asteroid Nealley. What's the Story??



Global Path Map, and Data

903 Nealley occults TYC 1377-01388-1 on 2020 Apr 19 from 4h 44m to 4h 58m UT

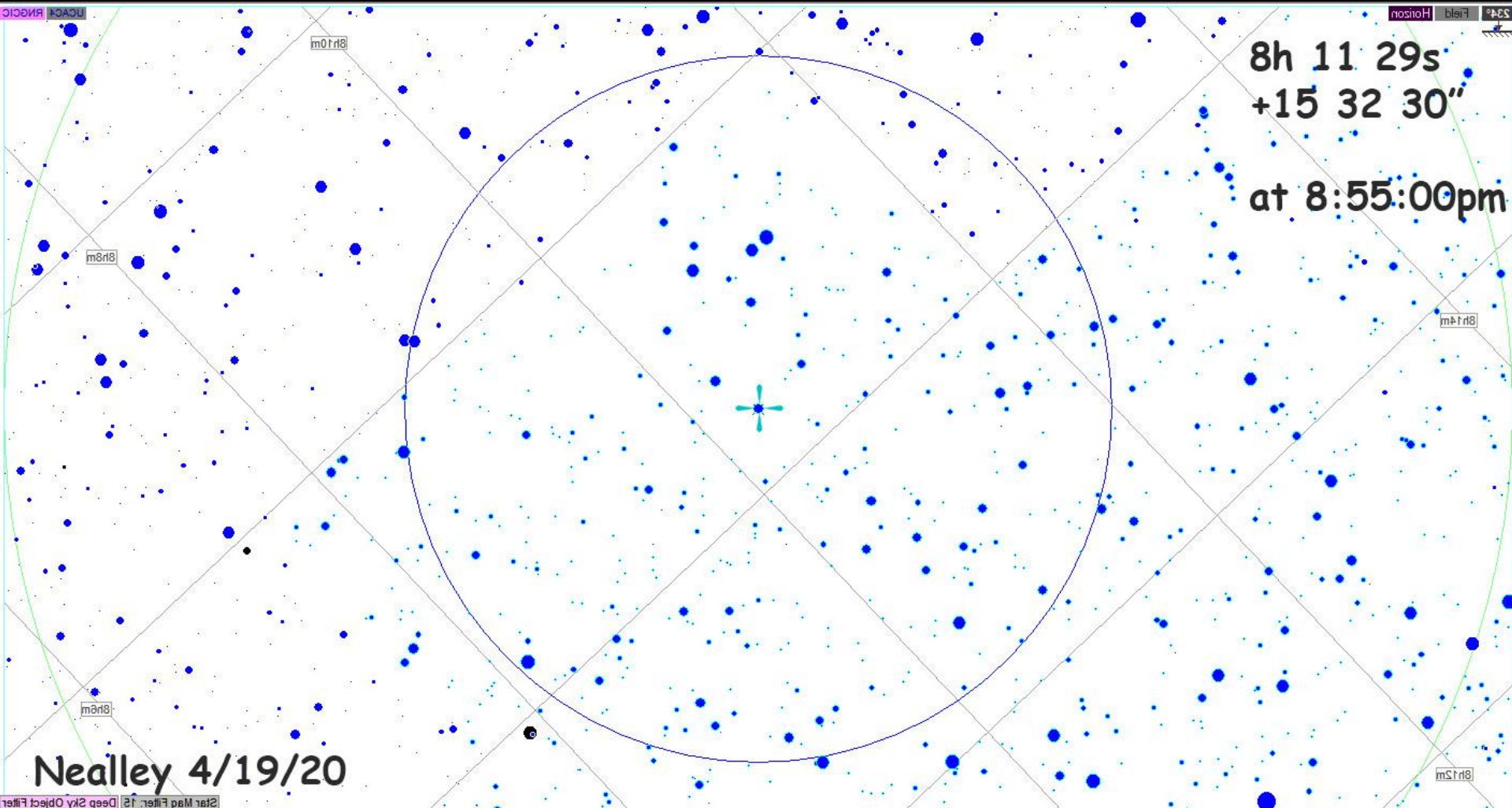
Star:
Mag V = 11.0
RA = 8 10 21.1089 (BCRS)
Dec = 15 36 7.982
[of Date: 8 11 29, 15 32 30]
Prediction of 2020 Mar 14.0

Max Duration = 4.2 secs
Mag Drop = 5.0 (0.0r)
Sun : Dist = 92°
Moon: Dist = 134°
: illum = 13 %
E 0.019"x 0.010" in PA 91

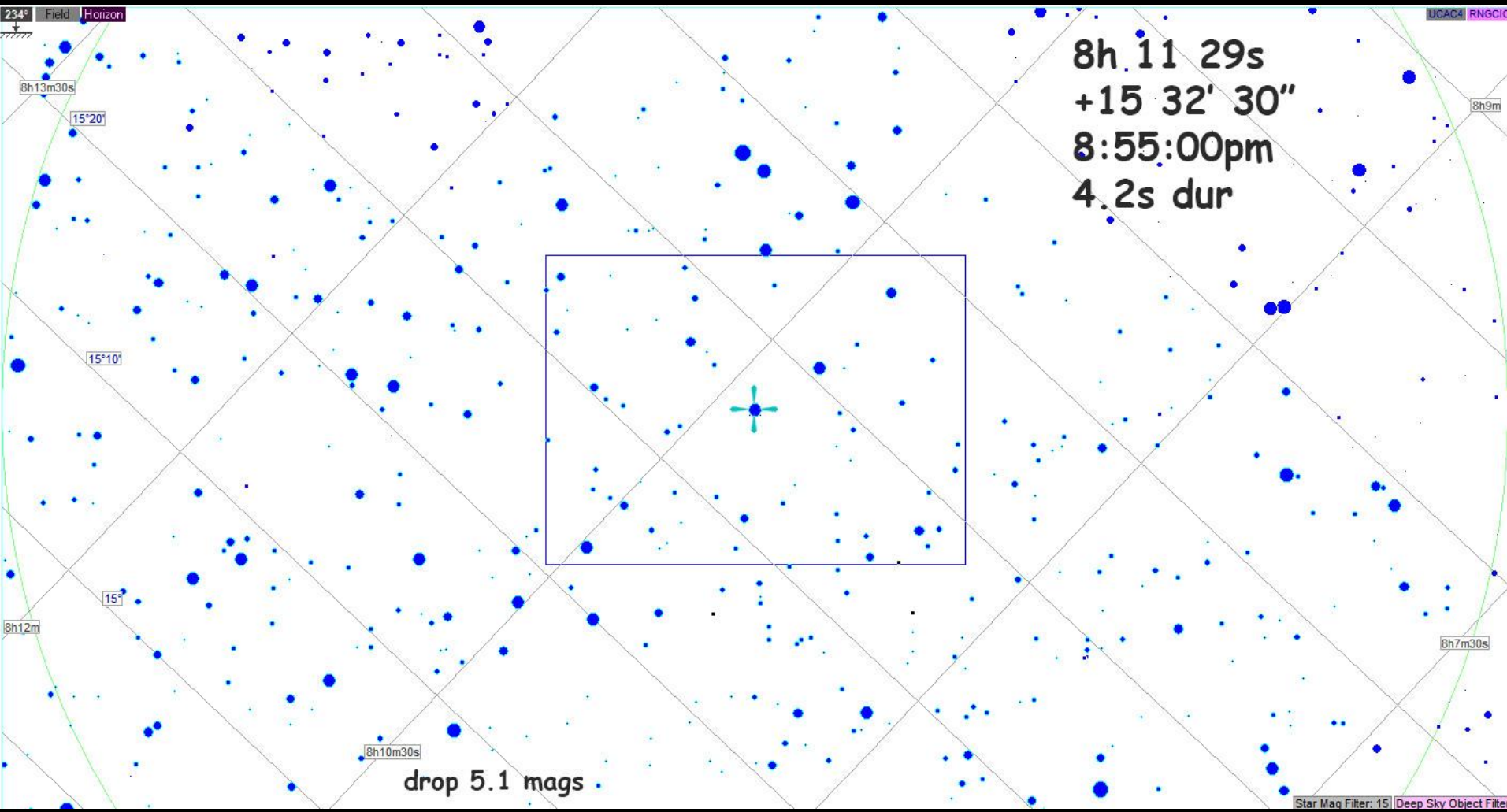
Asteroid:
Mag = 16.0
Dia = 63km, 0.028"
Parallax = 2.857"
Hourly dRA = 1.651s
dDec = 2.99"

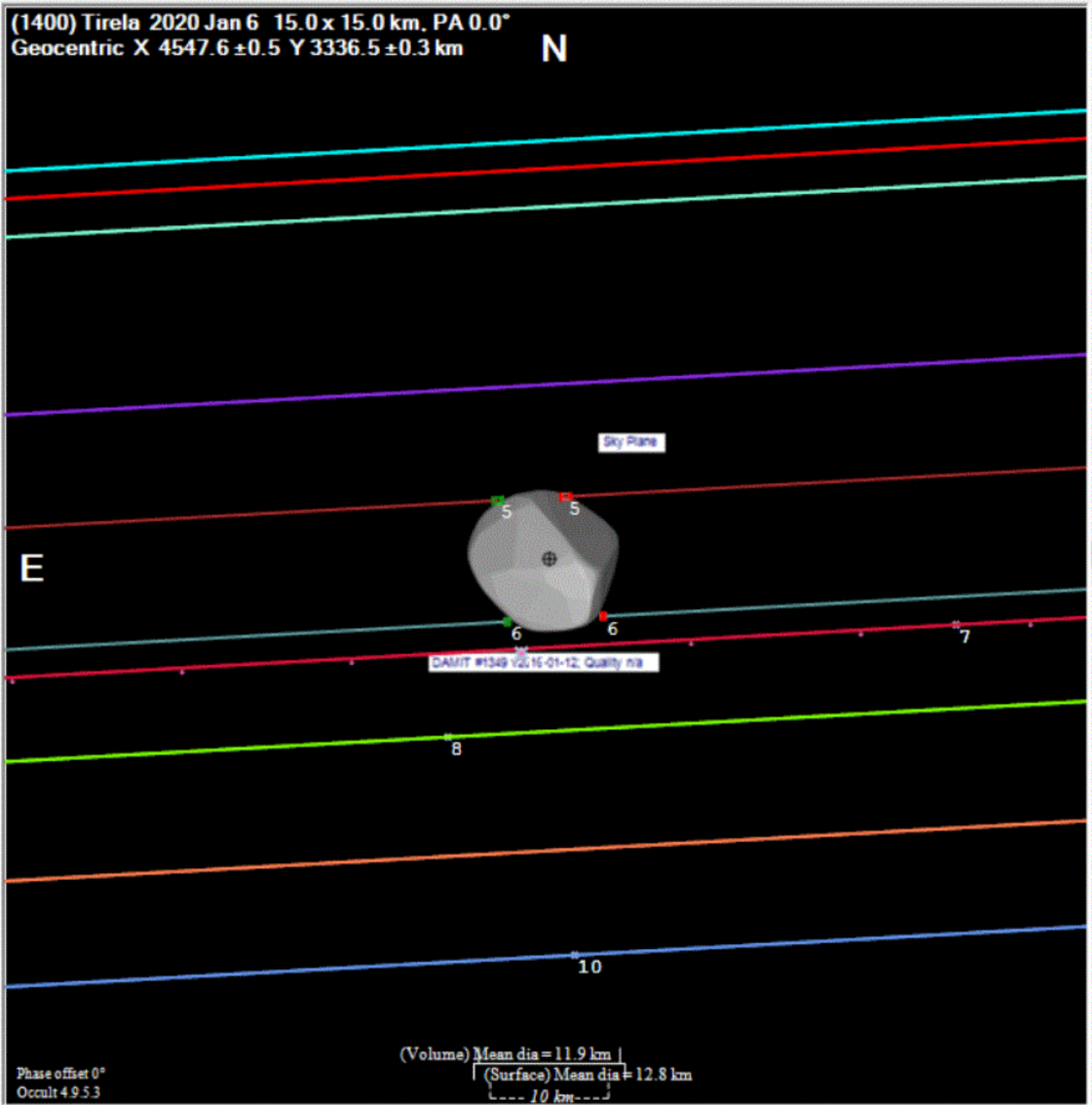


The Eyepiece View Through Our Celestron 8SE Telescopes Shortly Before the Occultation



The View on the LCD Screen of the ZR45mc Canon Camcorder





Find best fit

Center X: 0.0 0.0 Centered on Shape model
 Center Y: 0.0 -0.5

Major axis (km): 15.0 0.0 a/b=1.00
 Minor axis (km): 15.0 0.0 dMag=0.00
 Orientation: 0.0 0.0 Motion: 14.34km/s, X

Circular Use assumed diameter Include Miss events

Double star

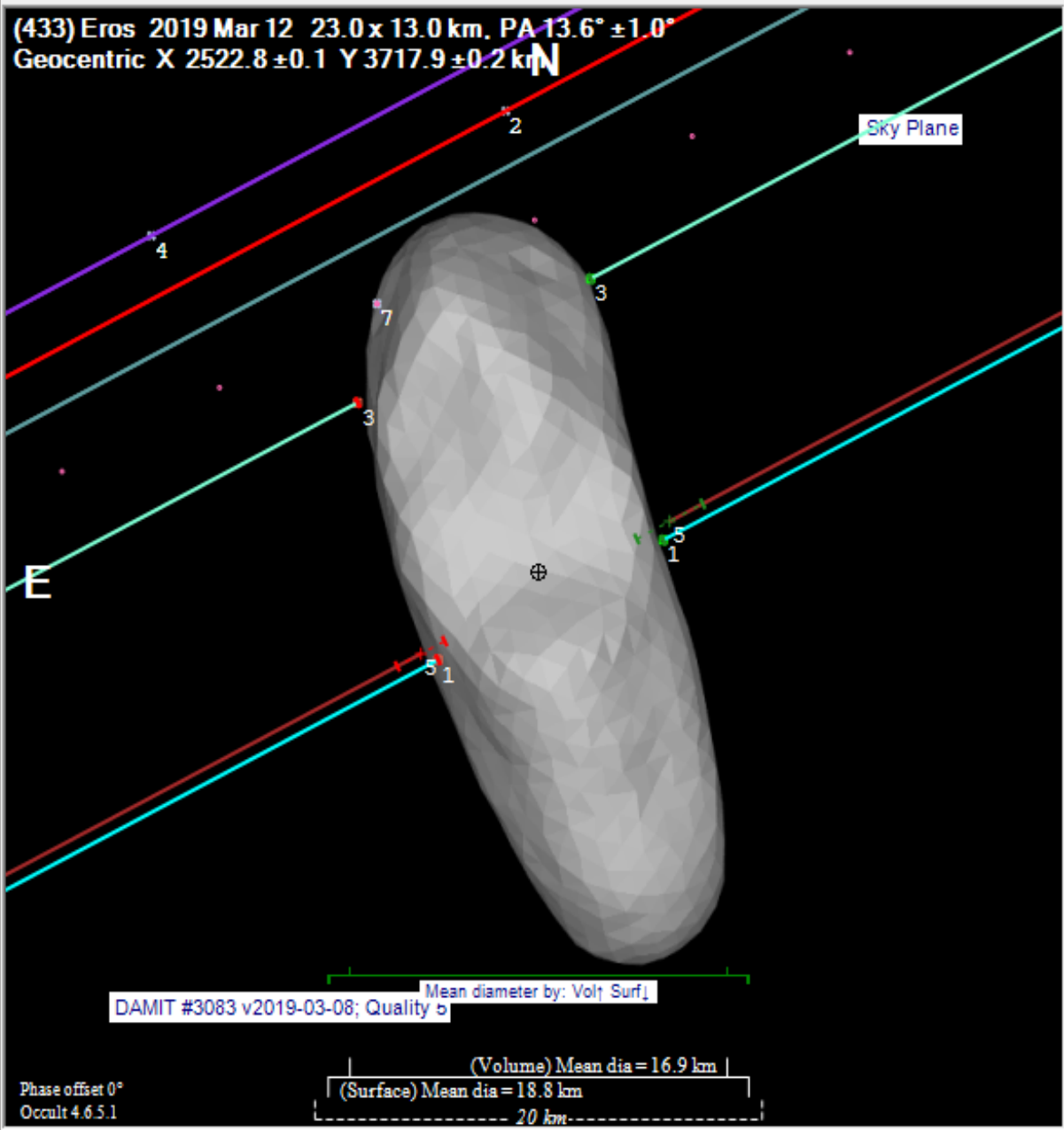
Seprn (masec): 0.0 0.0
 PA of 2nd: 0.0 0.0

0 Solution
 #1 #3
 #2 #4

Show: Both Primary Secondary

Plot scale **Quality of the fit**
 RMS fit: -1.3 ± 0.5 km Quality of the fit: No reliable position or size
 Opacity: [Slider]

| | | |
|--|--------|-------------|
| | 1 (M) | D Dunham |
| | 2 (M) | D Dunham |
| | 3 (M) | D Dunham |
| | 4 (M) | D Dunham |
| | 5 | D Dunham |
| | 6 | R Reaves |
| | 7 (M) | D Dunham |
| | 8 (M) | P Maley |
| | 9 (M) | C McPartlin |
| | 10 (M) | G Lyzenga |
| | 11 (P) | |



Find best fit

Center X -0.1 0.0 Centered on Shape model

Center Y 0.1 0.0

Major axis (km) 23.0 0.0 a/b=1.77

Minor axis (km) 13.0 0.0 dMag=-0.62

Orientation 13.6 0.0 Motion 7.04km/s, X

Circular Use assumed diameter Include Miss events

Double star

Seprn (masec) 0.0 0.0

PA of 2nd 0.0 0.0

Show: Both Primary Secondary

0 Solution

#1 #2 #3 #4

Plot scale

Quality of the fit

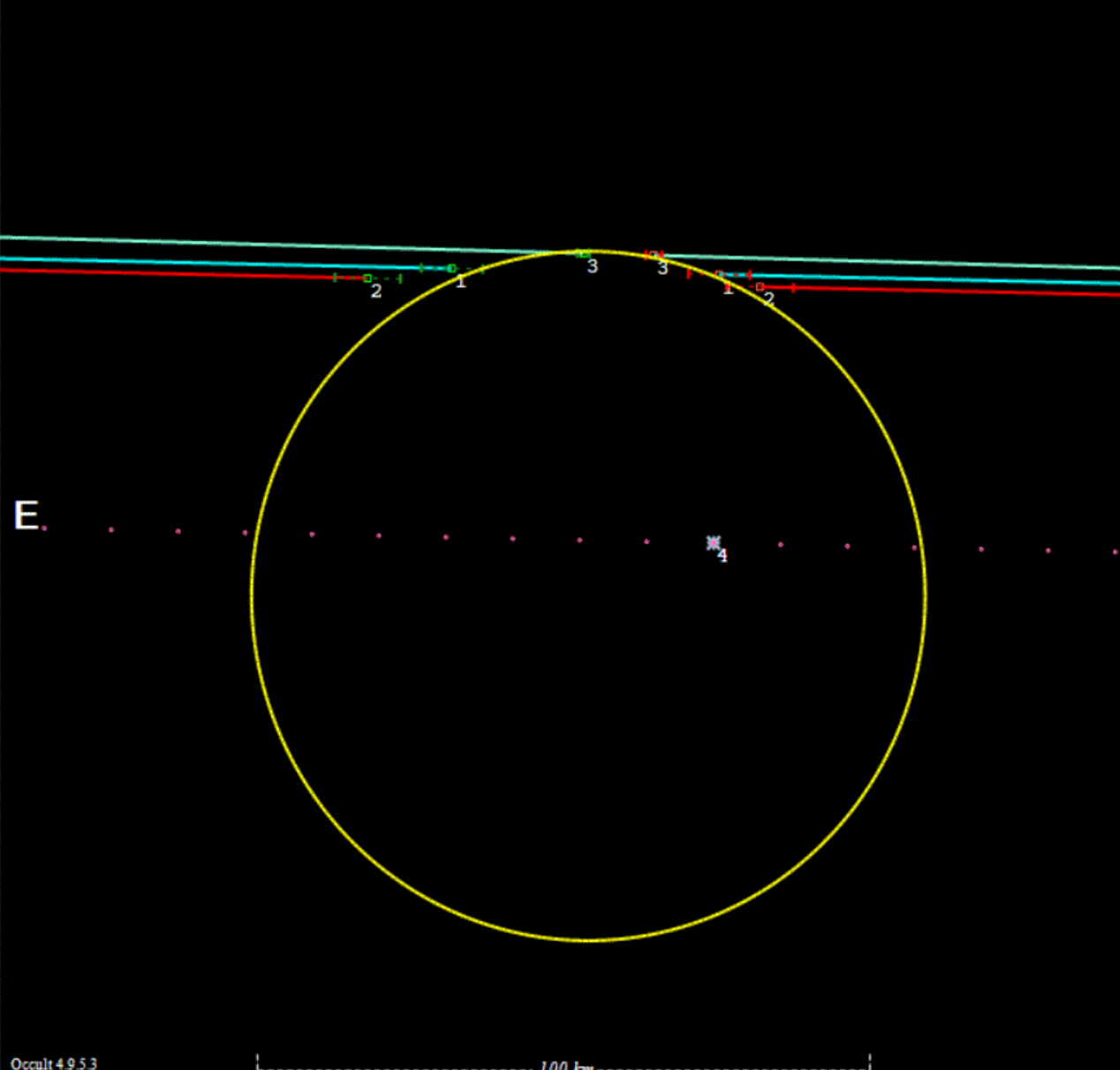
No reliable position or size

RMS fit 0.2 ± 0.2 km

Opacity

| | | |
|--|-------|--------------|
| | 1 | K Bender |
| | 2 (M) | T Case |
| | 3 | R Howard |
| | 4 (M) | W Morgan |
| | 5 | R Nolthenius |
| | 6 (M) | L Steger |
| | 7 (P) | Prediction |

(230) Athamantis 2020 Jan 12 110.0 x 110.0 km, PA 0.0°
Geocentric X -2049.9 ± 2.5 Y 3668.2 ± 1.1 km N



Find best fit

Center X 4.0 -4.3 Centered on Shape model

Center Y -52.0 2.1

Major axis (km) 110.0 0.0 a/b=1.00

Minor axis (km) 110.0 0.0 dMag=0.00

Orientation 0.0 0.0 Motion 10.95km/s, X

Circular Use assumed diameter Include Miss events

Double star

Seprn (masec) 0.0 0.0

PA of 2nd 0.0 0.0

0 solutions

#1 #3

#2 #4

Show: Both Primary Secondary

Plot scale

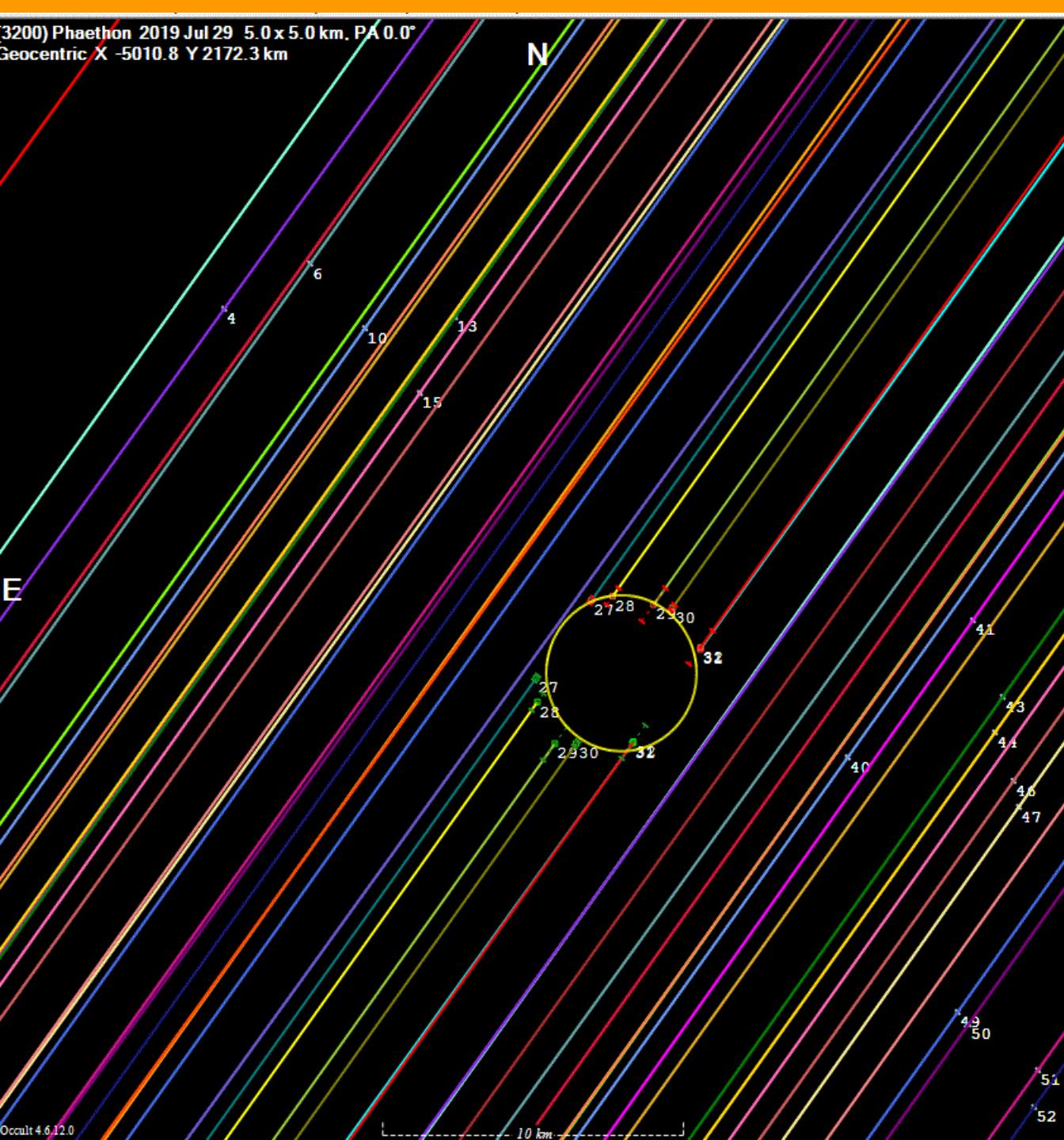
RMS fit 1.9 ± 2.5 km

Quality of the fit

Opacity

| | | |
|---------------------------------------|-------|--------------|
| — | 1 | K Bender |
| — | 2 | R Nolthenius |
| — | 3 | J Marco |
| — | 4 (P) | |

3200 Phaethon 2019 Jul 29 5.0 x 5.0 km, PA 0.0°
 Geocentric X -5010.8 Y 2172.3 km



Find best fit

Center X: 0.1 0.0 Centered on Shape model

Center Y: -0.1 0.0

Major axis (km): 5.0 0.0 a/b=1.00

Minor axis (km): 5.0 0.0 dMag=0.00

Orientation: 0.0 0.0 Motion: 8.90km/s, Y

Circular Use assumed diameter Include Miss events

Double star

Seprn (masec): 0.0 0.0

PA of 2nd: 0.0 0.0

Show: Both Primary Secondary

0 solutions

#1 #3

#2 #4

Plot scale

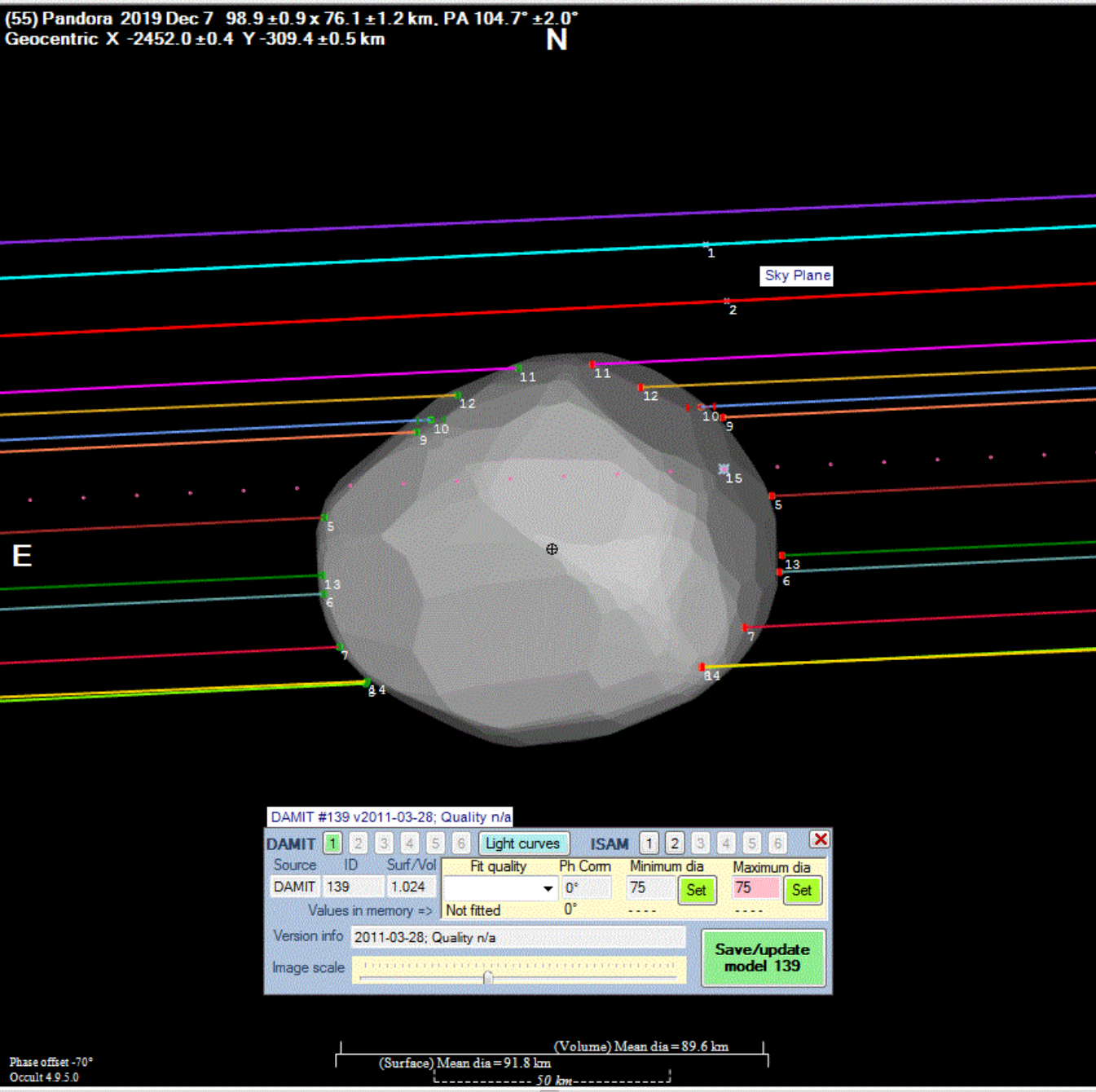
Quality of the fit: **No reliable position or size**

RMS fit 0.2 ±0.3 km

Opacity

| | | |
|--|--------|---------------------|
| | 1 (M) | R Royer |
| | 2 (M) | W Merline |
| | 3 (M) | K Caceres |
| | 4 (M) | J Kok |
| | 5 (M) | S Degenhardt |
| | 6 (M) | R Howard |
| | 7 (M) | S Degenhardt |
| | 8 (M) | S Degenhardt |
| | 9 (M) | S Degenhardt |
| | 10 (M) | R Howard |
| | 11 (M) | S Degenhardt |
| | 12 (M) | J Briggs |
| | 13 (M) | E Wilson |
| | 14 (M) | B Whitehurst & J M |
| | 15 (M) | R Howard |
| | 16 (M) | B Whitehurst & J M |
| | 17 (M) | M Buie |
| | 18 (M) | B Whitehurst & J M |
| | 19 (M) | W Thomas |
| | 20 (M) | J Keller |
| | 21 (M) | B Whitehurst & J M |
| | 22 (M) | B Whitehurst & J M |
| | 23 (M) | J Bardecker |
| | 24 (M) | B Keeney |
| | 25 (M) | B Whitehurst & J M |
| | 26 (M) | R Leiva |
| | 27 | B Whitehurst & J M |
| | 28 | S Degenhardt |
| | 29 | Q Ye, Q Zhang et al |
| | 30 | R Nolthenius |
| | 31 | A Parker & L Shera |
| | 32 | S Degenhardt |
| | 33 (M) | K Getrost |
| | 34 (M) | A Vebiscer & J Jew |
| | 35 (M) | B Whitehurst & J M |
| | 36 (M) | D Terrell & J Salm |
| | 37 (M) | K Bender |
| | 38 (M) | F Marchis |

(55) Pandora 2019 Dec 7 98.9 ± 0.9 x 76.1 ± 1.2 km, PA 104.7° ± 2.0°
Geocentric X -2452.0 ± 0.4 Y -309.4 ± 0.5 km



Find best fit

Center X: -0.5 (checked) 0.0 Centered on Shape model
 Center Y: -6.2 (checked) 0.0

Major axis (km): 98.9 (checked) 0.0 a/b=1.30
 Minor axis (km): 76.1 (checked) 0.0 dMag=0.28
 Orientation: 104.7 (checked) 0.0 Motion: 11.31km/s, X

Circular Use assumed diameter Include Miss events

Double star
 Sepn (masec): 0.0 (checked) 0.0
 PA of 2nd: 0.0 (checked) 0.0

Show: Both Primary Secondary

Plot scale: RMS fit 0.0 ± 1.2 km
 Quality of the fit: Astrometry only. No reliable size
 Opacity: [slider]

| | |
|--------|---------------------|
| 1 (M) | D Dunham |
| 2 (M) | D Dunham |
| 3 (M) | P Stuart |
| 4 (M) | R Venable |
| 5 | D Dunham |
| 6 | D Dunham |
| 7 | D Dunham |
| 8 | D Dunham |
| 9 | R Frankenberger |
| 10 | R Nugent |
| 11 | B Tobias & D Dunham |
| 12 | R Venable |
| 13 | R Venable |
| 14 | R Venable |
| 15 (P) | Predicted |

DAMIT #139 v2011-03-28; Quality n/a

DAMIT [1] [2] [3] [4] [5] [6] Light curves ISAM [1] [2] [3] [4] [5] [6] [X]

| Source | ID | Surf./Vol | Fit quality | Ph Corn | Minimum dia | Maximum dia |
|---------------------|-----|-----------|-------------|---------|-------------|-------------|
| DAMIT | 139 | 1.024 | [dropdown] | 0° | 75 [Set] | 75 [Set] |
| Values in memory => | | | Not fitted | 0° | ---- | ---- |

Version info: 2011-03-28; Quality n/a

Image scale: [slider]

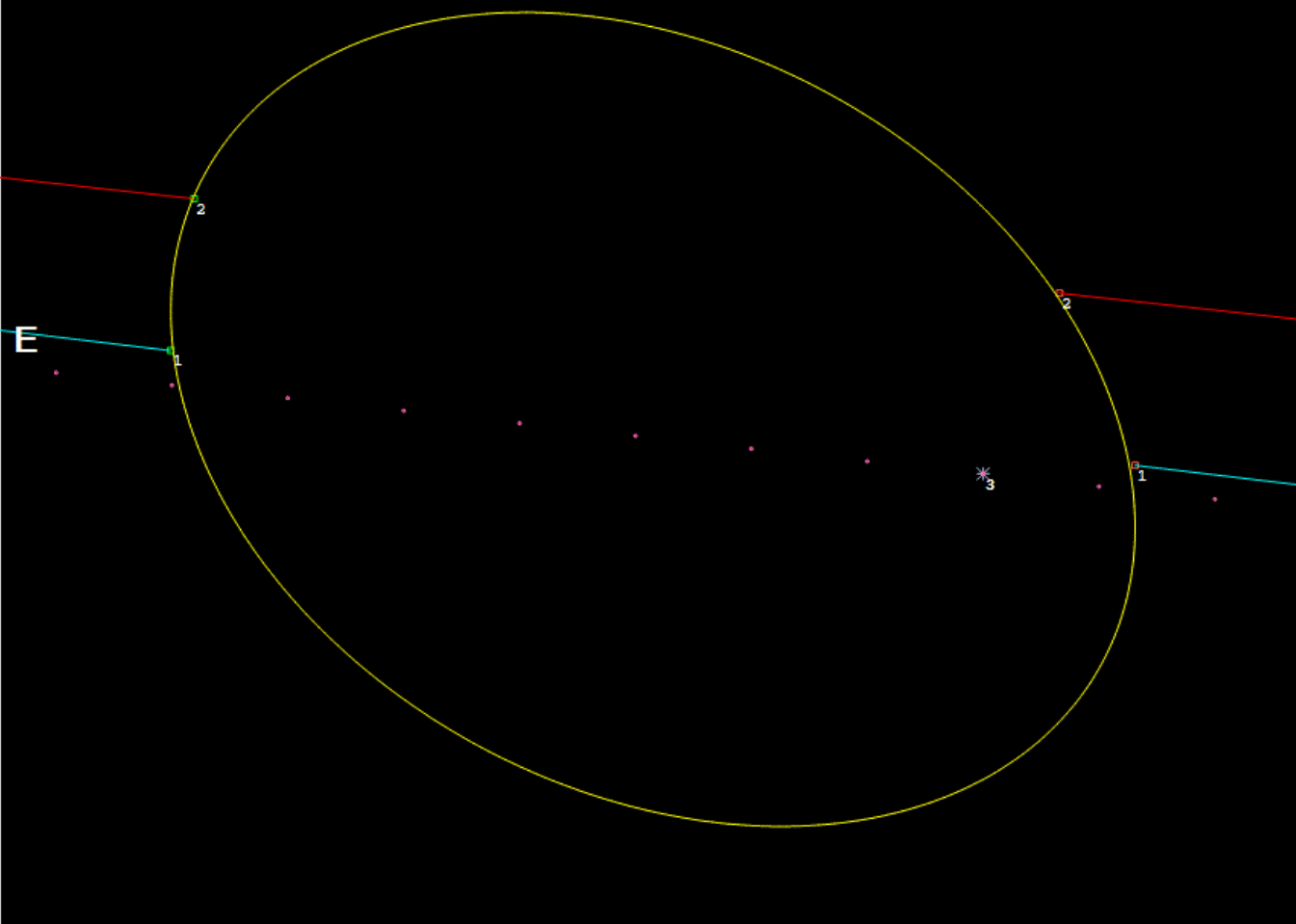
Save/update model 139

Phase offset -70°
 Occult 4.9.5.0

(Surface) Mean dia = 91.8 km
 (Volume) Mean dia = 89.6 km
 50 km [scale bar]

(389) Industria 2019 Dec 23 76.0 x 104.0 km, PA 330.0°
Geocentric X 15.2 ± 0.2 Y 1835.2 ± 0.5 km

N



Find best fit

Center X 0.0 0.3 Centered on Shape model

Center Y -9.0 0.4

Major axis (km) 76.0 0.0 a/b=0.73

Minor axis (km) 104.0 0.0 dMag=0.34

Orientation 330.0 0.0 Motion 11.74km/s, X

Circular Use assumed diameter Include Miss events

Double star

Sepn (masec) 0.0 0.0

PA of 2nd 0.0 0.0

0 solutions

#1 #3

#2 #4

Show: Both Primary Secondary

Plot scale

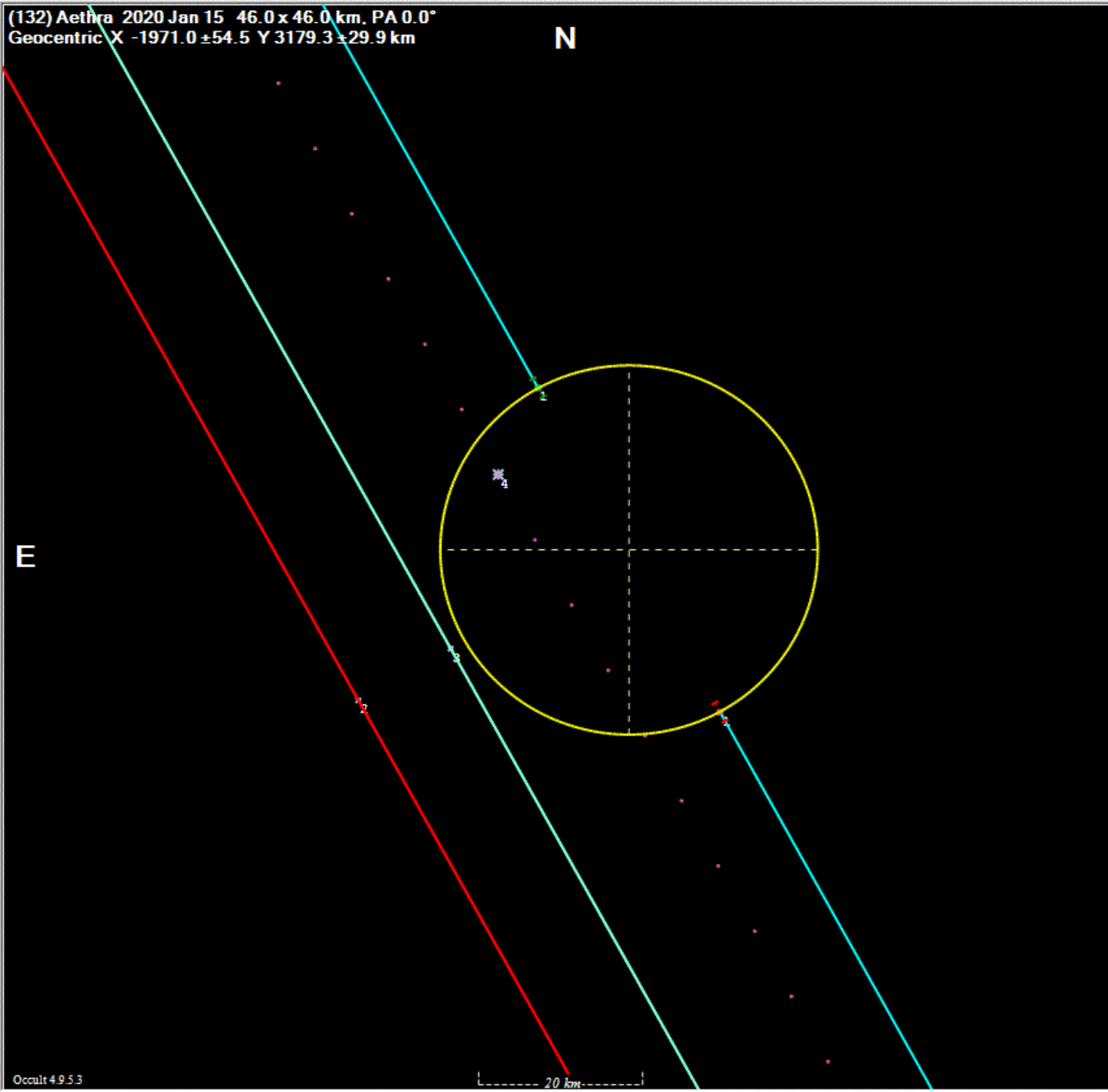
Quality of the fit **No reliable position or size**

RMS fit 0.2 ± 0.3 km

Opacity

| | | |
|--------------------------------------|-------|--------------|
| — | 1 | R Bria |
| — | 2 | R Nolthenius |
| — | 3 (P) | |

(132) Aethra 2020 Jan 15 46.0 x 46.0 km, PA 0.0°
Geocentric X -1971.0 ± 54.5 Y 3179.3 ± 29.9 km



Find best fit

Center X 0.0 22.3 Centered on Shape model

Center Y 0.0 12.1

Major axis (km) 46.0 0.0 a/b=1.00

Minor axis (km) 46.0 0.0 dMag=0.00

Orientation 0.0 0.0 Motion 8.13km/s, Y

Circular Use assumed diameter Include Miss events

Double star

Seprn (masec) 0.0 0.0

PA of 2nd 0.0 0.0

Show: Both Primary Secondary

0 Solution

#1 #3

#2 #4

Plot scale

Quality of the fit: No reliable position or size

RMS fit 0.0 ± 0.1 km

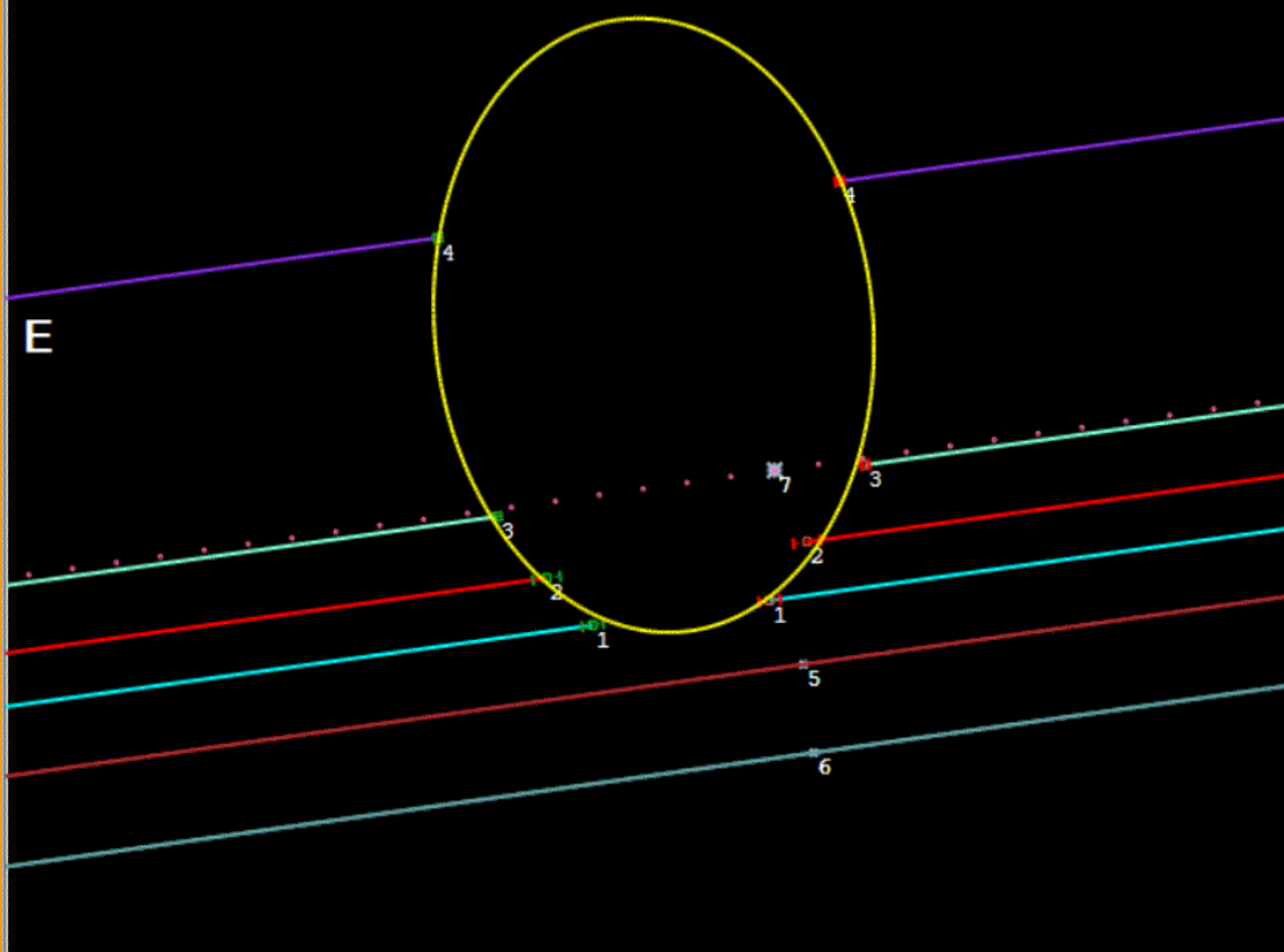
Opacity

- 1 T Swift
- 2 (M) K Bender
- 3 (M) R Nolthenius
- 4 (P) Predicted

(153) Hilda 2020 Jan 25 $214.9 \pm 11.3 \times 158.5 \pm 3.5$ km, PA $6.3^\circ \pm 2.5^\circ$
 Geocentric X 1285.7 ± 1.4 Y 2182.2 ± 4.3 km

N

E



Find best fit

Center X 0.8 0.0 Centered on Shape model

Center Y 27.2 0.0

Major axis (km) 214.9 0.0 a/b=1.36

Minor axis (km) 158.5 0.0 dMag=-0.33

Orientation 6.3 0.0 Motion 15.87km/s, X

Circular Use assumed diameter Include Miss events

Double star

Sepn (masec) 0.0 0.0

PA of 2nd 0.0 0.0

Show: Both Primary Secondary

0 Solution

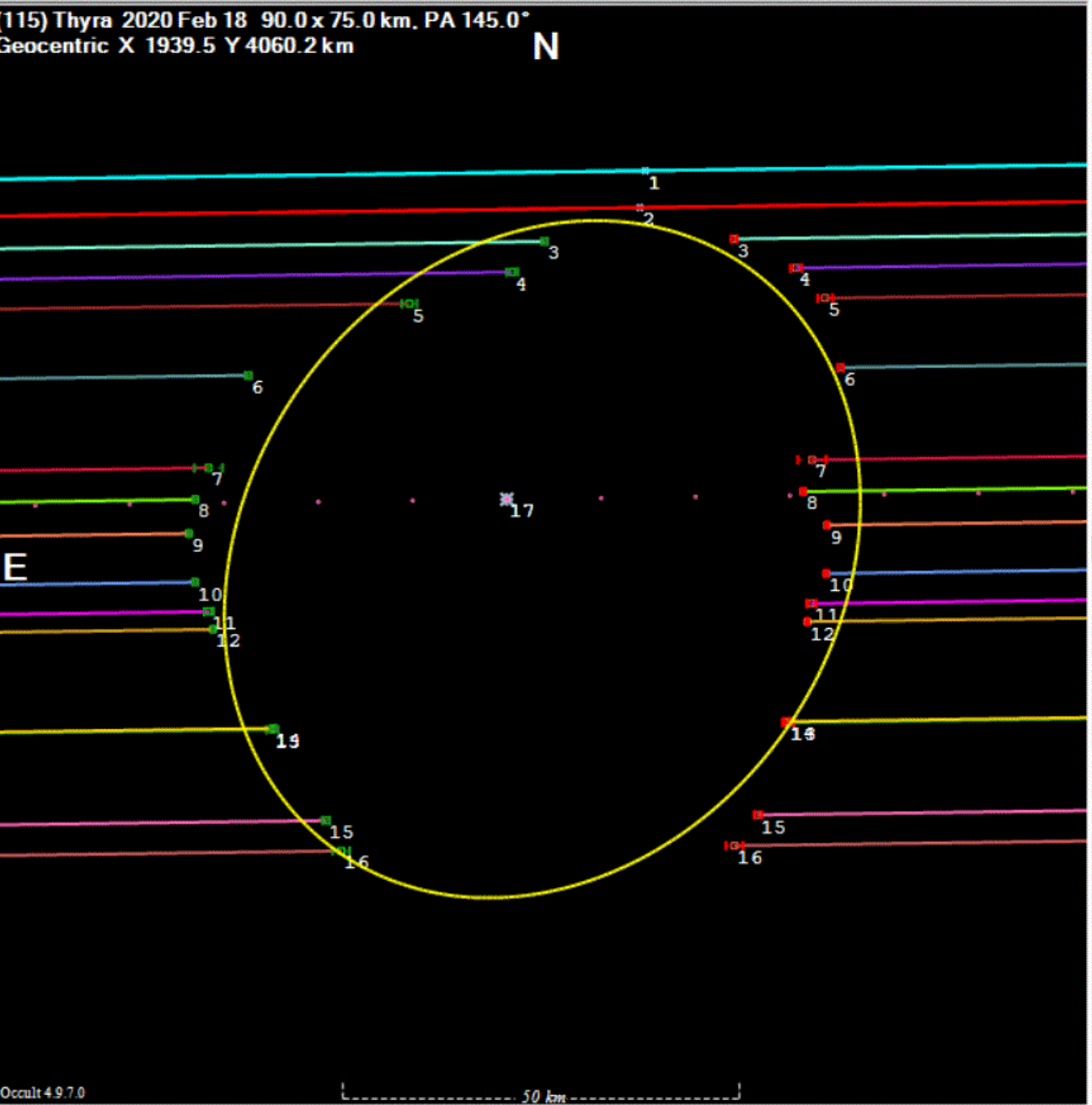
#1 #3

#2 #4

Plot scale Quality of the fit **No reliable position or size**

RMS fit 0.0 ± 2.5 km Opacity

| | | |
|---------------------------------------|-------|-------------|
| — | 1 | J Barton |
| — | 2 | D Einfeldt |
| — | 3 | P Maley |
| — | 4 | W Thomas |
| — | 5 (M) | T George |
| — | 6 (M) | C McPartlin |
| — | 7 (P) | Predicted |



Find best fit

Center X 3.5 0.0 Centered on Shape model

Center Y -1.8 0.0

Major axis (km) 90.0 0.0 a/b=1.20

Minor axis (km) 75.0 0.0 dMag=-0.20

Orientation 145.0 0.0 Motion 11.90km/s, X

Circular Use assumed diameter Include Miss events

Double star

Septn (masec) 0.0 0.0

PA of 2nd 0.0 0.0

0 Solution

#1 #3

#2 #4

Show: Both Primary Secondary

Plot scale Quality of the fit

RMS fit 0.1 ±4.0 km **No reliable position or size**

Opacity

| | | |
|--|--------|----------------------|
| | 1 (M) | D Dunham & Station_7 |
| | 2 (M) | D Dunham & Station_6 |
| | 3 | D Dunham & Station_5 |
| | 4 | S Messner |
| | 5 | D Dunham & Station_4 |
| | 6 | D Dunham & Station_3 |
| | 7 | D Dunham & Station_1 |
| | 8 | P Maley |
| | 9 | T George |
| | 10 | J Moore |
| | 11 | D Kenyon |
| | 12 | N Carlson |
| | 13 | S Insana |
| | 14 | T Blank |
| | 15 | W Thomas |
| | 16 | T Blank |
| | 17 (P) | Predicted |

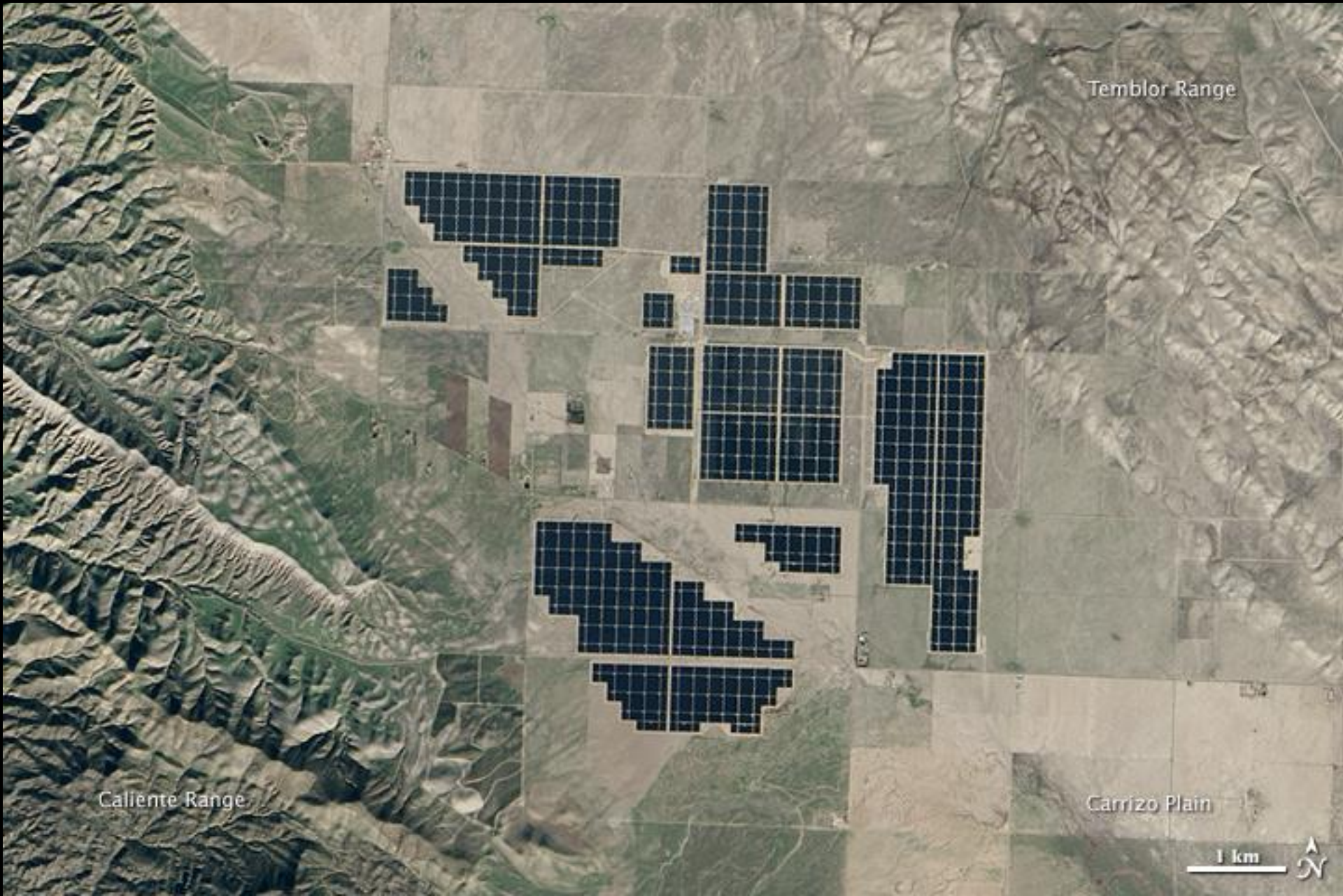
A cosmology lecture after the occultation excitement is over. Here, I'm trying to explain how BIG the universe is, and failing.



Sunrise Sunday from camp, looking southeast



Topaz Solar Powerplant



Temblor Range

Caliente Range

Carrizo Plain

