

High Precision Astrometry of Occulting Asteroids

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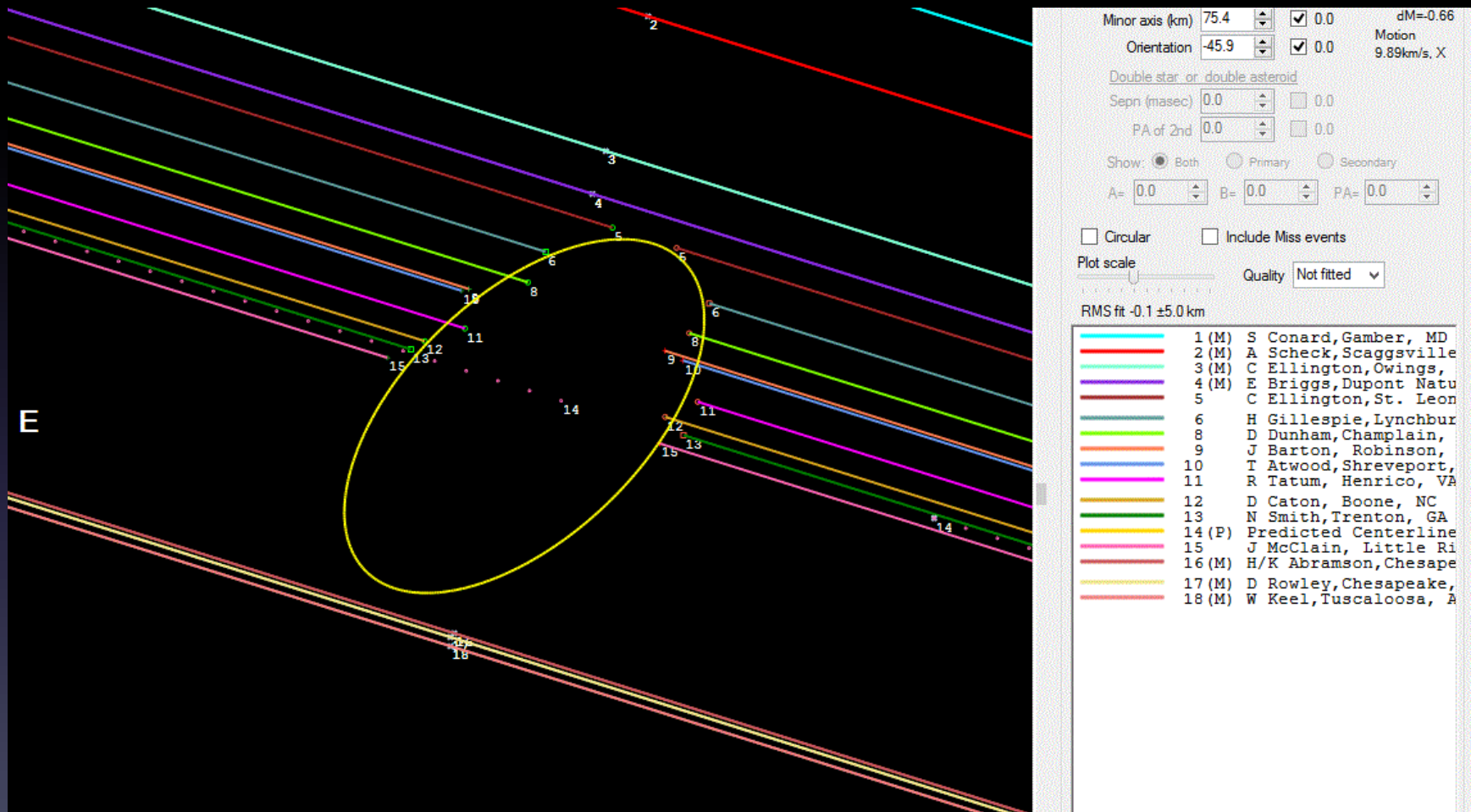
Partner: Mark Shiffer

Occulting asteroids

- These are asteroids that in the near future will block a star as seen from earth. Our goal is to observe these asteroids in order to update their positions. This will allow people all over the world to point their telescopes to the right place and time and observe these events.



Occultation by Hohensteina



Astrometry of Occulting Asteroids

- It is the precise measuring of the position of occulting asteroids in the sky.
- We try to measure the exact right ascension and declination of these asteroids more precisely.
- Picture: Eros; courtesy of NASA's NEAR Mission



Updating their positions

- We Update the positions of these asteroids by taking exposures of them with nearby reference stars. The reference stars, which are cataloged, can be used to calculate position of the asteroids in the sky

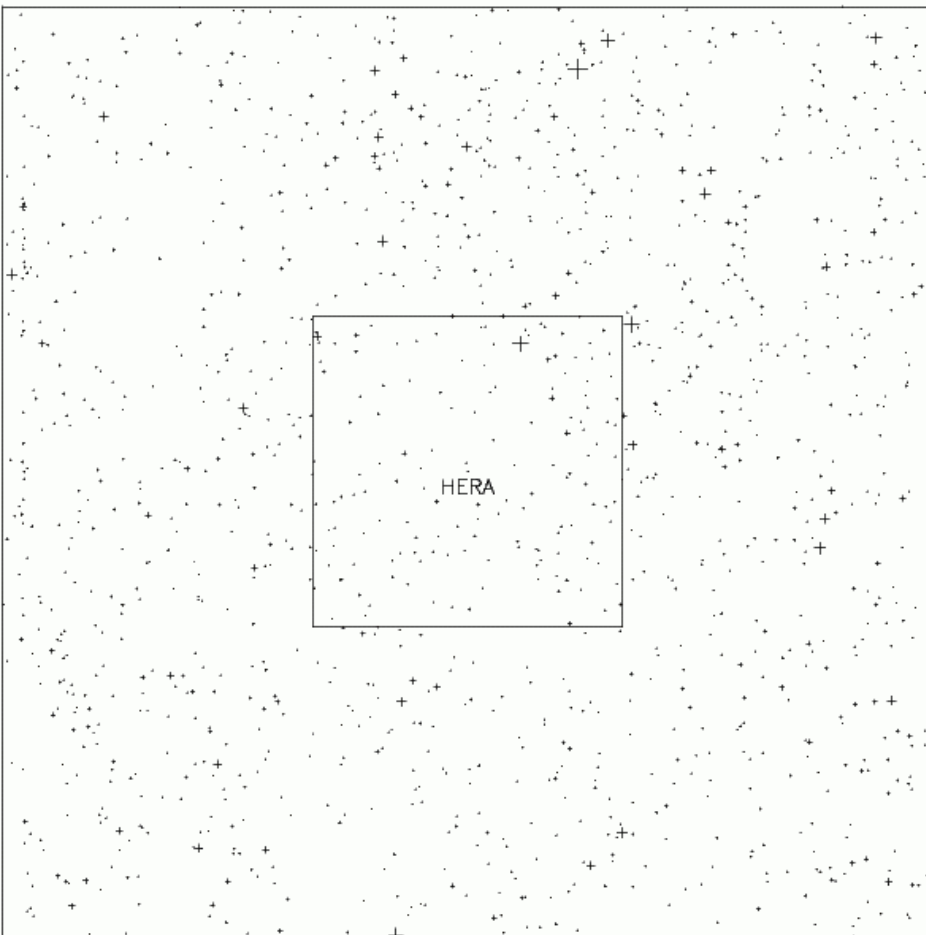
Planning

- We can only choose certain asteroids to observe . We use software to create prediction plots of where these asteroids would be on the night of observation. From the predictions we only chose asteroids that fit certain criteria.
- The asteroids could not be too far south (Declination of -30 or greater),
- They need to have catalogued stars nearby
- Could not be too close to the sun, a BT of 90 or greater.
- Could be not to close to the moon in the sky

More is always better!!!

After we choose the plots that fit our criteria, we have to decide what pictures we want to take.

In order to get as many stars in our exposures we off set the pictures by a few seconds in Right ascension and a few minutes in Declination in order.

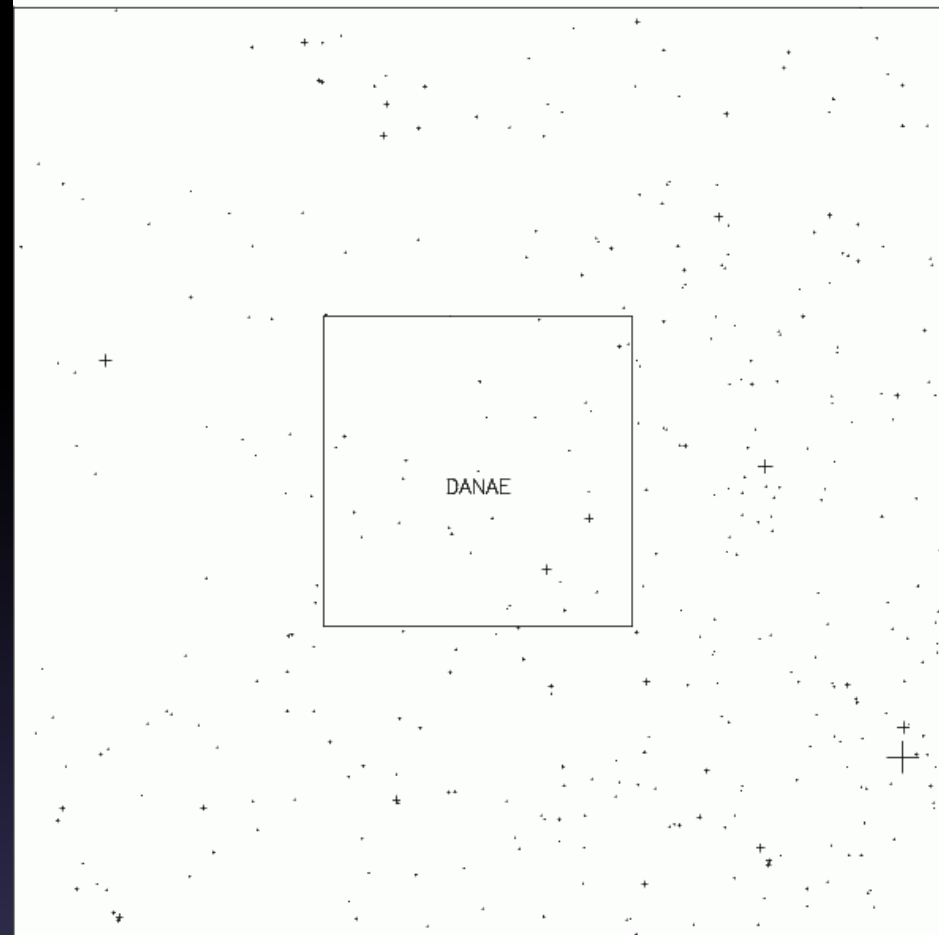


CAMERA: 2A EXPTIM: 60.0000

TOB: 2014 AUG 13 (225) 08:00:00.000

RA: 18^h36^m24.^s08
DEC: -20°05'37".3
TWIST: -0.086038

AL: 102.924630
BT: 138.151496
GAM: -90.262850



CAMERA: 2A EXPTIM: 60.0000

TOB: 2014 AUG 13 (225) 08:00:00.000

RA: 16^h30^m26.^s63
DEC: -41°58'24".4
TWIST: -0.103582

AL: 76.978432
BT: 110.777218
GAM: -88.723329

Observing

- For the observation we went to the Table Mountain Facility

Table Mountain Facility



0.6 Meter Telescope in TM-12

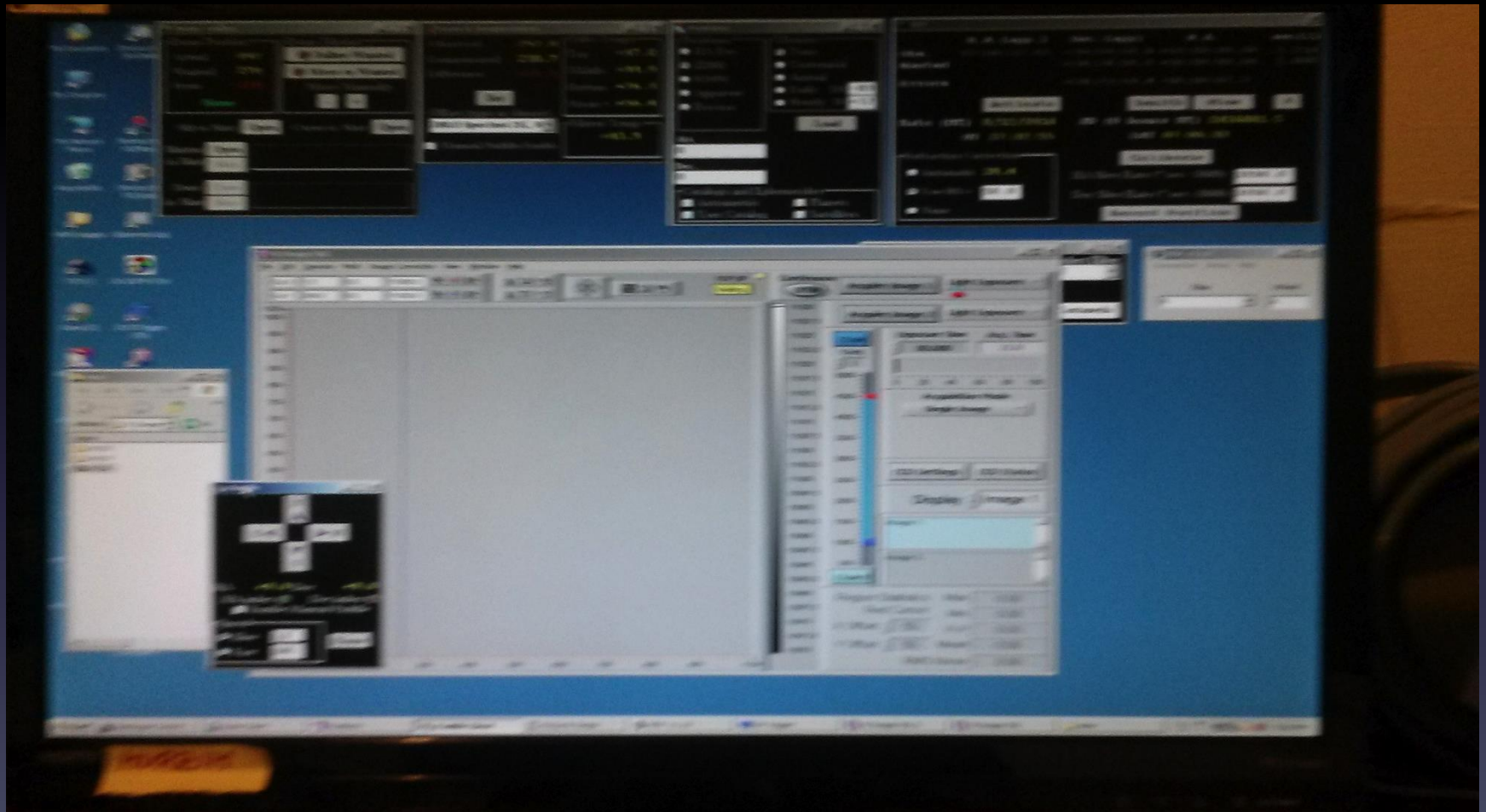


2K CCD camera

Prep for Observation

- We have to focus the camera
- Center the camera
- Calibration

Observing



Calibration Field M 11





Data Reduction

- After all the pictures are taken, we transfer them to our computer back at JPL where we run software to do all the data reduction. The prepare script formats the pictures into something we can use

Centroid

- The centroid script runs through all the pictures identifying and cataloging all the the objects in each of the pictures.

Reduce

- Using the cataloged stars the software identified, it uses the root mean square from the distance between all the stars and asteroid to calculate all the new position of the asteroid in the sky.

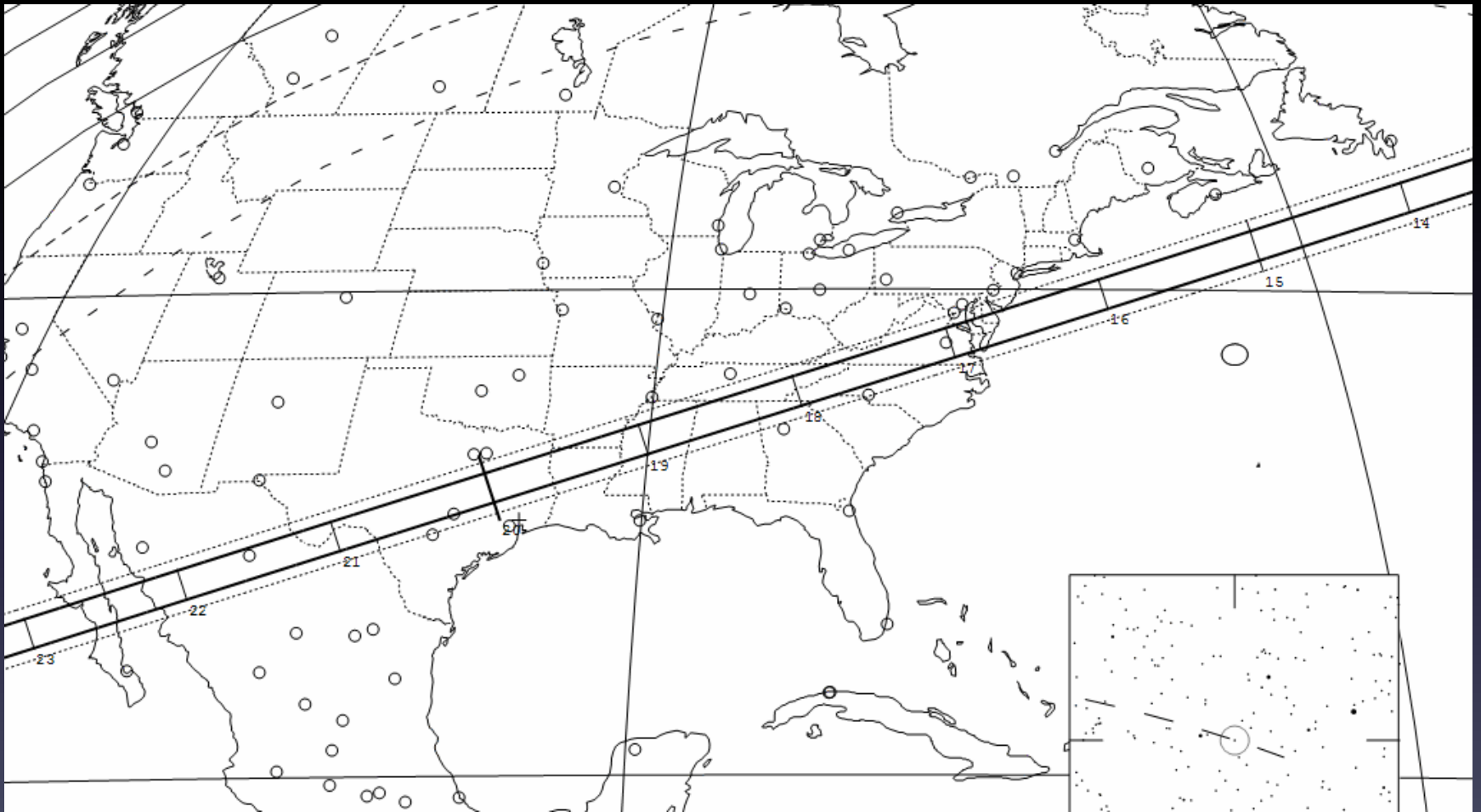
Errors

- If there are any objects with bad residuals, we manually go in and erase these objects and run the script again.

Minor Planet Center

- Once the positions of the asteroids are updated, the information is sent to the minor planet center where they are published for everyone to see.

Updated Positions



What I learned

- How to use Unix
- How to operate a telescope
- How to adapt to changing circumstances

Acknowledgements



Dr. William Owen, Mentor
Paul McCudden, Program Director
Mark Shiffer, Partner

This work was supported by
National Science Foundation
grant #AST-1156756 to Los
Angeles City College