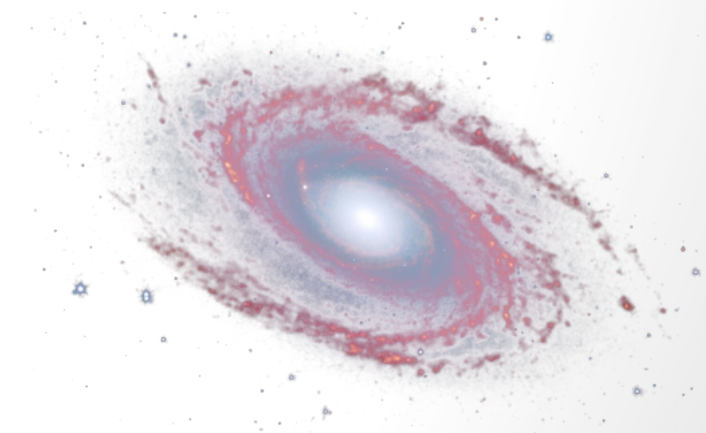


# NON COM ASTRONOMY TALKS

*JSkyCalc*

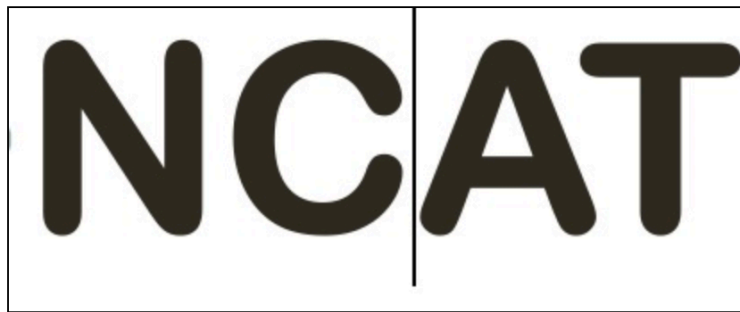
Chuck Horst  
San Diego State University

**NCAT**



# NCAT WEBPAGE

- [Mintaka.sdsu.edu/faculty/chorst/NCAT.html](http://Mintaka.sdsu.edu/faculty/chorst/NCAT.html)



## Non Compulsory Astronomy Talks

SDSU Astronomy Department

---

### THE NCAT PROGRAM

NCAT is an optional seminar series geared to the upper division and graduate students within the Astronomy department at SDSU. However, all SDSU astronomy students are welcome. These Non Compulsory Astronomy Talks (NCAT) are designed to help students get off to a productive start in the astronomy program by providing assistance with computer setup, software installation, with an emphasis on observing techniques and principals. Some ancillary topics will be covered that are not included in classwork to benefit all students regardless of year or level. In addition to faculty lead discussions, opportunities are provided for students to present and lead discussions on topics of which they possess significant experience. Student lead discussions are of benefit to the attendees with regard to the topical content provided and the presenter affording presentation experience.

Contact Chuck Horst if you are interested in participating in the NCAT program.

# NCAT WEBPAGE

## NEXT MEETING

*Tuesday September 22, 2015 at 4:00PM in PA256.*

**AGENDA:** We will begin with a discussion of JSkyCalc a useful ephemeris tool for observing. Included will be a brief tutorial on manipulating data with "awk". These topics are relative to anybody interested in observing. After the tutorial we will continue setting everyones PC based computers up with VirtualBox, openSUSE and Ureka. A guide will be provided to document this procedure. Assistance with OSX will be provided as well.

## FUTURE MEETINGS

- *Tuesday September 29, 2015 at 4:00PM in PA256.*  
Topic to be announced.

## PREVIOUS MEETINGS

- September 14, 2015: [Introduction to NCAT](#)

## ADDITIONAL DOWNLOADS

### **Computer Setup**

- [Setting up a Yosemite computer for astronomy research.](#)
- *Coming soon: Setting up a VirtualBox with openSUSE for astronomy research.*

### **Software Applications**

- *Coming soon.*

### **Observing Materials**

- *Coming soon.*

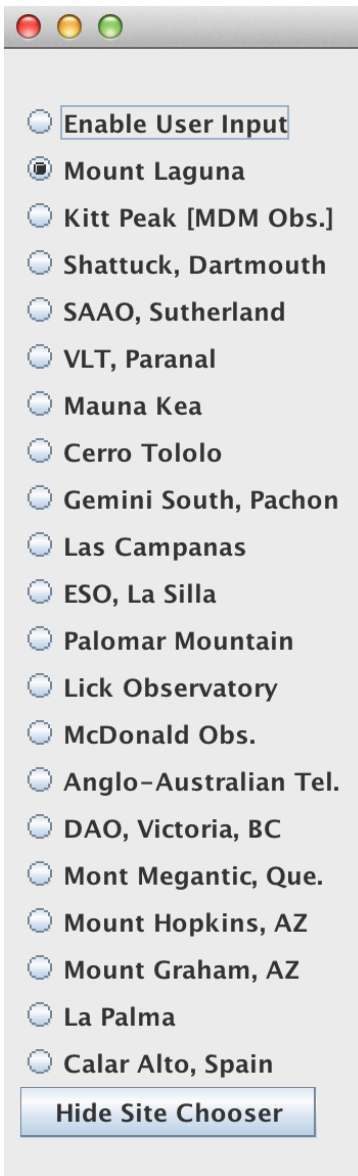
# OUTLINE

- An Introduction To JSkyCalc (JSC)
- Working With JSC
- How To Obtain JSC
- How To Configure JSC For MLO
- Data Manipulation “With AWK”

# JSkyCalc- INTRODUCTION

- **What Is The Problem Being Addressed?**
  - Are target objects available for viewing?
  - How to best plan the observing run
- **Ephemeris Tool**
  - Observing logistics
  - Air mass plots
  - Hourly circumstances
  - Seasonal observability
- **Run Environment**
  - Written in Java
    - Linux, OSX, Windows
  - Run from java enabled browser
    - Can't load observer list or customize for site on browser based
  - Best to download and run locally
- **Operations Manual**
  - Great online manual

# JSkyCalc- WORKING WITH

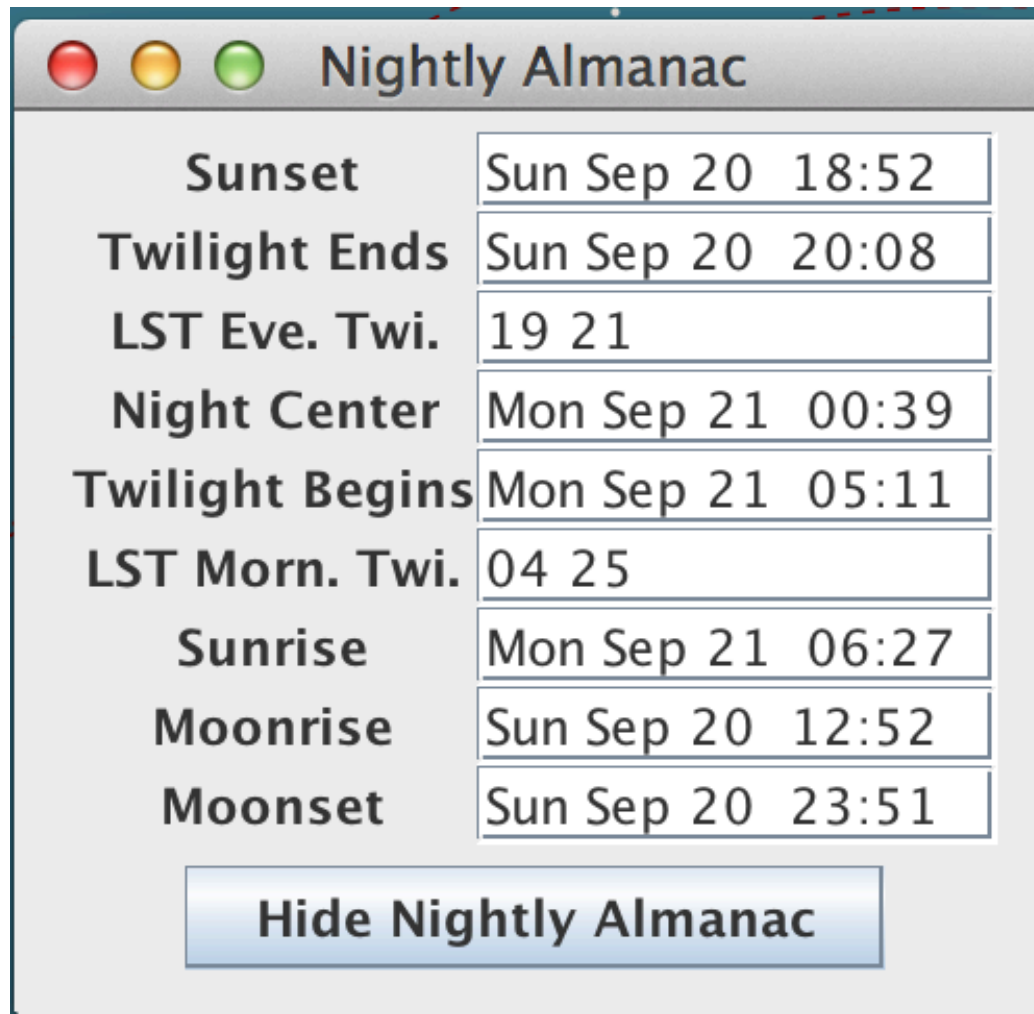


# JSkyCalc- WORKING WITH

JSkyCalc v1.2: John Thorstensen, Dartmouth College

|                |   |                 |                               |
|----------------|---|-----------------|-------------------------------|
| Object:        | 223831  | Sidereal        | 20 32 29                      |
| RA:            | 22 38 31.31   | HA              | -2 06 49                      |
| dec:           | +13 19 55.9   | Airmass         | 1.217                         |
| equinox:       | 2000.00   | AltAz           | 55.2 az = 116.4               |
| Date:          | 2015 Sep 21 Mon   | parallactic     | -50.7 [129.3] degr.           |
| Time:          | 21 15 19.5  | SunRAdec        | 11:55:49.0 +00:27:05          |
| Time is:       | <input checked="" type="radio"/> Local <input type="radio"/> UT | SunAltAz        | -31.8 az = 294.2              |
| timestep:      | 1 h   | ZTwilight       | No twilight.                  |
| sleep for (s): | 2   | MoonPhase       | 0.8 days after first quarter. |
| JD:            | 2457287.677309  | MoonRAdec       | 18:34:26.5 -18:37:29          |
| Site name:     | Mount Laguna  | MoonAltAz       | 31.3 az = 213.1               |
| Longitude:     | 07 45 42.2 H W  | MoonIllumFrac   | 0.581                         |
| Latitude:      | +32 50 24   | LunSkyBrght     | 20.9 V mag/sq arcsec          |
| Time zone:     | 8.00  | Moon-Obj ang.   | 68.3 deg                      |
| DST code:      | 1   | Bary. JD        | 2457287.68264 [ 460.9 s]      |
| Zone name:     | Pacific   | Bary. Vcorr.    | -6.11 km/s                    |
| Elevation:     | 1859 m  | Constellation   | Peg                           |
| Terrain elev:  | 1859 m  | Planet Warning? | ---                           |

# JSkyCalc- WORKING WITH



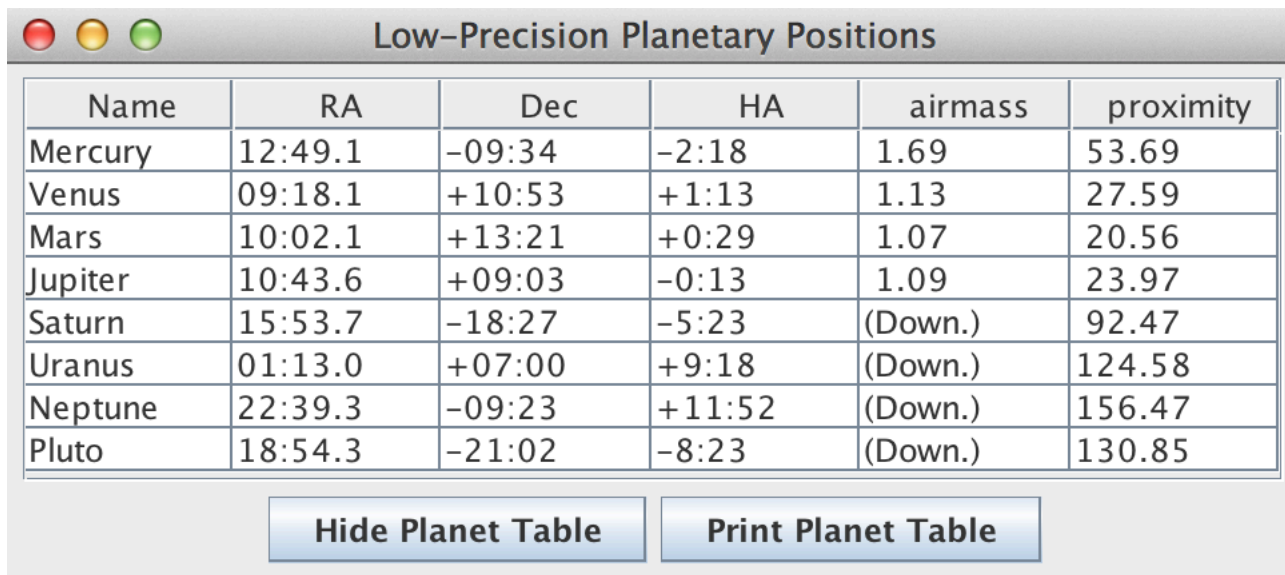
The screenshot shows a window titled "Nightly Almanac" with a standard macOS-style title bar (red, yellow, green buttons). The window contains a table of astronomical events. The events are listed on the left, and their corresponding dates and times are in text boxes on the right. At the bottom of the window is a button labeled "Hide Nightly Almanac".

|                        |                  |
|------------------------|------------------|
| <b>Sunset</b>          | Sun Sep 20 18:52 |
| <b>Twilight Ends</b>   | Sun Sep 20 20:08 |
| <b>LST Eve. Twi.</b>   | 19 21            |
| <b>Night Center</b>    | Mon Sep 21 00:39 |
| <b>Twilight Begins</b> | Mon Sep 21 05:11 |
| <b>LST Morn. Twi.</b>  | 04 25            |
| <b>Sunrise</b>         | Mon Sep 21 06:27 |
| <b>Moonrise</b>        | Sun Sep 20 12:52 |
| <b>Moonset</b>         | Sun Sep 20 23:51 |

Hide Nightly Almanac



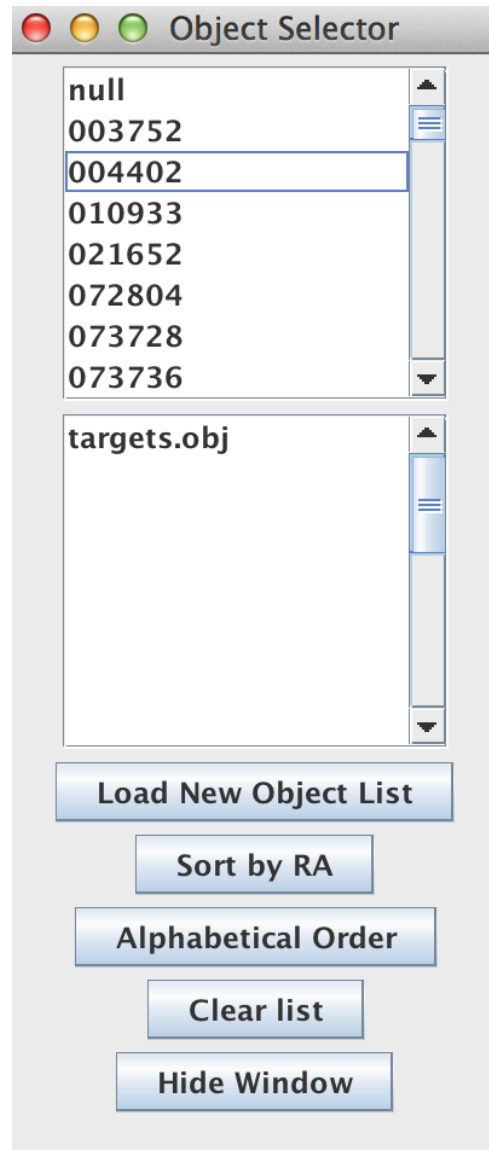
# JSkyCalc- WORKING WITH



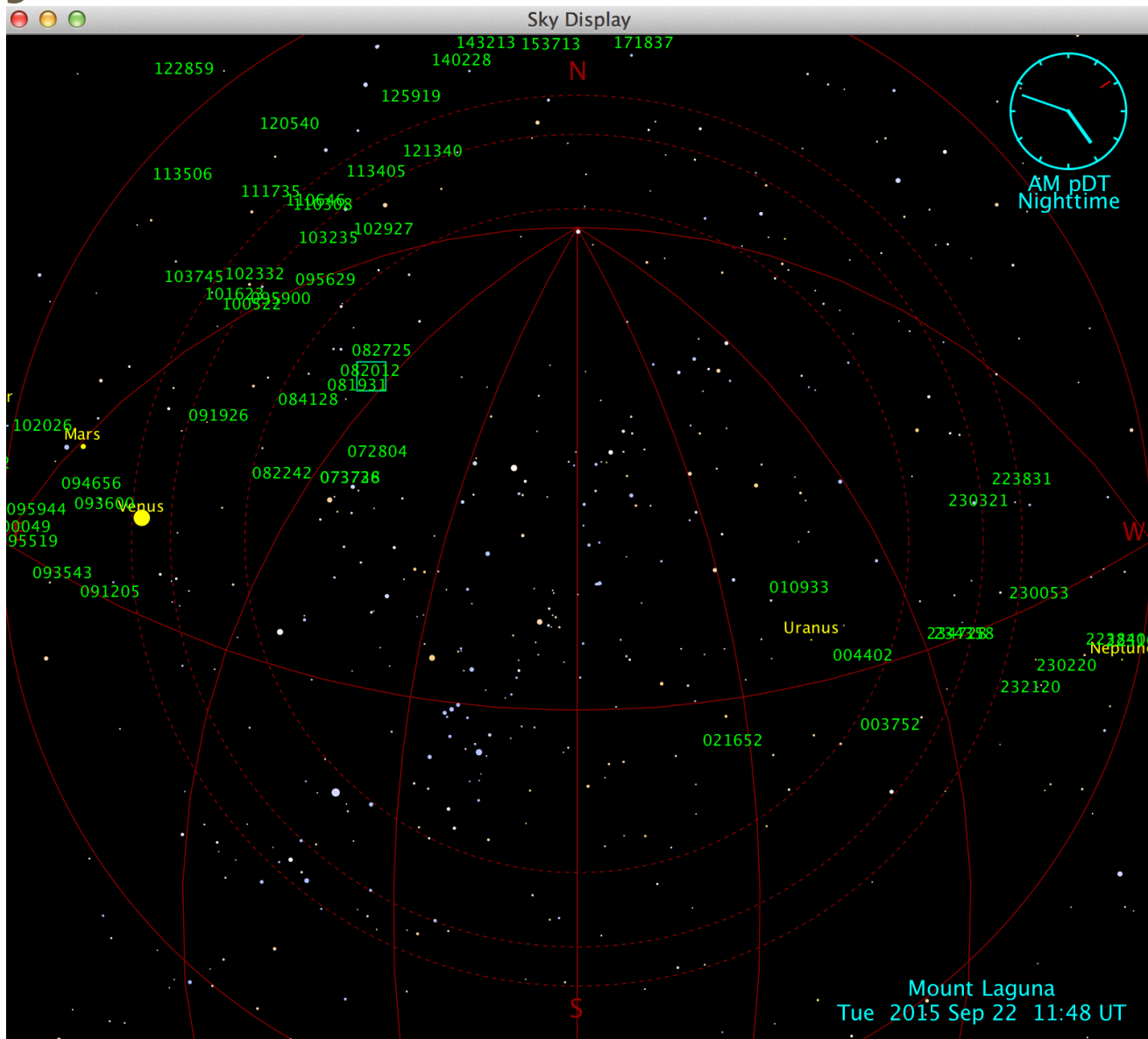
| Name    | RA      | Dec    | HA     | airmass | proximity |
|---------|---------|--------|--------|---------|-----------|
| Mercury | 12:49.1 | -09:34 | -2:18  | 1.69    | 53.69     |
| Venus   | 09:18.1 | +10:53 | +1:13  | 1.13    | 27.59     |
| Mars    | 10:02.1 | +13:21 | +0:29  | 1.07    | 20.56     |
| Jupiter | 10:43.6 | +09:03 | -0:13  | 1.09    | 23.97     |
| Saturn  | 15:53.7 | -18:27 | -5:23  | (Down.) | 92.47     |
| Uranus  | 01:13.0 | +07:00 | +9:18  | (Down.) | 124.58    |
| Neptune | 22:39.3 | -09:23 | +11:52 | (Down.) | 156.47    |
| Pluto   | 18:54.3 | -21:02 | -8:23  | (Down.) | 130.85    |

Hide Planet Table      Print Planet Table

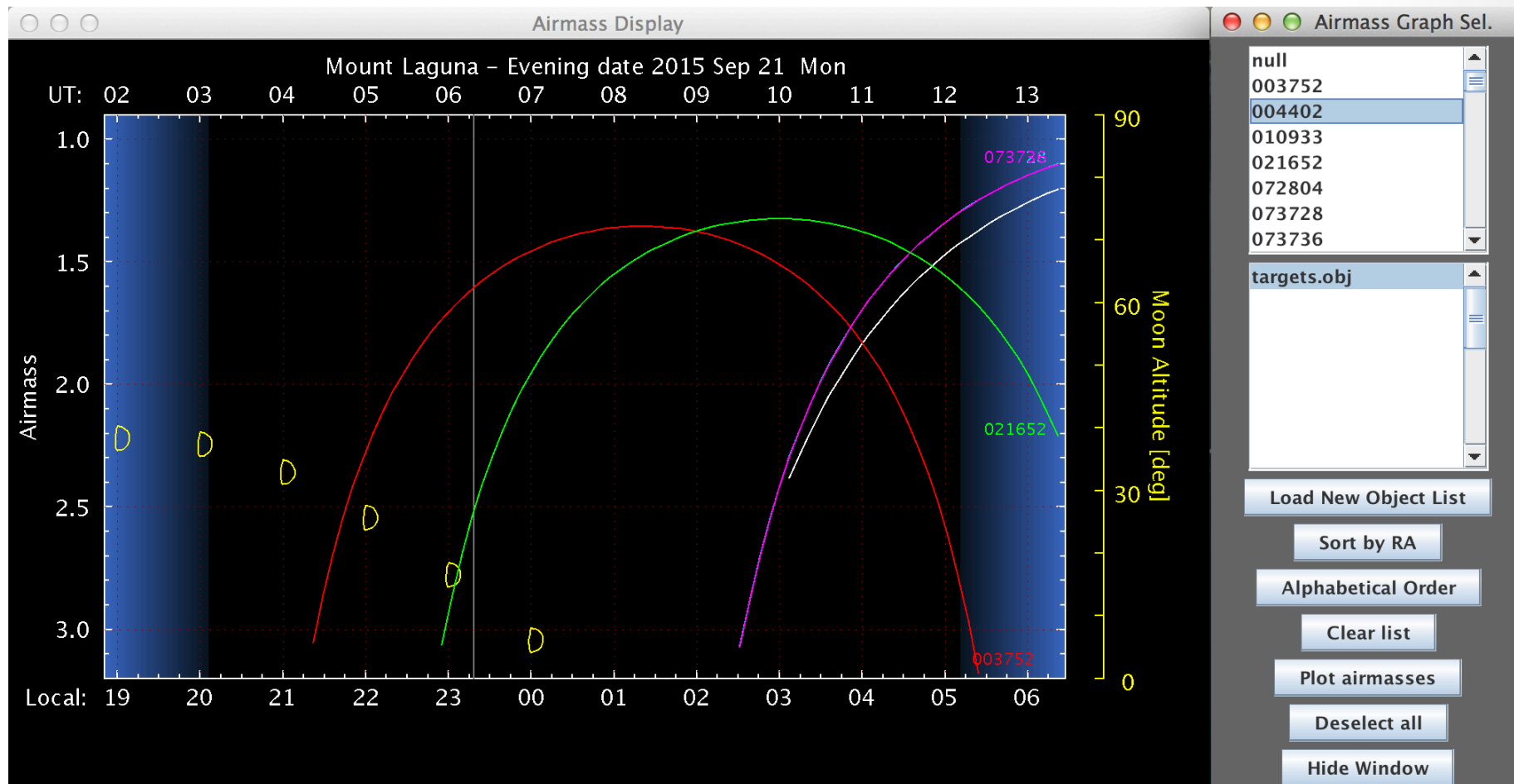
# JSkyCalc- WORKING WITH



# JSkyCalc- WORKING WITH



# JSkyCalc- WORKING WITH



# JSkyCalc- WORKING WITH

Hourly Circumstances

| Local            | UT    | LST   | HA     | Airmass | moonalt | sunalt |
|------------------|-------|-------|--------|---------|---------|--------|
| Mon Sep 21 18:00 | 01:00 | 17:17 | +8:55  | > 10.   | 35.6    | 8.4    |
| Mon Sep 21 19:00 | 02:00 | 18:17 | +9:55  | (Down.) | 38.3    | -4.2   |
| Mon Sep 21 20:00 | 03:00 | 19:17 | +10:56 | (Down.) | 37.4    | -16.7  |
| Mon Sep 21 21:00 | 04:00 | 20:17 | +11:56 | (Down.) | 32.9    | ---    |
| Mon Sep 21 22:00 | 05:00 | 21:17 | -11:04 | (Down.) | 25.7    | ---    |
| Mon Sep 21 23:00 | 06:00 | 22:17 | -10:04 | (Down.) | 16.5    | ---    |
| Tue Sep 22 00:00 | 07:00 | 23:18 | -9:04  | > 10.   | 6.1     | ---    |
| Tue Sep 22 01:00 | 08:00 | 00:18 | -8:04  | 7.58    | ---     | ---    |
| Tue Sep 22 02:00 | 09:00 | 01:18 | -7:03  | 3.84    | ---     | ---    |
| Tue Sep 22 03:00 | 10:00 | 02:18 | -6:03  | 2.49    | ---     | ---    |
| Tue Sep 22 04:00 | 11:00 | 03:18 | -5:03  | 1.83    | ---     | ---    |
| Tue Sep 22 05:00 | 12:00 | 04:18 | -4:03  | 1.47    | ---     | ---    |
| Tue Sep 22 06:00 | 13:00 | 05:19 | -3:03  | 1.26    | ---     | -7.9   |
| Tue Sep 22 07:00 | 14:00 | 06:19 | -2:03  | 1.13    | ---     | 4.7    |
|                  |       |       |        |         |         |        |
|                  |       |       |        |         |         |        |
|                  |       |       |        |         |         |        |
|                  |       |       |        |         |         |        |

Hide Hourly Table      Dump to 'jskycalc.out'

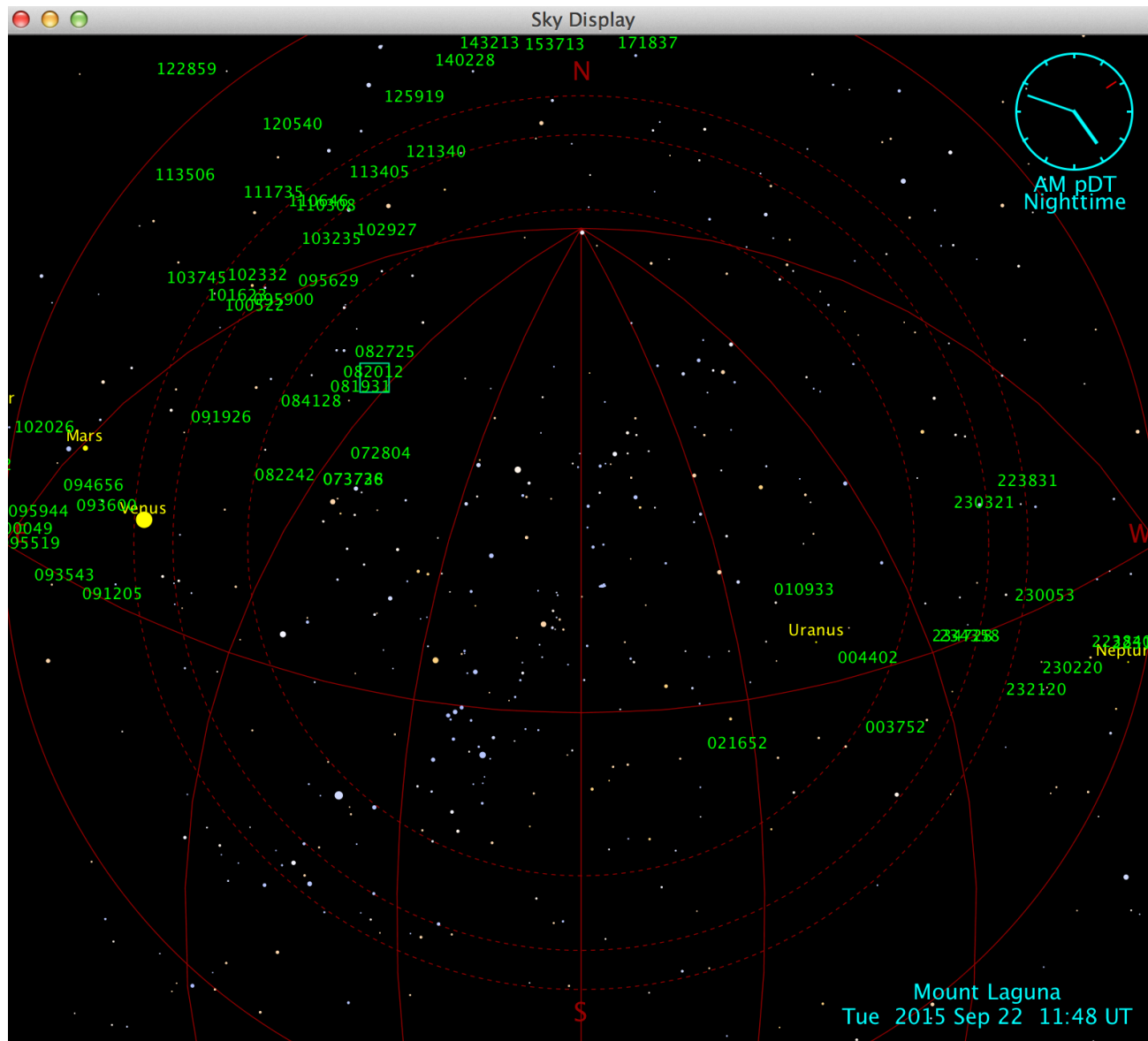
# JSkyCalc- WORKING WITH

| Moon | Evening Date | HA.eve | airm.eve | HA.ctr | airm.ctr | HA.morn | airm.m... | hrs<3 | hrs<2 | hrs<1.5 |
|------|--------------|--------|----------|--------|----------|---------|-----------|-------|-------|---------|
| New  | 2015 Jun 15  | +6:07  | 2.54     | +9:16  | (down)   | -11:34  | (down)    | 0.4   | 0.0   | 0.0     |
| Full | 2015 Jul 01  | +7:12  | 4.14     | +10:23 | (down)   | -10:26  | (down)    | 0.0   | 0.0   | 0.0     |
| New  | 2015 Jul 15  | +8:01  | 7.31     | +11:20 | (down)   | -9:21   | (down)    | 0.0   | 0.0   | 0.0     |
| Full | 2015 Jul 30  | +8:47  | > 10.    | -11:40 | (down)   | -8:07   | 8.03      | 0.0   | 0.0   | 0.0     |
| New  | 2015 Aug 13  | +9:25  | (down)   | -10:47 | (down)   | -6:58   | 3.67      | 0.0   | 0.0   | 0.0     |
| Full | 2015 Aug 28  | +10:03 | (down)   | -9:51  | (down)   | -5:45   | 2.25      | 0.8   | 0.0   | 0.0     |
| New  | 2015 Sep 12  | +10:40 | (down)   | -8:57  | > 10.    | -4:34   | 1.63      | 2.0   | 0.8   | 0.0     |
| Full | 2015 Sep 27  | +11:17 | (down)   | -8:03  | 7.54     | -3:24   | 1.32      | 3.1   | 2.0   | 0.8     |
| New  | 2015 Oct 12  | +11:57 | (down)   | -7:09  | 4.02     | -2:14   | 1.15      | 4.3   | 3.1   | 1.9     |
| Full | 2015 Oct 26  | -11:23 | (down)   | -6:16  | 2.69     | -1:09   | 1.07      | 5.4   | 4.2   | 3.0     |
| New  | 2015 Nov 10  | -10:35 | (down)   | -5:17  | 1.95     | +0:02   | 1.04      | 6.5   | 5.4   | 4.2     |
| Full | 2015 Nov 25  | -9:42  | (down)   | -4:14  | 1.53     | +1:13   | 1.07      | 7.7   | 6.6   | 5.3     |
| New  | 2015 Dec 10  | -8:42  | > 10.    | -3:09  | 1.28     | +2:23   | 1.17      | 8.9   | 7.7   | 6.5     |
| Full | 2015 Dec 24  | -7:41  | 5.60     | -2:07  | 1.14     | +3:26   | 1.33      | 9.9   | 8.8   | 7.6     |
| New  | 2016 Jan 09  | -6:27  | 2.89     | -0:57  | 1.06     | +4:33   | 1.63      | 11.0  | 9.9   | 8.3     |
| Full | 2016 Jan 23  | -5:20  | 1.98     | +0:03  | 1.04     | +5:26   | 2.04      | 10.7  | 10.7  | 8.3     |

Hide Observability Table

Print Observability Table

# JSkyCalc- LIVE DEMO



# JSkyCalc- OBTAINING

- Download and install Java
  - <https://java.com/en/download/>
- Download JSkyCalc.jar
  - <http://www.dartmouth.edu/~physics/faculty/skycalc/flyer.html>



# JSkyCalc- CONFIGURATION

- **Edit JSkyCalc**
  - Put JSkyCalc.jar in otherwise empty directory
  - From within directory using terminal;
    - `> Jar -xvf JSkyCalc.jar`
  - Edit skycalcsites.dat to add Mount Laguna
    - You may have to delete an observatory to make room
    - “Mount Laguna”, 7.76173. 32.84, 8., 1, “Pacific”, “P”, 1859., 1859.
- **Reconstruct JSkyCalc**
  - Remove JSkyCalc.jar from directory
  - `Jar -cvmf myManifest.mf JSkyCalc.jar *.*`
    - This will create a new JSkyCalc.jar
  - Move JSkyCalc.jar to /Applications
  - Delete directory containing residual files from JSkyCalc expansion

# DATA MANIPULATION

- **DATA FORMAT**

- Name\_no\_blanks    hh mm ss    dd mm ss    equinox

- **EXAMPLE DATA**

- 4U1234+56            12 34 35.3    +56 01 02    2000
- Colons in RA & DEC seem to be OK
- Fields beyond equinox also seem to be OK

# DATA MANIPULATION

- **Your Friends With Data Manipulation**

- Awk, sed, paste ...

- **Sample Data**

- 00:37:52.92 -09:42:16.5 SDSSJ0037-0942 2000.0 0.20 0.63 R\_John 40 min
- 00:44:02.90 +01:13:12.6 SDSSJ0044+0113 2000.0 0.12 0.20 R\_John 5 min

- **JSkyCalc Formatted**

- 0037.40 00:37:52.92 -09:42:16.5 2000.0 +++

# DATA MANIPULATION w/ AWK

- **Using AWK to Edit Target.lst**

- **Copy original**

- `>cp targets.lst targets.lst.orig`
- Try viewing targets.lst in JSkyCalc

- **Reorder columns**

- `>awk '{print $3,$1,$2,$4,$5,$6,$7,$8,$9}' targets.lst > temp1`
- Try viewing temp1 in JSkyCalc

- **Reorder columns and duplicate the 2nd column**

- `>awk '{print $1,$1,$2,$4,$5,$6,$7,$8,$9,$3}' targets.lst > temp2`

- **remove ":" from first column**

- `>awk '{gsub(/:/,"",$1);print}' temp2 > temp3`

- **Trim xx from first column**

- `>awk '{sub(/..$/,"",$1);print}' temp3 > temp4`

- **Add exposure time to first column**

- `>awk '{print $1$8,$2,$3,$4,$5,$6,$7,$8,$9,$10}' temp4 > targets.obj`

# DATA MANIPULATION w/ AWK

- **End Result**

- 0037.40 00:37:52.92 -09:42:16.5 2000.0 0.20 0.63 R\_John 40 min SDSSJ0037-0942
- 0044.5 00:44:02.90 +01:13:12.6 2000.0 0.12 0.20 R\_John 5 min SDSSJ0044+0113