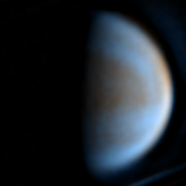
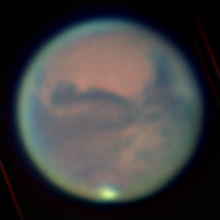
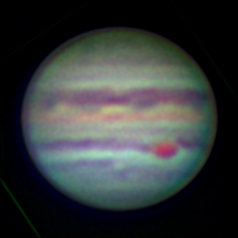
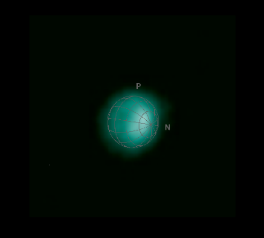
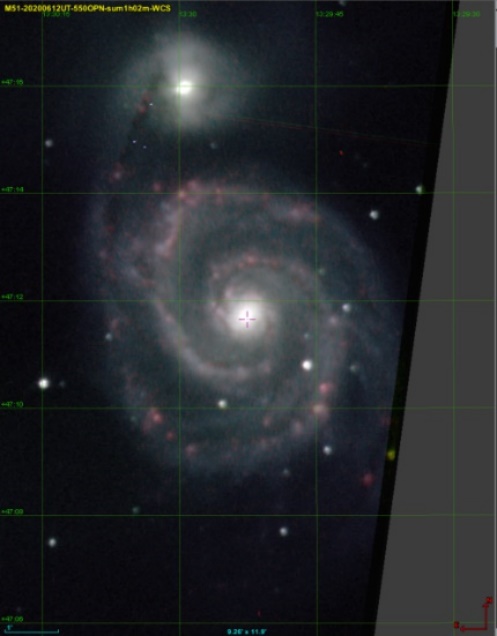
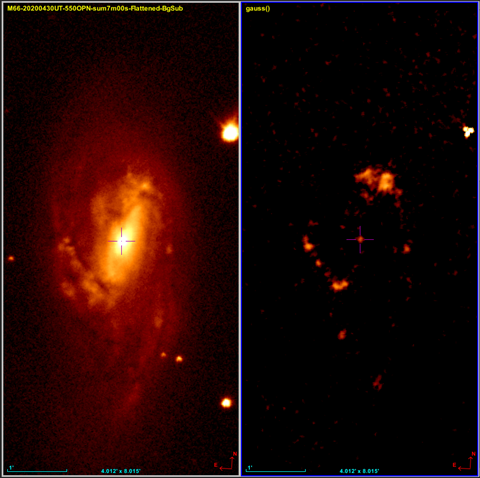
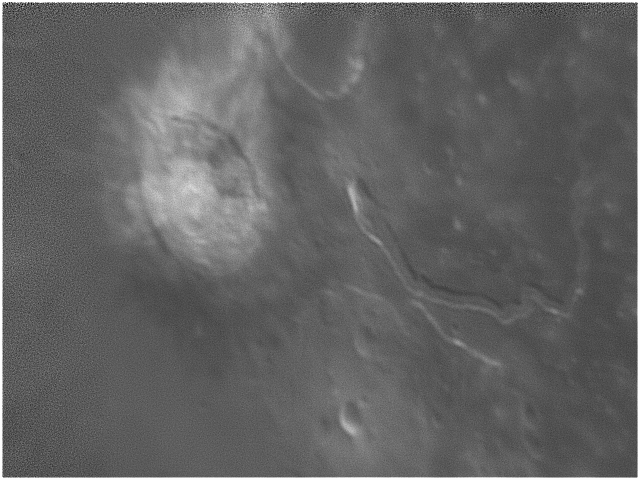
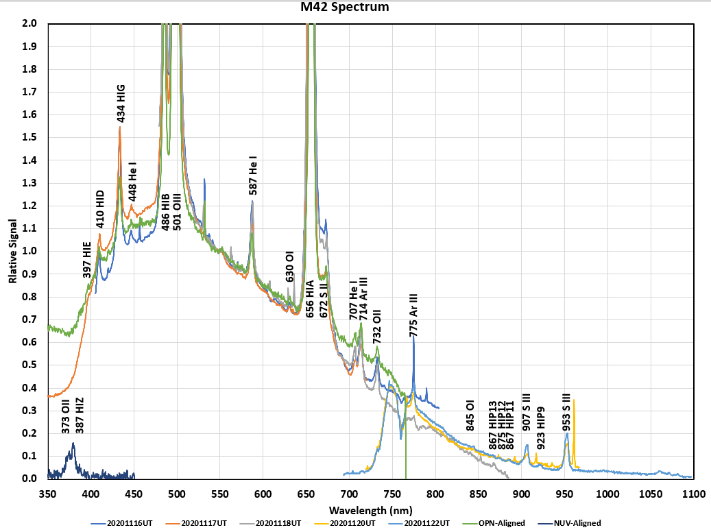
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## Highlights Year in Review

Main efforts so far

* Emission line data gathering for nebulae and galaxy analysis with continuum subtraction
  + M33
  + M42
  + M109
  + M51
* Planetary observations
  + Venus with some attempts at middle cloud NIR observations – unable to try surface emission imaging due to horizon blockage
  + NH3 detection and mapping on Jupiter. Key good key reference is <Texes>. At least with ST2000XM images, I believe I can detect the mid-latitude NH3 depletion. Possibly also with ASI120MM. While as of 9/2/2020 I’ve tried a few data analysis experiments, I probably need to work out the workflow and analytic details before proceeding to a formal analysis. I need to be clear on how to get at NH3 absorption, effective column length, and ultimately abundance and releative humidity. I may be able to convert DN to I/F as long as I have a reference star as proxy for solar illumination.
  + Titan photometry and surface detection. I need to get at good coverage at all CMs through at least on 16 day orbit. I can use 889CH4 as a fiducial for the surface albedo changes expected at 940NIR. 1000NIR may also show interesting variations. If 647CNT and 656HIA are available, they may also serve as fiducials.
  + Uranus bright polar cap
  + PLAN for Jupiter quantitative atmosphere absorption observations and weather observations
  + PLAN for Saturn observations
  + PLAN to for Mars observations

### M42 Orion Nebula

Observations of M24 were extensive and included wide-field, narrowband imaging for integrated photometry (Table 1); high-resolution, narrowband imaging for structural and plasma analysis (Table 2); and wide-field, objective grating spectroscopy for integrated plasma diagnostics (Table 3).

Table 1: Imaging with C11 with plate scale of ~1.1 arcsec

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Row Labels | 1000NIR | 940NIR | 730OII | 672SII | 658NII | 656HIA | 647CNT | 540CNT | 501OIII | 486HIB | 467HeII | **Total** |
| **1/5/2020** |  |  |  |  |  | **210** |  | **210** | **130** | **230** | **210** | **990** |
| **3/23/2020** |  |  |  | **200** | **160** | **200** | **210** |  |  |  |  | **770** |
| **3/25/2020** |  |  |  | **670** | **310** | **310** | **790** |  |  |  |  | **2080** |
| **12/9/2020** | **1310** | **1190** | **1540** |  |  |  |  |  | **800** |  |  | **4840** |
| **12/22/2020** | **4540** |  |  |  |  |  |  |  |  |  |  | **4540** |
| **12/24/2020** |  | **6460** |  |  |  |  |  |  |  |  |  | **6460** |
| **12/25/2020** |  |  | **7130** |  |  |  |  |  |  |  |  | **7130** |
| **Grand Total** | **5850** | **7650** | **8670** | **870** | **470** | **720** | **1000** | **210** | **930** | **230** | **210** | **26810** |

Table 2: Imaging with Pentax for whole-nebula photometry with a plate scale of ~11 arcsec

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Row Labels | 940NIR | 730OII | 658NII | 647CNT | 1000NIR | **Total** |
| **11/29/2020** | **2400** |  |  |  | **4140** | **6540** |
| **11/30/2020** |  |  |  |  | **10200** | **10200** |
| **12/4/2020** |  | **6960** |  |  |  | **6960** |
| **12/6/2020** |  | **1920** |  |  |  | **1920** |
| **12/7/2020** |  |  | **3600** | **5100** |  | **8700** |
| **12/8/2020** | **6960** |  |  |  |  | **6960** |
| **Grand Total** | **9360** | **8880** | **3600** | **5100** | **14340** | **41280** |

Table 3: Spectra taken with Pentax and 200lpm grating

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Row Labels | 742NIR | 550CLR | 380NUV | Grand Total |
| **11/16/2020** |  | **8700** | **720** | **9420** |
| **11/17/2020** |  | **5700** |  | **5700** |
| **11/18/2020** | **2760** | **2160** |  | **4920** |
| **11/20/2020** | **5400** |  |  | **5400** |
| **11/22/2020** | **5400** |  |  | **5400** |
| **11/25/2020** |  | **6840** |  | **6840** |
| **11/26/2020** | **8580** |  |  | **8580** |
| Grand Total | 22140 | 23400 | 720 | 46260 |

**M42 objective grating spectra** detected 15 emission lines:

* **Hydrogen** α, β, γ, δ, and ζ Balmer lines at 656, 486, 434, 410, and 397nm.
* **Helium I** lines at 447, 588, and 707nm.
  + The line at 668nm, if present, is swamped by Hα and NII at 656 and 658
* **Oxygen III** at 501nm
* **Sulfur II** at 672nm
* **Oxygen I** at 630nm
* **Oxygen II** at 732nm
* **Argon III** at 714 and 775nm
* **Sulfur III** at 906 and 953nm

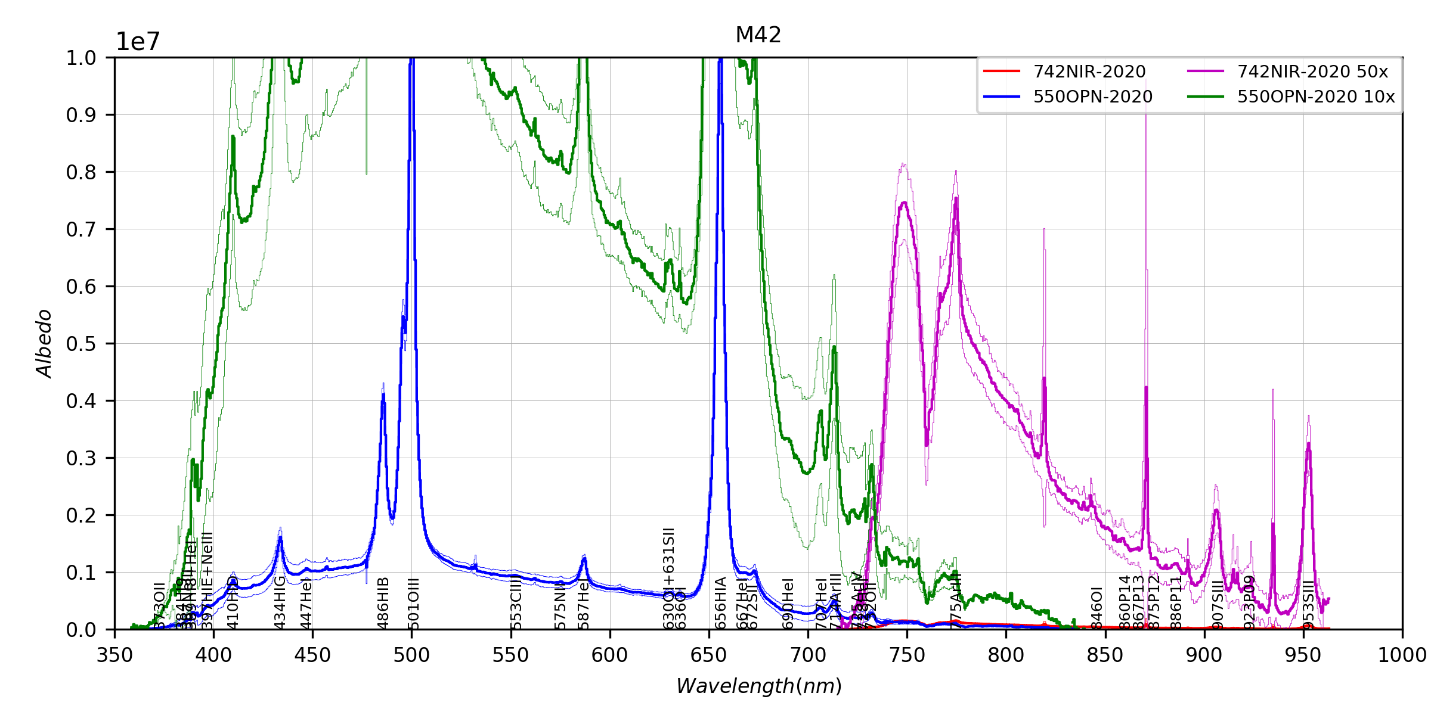


Figure 1: M42 Aggregation.png produced by M42\_Spectral\_Aggregation.py under F:\Astronomy\Projects\Nebulae-Diffuse\M42 - Wide Field\Spectral Data\M42SpectralAnalysis

**Next analysis steps:**

* Subtract continuum via spline fit
  + Do on individual input spectra or do on final aggregate. The former would probably reduce variance significantly because most seems to be due to continuum.
* Eliminate start contamination (NANs or zeros in those pixels)
* Implications of stellar absorption lines, e.g., Balmer lines, on observed emission lines
* Measure and compile observed EWs
* Reddening correction
  + Can use Hβ and Hγ
  + Will have to make assumptions about Hα/NII contributions to use Hα
* Do plasma analysis
* Do ionic abundances
* Do atomic abundances

### Venus

This year’s evening apparition is one of the best. On Mar 24, 2020 when Venus reaches maximum elongation at 46 degrees, it will be 44 degrees above the horizon at sunset. In addition, this will be the first apparition with the C11, increasing both resolution and light-gathering capacity over prior apparitions with the C8.

Given the seasonal timing, the following morning apparition in the fall will also be extremely good. And with remote work mandatory due to COVID, going out for an hour before sunrise to make observations is not a problem.

I learned a lot from the prior apparition with the C8 and the ASI120MM. In particular, the ability to improve resolution through 2x2 binning due to the 4x shorter exposures reducing seeing problems and increasing the total number of good frames. Besides doing the standard 380 and 889CH4 imaging (sometimes with 550GRN added), the following filters might be interesting to investigate:

* 1000NIR for low clouds in the daytime and surface emission at night
* 940NIR in contrast to 889CH4
* 807NIR in contrast to 889CH5
* 467HeII in contrast to 380NUV – possibly higher resolution but lower contrast UV/blue clouds compared to 380NUV. Maybe difference or ratio with 540CNT to enhance contrast?
* 467HeII in contrast to 450BLU – maybe improved resolution due to narrowband nature of 467HeII

Overall, I made 15 multispectral observations of Venus in 2020, the most ever in a single year. The NUV albedo observations often showed significant detail, but many times showed a pretty uniform disk aside from polar cap bright regions. Attempts at seeing NIR albedo features are inconclusive as of this writing (12/30/2020). Attempts to detect surface thermal emission were unsuccessful due to the observing geometry preventing access to Venus close to conjunction in dark skies.

### Mars

Dust storms

High resolution NIR mapping

North polar hood development

South polar cap melting

Spectra, mainly for solar spectrum and filter calibration

### Jupiter

* Lot’s of quantitative and qualitative observations of CH4 and NH3 and their spatial distributions
* Observed the storm outbreak in the NTB(?) in CH4 and maybe other bands

### Saturn/Titan

* Video observations may show the hexagon
* Some CH4 and NH3 quantitative imaging
* Photometric observations tried to detect Titan’s surface albedo features in the 940nm window

## January

### Winter 2020 Planning

Last Updated 12/31/2019

* Observations – Astro twilight begins around
  + Double Stars Video – **5600mm (C11 w/Barlow); ASI120MM**
    - STF3050AB (HR9074) (new)
    - 36 And (STF73AB) (new)
    - Zet Aqr (STF2909) (new)
    - 53 Aqr (SHJ 345AB) (new)
    - Eta Cas (STF60) (transit 8:00pm)
    - STF3062
    - Iot Cas (StF262Aa-B)
    - Xi Cep (new)
    - STF202 (new)
  + Galaxies
    - **M33** – **2800mm (C11 prime); ST2000XM (binned 2x2?)**
      * Ha regions – Take confirming 486HIB and 501OIII images of a couple of regions at varying radii from the galactic center. Also take continuum images in 467HeII and 540CNT for background subtraction. Goal will be to get quantitative on the O++/H+ abundance
  + Nebulae
    - **M42 – 2800mm (C11 prime); ST2000XM (binned 2x2?)**
      * Need to get blue continuum (467HeII) and green continuum (540CNT) for background subtraction for 486HIB & 501OIII. That will give O++/H+ abundance.
      * Would be great to improve the continuum SNR in the 540 and 467 bands by about a factor of five. So about 15 mins exposure in each.
      * Need to get red continuum (647VIS or 647CNT) for red-regime correction.
      * Try 940NIR and 1000NIR for kicks for NIR stars?
  + Planets
    - **Venus** – **5600mm (C11 w/Barlow); ASI120MM**
      * **Need to get good cloud structure. Be more deliberate in filter selection in the IR and NB if appropriate.**
        + **380NUV – upper clouds**
        + **450BLU – upper clouds – low contrast?**
        + 467HeII (NB Blue) – possible low contrast upper clouds
        + 685NIR – possible better SNR for lower clouds
        + **807NIR – lower clouds or uniform disk**
        + **889CH4 – lower clouds or uniform disk**
        + **940NIR – lower clouds or uniform disk**
        + **1000NIR – lower clouds (day) or surface (night)**
    - **Uranus** – **5600mm (C11 w/Barlow); ASI120MM**
      * Primary goal is to simply capture the brighter polar cap, for that we need 685NIR
      * Secondary goal is to see if any features show in the weaker CH4 bands towards the blue
        + 380NUV – detection threshold only
        + 450BLU
        + **467HeII (NB Blue)**
        + **486HIB (486CH4)**
        + **501OIII (NB Green)**
        + **540CNT (moderate 543CH4)**
        + **685NIR (CH4 reference)**
        + 807NIR – Detection threshold, possible moon detections
  + General code cleanup and consolidation
    - Astrophysical target data codes
    - Observational metadata codes
    - Observational data codes
    - Plot setup codes
    - **Start deleting organic spectroscopic and EW codes**
  + Photometry updates
    - **Numeric output**
    - Catalog data input
    - Response and transformation to standard filters
    - Variable stars and time series plots
    - Blackbody fit and Wein’s law temperature
  + Spectroscopy updates
    - **Make codes, including Vega and M57, more generic**
    - **Blackbody fit and Wein’s law temperature (new code)**
    - Spline fit for normalization (create class or generic routine)
    - Integration into EW Utils
    - **Line-based temperatures (H I and Na II)**
    - Consolidate EW plotting codes, e.g., EW vs line strength or N vs line strength (Jupiter and Vega…)
    - Balmer thermometer?
  + Jupiter spectroscopy and atmospheric vertical modeling – need to wrap up analysis at a clearly documented stopping point.
  + Should figure out what to do with individual star analyses, e.g., Vega, Castor
  + Galaxy composition gradient analysis
    - M31 Multispectral Analysis *ala* M33, M81, M101 etc.
    - Update M81 analysis with new narrowband data
  + Solar Eclipse Movies, ratio analysis, etc.
  + Questions for OPT
    - GoTo Mounts
    - Motorized Focuser

### 2020-Jan-04 (Jan-05 UT): M42 Narrowband including NB Continuum

Last Updated 1/5/2020

Transparency was excellent (4/5) and seeing was good (3/5). Ice started forming on the detector at -10C, so I reset the temperature to +1C. I took biases, darks, and - for the first time with the C11 - flats. (The next day I baked the desiccant plug at 450F for two hours.) All images were binned 2x2 to give a plate scale of about 1.1 arcsec-pix-1. FWHM is worst on the 467HeII images at about 4.7 arcsec (TBC). The other images are more like 3.5 arcsec (TBC).

|  |  |
| --- | --- |
|  |  |
| M42-20200105UT-467HeII-sum3m30s-Filtered-Log-HalfSize.jpg | M42-20200105UT-540CNT-sum3m30s-Filttered-Log-HalfSize.jpg |
|  |  |
| M42-20200105UT-486HIBsum3m50s-Filtered-Log-HalfSize.jpg | M42-20200105UT-501OIII-sum2m10s-Filtered-Log-HalfSize.jpg |
|  |  |
| M42-20200105UT-656HIA-sum3m30s-Filtered-Log-HalfSize.jpg | M42-20200105UT-501OIIILog-55pct486HIBLog-PureTest-HalfSize.jpg |

|  |  |
| --- | --- |
|  |  |
| M42-20200105UT-486HIBsum3m50s-PureTest-Log-HalfSize.jpg | M42-20200105UT-501OIII-sum2m10s-PureTest-Log-HalfSize.jpg |
|  |  |
| M42-20200105UT-PureConts-Log-HalfSize.jpg | M42-20200105UT-RGB-Pure(Cont-HIB-OIII)-HalfSize.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Jan-13 (Jan-14 UT): M33 Narrowband including NB Continuum

Last Updated 1/5/2020

Transparency was excellent (4/5) and seeing was good (3/5). I baked the desiccant and took flats (got the temperature down to -20C) on 2020-Jan-06UT.

**Note that I failed to update the file naming for the images tonight so they are labelled 20200106UT rather than 20200114UT.**

Need to note issues with possible use of “all” flats for each filter.

All images were calibrated *without* filtering for hot or dark pixels to better preserve photometric accuracy.

|  |  |
| --- | --- |
|  |  |
| M33-NGC604-20200106UT-XXX-RGB-486-540-501-log-HalfSize.jpg | M33-UNK-20200106UT-XXX-RGB-486-540-501-log-HalfSize.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Jan-14 (Jan-15 UT): M33 Narrowband including NB Continuum

Last Updated 1/5/2020

Transparency was excellent (4/5) and seeing was good (3/5). It appears that patchy clouds affected some of the later exposures, e.g., those on NGC588. When I shut down for the night, I saw some patchy clouds pretty far to the north, but nothing overhead or in any other direction, but in a few of the sub-exposures stars are significantly dimmed.

All images, except the 550OPN ones, were calibrated *without* filtering for hot or dark pixels to better preserve photometric accuracy.

|  |  |
| --- | --- |
|  |  |
| M33-NGC595-20200115UT-XXX-RGB-486-540-501-Log-HalfSize.jpg | M33-NGC588-20200115UT-XXX-RGB-486-540-501-Log-HalfSize.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Jan-15 (Jan-16 UT): M33 Narrowband including NB Continuum

Last Updated 1/5/2020

Transparency was excellent (4/5) and seeing was good (3/5).

|  |  |
| --- | --- |
|  |  |
| M33-UNKB-20200116UT-XXX-RGB-486-540-501-Log-HalfSize.jpg | M33-UNKC-20200116UT-XXX-RGB-486-540-501-Log-HalfSize.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Jan-18 (Jan-19 UT): M33 Narrowband including NB Continuum

Last Updated 1/5/2020

Transparency was excellent (4/5) and seeing was good (3/5).

|  |  |
| --- | --- |
|  |  |
| M33-NGC604-20200119UT-XXX-RGB-486-540-501-Log-HalfSize.jpg | M33-IC132-20200119UT-XXX-RGB-486-540-501-Log-Halfsize.jpg |
|  |  |
| M33-NGC604-20200119UT-550OPN-sum14m10s-Log-Halfsize.jpg | M33-IC132-20200119UT-550OPN-sum9m00s-Log-HalfSize.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Jan-19 (Jan-20 UT): M33 Narrowband including NB Continuum

Last Updated 1/5/2020

Transparency was excellent (4/5) and seeing was good (3/5).

|  |  |
| --- | --- |
|  |  |
| M33-NGC588-20200120UT-XXX-RGB-486-540-501-Log-HalfSize.jpg | M33-UNKC-20200120UT-XXX-RGB-486-540-501-Log-HalfSize.jpg |
|  |  |
| M33-NGC588-20200120UT-550OPN-sum6m20s-Log-HalfSize.jpg | M33-UNKC-20200120UT-550OPN-sum2m50s-BAD-Log-HalfSize.jpg |

|  |  |
| --- | --- |
|  |  |
| M33-UNKB-20200120UT-XXX-RGB-486-540-501-Log-HalfSize.jpg | M33-NGC595-20200120UT-XXX-RGB-486-540-501-Log-HalfSize.jpg |
|  |  |
| M33-UNKB-20200120UT-550OPN-sum7m20s-Log-HalfSize.jpg | M33-NGC595-20200120UT-550OPN-sum7m10s-Log-HalfSize.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Jan-23 (Jan-24 UT): Venus and Uranus Video

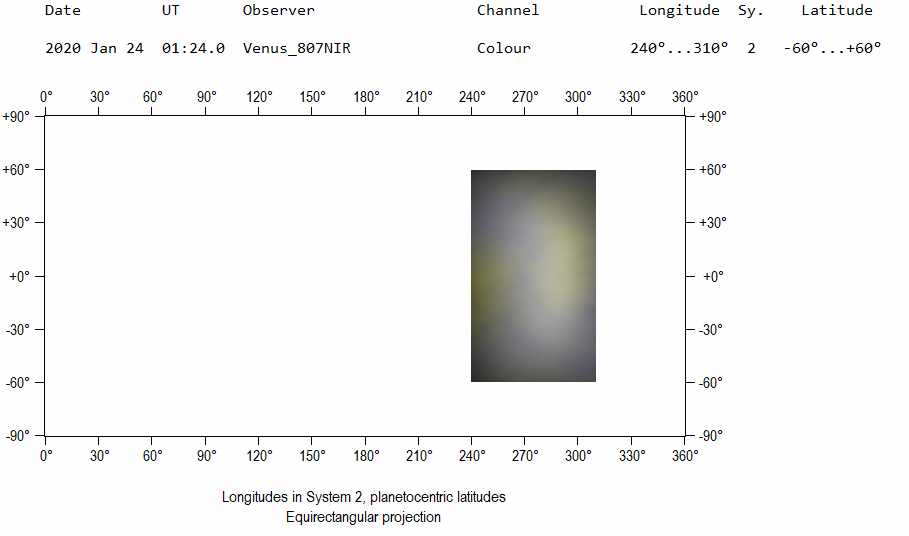
Last Updated 1/26/2020

Transparency was mixed (3/5) early with low clouds, but good later (4/5) after clearing. Seeing was very good (4/5) judging by the quality of the Uranus images.

**Venus**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-01-24-0051\_2-Venus\_380NUV.avi | 0.02 | 100 | 50 | 2 | 640x480 |
| 2020-01-24-0052\_8-Venus\_380NUV.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-01-24-0156\_0-Venus\_807NIR.avi | 0.003 | 50 | 50 | 2 | 640x480 |
| 2020-01-24-0158\_4-Venus\_380NUV\_DARK.avi | 0.02 | 100 | 50 | 2 | 640x480 |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-01-24-0156\_0-Venus\_807NIR-Stack400-Wavelets3x50-Cont60pct-Crop.png | 2020-01-24-0052\_0-Venus\_380NUV-Stack600-Wavelets3x10+4x20-Crop.png | 2020-01-24-0124\_0-Venus\_807NIR-380NUV-Wavelets-Crop.png |



2020-01-24-0124\_0-Venus\_807NIR-380NUV-MAP.png

For mapping in WinJUPOS, the plate scale was found to be 0.2634 arcsec-pix-1 and the rotation was found to be 354.69 deg.

**Uranus**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-01-24-0227\_6-Uranus\_685NIR.avi | 0.2 | 100 | 50 | 2 | 640x480 |
| 2020-01-24-0228\_9-Uranus\_685NIR.avi | 0.2 | 100 | 50 | 2 | 640x480 |
| 2020-01-24-0231\_6-Uranus\_450BLU.avi | 0.05 | 100 | 50 | 2 | 640x480 |
| 2020-01-24-0234\_4-Uranus\_467HeII.avi | 0.2 | 100 | 50 | 2 | 640x480 |
| 2020-01-24-0239\_2-Uranus\_807NIR.avi | 0.999 | 100 | 50 | 2 | 640x480 |
| 2020-01-24-0241\_9-Uranus\_685NIR.avi | 0.2 | 100 | 50 | 2 | 640x480 |
| 2020-01-24-0259\_7-Uranus\_Dark\_50ms.avi | 0.05 | 100 | 50 | 2 | 640x480 |
| 2020-01-24-0300\_2-Uranus\_Dark\_200ms.avi | 0.2 | 100 | 50 | 2 | 640x480 |
| 2020-01-24-0300\_8-Uranus\_Dark\_999ms.avi | 0.999 | 100 | 50 | 2 | 640x480 |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| 2020-01-24-0239\_2-Uranus\_807NIR-Stack50-Wavelets3x20-2x-Crop.jpg | 2020-01-24-0236\_4-Uranus\_685NIR-Stack315-Wavelets2x3+3x3-2x-Crop.jpg | 2020-01-24-0231\_6-Uranus\_450BLU-Stack600-Wavelets2x40+3x10-Cont60pct-2x-Crop.jpg | 2020-01-24-0234\_4-Uranus\_467HeII-Stack150-Wavelets3x20-2x-Crop.jpg |
|  |  |  |  |
| 2020-01-24-0235\_0-Uranus\_685NIR+807NIR-Stack365-Wavelets2x3+3x3-2x-Crop.jpg | 2020-01-24-0234\_0-Uranus\_685NIRminus40pct450BLU-2x-Crop.png | 2020-01-24-0234\_0-Uranus\_685NIRminus40pct450BLU-2x-Crop-PseudoColor-CapGrid.PNG |  |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

## February

### 2020-Feb-02 (Feb-03 UT): Venus and Moon Video

Last Updated 2/04/2020

Transparency was excellent (4/5) and seeing was very, very good (4+/5).

**Venus**

I took lots of video tonight and built images out of about the top 15% of frames. Seeing was very good. All binning was 1x1 except for 889CH4, 940NIR, and 380NUV. I could have gotten many more frames if I’d gone down to 320x240 sub-framing.

I captured detail in the NUV that is verified by images on JALPO taken about 6 and 12 hours earlier. I had hoped to capture NIR detail, but at best it is very low contrast and shows only large spatial scales.

I’ve tried a few processing techniques that need to be explored more thoroughly. First, I tried unsharp masking in MaximDL. That definitely brought out detail in the NUV and seemed not to over-enhance the limb. Second, I tried limb darkening correction in WinJUPOS. This seems to provide detail enhancement, but there appears to be no way to save the images other than making a map with them. Third, and I’ve done this before, dividing the NUV by the NIR images.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-02-03-0034\_7-Venus\_807NIR.avi | 0.004 | 50 | 50 | 1 | 640x480 |
| 2020-02-03-0036\_9-Venus\_807NIR.avi | 0.004 | 50 | 50 | 1 | 640x480 |
| 2020-02-03-0037\_9-Venus\_807NIR.avi | 0.004 | 50 | 50 | 1 | 640x480 |
| 2020-02-03-0040\_1-Venus\_889CH4.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-02-03-0042\_1-Venus\_889CH4.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-02-03-0044\_8-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-02-03-0046\_8-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-02-03-0049\_4-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 640x480 |
| 2020-02-03-0050\_5-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 640x480 |
| 2020-02-03-0058\_9-Venus\_380NUV.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-02-03-0059\_9-Venus\_380NUV.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-02-03-0101\_0-Venus\_380NUV.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-02-03-0102\_0-Venus\_380NUV.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-02-03-0103\_1-Venus\_380NUV.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-02-03-0104\_1-Venus\_380NUV.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-02-03-0105\_2-Venus\_380NUV.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-02-03-0106\_2-Venus\_380NUV.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-02-03-0107\_3-Venus\_380NUV.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-02-03-0108\_3-Venus\_380NUV.avi | 0.03 | 50 | 50 | 2 | 640x480 |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| 940  2020-02-03-0045\_8-Venus\_940NIR-Stack800-Wavelets2x15+3x10-2X-Derotated.png | 889  2020-02-03-0041\_1-Venus\_889CH4-Stack800-Wavelets3x20+4x10-Str0to128-Derotated.png | 807  2020-02-03-0036\_5-Venus\_807NIR-Stack1500-Wavelets2x20+3x10-Derotated.png | 685  2020-02-03-0050\_0-Venus\_685NIR-Stack1000-Wavelets3x20+4x20-Derotated.png |
|  |  |  |  |
| 380  2020-02-03-0103\_6-Venus\_380NUV-Stack3000-Wavelets3x40-Str0to128-2X-Wavelets5x20-Derotated.png | 380  2020-02-03-0103\_6-Venus\_380NUV-Stack3000-Wavelets3x40-Str0to128-2X-Wavelets5x20-Derotated-Unsharp.png | NUV/ALLNIR  2020-02-03-0053\_4-Venus\_NUVoverALLNIR-Derotated.png | RGB  2020-02-03-0050\_1-Venus-Hill-807-Synth-380-R(G)B.png |

**Moon**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Video File** | | **Exposure** | **Gain** | | | **Gamma** | | **Binning** | | **Capture Area** |
| 2020-02-03-0221\_1-Moon\_685NIR.avi  Posidonius | 0.015 | | | 50 | 50 | | 1 | | 1280x960 | |
| 2020-02-03-0222\_1-Moon\_685NIR.avi  Posidonius | 0.015 | | | 50 | 50 | | 1 | | 1280x960 | |
| 2020-02-03-0226\_8-Plato\_685NIR.avi  Plato | 0.03 | | | 50 | 50 | | 1 | | 1280x960 | |
| 2020-02-03-0227\_9-Plato\_685NIR.avi  Plato | 0.03 | | | 50 | 50 | | 1 | | 1280x960 | |
| 2020-02-03-0229\_7-Plato\_685NIR.avi  Montes Teneriffe | 0.03 | | | 50 | 50 | | 1 | | 1280x960 | |
| 2020-02-03-0230\_7-Plato\_685NIR.avi  Montes Teneriffe | 0.03 | | | 50 | 50 | | 1 | | 1280x960 | |
| 2020-02-03-0232\_5-Moon\_685NIR.avi  Archimedes | 0.03 | | | 50 | 50 | | 1 | | 1280x960 | |
| 2020-02-03-0234\_4-Moon\_685NIR.avi  Eratosthenes | 0.03 | | | 50 | 50 | | 1 | | 1280x960 | |
| 2020-02-03-0237\_0-Moon\_685NIR.avi  Copernicus | **0.05** | | | 50 | 50 | | 1 | | 1280x960 | |
| 2020-02-03-0239\_8-Moon\_685NIR.avi  Rupes Recta | 0.03 | | | 50 | 50 | | 1 | | 1280x960 | |
| 2020-02-03-0243\_2-Moon\_685NIR.avi  Pitatus | 0.03 | | | 50 | 50 | | 1 | | 1280x960 | |
| 2020-02-03-0246\_0-Moon\_685NIR.avi  Rima Hyginus | 0.03 | | | 50 | 50 | | 1 | | 1280x960 | |
| 2020-02-03-0247\_9-FlatWGradient\_685NIR.avi | 0.03 | | | 50 | 50 | | 1 | | 1280x960 | |

|  |  |
| --- | --- |
|  |  |
| POSIDONIUS  2020-02-03-0221\_6-Moon\_685NIR-Stack300-Crater-Wavelets2x30+3x20-Wavelets-HalfSize.jpg | PLATO  2020-02-03-0227\_3-Plato\_685NIR-Stack300-1pt-Wavelets2x30+3x20-Gam150pct-Wavelets-HalfSize.jpg |
|  |  |
| MONTES TENERIFFE  2020-02-03-0230\_2-Plato\_685NIR-Stack300-Wavelets2x20+3x20-Gam150pct-Wavelets-Gam-HalfSize.jpg | ARCHIMEDES  2020-02-03-0232\_5-Moon\_685NIR-Stack150-Wavelets2x30+3x30-HalfSize.png |
|  |  |
| ERATOSTHENES  2020-02-03-0234\_4-Moon\_685NIR-Stack150-Wavelets2x30+3x20-Crater-HalfSize.jpg | ERATOSTHENES  2020-02-03-0234\_4-Moon\_685NIR-Stack150-Mountain-Wavelets2x30+3x20-HalfSize.jpg |

|  |  |
| --- | --- |
|  |  |
| COPERNICUS  2020-02-03-0237\_0-Moon\_685NIR-Stack150-Wavelets2x30+3x20-Gam150pct-HalfSize.jpg | RUPES RECTA  2020-02-03-0239\_8-Moon\_685NIR-Stack150-Crater-Wavelets2x30+3x20-Gam150pct-HalfSize.jpg |
|  |  |
| PITATUS  2020-02-03-0243\_2-Moon\_685NIR-Stack150-Wavelets2x10+3x20-Gam150pct-HalfSize.jpg | RIMA HYGINUS  2020-02-03-0246\_0-Moon\_685NIR-Stack150-Crater-Wavelets2x30+3x20-HalfSize.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

## March

### 2020-Mar-05 (Mar-06 UT): Venus Video

Last Updated 3/05/2020

A very clear night with transparency 3.5/5 because there were a couple of contrails. Seeing was very good at 4/5.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| 2020-03-06-0144\_4-Venus\_940NIR-Derotated.png | 2020-03-06-0138\_3-Venus\_889CH4-Derotated.png | 2020-03-06-0133\_9-Venus\_807NIR-Derotated.png | 2020-03-06-0131\_0-Venus\_685NIR-Derotated.png |
|  |  |  |  |
| 2020-03-06-0117\_7-Venus\_380NUV-Derotated.png |  |  | RGB  2020-03-06-0128\_0-Venus-Hill-NUV-889-R(G)B.png |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-03-06-0110\_3-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-06-0112\_3-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-06-0114\_5-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-06-0116\_6-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-06-0118\_7-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-06-0120\_8-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-06-0123\_0-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-06-0125\_2-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-06-0130\_3-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-03-06-0130\_6-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-03-06-0131\_0-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-03-06-0131\_3-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-03-06-0131\_7-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-03-06-0132\_5-Venus\_807NIR.avi | 0.003 | 50 | 50 | 1 | 320x240 |
| 2020-03-06-0133\_0-Venus\_807NIR.avi | 0.003 | 50 | 50 | 1 | 320x240 |
| 2020-03-06-0133\_3-Venus\_807NIR.avi | 0.003 | 50 | 50 | 1 | 320x240 |
| 2020-03-06-0133\_6-Venus\_807NIR.avi | 0.003 | 50 | 50 | 1 | 320x240 |
| 2020-03-06-0134\_6-Venus\_807NIR.avi | 0.003 | 50 | 50 | 1 | 320x240 |
| 2020-03-06-0134\_9-Venus\_807NIR.avi | 0.003 | 50 | 50 | 1 | 320x240 |
| 2020-03-06-0135\_2-Venus\_807NIR.avi | 0.003 | 50 | 50 | 1 | 320x240 |
| 2020-03-06-0137\_2-Venus\_889CH4.avi | 0.003 | 50 | 50 | 1 | 320x240 |
| 2020-03-06-0138\_2-Venus\_889CH4.avi | 0.02 | 50 | 50 | 2 | 320x240 |
| 2020-03-06-0139\_3-Venus\_889CH4.avi | 0.02 | 50 | 50 | 2 | 320x240 |
| 2020-03-06-0141\_3-Venus\_940NIR.avi | 0.02 | 50 | 50 | 2 | 320x240 |
| 2020-03-06-0143\_4-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-06-0145\_4-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-06-0147\_5-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Mar-10 (Mar-11 UT): Venus Video

Last Updated 3/12/2020

A very clear night with transparency 3.5/5. Seeing was poor at 2/5, but I wanted to try out the 1000nm filter.

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-03-11-0103\_3-Venus\_1000NIR-Derotated.png | 2020-03-11-0108\_1-Venus\_807NIR-Derotated.png | 2020-03-11-0110\_5-Venus\_685NIR-Derotated.png |
|  |  |  |
| 2020-03-11-0121\_9-Venus\_380NUV-Derotated.png |  | 2020-03-11-0116\_2-Venus-Hill-NUV-685-R(G)B.png |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-03-11-0101\_6-Venus\_1000NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-03-11-0103\_6-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-03-11-0104\_7-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-03-11-0107\_6-Venus\_807NIR.avi | 0.005 | 50 | 50 | 1 | 640x480 |
| 2020-03-11-0108\_6-Venus\_807NIR.avi | 0.005 | 50 | 50 | 1 | 640x480 |
| 2020-03-11-0110\_0-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 640x480 |
| 2020-03-11-0111\_1-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 640x480 |
| 2020-03-11-0116\_7-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-11-0118\_7-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-11-0120\_8-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-11-0123\_0-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-11-0125\_1-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-11-0127\_2-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Mar-22 (Mar-23 UT): M42 – Narrow Band Reds

Last Updated 3/12/2020

A very clear night with transparency 4/5. Seeing was fair at 3/5.

Tons (six-ish) tiny satellites around Polaris through the polar alignment scope. Looked like little fish swimming around, some following each other. All were of identical brightness, a bit fainter than Polaris. This was during twilight, so I’m assuming these were Starlink satellites. Since the last launch was only four days prior, these were probably part of that batch before orbit raising was completed.

|  |  |
| --- | --- |
|  |  |
| M42-20200323UT-647CNT-sum3m30sLog-HalfSize.jpg | M42-20200323UT-656HIA-sum3m20s-Log-HalfSize.jpg |
|  |  |
| M42-20200323UT-658NII-sum2m40s-Log-HalfSize.jpg | M42-20200323UT-672SII-sum3m20s-log-HalfSize.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Mar-24 (Mar-25 UT): M42 – Narrow Band Reds

Last Updated 3/26/2020

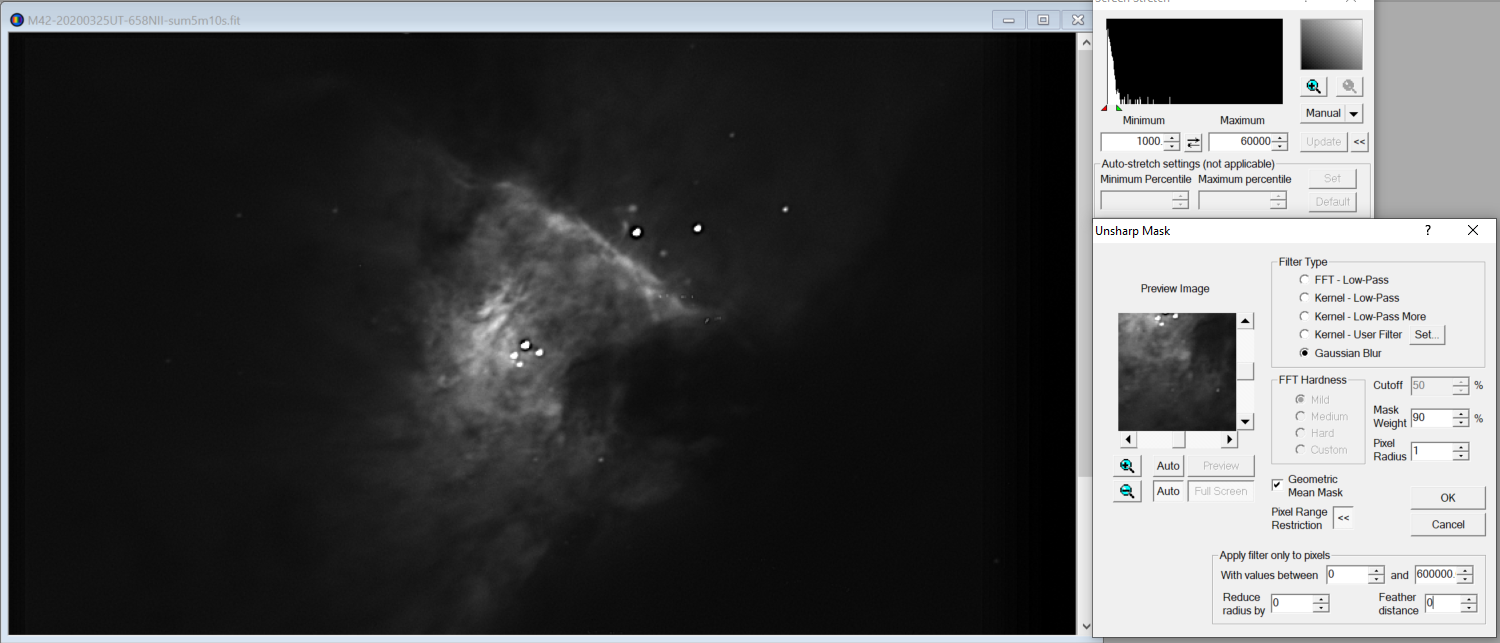
A clear night with transparency 3/5. Seeing was fair at 3/5.

|  |  |
| --- | --- |
|  |  |
| M42-20200325UT-647CNT-sum12m50s-log-HalfSize.jpg | M42-20200325UT-656HIA-sum5m10s-log-HalfSize.jpg |
|  |  |
| M42-20200325UT-658NII-sum5m10s-log-HalfSize.jpg | M42-20200325UT-672SII-sum11m10s-log-HalfSize.jpg |

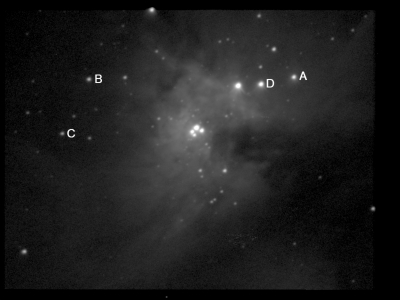
**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

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| --- | --- |
|  |  |
| M42-2020032XUT-647CNT-sum16m40s-Log-HalfSize.jpg | M42-2020032XUT-656HIA-sum8m30s-Log-HalfSize.jpg |
|  |  |
| M42-2020032XUT-658NII-sum7m50s-Log-HalfSize.jpg | M42-2020032XUT-672SII-sum14m30s-log-HalfSize.jpg |







M42-2020032XUT-647CNT-sum16m40s-Log-Annotated-HalfSize.jpg

### 2020-Mar-30 (Mar-31 UT): Venus and Sirius Video

Last Updated 3/12/2020

A clear night with transparency 4/5. Seeing was fair to good at 3/5.

**VENUS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-03-31-0217\_3-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-31-0219\_3-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-31-0221\_5-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-31-0223\_5-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-31-0228\_6-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-03-31-0234\_0-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-03-31-0235\_5-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-03-31-0236\_5-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-03-31-0237\_6-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-03-31-0235\_9-Venus\_1000NIR-Derotated.png | 2020-03-31-0229\_0-Venus-Hill-380(G)1000-R(G)B.png | 2020-03-31-0222\_0-Venus\_380NUV-Derotated.png |

**SIRIUS**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Video File** | | **Exposure** | | **Gain** | | **Gamma** | | **Binning** | **Capture Area** |
| 2020-03-31-0248\_7-Sirius\_807NIR.avi | | 0.005 | | 50 | | 100 | | 1 | 320x240 |
| 2020-03-31-0249\_0-Sirius\_807NIR.avi | | 0.005 | | 50 | | 100 | | 1 | 320x240 |
| 2020-03-31-0249\_3-Sirius\_807NIR.avi | | 0.005 | | 50 | | 100 | | 1 | 320x240 |
| 2020-03-31-0249\_7-Sirius\_807NIR.avi | | 0.005 | | 50 | | 100 | | 1 | 320x240 |
| 2020-03-31-0250\_7-Sirius\_807NIR.avi | | 0.005 | | 50 | | 100 | | 1 | 640x480 |
| 2020-03-31-0251\_7-Sirius\_807NIR.avi | | 0.005 | | 50 | | 100 | | 1 | 640x480 |
| 2020-03-31-0253\_7-Sirius\_807NIR.avi\* | | 0.05 | | 50 | | 100 | | 1 | 640x480 |
| 2020-03-31-0255\_6-Sirius\_807NIR.avi | | 0.1 | | 100 | | 100 | | 1 | 640x480 |
| 2020-03-31-0257\_8-Sirius\_685NIR.avi | | 0.02 | | 100 | | 100 | | 1 | 640x480 |
| 2020-03-31-0258\_8-Dark\_685NIR.avi | 0.02 | | 100 | | 100 | | 1 | | 640x480 |
| 2020-03-31-0303\_9-Sirius\_380NUV.avi | | 0.02 | | 100 | | 100 | | 2 | 640x480 |
| 2020-03-31-0304\_7-Dark\_380NUV.avi | 0.02 | | 100 | | 100 | | 2 | | 640x480 |
| 2020-03-31-0307\_6-Sirius\_380NUV.avi | 0.2 | | 100 | | 100 | | 2 | | 640x480 |
| 2020-03-31-0309\_0-Dark\_380NUV.avi | 0.2 | | 100 | | 100 | | 2 | | 640x480 |

Appears to be a switch in exposure from 0.05 to 0.1 in the middle. Stacked image is taken only from the longer exposures.

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-03-31-0249\_2-Sirius\_807NIR-Stack1200-Wavelets1x20+2x10-Wavelets2x5.png | 2020-03-31-0251\_2-Sirius\_807NIR-Stack600-Wavelets1x20+2x10.png | 2020-03-31-0254\_7-Sirius\_807NIR-Stack600-Wavelets3x10.png |
|  |  |  |
| 2020-03-31-0257\_8-Sirius\_685NIR-Stack2986.png | 2020-03-31-0303\_9-Sirius\_380NUV-Stack1500-Wavelets3x10.png | 2020-03-31-0307\_6-Sirius\_380NUV-Stack300-Wavelets3x10.png |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

## April

### 2020-Mar-31 (Apr-01 UT): Venus and Moon Video

Last Updated 3/05/2020

A clear night with transparency 4/5. Seeing was fair to good at 3/5.

**VENUS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-04-01-0127\_6-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0129\_8-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0131\_8-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0133\_9-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0136\_0-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0138\_3-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0140\_3-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0144\_0-Venus\_889CH4.avi | 0.025 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0145\_1-Venus\_889CH4.avi | 0.025 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0146\_2-Venus\_889CH4.avi | 0.025 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0147\_2-Venus\_889CH4.avi | 0.025 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0148\_3-Venus\_889CH4.avi | 0.025 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0150\_3-Venus\_889CH4.avi | 0.001 | 50 | 50 | 2 | 320x240 |
| 2020-04-01-0150\_6-Venus\_807NIR.avi | 0.001 | 50 | 50 | 2 | 320x240 |
| 2020-04-01-0150\_9-Venus\_807NIR.avi | 0.001 | 50 | 50 | 2 | 320x240 |
| 2020-04-01-0151\_2-Venus\_807NIR.avi | 0.001 | 50 | 50 | 2 | 320x240 |
| 2020-04-01-0151\_5-Venus\_807NIR.avi | 0.001 | 50 | 50 | 2 | 320x240 |
| 2020-04-01-0152\_3-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0153\_7-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0155\_7-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0157\_8-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0200\_0-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0204\_3-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0205\_5-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0206\_5-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0207\_6-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0208\_7-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0210\_5-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0216\_2-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0218\_4-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-01-0226\_2-Venus\_940NIR.avi | 0.1 | 50 | 50 | 1 | 1280x960 |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-04-01-0207\_2-Venus\_1000NIR--Derotated.png | 2020-04-01-0203\_6-Venus\_940NIR--Derotated.png | 2020-04-01-0146\_2-Venus\_889CH4-Derotated.png |
|  |  |  |
| 2020-04-01-0150\_9-Venus\_807NIR-Derotated.png | 2020-04-01-0134\_0-Venus\_380NUV-Derotated.png | 2020-04-01-0150\_6-Venus-Hill-380(G)1000-R(G)B.png |

**MOON**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-04-01-0230\_1-Moon\_685NIR.avi | 0.05 | 50 | 50 | 1 | 1280x960 |
| 2020-04-01-0232\_5-Moon\_685NIR.avi | 0.05 | 50 | 50 | 1 | 1280x960 |
| 2020-04-01-0235\_0-Moon\_685NIR.avi | 0.05 | 50 | 50 | 1 | 1280x960 |
| 2020-04-01-0237\_8-Moon\_685NIR.avi | 0.05 | 50 | 50 | 1 | 1280x960 |
| 2020-04-01-0240\_1-Moon\_685NIR.avi | 0.05 | 50 | 50 | 1 | 1280x960 |
| 2020-04-01-0251\_1-Apollo15\_685NIR.avi | 0.05 | 50 | 50 | 1 | 1280x960 |
| 2020-04-01-0253\_4-Apollo15\_685NIR.avi | 0.05 | 50 | 50 | 1 | 1280x960 |
| 2020-04-01-0255\_7-Apollo15\_685NIR.avi | 0.05 | 50 | 50 | 1 | 1280x960 |

|  |  |
| --- | --- |
|  |  |
| 2020-04-01-0235\_1-Moon-Mosaic-Alphonsus-Gam60pct-Unsharp-HalfSize.jpg | 2020-04-01-0253\_4-Apollo15\_685NIR\_Stach1150-Wavelets2x50+3x25-Gam150pct-Wavelets-HalfSize.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Apr-06 (Apr-07 UT): Venus Video

Last Updated 3/05/2020

A clear night with transparency 4/5. Seeing was fair to good at 3/5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-04-07-0124\_2-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0126\_2-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0128\_3-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0130\_5-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0132\_7-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0134\_3-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0136\_4-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0138\_5-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0143\_9-Venus\_1000NIR.avi | 0.015 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0145\_0-Venus\_1000NIR.avi | 0.015 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0146\_2-Venus\_1000NIR.avi | 0.015 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0147\_2-Venus\_1000NIR.avi | 0.015 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0149\_4-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0151\_6-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0155\_2-Venus\_889NIR.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0156\_3-Venus\_889NIR.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0157\_4-Venus\_889NIR.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0158\_4-Venus\_889NIR.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0159\_4-Venus\_889NIR.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-04-07-0206\_4-Venus\_807NIR.avi | 0.005 | 50 | 50 | 1 | 320x240 |
| 2020-04-07-0207\_5-Venus\_807NIR.avi | 0.005 | 50 | 50 | 1 | 320x240 |
| 2020-04-07-0207\_8-Venus\_807NIR.avi | 0.005 | 50 | 50 | 1 | 320x240 |
| 2020-04-07-0208\_1-Venus\_807NIR.avi | 0.005 | 50 | 50 | 1 | 320x240 |
| 2020-04-07-0208\_4-Venus\_807NIR.avi | 0.005 | 50 | 50 | 1 | 320x240 |
| 2020-04-07-0209\_2-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-04-07-0209\_5-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-04-07-0209\_9-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-04-07-0210\_2-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-04-07-0210\_8-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-04-07-0211\_1-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-04-07-0145\_6-Venus\_1000NIR-Derotated.png | 2020-04-07-0131\_2-Venus\_380NUV-Derotated.png | 2020-04-07-0138\_4-Venus-Hill-1000(G)380-R(G)B.png |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Apr-07 (Apr-08 UT): Venus Video

Last Updated 3/05/2020

A clear night with transparency 4/5. Seeing was fair to good at 3/5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-04-08-0130\_7-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0133\_3-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0136\_1-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0138\_4-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0140\_6-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0143\_2-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0147\_6-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0148\_8-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0150\_2-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0151\_4-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0153\_5-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0154\_9-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0201\_1-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0203\_5-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0208\_9-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0211\_2-Venus\_940NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-04-08-0222\_0-Venus\_807NIR.avi | 0.001 | 50 | 50 | 2 | 320x240 |
| 2020-04-08-0222\_8-Venus\_807NIR.avi | 0.001 | 50 | 50 | 2 | 320x240 |
| 2020-04-08-0223\_1-Venus\_807NIR.avi | 0.001 | 50 | 50 | 2 | 320x240 |
| 2020-04-08-0223\_9-Venus\_807NIR.avi | 0.001 | 50 | 50 | 2 | 320x240 |
| 2020-04-08-0224\_2-Venus\_807NIR.avi | 0.001 | 50 | 50 | 2 | 320x240 |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-04-08-0151\_1-Venus\_1000NIR-Derotated.png | 2020-04-08-0206\_2-Venus\_940NIR-Derotated.png | 2020-04-08-0223\_2-Venus\_807NIR-Derotated.png |
|  |  |  |
| 2020-04-08-0137\_0-Venus\_380NUV-Derotated.png | 2020-04-08-0144\_1-Venus-Hill-1000(G)380-R(G)B.png |  |

### 2020-Apr-20 (Apr-21 UT): Venus Imaging (ST2000XM)

Last Updated 3/05/2020

A clear night with transparency 4/5. Seeing was very good at 4/5 or better.

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-04-21-0239\_0-Venus-1000NIR-Derotated.png | 2020-04-21-0224\_0-Venus-940NIR-Derotated.png | 2020-04-21-0212\_0-Venus-889CH4-Derotated.png |
|  |  |  |
| 2020-04-21-0158\_0-Venus-380NUV-Derotated.png | 2020-04-21-0218\_5-Venus-Hill-1000(G)380-R(G)B-Sat200pct.png | 2020-04-21-0143\_0-Venus-1000NIR-5sec-Stack5.png |

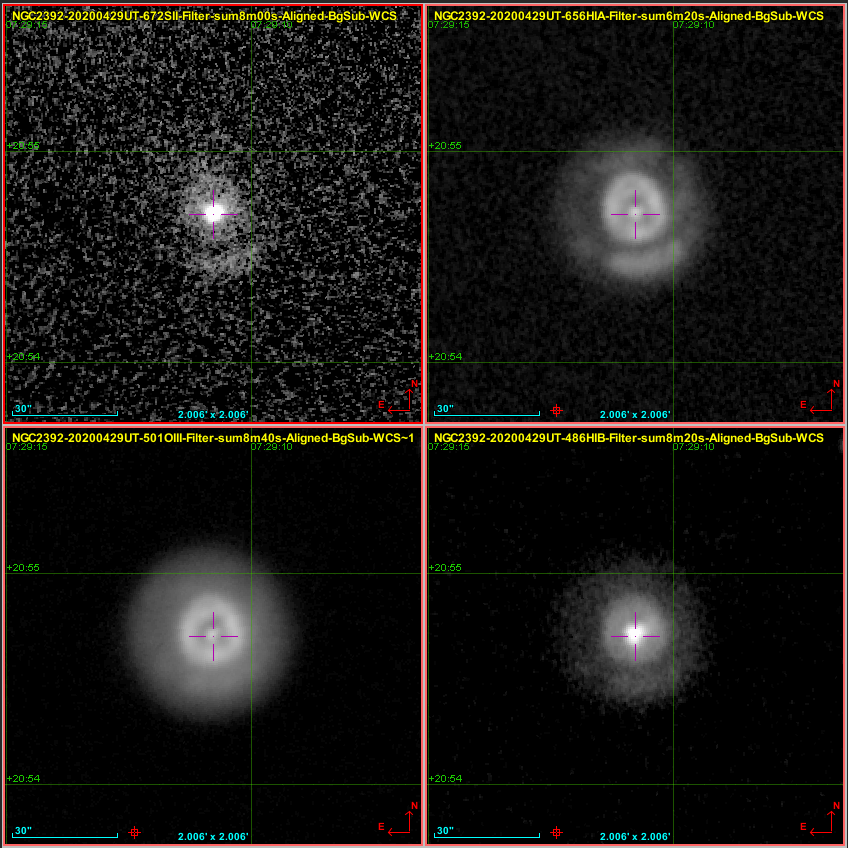
**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

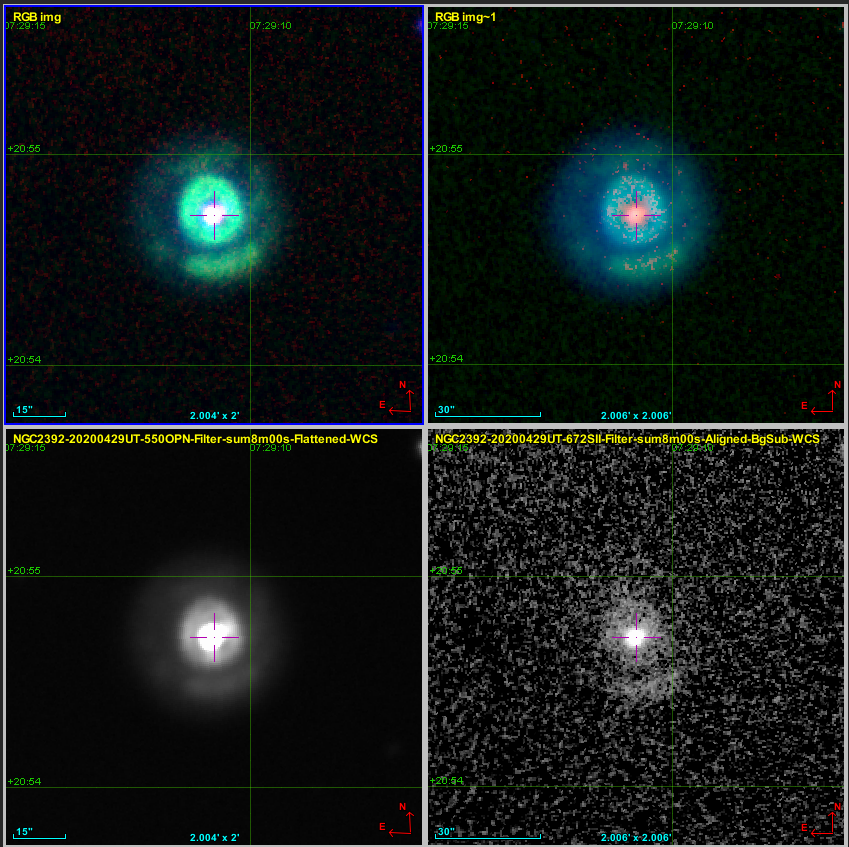
### 2020-Apr-28 (Apr-29 UT): NGC2932 – Eskimo Nebula (ST2000XM)

Last Updated 5/01/2020

A clear night with transparency 4/5. Seeing was very good at 4/5 or better. Got multispectral data (486HIB, 501OIII, 656HIA, and 672SII) images along with a 550CLR image.



NGC2392-20200429UT-2800mm-Narrowband-Log-2x2-2x2min.PNG

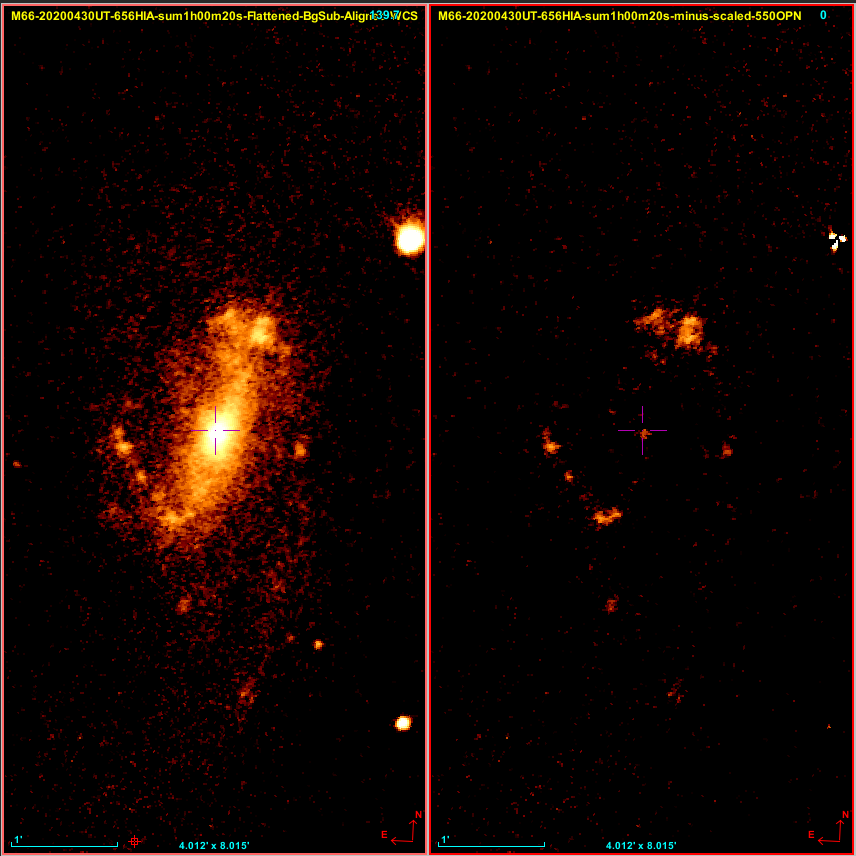
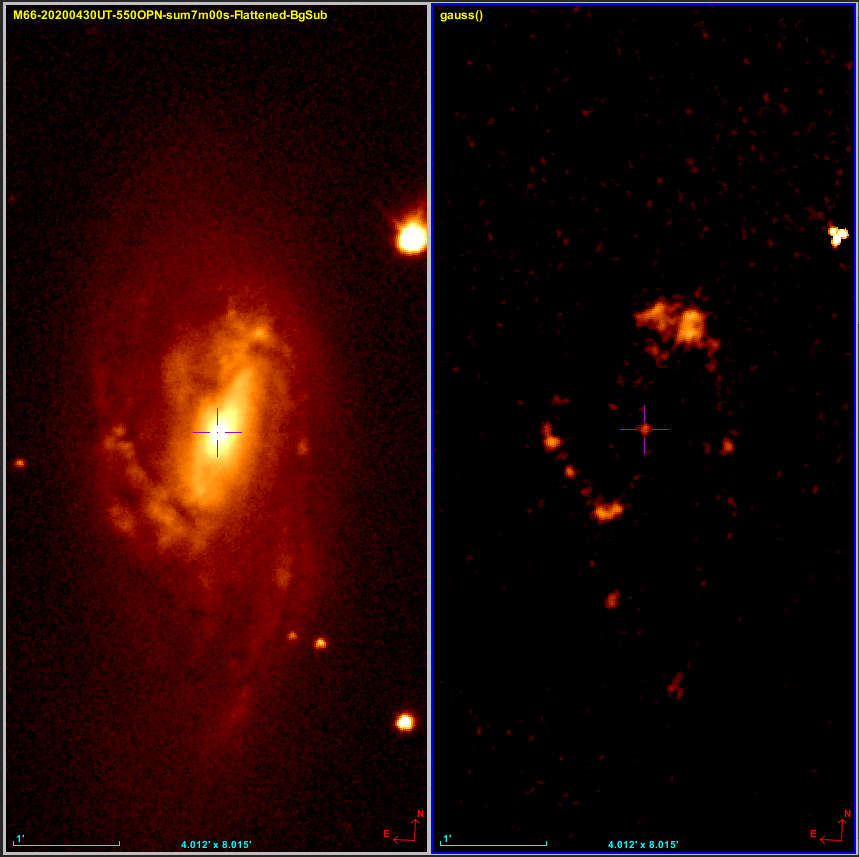


NGC2392-20200429UT-2800mm-NarrowbandRGB-Log-2x2-2x2min.PNG

### 2020-Apr-29 (Apr-30 UT): M66 Galaxy in Leo (ST2000XM)

Last Updated 3/05/2020

A clear night moderate transparency 3/5 degrading to poor 1/5 with high cirrus. Seeing was very good at 4/5 or better. Got 656HIA and 550CLR images. Transparency was poor enough that this cannot be used for photometric data. Maybe, just maybe it could be scaled if it were calibrated against HIA data taken on a truly clear night. I’d use the continuum emission from nearby stars and come up with a correction factor between the poor transparency conditions and good transparency conditions.

M66-20200430UT-2x1-4x8arcmin-656HIA-656HIA\_minus\_550OPN-Log.PNG

M66-20200430UT-2x1-4x8arcmin-550OPN-656HIA\_minus\_550OPN-Smth-Log.PNG

## May

### Spring 2020 Planning

* Observations – Astro twilight begins around
  + Galaxies
    - **2800mm FL**
      * M66 – no good guide stars
      * M109 – 9.24n guide star NORTH
      * NGC 3184 – 6.55m guide star WNW
      * NGC 3521 – 7.91 mag guide star
      * **M99 - 6.52m guide star**
      * M100 – 9.78m guide star
      * NGC 4216 – 8.84m guide star
      * M61 – 8.20m guide star
      * NGC 4536 7.52m guide star
      * NGC 4526 6.76m guide star
      * M89 elliptical – 8.95m guide star
      * M90 8.22m guide star
      * M88 9.38m guide star
      * NGC 4565 9.12m guide star
      * M94 9.61m guide star NORTH
      * NGC 5866, 7.69m guide star – unique spindle galaxy!
    - 2000mm FL
      * M51 7.06m guide star – **this was for 1260mm!**
      * NGC 4627 9.03m guide star
      * NGC 4710 8.58m guide star
      * NGC 4273 cluster 7.28m guide star
      * M60 9.17m guide star
      * NGC 3852 Group, 7.54m guide star
      * NGC 3432 9.21m guide star
      * NGC 3424 Group, 7.69m guide star
      * M101, 9.06m guide star WEST
      * NGC 5906(7?), 8.37m guide star
      * NGC 5965 & 5962, 8.16m guide star, beautiful pair!
      * Abell 2151 in Hercules, 6.75m guide star
      * Try 940NIR and 1000NIR for kicks for NIR stars?
  + Moon
    - Composition Filter Substitutions:
      * 380NUV instead of 415 nm
      * 672SII instead of 750 nm
      * 889CH4 instead of 900 nm
      * 940NIR instead of 950 nm
      * 1000NIR for 1000 nm
  + Planets
    - **Jupiter opposition July 14th**
    - **Saturn opposition July 20th**
    - **Mars opposition October 13th**
* Analysis
  + General code cleanup and consolidation
    - Astrophysical target data codes
    - Observational metadata codes
    - Observational data codes
    - Plot setup codes
    - **Start deleting organic spectroscopic and EW codes**
  + Photometry updates
    - **Numeric output**
    - Catalog data input
    - Response and transformation to standard filters
    - Variable stars and time series plots
    - Blackbody fit and Wein’s law temperature
  + Spectroscopy updates
    - **Make codes, including Vega and M57, more generic**
    - **Blackbody fit and Wein’s law temperature (new code)**
    - Spline fit for normalization (create class or generic routine)
    - Integration into EW Utils
    - **Line-based temperatures (H I and Na II)**
    - Consolidate EW plotting codes, e.g., EW vs line strength or N vs line strength (Jupiter and Vega…)
    - Balmer thermometer?
  + Jupiter spectroscopy and atmospheric vertical modeling – need to wrap up analysis at a clearly documented stopping point.
  + Should figure out what to do with individual star analyses, e.g., Vega, Castor
  + Galaxy composition gradient analysis
    - M31 Multispectral Analysis *ala* M33, M81, M101 etc.
    - Update M81 analysis with new narrowband data
  + Solar Eclipse Movies, ratio analysis, etc.
  + Questions for OPT
    - GoTo Mounts
    - Motorized Focuser

### 2020-May 07 (May-08 UT): M109 Galaxy in Ursa Major (ST2000XM)

Last Updated 3/05/2020

Having to recall back. I believe that the seeing was good 3/5 and transparency was good

|  |  |
| --- | --- |
|  |  |
| M109-20200508UT-550OPN-sum14m10s-Flattened-Log-HalfSize.jpg | M42-20200325UT-656HIA-sum5m10s-log-HalfSize.jpg |

### 2020-May-19 (May-20 UT): M109 Galaxy in Ursa Major (ST2000XM)

Last Updated 3/05/2020

A clear night moderate transparency 3/5 degrading to poor 1/5 with high cirrus. Seeing was very

|  |  |
| --- | --- |
|  |  |
| M109-20200520UT-550OPN-sum45m-Flattened-Log-HalfSize.jpg | M109-20200520UT-650RED-sum10m-2X-Flattened-Log-HalfSize.jpg |
|  |  |
| M109-20200520UT-550GRN-sum15m-2X-Flattened-HalfSize.jpg | M109-20200520UT-450BLU-sum15m-2X-Flattened-HalfSize.jpg |

### 2020-May-25 (May-26 UT): M109 Galaxy in Ursa Major (ST2000XM)

Last Updated 3/05/2020

A clear night moderate transparency 3/5 degrading to poor 1/5 with high cirrus. Seeing was very

|  |  |
| --- | --- |
|  |  |
| M109-20200526UT-550OPN-sum0h55m-Flattened-Log-HalfSize.jpg | M109-20200526UT-656HIA-sum1h10m-2X-Flattened-Log-HalfSize.jpg |
|  |  |
| M109-20200526UT-650RED-sum0h25m-2X-Flattened-Log-HalfSize.jpg | M109-20200526UT-550GRN-sum0h10m-2X-Flattened-Log-HalfSize.jpg |
|  |  |
| M109-20200526UT-450BLU-sum0h10m-2X-Flattened-Log-HalfSize.jpg |  |

### 2020-May-26 (May-27 UT): M109 Galaxy in Ursa Major (ST2000XM)

Last Updated 3/05/2020

A clear night moderate transparency 3/5 degrading to poor 1/5 with high cirrus. Seeing was very good 3.5/5.

Need to update this table

|  |  |
| --- | --- |
|  |  |
| M109-20200526UT-550OPN-sum0h55m-Flattened-Log.jpg | M109-20200526UT-656HIA-sum1h10m-2X-Flattened-Log.jpg |
|  |  |
| M109-20200526UT-650RED-sum0h25m-2X-Flattened-Log.jpg | M109-20200526UT-550GRN-sum0h10m-2X-Flattened-Log.jpg |
|  |  |
| M109-20200526UT-450BLU-sum0h10m-2X-Flattened-Log.jpg |  |

|  |  |
| --- | --- |
|  |  |
| M109-202005XXUT-550OPN-sum3h39m10s-Flattened-Log.jpg | M109-20200526UT-656HIA-sum1h10m-2X-Flattened-Log.jpg |
|  |  |
| M109-20200526UT-650RED-sum0h25m-2X-Flattened-Log.jpg | M109-20200526UT-550GRN-sum0h10m-2X-Flattened-Log.jpg |
|  |  |
| M109-20200526UT-450BLU-sum0h10m-2X-Flattened-Log.jpg | M109-202005XXUT-X50-L(R+H)GB-Cropped-Log-Gimp.png |

## June

### 2020-Jun-02 (Jun-03 UT): Lunar Mineralogy Imaging

Last Updated 3/05/2020

Patchy light cumulous clouds early, and some haze later. Transparency was 2/5, definitely non-photometric. Seeing was 3/5.

|  |  |
| --- | --- |
|  |  |
| 20200603UT-MoonMosaic-R(1000)G(672)B(380)-13-WhtBal-Sat200pct-HalfSize-QuarterSize.jpg | 20200603UT-MoonMosaic-Mafic-WhtBal-HalfSize-QuarterSize.jpg |
|  |  |
| 20200603UT-MoonMosaic-Mafic-WhtBal-HalfSize-QuarterSize.jpg |  |

### 2020-Jun-09 (Jun-10 UT): M51 – 550OPN and 656HIA

Last Updated 6/12/2020

Very clear with transparency of 4/5. Seeing was very bad (2/5) and it was windy. The wind negatively affected tracking with a number of exposures with jumps or “double” stars. I also discovered for extended (hours long) imaging periods, the C11 telescope focus degrades on time scales of 15-30 minutes. Thus, the images below are stacks of the best images and are of significantly shorter time than the overall imaging. The data not included in the images below still has photometric value as long as good resolution is not needed.

Guiding was on HD117815 to the east of M51.

|  |  |
| --- | --- |
|  |  |
| M51-20200610UT-550OPN-sum0h24m-Flattened-Log-HalfSize.jpg | M51-20200610UT-656HIA-sum2h00m-Log.jpg |

|  |  |  |
| --- | --- | --- |
| **Filter** | **Duration (min)** | **FWHM (arcsec)** |
| 550OPN | 18 | 3.89 |
|  | 24 | 3.90 |
| 656HIA | 120 | 6.81 |
|  | 238 | 7.09 |

FWHM was taken of GSC2.2 star N1303133379, the brightest star to the east of the companion galaxy NGC 5195.

### 2020-Jun-10 (Jun-11 UT): M51 – 550OPN, 486HIB, and 501OIII

Last Updated 6/18/2020

Seeing was much better and lower wind. Seeing ~ 3/5. Transparency 4/5.

|  |  |
| --- | --- |
|  |  |
| M51-20200611UT-550OPN-sum0h20m-Flattened-Log.jpg |  |
|  |  |
| M51-20200611UT-486HIB-sum1h00m-Flattened-Log.jpg | M51-20200611UT-501OIII-sum1h00m-Flattened-Log.jpg |

|  |  |  |
| --- | --- | --- |
| **Filter** | **Duration (min)** | **FWHM (arcsec)** |
| 550OPN | 20 | 6.29 |
| 486HIB | 60 | 9.80 |
|  | 108 | 11.11 |
| 501OIII | 60 | 9.84 |
|  | 106 | 11.21 |

### 2020-Jun-11 (Jun-12 UT): M51 – 550OPN, 685NIR, 656HIA

Last Updated 6/18/2020

Seeing ~ 3/5. Transparency 4/5.

|  |  |
| --- | --- |
|  |  |
| M51-20200612UT-550OPN-sum0h18m-Flattened-Log.jpg | M51-20200612UT-685NIR-sum1h00m-Flattened-Log.jpg |
|  |  |
| M51-20200612UT-656HIA-sum2h00m-Flattened-Log.jpg |  |

|  |  |  |
| --- | --- | --- |
| **Filter** | **Duration (min)** | **FWHM (arcsec)** |
| 550OPN | 18 | 4.29 |
| 685NIR | 20 | 7.11 |
|  | 60 | 8.82 |
| 656HIA | 120 | 7.65 |

### 2020-Jun-14 (Jun-15 UT): M51 – 550OPN, 685NIR, 656HIA

Last Updated 6/18/2020

Seeing ~ 3/5. Transparency 4/5.

|  |  |
| --- | --- |
|  |  |
| M51-20200615UT-685NIR-sum0h44m-Flattened-Log-HalfSize.jpg | M51-20200615UT-656HIA-sum0h44m-Flattened-Log-HalfSize.jpg |
|  |  |
| M51-20200612UT-656HIA-sum2h00m-Flattened-Log.jpg |  |

|  |  |  |
| --- | --- | --- |
| **Filter** | **Duration (min)** | **FWHM (arcsec)** |
| 685NIR | 31 | 4.98 |
|  | 44 | 5.23 |
| 656HIA | 44 | 4.23 |
| 486HIB | 40 | 4.21 |
| 501OIII | 42 | 4.31 |

### 2020-Jun-16 (Jun-17 UT): M51 – 467HeII, 540CNT, and 647CNT

Last Updated 6/18/2020

Seeing ~ 3/5. Transparency 2-3/5, hazy

|  |  |
| --- | --- |
|  |  |
| M51-20200617UT-647CNT-sum0h38m-Flattened-Log-HalfSize.jpg | M51-20200617UT-540CNT-62FL+38WF-sum1h01m-Flattened-Log-HalfSize.jpg |
|  |  |
| M51-20200617UT-467HeII-sum0h10m-HalfSize.jpg |  |

|  |  |  |
| --- | --- | --- |
| **Filter** | **Duration (min)** | **FWHM (arcsec)** |
| 647CNT | 38 | 7.197 |
| 540CNT | 61 | 5.343 |
| 467HeII | 10 | - |

Observing Notes:

* I got lost in finding M51. Didn’t recognize 24 CVn when it was in the field of view
* Was very hard to find a good focus for 647CNT and 540CNT simultaneously
* Sky was hazy with smoke from fires in Arizona, so non-photometric
* Accidentally set individual exposures to 20 sec rather than 120 sec for the 467 HeII

## July

### 2020-Jun-30 (Jul-01 UT): Configuration Change (no observations)

Last updated 7/1/2020

I changed the configuration of the telescope and camera for targeting planetary nebulae high-resolution video imaging. The new configuration is:

* Focal Length: 2000mm (C11 and reducer)
* Camera: ASI120MM
* Plate Scale: 0.361 arcsec-pix-1
* Filters: 550OPN, 450BLU, 550GRN, 650RED, 685NIR, 501OIII, 656HIA

Need to:

* Verify alignment on Telrad and finder scope on Moon
* Can try some true-color RGB images of the Moon
* Tune collimation prior to a high-resolution imaging campaign.

### Summer 2020 Planning

* Observations
  + Planetary Nebulae
    - NGC6543 – Rather hard to find with the C11 system. Probably need a computerized mount
      * High resolution (video) luminance, red, green, and blue imaging
      * High resolution (video) HIA, OIII, HIB, SII, NII, and HeII imaging
      * High resolution (video) NUV and NIR imaging
      * High resolution (video) continuum imaging 540 and 647
      * Narrowband emission line photometric measurement (ST2000XM and fl=2800mm) in HIA, OIII, HIB, SII, NII, and HeII along with continuum 540 and 647
    - M57
      * Improve SNR quantitative emission band images (and reference continua)
    - M27 Emission line images (quantitative)
      * Blue group (550CLR, 467HeII, 486HIB, 501OIII, 540CNT)
      * Red group (550CLR, 647CNT, 656HIA, 658NII, 672SII)
      * Reddening group (550CLR, 486HIB, 540CNT, 647CNT, 656HIA)
    - NGC7009 Emission line images (quantitative)
      * Blue group (550CLR, 467HeII, 486HIB, 501OIII, 540CNT)
      * Red group (550CLR, 647CNT, 656HIA, 658NII, 672SII)
      * Reddening group (550CLR, 486HIB, 540CNT, 647CNT, 656HIA)
  + Planets
    - COMET C/2020 F3 NEOWISE? 2nd Mag. Mid July?
      * Canon EOS imaging at 200mm FL for long tail RGB
      * ST2000XM with 135mm and other filters
        + 380NUV (CN)
        + 467HeII (C2 Δv=-1)
        + 486HIB (blue continuum mostly with a bit of C2 Δv=0)
        + 501OIII (slope of C2 Δv=0)
        + 505C2 (C2 Δv=0) New filter
        + 647CNT (red continuum)
    - **Jupiter opposition July 14th**
      * Full longitude coverage with video (R or 685, G, B)
      * Experimentation (video) with NH3 imaging (647CNT) compared to other 656HIA as a continuum reference
      * >1000nm video compared to 889, 940, and 807?
      * Quantitative observations of CH4 absorption (889/940)
      * Quantitative observations of NH3 absorption (647/656)
      * Rapid weather coverage RGB with video (3 or fewer Jovian days); supplement with online images)
      * Galilean moon albedo features
    - **Saturn opposition July 20th**
      * RGB+685NIR high resolution imaging
      * Explore CH4 using 889CH4, 940NIR, and 1000NIR
      * Titan photometry or spectroscopy, surface detection (889/940 + 1000? – Requires 16+ days
    - **Mars opposition October 13th**
      * Polar cap recession
      * Detailed albedo map and surface features
      * Dust & water clouds
      * Minerology in NIR – have to pick NIR bands
* Analysis
  + General code cleanup and consolidation
    - Astrophysical target data codes
    - Observational metadata codes
    - Observational data codes
    - Plot setup codes
    - **Start deleting organic spectroscopic and EW codes**
  + Photometry updates
    - **Numeric output**
    - Catalog data input
    - Response and transformation to standard filters
    - Variable stars and time series plots
    - Blackbody fit and Wein’s law temperature
  + Spectroscopy updates
    - **Make codes, including Vega and M57, more generic**
    - **Blackbody fit and Wein’s law temperature (new code)**
    - Spline fit for normalization (create class or generic routine)
    - Integration into EW Utils
    - **Line-based temperatures (H I and Na II)**
    - Consolidate EW plotting codes, e.g., EW vs line strength or N vs line strength (Jupiter and Vega…)
    - Balmer thermometer?
  + Jupiter spectroscopy and atmospheric vertical modeling – need to wrap up analysis at a clearly documented stopping point.
  + Should figure out what to do with individual star analyses, e.g., Vega, Castor
  + Galaxy composition gradient analysis
    - M31 Multispectral Analysis *ala* M33, M81, M101 etc.
    - Update M81 analysis with new narrowband data
  + Solar Eclipse Movies, ratio analysis, etc.
  + Questions for OPT
    - GoTo Mounts
    - Motorized Focuser

### 2020-Jul-01 (Jul-02 UT): Moon and Jupiter Video

Last updated 7/1/2020

Seeing was good 3/5, but transparency degraded to 1/5 with scattered clouds. Initially it was a bit hazy with a bright gibbous moon, maybe 3/5 at best

* I aligned the finder scope to the C11 using the Moon for rough alignment and rotated the detector so that it’s has a landscape orientation (1280x960 : E-W x N-S)
* Then I used Arcturus for finer alignment
* On Arcturus I was going to tune up the collimation, but with the star defocused, collimation looked very good already!
* I then played with the Bahtinov mask I got with the C11 for focusing. It worked very well! Has to be used on point sources
* I tried to find NGC6543 (Cat’s Eye), but with the bright sky and few nearby stars to navigate by. It might not be possible to find in Denver skies with the C11 without a computerized mount.
* I went back to the moon and imaged Plato, a nearby crater, and Clavius. It was very favorable libration for Plato.
* Then I saw Jupiter rising and took RGB and 685NIR images. Clouds were passing by and Jupiter was very low (~14 deg, airmass > 4), so quality is poor, and photometry is absent.
* Note that the best elevation and airmass during this apparition

**MOON**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-02-0412\_1-Moon\_685NIR.avi | 0.002 | 50 | 50 | 1 | 320x240 |
| 2020-07-02-0413\_6-Moon\_685NIR.avi | 0.002 | 50 | 50 | 1 | 320x240 |
| 2020-07-02-0416\_4-Moon\_685NIR.avi | 0.002 | 50 | 50 | 1 | 320x240 |

|  |  |
| --- | --- |
|  |  |
| 2020-07-02-0412\_1-Moon-Plato\_685NIR-Stack600-Wavelets1x50.png | 2020-07-02-0413\_6-Moon-JHerschel\_685NIR-Stack600-Wavelets1x50.png |
|  |  |
| 2020-07-02-0416\_4-Moon-Clavius\_685NIR-Stack600-Wavelets1x50.png |  |

**JUPITER**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-02-0447\_3-Jupiter\_685NIR.avi | 0.03 | 50 | 50 | 1 | 640x480 |
| 2020-07-02-0449\_0-Jupiter\_685NIR.avi | 0.005 | 50 | 50 | 1 | 320x240 |
| 2020-07-02-0450\_6-Jupiter\_650RED.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-02-0451\_2-Jupiter\_550GRN.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-02-0451\_8-Jupiter\_450BLU.avi | 0.01 | 50 | 50 | 1 | 320x240 |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-07-02-0449\_0-Jupiter\_685NIR-Derotated.png | 2020-07-02-0450\_6-Jupiter\_650RED-Derotated.png | 2020-07-02-0451\_2-Jupiter\_550GRN-Derotated.png |
|  |  |  |
| 2020-07-02-0451\_8-Jupiter\_450BLU-Derotated.png | 2020-07-02-0451\_2-Jupiter-RGB-WhtBal-Sat150pct-Smooth.png |  |

### 2020-Jul-05 (Jul-06 UT): Jupiter and Saturn Video

Last updated 7/1/2020

Seeing was very good 4/5 and transparency was very good 4/5.

**JUPITER**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-06-0456\_1-Jupiter-1000NIR.avi | 0.5 | 70 | 50 | 2 | 1280x960 |
| 2020-07-06-0458\_6-Jupiter\_1000NIR.avi | 0.5 | 70 | 50 | 2 | 1280x960 |
| 2020-07-06-0502\_0-Jupiter\_940NIR.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-06-0504\_1-Jupiter\_940NIR.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-06-0506\_5-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-06-0508\_6-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-06-0513\_0-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-06-0515\_7-Jupiter\_1000NIR.avi | 0.5 | 70 | 50 | 2 | 640x480 |
| 2020-07-06-0517\_8-Jupiter\_1000NIR.avi | 0.5 | 70 | 50 | 2 | 640x480 |
| 2020-07-06-0520\_3-Jupiter\_940NIR.avi | 0.999 | 100 | 50 | 2 | 640x480 |
| 2020-07-06-0522\_4-Jupiter\_940NIR.avi | 0.999 | 100 | 50 | 2 | 640x480 |
| 2020-07-06-0524\_7-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 640x480 |
| 2020-07-06-0526\_8-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 640x480 |
| 2020-07-06-0529\_5-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-06-0534\_3-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-06-0536\_7-Jupiter\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-06-0539\_7-Jupiter\_380NUV.avi | 0.5 | 100 | 50 | 2 | 640x480 |
| 2020-07-06-0541\_8-Jupiter\_380NUV.avi | 0.5 | 100 | 50 | 2 | 640x480 |
| 2020-07-06-0543\_7-Jupiter\_380NUV\_Dark\_Small.avi | 0.5 | 100 | 50 | 2 | 640x480 |
| 2020-07-06-0544\_6-Jupiter\_1000NIR\_Dark\_Small.avi | 0.5 | 70 | 50 | 2 | 640x480 |
| 2020-07-06-0545\_4-Jupiter\_1000NIR\_Dark\_Large.avi | 0.5 | 70 | 50 | 2 | 1280x960 |
| 2020-07-06-0546\_3-Jupiter\_889+940\_Dark\_Large.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-06-0547\_0-Jupiter\_889+940\_Dark\_Small.avi | 0.999 | 100 | 50 | 2 | 640x480 |
| 2020-07-06-0551\_8-Jupiter+Moon\_685NIR.avi | 0.05 | 50 | 50 | 2 | 1280x960 |

|  |  |
| --- | --- |
|  |  |
| 2020-07-06-0530\_8-Jupiter-sum-685-550-450-RGB-WhtBal-ClrSmth-Smth-Wavelets.png | 2020-07-06-0513\_5-Jupiter-sum-1000-940-685-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |
|  |  |
| 2020-07-06-0527\_4-Jupiter-sum-1000-550-380-RGB-WhtBal-ClrSmth-Smth-Wavelets.png | 2020-07-06-0530\_6-Jupiter-sum-889-550-380-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-07-06-0507\_1-Jupiter-1000NIR.png | 2020-07-06-0512\_2-Jupiter\_940NIR.png | 2020-07-06-0516\_6-Jupiter\_889CH4.png |
|  |  |  |
| 2020-07-06-0521\_3-Jupiter\_685NIR.png | 2020-07-06-0534\_3-Jupiter\_550GRN-Derotated.png | 2020-07-06-0536\_7-Jupiter\_450BLU-Derotated.png |
|  |  |  |
| 2020-07-06-0540\_8-Jupiter\_380NUV.png |  |  |

**SATURN**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-06-0558\_2-Saturn\_685NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-06-0600\_6-Saturn\_550GRN.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-06-0602\_8-Saturn\_450BLU.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-06-0608\_4-Saturn\_1000NIR.avi | 0.999 | 100 | 50 | 2 | 640x480 |
| 2020-07-06-0610\_5-Saturn\_1000NIR.avi | 0.999 | 100 | 50 | 2 | 640x480 |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-07-06-0609\_5-Saturn\_1000NIR-Derotated.png | 2020-07-06-0558\_2-Saturn\_685NIR-Derotated.png | 2020-07-06-0600\_6-Saturn\_550GRN-Derotated.png |
|  |  |  |
| 2020-07-06-0602\_8-Saturn\_450BLU-Derotated.png | 2020-07-06-0604\_3-Hill-Saturn-R(1000)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png | 2020-07-06-0600\_5-Hill-Saturn-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

### 2020-Jul-09 (Jul-09 UT): Comet NEOWISE (C/2020 F3)

Last updated 7/1/2020

Got up early to observe C/2020 F3 NEOWISE with the kids. Out of bed at about 4am. Clouds in the east initially blocked the view, but then cleared by about 0430. It was amazing to see the arc of the ecliptic marked by Jupiter, Saturn, Mars and Venus, along with the Moon.

I used the Canon EOS to take images at 100mm and 300mm focal lengths at F/5.6 and ISO 800. Computer control via MaximDL wouldn’t work (couldn’t find the camera), so I used the EOS control software. I also took images manually with the shutter button on the camera.

Image time tagging was problematic. The camera clock was off from MDT

Focusing was a bit difficult. Had to observe from the driveway *beneath* trees across the street. Later, as the sky brightened I was able to get some photos from the back of the garden in the backyard.

We had two pairs of 10x50 binoculars and Shira, Nathan, and Noah got up to see the comet. It was easy to the naked eye, including a few (3-ish) degrees of tail. In binoculars it was beautiful. The kids also saw Jupiter’s moons and Saturn’s oblateness due to the rings.

**Time offset:**

* **Camera 16:23:00**
* **Computer 12:32:44**
* **UT:18:32:44**

**20200709UT-NEOWISE-Filelist.xlsx**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Date** | **Time**  **(File write?)** | **Filename** | **FL**  **(mm)** | **Exp (s)** | **F/** | **ISO** | **Location** | **Target** | **Man/Comp** | **Quality** |
| 7/9/2020 | 8:14 AM | IMG\_4815.CR2 | 100 | 2 | 5.6 | 800 | Front | NEOWISE | Manual | A, A+B |
| 7/9/2020 | 8:14 AM | IMG\_4816.CR2 | 100 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Manual | A, A+B |
| 7/9/2020 | 8:15 AM | IMG\_4817.CR2 | 100 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Manual | B, A+B |
| 7/9/2020 | 8:15 AM | IMG\_4818.CR2 | 100 | 5.1873 | 5.6 | 800 | Front | NEOWISE | **Manual** | B, A+B |
| 7/9/2020 | 8:17 AM | IMG\_0001\_2.CR2 | 100 | 5.1873 | 5.6 | 800 | Front | NEOWISE | **Computer** | B, A+B |
| 7/9/2020 | 8:18 AM | IMG\_0002\_2.CR2 | 100 | 5.1873 | 5.6 | 800 | Front | NEOWISE | **Computer** | B, A+B |
| 7/9/2020 | 8:18 AM | IMG\_0003\_1.CR2 | 100 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer | Bad - mid slew |
| 7/9/2020 | 8:18 AM | IMG\_0004\_1.CR2 | 100 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer | A, A+B |
| 7/9/2020 | 8:18 AM | IMG\_0005\_1.CR2 | 100 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer | A, A+B |
| 7/9/2020 | 8:19 AM | IMG\_0006\_1.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:19 AM | IMG\_0007\_1.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:19 AM | IMG\_0008\_1.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:19 AM | IMG\_0009\_1.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:19 AM | IMG\_0010.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:20 AM | IMG\_0011.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:20 AM | IMG\_0012.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:20 AM | IMG\_0013.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:20 AM | IMG\_0014.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:20 AM | IMG\_0015.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:21 AM | IMG\_0016.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:23 AM | IMG\_0017.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:23 AM | IMG\_0018.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:23 AM | IMG\_0019.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:25 AM | IMG\_0001\_3.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:25 AM | IMG\_0002\_3.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:25 AM | IMG\_0003\_2.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:25 AM | IMG\_0004\_2.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:26 AM | IMG\_0005\_2.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:26 AM | IMG\_0006\_2.CR2 | 300 | 5.1873 | 5.6 | 800 | Front | NEOWISE | Computer |  |
| 7/9/2020 | 8:32 AM | IMG\_4819.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | Miss | Manual |  |
| 7/9/2020 | 8:32 AM | IMG\_4820.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | NEOWISE | Manual |  |
| 7/9/2020 | 8:32 AM | IMG\_4821.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | Tail? | Manual |  |
| 7/9/2020 | 8:32 AM | IMG\_4822.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | NEOWISE | Manual |  |
| 7/9/2020 | 8:32 AM | IMG\_4823.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | NEOWISE | Manual |  |
| 7/9/2020 | 8:33 AM | IMG\_4824.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | NEOWISE | Manual |  |
| 7/9/2020 | 8:33 AM | IMG\_4825.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | NEOWISE | Manual |  |
| 7/9/2020 | 8:33 AM | IMG\_4826.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | NEOWISE | Manual |  |
| 7/9/2020 | 8:33 AM | IMG\_4827.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | NEOWISE | Manual |  |
| 7/9/2020 | 8:34 AM | IMG\_4828.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | NEOWISE | Manual |  |
| 7/9/2020 | 8:34 AM | IMG\_4829.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | NEOWISE | Manual |  |
| 7/9/2020 | 8:34 AM | IMG\_4830.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | NEOWISE | Manual |  |
| 7/9/2020 | 8:34 AM | IMG\_4831.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | NEOWISE | Manual |  |
| 7/9/2020 | 8:35 AM | IMG\_4832.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | Stars | Manual |  |
| 7/9/2020 | 8:35 AM | IMG\_4833.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | Stars | Manual |  |
| 7/9/2020 | 8:35 AM | IMG\_4834.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | Stars | Manual |  |
| 7/9/2020 | 8:35 AM | IMG\_4835.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | Stars | Manual |  |
| 7/9/2020 | 8:36 AM | IMG\_4836.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | Stars | Manual |  |
| 7/9/2020 | 8:36 AM | IMG\_4837.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | Miss | Manual |  |
| 7/9/2020 | 8:36 AM | IMG\_4838.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | NEOWISE | Manual | Clouds |
| 7/9/2020 | 8:36 AM | IMG\_4839.CR2 | 100 | 5.1873 | 5.6 | 800 | Back | NEOWISE | Manual | Clouds |

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| 2020-07-09T08-18-02-Neowise-sum10s-100mm-Filtered-WhtBal-HalfSize-Unsharp-QuarterSize.jpg |
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| '2020-07-09T08-18-32-Neowise-10sec-100mm-Filtered-WhtBal-HalfSize-Unsharp-QuarterSize.jpg |
|  |
| 2020-07-09T08-21-57-Neowise-sum36s-300mm-Cropped-Flattened-WhtBal-HalfSize-ClrSmth-QuarterSize.jpg | 2020-07-09T08-23-25-Neowise-sum01m13s-300mm-Cropped-Flattened-WhtBal-ClrSmth-HalfSize-QuarterSize.jpg |

### 2020-Jul-09 (Jul-10 UT): Jupiter and Moons Video

Last updated 7/1/2020

Seeing was fair to poor 2.5/5 and transparency was good 3/5 with maybe a bit of haze.

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| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-10-0458\_0-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-10-0501\_7-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-10-0506\_0-Jupiter\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-10-0511\_6-Jupiter\_380NUV.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-10-0513\_7-Jupiter\_380NUV.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-10-0519\_1-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-10-0521\_2-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-10-0523\_7-Jupiter\_940NIR.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-10-0525\_8-Jupiter\_940NIR.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-10-0531\_0-Jupiter\_1000NIR.avi | 0.5 | 70 | 50 | 2 | 1280x960 |
| 2020-07-10-0533\_1-Jupiter\_1000NIR.avi | 0.5 | 70 | 50 | 2 | 1280x960 |
| 2020-07-10-0535\_0-Jupiter\_1000NIR\_Dark.avi | 0.5 | 70 | 50 | 2 | 1280x960 |
| 2020-07-10-0535\_6-Jupiter\_380NUV\_Dark.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-10-0536\_3-Jupiter\_889+940Dark.avi | 0.999 | 100 | 50 | 2 | 1280x960 |

Moons Recorded

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| **Video File** | **Io** | **Ganymede** |
| 2020-07-10-0458\_0-Jupiter\_685NIR.avi |  |  |
| 2020-07-10-0501\_7-Jupiter\_550GRN.avi |  |  |
| 2020-07-10-0506\_0-Jupiter\_450BLU.avi |  |  |
| 2020-07-10-0511\_6-Jupiter\_380NUV.avi | X | X |
| 2020-07-10-0513\_7-Jupiter\_380NUV.avi | ? | X |
| 2020-07-10-0519\_1-Jupiter\_889CH4.avi | X | X |
| 2020-07-10-0521\_2-Jupiter\_889CH4.avi | X | X |
| 2020-07-10-0523\_7-Jupiter\_940NIR.avi |  | X |
| 2020-07-10-0525\_8-Jupiter\_940NIR.avi | X | X |
| 2020-07-10-0531\_0-Jupiter\_1000NIR.avi | X | X |
| 2020-07-10-0533\_1-Jupiter\_1000NIR.avi | X | X |
| 2020-07-10-0535\_0-Jupiter\_1000NIR\_Dark.avi |  |  |
| 2020-07-10-0535\_6-Jupiter\_380NUV\_Dark.avi |  |  |
| 2020-07-10-0536\_3-Jupiter\_889+940Dark.avi |  |  |

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| 2020-07-10-0501\_9-Jupiter-R(685)GB-WhtBal-ClrSmth-Wavelets-Str0to128.png | 2020-07-10-0518\_3-Jupiter-1000-940-685-RGB-WhtBal-ClrSmth-Wavelets-Str0to128.png |
|  |  |
| 2020-07-10-0515\_5-Jupiter-1000-550-380-RGB-WhtBal-ClrSmth-Wavelets-Str0to128.png | 2020-07-10-0511\_5-Jupiter-889-550-380-RGB-WhtBal-ClrSmth-Wavelets-Str0to196.png |

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| 2020-07-10-0532\_0-Jupiter\_1000NIR-Derotated.png | 2020-07-10-0524\_8-Jupiter\_940NIR-Derotated.png | 2020-07-10-0520\_1-Jupiter\_889CH4-Derotated.png |
|  |  |  |
| 2020-07-10-0458\_0-Jupiter\_685NIR-Derotated.png | 2020-07-06-0534\_3-Jupiter\_550GRN-Derotated.png | 2020-07-10-0506\_0-Jupiter\_450BLU-Derotated.png |
|  |  |  |
| 2020-07-10-0512\_7-Jupiter\_380NUV-Derotated.png |  |  |

### 2020-Jul-12 (Jul-12 UT): Mars, Venus, and Moon Video

Last updated 7/21/2020

Seeing was fair to poor 2.5/5 and transparency was good 3/5 with maybe a bit of haze.

**MARS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-12-1030\_7-Mars\_380NUV.avi | 0.2 | 100 | 50 | 2 | 1280x960 |
| 2020-07-12-1033\_3-Mars\_380NUV.avi | 0.2 | 100 | 50 | 2 | 1280x960 |
| 2020-07-12-1036\_7-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-12-1039\_9-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-07-12-1043\_6-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-12-1044\_1-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-12-1044\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-12-1045\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-12-1049\_9-Mars\_889.avi | 0.2 | 50 | 50 | 2 | 640x480 |
| 2020-07-12-1053\_2-Mars\_940NIR.avi | 0.2 | 80 | 50 | 2 | 640x480 |
| 2020-07-12-1058\_4-Mars\_1000NIR.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-12-1100\_3-Mars\_940NIR\_Dark.avi | 0.2 | 80 | 50 | 2 | 640x480 |
| 2020-07-12-1101\_5-Mars\_380NUV\_Dark.avi | 0.2 | 100 | 50 | 2 | 1280x960 |

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| 2020-07-12-1042\_7-Mars-R(AllNIR)GB-RGB-Wavelets.png | 2020-07-12-1040\_3-Mars-R(685)GB-RGB-Wavelets.png | 2020-07-12-1053\_8-Mars-1000-940-889-RGB-WhtBal-Wavelets.png | 2020-07-12-1051\_5-Mars-All-NIR-Wavelets.png |

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| 2020-07-12-1058\_4-Mars\_1000NIR-Derotated.png | 2020-07-12-1053\_2-Mars\_940NIR-Derotated.png | 2020-07-12-1049\_9-Mars\_889-Derotated.png | 2020-07-12-1044\_4-Mars\_685NIR-Derotated.png |
|  |  |  |  |
| 2020-07-12-1039\_9-Mars\_550GRN-Derotated.png | 2020-07-12-1036\_7-Mars\_450BLU-Derotated.png | 2020-07-12-1033\_3-Mars\_380NUV-Derotated.png |  |

**VENUS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-12-1153\_5-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-12-1155\_5-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-12-1159\_0-Venus\_685NIR.avi | 0.001 | 50 | 50 | 1 | 640x480 |
| 2020-07-12-1200\_8-Venus\_889CH4.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-07-12-1203\_3-Venus\_940NIR.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-12-1205\_5-Venus\_940NIR.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-12-1208\_1-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-07-12-1209\_6-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |

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| 2020-07-12-1208\_9-Venus\_1000NIR-Derotated.png | 2020-07-12-1204\_4-Venus\_940NIR-Derotated.png | 2020-07-12-1200\_8-Venus\_889CH4-Derotated.png | 2020-07-12-1159\_0-Venus\_685NIR-Derotated.png |
|  |  |  |  |
| 2020-07-12-1154\_5-Venus\_380NUV-Derotated.png | 2020-07-12-1201\_7-Venus-Hill-380-(G)-1000-R(G)B-ColAlgn-WhtBal.png | 2020-07-12-1204\_7-Venus-Hill-1000-940-889-RGB-ColAlgn-WhtBal.png |  |

**MOON**

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| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-12-1219\_8-Moon\_Gassendi\_640NIR.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-07-12-1223\_2-Moon\_RupesRecti\_640NIR.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-07-12-1225\_9-Moon\_Aristarchus\_640NIR.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-07-12-1231\_1-Moon\_Plato\_640NIR.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-07-12-1233\_0-Moon\_Tenerife\_640NIR.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-07-12-1241\_4-Moon\_Schroter\_640NIR.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-07-12-1242\_6-Moon\_Schroter\_640NIR.avi | 0.015 | 50 | 50 | 1 | 640x480 |

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| 2020-07-12-1219\_8-Moon\_Gassendi\_640NIR-Stack750-SingleAlign-Wavelets2x50+3x50-Cont85pct-Brt-10-HalfSize.jpg | 2020-07-12-1223\_2-Moon\_RupesRecti\_640NIR-Stack750-SingleAlign-Wavelets2x50+3x50-Cont85pct-HalfSize.jpg |
|  |  |
| 2020-07-12-1225\_9-Moon\_Aristarchus\_640NIR-Stack750-SingleAlign-Wavelets2x50+3x10-HalfSize.jpg | 2020-07-12-1231\_1-Moon\_Plato\_640NIR-Stack750-SingleAlign-Wavelets2x50+3x10-HalfSize.jpg |
|  |  |
| 2020-07-12-1233\_0-Moon\_Tenerife\_640NIR-Stack750-Wavelets1x50+2x50-HalfSize.jpg | 2020-07-12-1241\_4-Moon\_Schroter\_640NIR-Stack750-Wavelets1x50+2x50-HalfSize.jpg |
|  |  |
| 2020-07-12-1242\_6-Moon\_Schroter\_640NIR-Stack750-Wavelets1x50+2x30-HalfSize.jpg |  |

### 2020-Jul-17 (Jul-17 UT): Mars, Venus, and Moon Video

Last updated 7/21/2020

Seeing was very good 4/5. Transparency was poor and variable 2/5 I think.

**MARS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-17-1045\_1-Mars\_685NIR.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-07-17-1046\_1-Mars\_685NIR.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-07-17-1047\_2-Mars\_685NIR.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-07-17-1048\_3-Mars\_685NIR.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-07-17-1052\_5-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 640x480 |
| 2020-07-17-1054\_6-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 640x480 |
| 2020-07-17-1056\_5-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-07-17-1057\_5-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-07-17-1101\_9-Mars\_380NUV.avi | 0.2 | 100 | 50 | 2 | 640x480 |
| 2020-07-17-1104\_0-Mars\_380NUV.avi | 0.2 | 100 | 50 | 2 | 640x480 |
| 2020-07-17-1109\_2-Mars\_1000NIR.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-17-1111\_3-Mars\_1000NIR.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-17-1115\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 640x480 |
| 2020-07-17-1116\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-17-1117\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-17-1117\_8-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-17-1118\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-17-1119\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-17-1119\_6-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-17-1155\_6-Mars\_380NUV\_Dark.avi | 0.2 | 100 | 50 | 2 | 640x480 |

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|  |  |  |  |
| 2020-07-17-1110\_2-Mars\_1000NIR-Derotated.png | 2020-07-17-1102\_5-Mars\_685NIR-Stacked-Derotated.png | 2020-07-17-1057\_0-Mars\_550GRN-Derotated.png | 2020-07-17-1053\_5-Mars\_450BLU-Derotated.png |
|  |  |  |  |
| 2020-07-17-1102\_9-Mars\_380NUV-Derotated.png | 2020-07-17-1052\_6-Mars-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets-Cont85pct.png |  |  |

**VENUS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-17-1126\_0-Venus\_380NUV.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-17-1128\_0-Venus\_380NUV.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-17-1132\_5-Venus\_1000NIR.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-07-17-1135\_4-Venus\_685NIR.avi | 0.002 | 50 | 50 | 1 | 320x240 |
| 2020-07-17-1135\_8-Venus\_685NIR.avi | 0.002 | 50 | 50 | 1 | 320x240 |

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| 2020-07-17-1131\_3-Venus-Hill-685(G)380-R(G)B-ColorAligned-Wavelets.png | 2020-07-17-1132\_5-Venus\_1000NIR-Derotated.png | 2020-07-17-1135\_6-Venus\_685NIR-Stacked-Derotated.png | 2020-07-17-1127\_0-Venus\_380NUV-Stacked-Derotated.png |

**MOON**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-17-1143\_4-Moon\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-17-1144\_5-Moon\_685NIR.avi | 0.05 | 50 | 50 | 1 | 1280x960 |
| 2020-07-17-1147\_6-Moon\_685NIR.avi | 0.05 | 50 | 50 | 1 | 1280x960 |
| 2020-07-17-1153\_4-Moon\_685NIR\_Flat.avi | 0.05 | 50 | 50 | 1 | 1280x960 |
| 2020-07-17-1153\_8-Moon\_685NIR\_Flat640.avi | 0.05 | 50 | 50 | 1 | 640x480 |

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| 2020-07-17-1143\_4-Moon-MonsRumker\_685NIR-Stack300-Wavelets3x10+4x10-HalfSize.jpg |
|  |
| 2020-07-17-1144\_5-Moon-MonsRumker\_685NIR-Stack200-Wavelets3x20+4x20-Str-HalfSize.jpg | 2020-07-17-1147\_6-Moon-Grimaldi+Riccioli\_685NIR-Stack200-Wavelets3x50+4x20-Cont70pct-HalfSize.jpg |

### 2020-Jul-19 (Jul-20 UT): Jupiter & Saturn Video (visual on NEOWISE)

Last updated 7/21/2020

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| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-20-0418\_9-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-20-0422\_5-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-20-0426\_4-Jupiter\_450BLU.avi | 0.08 | 50 | 50 | 1 | 640x480 |
| 2020-07-20-0430\_0-Jupiter\_647CNT.avi | 0.08 | 50 | 50 | 2 | 640x480 |
| 2020-07-20-0432\_4-Jupiter\_656HIA.avi | 0.08 | 50 | 50 | 2 | 640x480 |
| 2020-07-20-0435\_3-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-20-0440\_3-Jupiter\_380NUV.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-20-0442\_4-Jupiter\_380NUV.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-20-0445\_9-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-20-0448\_0-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-20-0450\_8-Jupiter\_685NIR\_Wide.avi | 0.01 | 100 | 50 | 2 | 1280x960 |
| 2020-07-20-0511\_8-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-20-0515\_3-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-20-0517\_6-Jupiter\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-20-0523\_4-Jupiter\_647CNT.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-20-0525\_7-Jupiter\_656HIA.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-20-0528\_6-Jupiter\_380NUV\_Dark.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-20-0530\_2-Jupiter\_889CH4\_Dark.avi | 0.999 | 100 | 50 | 2 | 1280x960 |

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|  |  |
| 2020-07-20-0447\_6-R(685)GB-RGB-WhtBal-ClrSmth-Wavelets.png | 2020-07-20-0457\_9-Jupiter-R(656)(G)B(647Smth)-R(G)B-WhtBal-ClrSmth-Smth-Sat400pct.png |
|  |  |
| 2020-07-20-0444\_1-Jupiter-R(685)GB(380)-WhtBal-ClrSmth-Smth-Wavelets.png | 2020-07-20-0445\_7-Jupiter-R(889)GB(380)-WhtBal-ClrSmth-Smth-Wavelets.png |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-07-20-0446\_9-Jupiter\_889CH4-Stacked-Derotated.png | 2020-07-20-0442\_0-Jupiter\_685NIR-SumDerotated.png | 2020-07-20-0459\_1-Jupiter\_656HIA.png |
|  |  |  |
| 2020-07-20-0456\_7-Jupiter\_647CNT.png | 2020-07-20-0448\_9-Jupiter\_550GRN-SumDerotated.png | 2020-07-20-0452\_0-Jupiter\_450BLU-SumDerotated.png |
|  |  |  |
| 2020-07-20-0441\_3-Jupiter\_380NUV-Stacked-Derotated.png |  |  |

Approach to qualitative NH3 distribution:

Less signal in will result in brighter regions in . However, these could be due to either increased NH3 concentration or due to longer absorption path length. To compensate for this we create an indicator of relative cloud height:

Or conversely path length:

Qualitatively the NH3 concentration is:

**SATURN**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-20-0457\_7-Saturn\_685NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-20-0500\_3-Saturn\_550GRN.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-20-0504\_1-Saturn\_450BLU.avi | 0.05 | 50 | 50 | 2 | 640x480 |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-07-20-0457\_7-Saturn\_685NIR-Derotated.png | 2020-07-20-0500\_3-Saturn\_550GRN-Derotated.png | 2020-07-20-0504\_1-Saturn\_450BLU-Derotated.png |
|  |  |  |
| 2020-07-20-0500\_7-Hill-Saturn-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |  |  |

Seeing was fair to poor 2.5/5 and transparency was good 3/5 with maybe a bit of haze.

Noam came over

### 2020-Jul-20 (Jul-21 UT): NEOWISE Imaging

Last updated 7/21/2020

Seeing was fair to poor 2.5/5 and transparency was good 3/5 with maybe a bit of haze.

Noam came over

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Position | Type | Filter Actual | Filter Recorded | Exposure (s) | Signal (DN/s) | Confidence in Filter (1-3) |
| 1 | Cont | 672SII? | 505C2 | 72 | 2.53e5 |  |
| 2 | Cont | 486HIB? | 672SII | 60 | 1.98e6 |  |
| 3 | C2 (slight) | 540CNT? | 486HIB | 63 | 5.18e5 |  |
| 4 | C2 | 467HeII? | 540CNT | 30 | 1.95e6 |  |
| 5 | C2 | **505C2** | 467HeII | 54 | 6.17e6 | 1 |

### 2020-Jul-28 (Jul-29 UT): Jupiter and Saturn Video

Last updated 7/21/2020

**JUPITER**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-29-0345\_4-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-29-0350\_4-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-29-0354\_8-Jupiter\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-29-0359\_7-Jupiter\_380NUV.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-29-0401\_8-Jupiter\_380NUV.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-29-0406\_2-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-29-0408\_2-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-29-0412\_3-Jupiter\_656HIA.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-29-0414\_6-Jupiter\_647CNT.avi | 0.1 | 50 | 50 | 2 | 640x480 |

|  |  |
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|  |  |
| 2020-07-29-0350\_2-R(685)GB-RGB-WhtBal-ColSmth-Smth-Wavelets.png | 2020-07-29-0413\_4-R(656)GB(647)-R(G)B-WhtBal-ColSmth-Smth-Sat400pct-Wavelets.png |
|  |  |
| 2020-07-29-0352\_2-Jupiter-685-550-380-RGB-WhtBal-ClrSmth-Smth-Wavelets.png | 2020-07-29-0359\_5-889-550-380-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-07-29-0407\_2-Jupiter\_889CH4-Stacked-Derotated.png | 2020-07-20-0442\_0-Jupiter\_685NIR-SumDerotated.png | 2020-07-29-0412\_3-Jupiter\_656HIA-Derotated.png |
|  |  |  |
| 2020-07-29-0414\_6-Jupiter\_647CNT-Derotated.png | 2020-07-29-0350\_4-Jupiter\_550GRN-Derotated.png | 2020-07-29-0354\_8-Jupiter\_450BLU-Derotated.png |
|  |  |  |
| 2020-07-29-0400\_7-Jupiter\_380NUV-Stacked-Derotated.png | 2020-07-29-0404\_1-Jupiter\_647CNT-647+656+685-Wavelets.png |  |

**SATURN**

Might be the first time I’ve ever imaged Iapetus!

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-29-0431\_6-Saturn\_Moons\_685NIR.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-29-0439\_4-Saturn\_685NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-29-0441\_6-Saturn\_685NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |

|  |  |
| --- | --- |
|  |  |
| 2020-07-29-0440\_5-Saturn\_685NIR-Derotated.png | 2020-07-29-0431\_6-Saturn\_Moons\_685NIR-Stack197-Wavelets2x20+3x30-Gam150pct-Derotated-Annotated.png |

### 2020-Jul-29 (Jul-29 UT): Mars Video

Last updated 7/21/2020

Need to add observing conditions here…

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-29-1050\_9-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-29-1051\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-29-1052\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-29-1052\_6-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-29-1055\_4-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-07-29-1056\_5-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-07-29-1100\_9-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 320x240 |
| 2020-07-29-1103\_1-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-07-29-1106\_0-Mars\_380NUV.avi | 0.2 | 100 | 50 | 2 | 1280x960 |
| 2020-07-29-1108\_2-Mars\_380NUV.avi | 0.2 | 100 | 50 | 2 | 1280x960 |
| 2020-07-29-1112\_4-Mars\_889CH4.avi | 0.2 | 50 | 50 | 2 | 640x480 |
| 2020-07-29-1114\_5-Mars\_889CH4.avi | 0.2 | 50 | 50 | 2 | 640x480 |
| 2020-07-29-1117\_8-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-29-1118\_4-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-29-1118\_9-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-29-1119\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-29-1120\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-07-29-1126\_2-Mars\_Dark\_380NUV.avi | 0.2 | 100 | 50 | 1 | 1280x960 |

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| --- | --- | --- | --- |
|  |  |  |  |
| 2020-07-29-1113\_5-Mars\_889CH4-Derotated.png | 2020-07-29-1105\_4-Mars\_685NIR-Stack6750-Derotated.png | 2020-07-29-1056\_0-Mars\_550GRN-Derotated.png | 2020-07-29-1102\_0-Mars\_450BLU-Derotated.png |
|  |  |  |  |
| 2020-07-29-1107\_1-Mars\_380NUV-Derotated.png | 2020-07-29-1101\_1-Mars-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |  |  |

### 2020-Jul-29 (Jul-30 UT): Jupiter Video

Last updated 7/21/2020

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-30-0442\_1-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-30-0444\_2-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-30-0448\_2-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-30-0450\_3-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-30-0452\_6-Jupiter\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-30-0454\_7-Jupiter\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-30-0457\_4-Jupiter\_380NUV.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-30-0459\_4-Jupiter\_380NUV.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-30-0503\_5-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-30-0505\_5-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-30-0507\_6-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-30-0511\_9-Jupiter\_647CNT.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-30-0514\_0-Jupiter\_647CNT.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-30-0516\_3-Jupiter\_656HIA.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-30-0518\_4-Jupiter\_656HIA.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-30-0520\_4-Jupiter\_656HIA.avi | 0.1 | 50 | 50 | 2 | 640x480 |

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| --- | --- |
|  |  |
| 2020-07-30-0448\_7-Jupiter-R(685)GB-RGB-WhtBal-ClrSmth-Wavelets.png | 2020-07-30-0515\_7-Jupiter-R(656)(G)B(647)-R(G)B-WhtBal-ColSmth-Smth-Sat400pct.png |
|  |  |
| 2020-07-30-0450\_3-Jupiter-685-550-380-RGB-WhtBal-ClrSmth-Smth-Wavekets.png | 2020-07-30-0457\_7-Jupiter-R(889)G(550)B(380)-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-07-30-0505\_5-Jupiter\_889CH4-Stacked-Derotated.png | 2020-07-30-0443\_2-Jupiter\_685NIR-Stacked-Derotated.png | 2020-07-30-0518\_4-Jupiter\_656HIA-Stacked-Detrotated.png |
|  |  |  |
| 2020-07-30-0512\_9-Jupiter\_647CNT-Stacked-Derotated.png | 2020-07-30-0449\_2-Jupiter\_550GRN-Stacked-Derotated.png | 2020-07-30-0453\_6-Jupiter\_450BLU-Stacked-Derotated.png |
|  |  |  |
| 2020-07-30-0458\_4-Jupiter\_380NUV-Stacked-Derotated.png | 2020-07-30-0504\_8-Jupiter-685+656+647-Wavelets.png |  |

### 2020-Jul-30 (Jul-31 UT): Jupiter and Saturn Video

Last updated 7/21/2020

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-31-0414\_6-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-31-0416\_7-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-31-0420\_6-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-31-0423\_0-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-31-0425\_3-Jupiter\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-31-0427\_4-Jupiter\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-07-31-0431\_8-Jupiter\_380NUV.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-31-0433\_8-Jupiter\_380NUV.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-31-0435\_9-Jupiter\_380NUV.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-31-0440\_9-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-31-0442\_9-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-31-0445\_1-Jupiter\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |
| 2020-07-31-0447\_5-Jupiter\_647NH3.avi | 0.1 | 50 | 50 | 2 | 1280x960 |
| 2020-07-31-0449\_0-Jupiter\_647NH3.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-31-0451\_1-Jupiter\_647NH3.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-31-0453\_5-Jupiter\_647NH3.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-31-0455\_8-Jupiter\_656HIA.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-31-0457\_9-Jupiter\_656HIA.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-31-0500\_1-Jupiter\_656HIA.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-31-0531\_7-Jupiter\_Dark\_380NUV.avi | 0.5 | 100 | 50 | 2 | 1280x960 |
| 2020-07-31-0532\_4-Jupiter\_Dark\_889CH4.avi | 0.999 | 100 | 50 | 2 | 1280x960 |

|  |  |
| --- | --- |
|  |  |
| 2020-07-31-0421\_3-Jupiter-R(685)GB-RGB-WhtBal-ClrSmth-Wavelets.png | 2020-07-31-0454\_1-Jupiter-R(656)(G)B(647)-R(G)B-WhtBal-ColSmth-Smth-Sat400pct-Wavelets.png |
|  |  |
| 2020-07-31-0423\_8-Jupiter-685-550-380-RGB-WhtBal-ClrSmth-Smth-Wavelets.png | 2020-07-31-0432\_9-Jupiter-R(889)G(550)B(380)-RGB-WhtBal-ColSmth-Smth-Wavelets.png |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-07-31-0443\_0-Jupiter\_889CH4-Stacked-Derotated.png | 2020-07-31-0415\_6-Jupiter\_685NIR-Stacked-Derotated.png | 2020-07-31-0457\_9-Jupiter\_656HIA-Stacked-Derotated.png |
|  |  |  |
| 2020-07-31-0450\_3-Jupiter\_647NH3-Stacked-Derotated.png | 2020-07-31-0421\_8-Jupiter\_550GRN-Stacked-Derotated.png | 2020-07-31-0426\_4-Jupiter\_450BLU-Stacked-Derotated.png |
|  |  |  |
| 2020-07-31-0433\_8-Jupiter\_380NUV-Stacked-Derotated.png | 2020-07-31-0441\_3-Jupiter-685+656+647-Wavelets.png |  |

**SATURN**

Rhea is just visible. Also looks like the hexagon might be visible.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-07-31-0508\_6-Saturn\_685NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-31-0510\_8-Saturn\_685NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-31-0512\_9-Saturn\_685NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-31-0517\_9-Saturn\_550GRN.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-31-0520\_0-Saturn\_550GRN.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-31-0522\_1-Saturn\_550GRN.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-07-31-0524\_7-Saturn\_450BLU.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-31-0526\_9-Saturn\_450BLU.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-07-31-0529\_1-Saturn\_450BLU.avi | 0.1 | 50 | 50 | 2 | 640x480 |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-07-31-0510\_8-Saturn\_685NIR-Derotated.png | 2020-07-31-0520\_0-Saturn\_550GRN-Derotated.png |
|  |  |
| 2020-07-31-0526\_9-Saturn\_450BLU-Derotated.png | 2020-07-31-0519\_2-Hill-Saturn-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets-Str0to192.png | 2020-07-31-0519\_2-Saturn\_Luminance-Log-Annotated.png |

## August

### 2020-Aug-08 (Aug-09 UT): Jupiter Video

Last updated 7/21/2020

Lost Jupiter in low clouds. Couldn’t get a second BLU video. Seeing 3/5. Transparency 1-2/5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-08-09-0403\_6-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-08-09-0405\_6-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-08-09-0409\_8-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-08-09-0411\_8-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-08-09-0414\_2-Jupiter\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |

|  |  |
| --- | --- |
|  |  |
| 2020-08-09-0404\_6-Jupiter\_685NIR-Stacked-Derotated.png | 2020-08-09-0410\_8-Jupiter\_550GRN-Stacked-Derotated.png |
|  |  |
| 2020-08-09-0414\_2-Jupiter\_450BLU-Derotated.png | 2020-08-09-0409\_9-Jupiter-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

### 2020-Aug-09 (Aug-09 UT): Mars & Moon Video

Last updated 7/21/2020

Scattered clouds. Couldn’t get Venus. Some of Mars is very non-photometric. Transparency 2/5. Seeing 4/5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-08-09-1057\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-08-09-1057\_6-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-08-09-1058\_1-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-08-09-1058\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-08-09-1100\_1-Mars\_550GNR.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-08-09-1101\_1-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-08-09-1103\_9-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 320x240 |
| 2020-08-09-1108\_0-Mars\_380NUV.avi | 0.2 | 100 | 50 | 2 | 640x480 |
| 2020-08-09-1110\_1-Mars\_380NUV.avi | 0.2 | 100 | 50 | 2 | 640x480 |
| 2020-08-09-1113\_3-Mars\_647CNT.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-08-09-1115\_0-Mars\_656HIA.avi | 0.03 | 50 | 50 | 2 | 640x480 |
| 2020-08-09-1117\_4-Mars\_889CH4.avi | 0.2 | 50 | 50 | 2 | 640x480 |
| 2020-08-09-1119\_5-Mars\_889CH4.avi | 0.2 | 50 | 50 | 2 | 640x480 |
| 2020-08-09-1121\_4-Mars\_380NUV\_Dark.avi | 0.2 | 100 | 50 | 2 | 640x480 |
| 2020-08-09-1126\_2-Mars\_380NUV\_Dark.avi | 0.02 | 50 | 50 | 1 | 1280x960 |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| 2020-08-09-1118\_4-Mars\_889CH4-Derotated.png | 2020-08-09-1057\_9-Mars\_685NIR-Derotated.png | 2020-08-09-1113\_9-Mars\_647CNT+656HIA-Derotated.png | 2020-08-09-1100\_6-Mars\_550GRN-Derotated.png |
|  |  |  |  |
| 2020-08-09-1103\_9-Mars\_450BLU-Derotated.png | 2020-08-09-1109\_0-Mars\_380NUVStack400-Derotated.png | 2020-08-09-1100\_8-Mars-R(685)GB-RGB-WhtBal-ClrSmth-Smth-RGB-Realigend-Wavelets.png |  |

### 2020-Aug-10 (Aug-11 UT): Jupiter Video

Last updated 7/21/2020

Heavy haze and smoke. Transparency 1/5. Seeing 3/5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-08-11-0351\_8-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-08-11-0353\_8-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-08-11-0403\_2-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-08-11-0405\_3-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-08-11-0409\_3-Jupiter\_450BLU.avi | 0.1 | 50 | 50 | 1 | 640x480 |
| 2020-08-11-0411\_3-Jupiter\_450BLU.avi | 0.1 | 50 | 50 | 1 | 640x480 |
| 2020-08-11-0415\_0-Jupiter+CI\_685NIR.avi | 0.05 | 50 | 50 | 1 | 1280x960 |
| 2020-08-11-0418\_3-Jupiter+GE\_685NIR.avi | 0.1 | 50 | 50 | 1 | 1280x960 |
| 2020-08-11-0356\_9-Europa\_Ganymede\_685NIR.avi | 0.1 | 50 | 50 | 1 | 640x480 |
| 2020-08-11-0359\_0-Europa\_Ganymede\_685NIR.avi | 0.1 | 50 | 50 | 1 | 640x480 |

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| --- | --- |
|  |  |
| 2020-08-11-0352\_8-Jupiter\_685NIR-Stacked-Derotated.png | 2020-08-09-0410\_8-Jupiter\_550GRN-Stacked-Derotated.png |
|  |  |
| 2020-08-11-0410\_3-Jupiter\_450BLU-Stacked-Derotated.png | 2020-08-09-0409\_9-Jupiter-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

I NEED TO PROCESS MOONS IMAGES AND SEE IF SOME ADDITIONAL JUPITER IMAGES SHOULD BE STACKED

## September

### 2020-Sep-01 (Sep-02 UT): Jupiter, Saturn, Moons, Vega, and Mars Imaging

Last updated 9/3/2020

Conditions were photometric – transparency 5/5. Seeing was very good 4/5

ST2000XM photometric work, particularly focused on:

1. Atmospheric retrievals of scattering layer height and ammonia concentration distribution in the Jovian atmosphere
2. Photometry of Titan in and out of atmospheric methane windows to look for surface albedo features in the light curve
3. Photometric evaluation of the filters 1000NIR, 940NIR, 889CH4, 656HIA, and 647CNT using Vega as a reference
4. Mars was a ‘pick up’ as it appeared low in the east.

**JUPITER**

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-09-02-0323\_0-Jupiter-1000NIR-sum8.5s-Derotated.png | 2020-09-02-0319\_8-Jupiter-940NIR-sum8.5s-Derotated.png | 2020-09-02-0316\_9-Jupiter-889CH4-sum8s-Derotated.png |
|  |  |  |
| 2020-09-02-0329\_3-Jupiter-656HIA-sum10s-Derotated.png | 2020-09-02-0329\_3-Jupiter-656HIA-sum10s-Derotated.png | 2020-09-02-0327\_8-Jupiter-657CNT+656HIA-Derotated-Wavelets.png (appears saturated) |
|  |  |  |
| 2020-09-02-0318\_4-Jupiter-R(889)(G)B(940)-R(G)B-WhtBal-ClrSmth-Smth-Str.png | 2020-09-02-0318\_4-Jupiter-R(940)(G)B(889)-R(G)B-WhtBal-ClrSmth-Smth-Str.png | 2020-09-02-0327\_8-Jupiter-647(G)656-R(G)B-WhtBal-ClrSmth-Smth-Sat1600pct.png |

**SATURN**

Two sets of images were taken, one with longer exposures to ensure adequate signal for the moons and one with shorter exposures to get better resolution on Saturn. The longer exposures show several moons including *Tethys, Dione, Rhea, Titan*, and *Iapetus*. Enceladus and Mimas are lost in the glare of Saturn and Hyperion is too faint. It also looks like the 656HIA image of Saturn may be saturated around the equatorial zone; possibly the 647CNT band also.

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| --- | --- | --- |
|  |  |  |
| 2020-09-02-0351\_8-Saturn-1000NIR-sum100s-Derotated.png | 2020-09-02-0347\_6-Saturn-940NIR-sum100s-Derotated.png | 2020-09-02-0343\_4-Saturn-889CH4-100s-Derotated.png |
|  |  |  |
| 2020-09-02-0408\_8-Saturn-656HIA-sum100s-Derotated.png | 2020-09-02-0355\_9-Saturn-647CNT-sum90s-Derotated.png | 2020-09-02-0402\_4-Hill-Saturn-R(647)(G)B(656)-R(G)B-WhtBal-Sat400pct.png |
|  |  |  |
| 2020-09-02-0347\_6-Hill-Saturn-R(1000)G(940)B(889)-RGB-WthBal.png | 2020-09-02-0345\_5-Hill-Saturn-R(940)(G)B(889)-R(G)B-WhtBal.png | 2020-09-02-0347\_6-Hill-Saturn-R(1000)(G)B(889)-R(G)B-WhtBal.png |
|  |  |  |
| 2020-09-02-0347\_6-Hill-Saturn-R(889)G(940)B(1000)-RGB-WthBal.png | 2020-09-02-0345\_5-Hill-Saturn-R(889)(G)B(940)-R(G)B-WhtBal.png | 2020-09-02-0347\_6-Hill-Saturn-R(889)G(940)B(1000)-RGB-WthBal.png |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-09-02-0417\_7-Saturn-1000NIR-sum10s-Derotated.png | 2020-09-02-0415\_1-Saturn-940NIR-sum10s-Derotated.png | 2020-09-02-0412\_6-Saturn-889CH4-sum9.5s-Derotated.png |
|  |  |  |
| 2020-09-02-0422\_8-Saturn-656HIA-sum10s-Derotated.png | 2020-09-02-0420\_3-Saturn-647CNT-sum8s-Derotated.png | 2020-09-02-0421\_6-Hill-Saturn-R(647)(G)B(656)-R(G)B-WhtBal-Sat400pct.png |
|  |  |  |
| 2020-09-02-0415\_1-Hill-Saturn-R(1000)G(940)B(889)-RGB-Smth-WhtBal-Str.png | 2020-09-02-0413\_8-Hill-Saturn-R(940)(G)B(889)-R(G)B-WhtBal-Smth-Str.png | 2020-09-02-0415\_2-Hill-Saturn-R(1000)(G)B(889)-R(G)B-WhtBal-Smth-Str.png |
|  |  |  |
| 2020-09-02-0415\_1-Hill-Saturn-R(889)G(940)B(1000)-RGB-Smth-WhtBal-Stra.png | 2020-09-02-0413\_8-Hill-Saturn-R(889)(G)B(940)-R(G)B-WhtBal-Smth-Str.png | 2020-09-02-0415\_2-Hill-Saturn-R(889)(G)B(1000)-R(G)B-WhtBal-Smth-Str.png |

**MARS**

Very little difference in colors in the red and NIR, so the RGB image is hard to interpret. The intention was to examine use of NIR bands for surface composition and minerology.

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| --- | --- | --- | --- |
|  |  |  |  |
| 2020-09-02-0555\_7-Mars-1000NIR-sum10.0s-Derotated.png | 2020-09-02-0553\_1-Mars-940NIR-sum9.5s-Derotated.png | 2020-09-02-0550\_6-Mars-889CH4-sum10.0s-Derotated.png | 2020-09-02-0602\_6-Mars-656HIA-sum1.0s-Derotated.png |
|  |  |  |  |
| 2020-09-02-0600\_2-Mars-647CNT-sum1.0s-Derotated.png | 2020-09-02-0556\_4-Mars-AllRed+NIR-Flipped-2X-Derotated.png | 2020-09-02-0555\_5-Mars-R(1000)G(889)B(647)-RGB-Realigned.png |  |

**VEGA**

### 2020-Sep-02 (Sep-03 UT): Jupiter, Saturn, Moons Photometric

Last updated 9/3/2020

Conditions were very good, possibly photometric. There were some high cirrus to the north. Transparency 4/5. Seeing was good 3/5.

### 2020-Sep-03 (Sep-04 UT): Jupiter, Saturn, Moons, Photometry and Jupiter Video

Last updated 9/3/2020

### 2020-Sep-04 (Sep-04 UT): Mars and Venus Video

Last updated 9/3/2020

**MARS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-09-04-1154\_8-MARS\_550GRN.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-09-04-1155\_9-MARS\_550GRN.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-09-04-1158\_2-MARS\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-09-04-1159\_2-MARS\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-09-04-1203\_1-MARS\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-04-1203\_6-MARS\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-04-1204\_2-MARS\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-04-1204\_7-MARS\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |

|  |  |
| --- | --- |
|  |  |
| 2020-09-04-1203\_9-MARS\_685NIR-Derotated.png | 2020-09-04-1155\_3-MARS\_550GRN-Derotated.png |
|  |  |
| 2020-09-04-1158\_7-MARS\_450BLU-Derotated.png | 2020-09-04-1159\_3-Mars-R(685)GB-RGB-WhtBal-ClrSmth-Smth.png |

**VENUS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-09-04-1213\_5-Venus\_685NIR.avi | 0.0003 | 50 | 50 | 1 | 320x240 |
| 2020-09-04-1213\_8-Venus\_685NIR.avi | 0.0003 | 50 | 50 | 1 | 320x240 |
| 2020-09-04-1220\_7-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-09-04-1222\_7-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-09-04-1224\_8-Venus\_380NUV.avi | 0.05 | 50 | 50 | 2 | 640x480 |

|  |  |
| --- | --- |
|  |  |
| 2020-09-04-1213\_5-Venus\_685NIR-Derotated.png | 2020-09-04-1222\_8-Venus\_380NUV-Derotated.png |
|  |  |
| 2020-09-04-1218\_2-Venus-Hill-685(G)380-R(G)B.png | 2020-09-04-1218\_2-Venus-Hill-685(G)380-R(G)B-L(380)RGB.png |

### 2020-Sep-05 (Sep-06 UT): Jupiter, Saturn, and Mars Video

Last updated 9/3/2020

Some smoke maybe?

**JUPITER**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-09-04-0405\_6-Flat\_450BLU.avi | 0.999 | 50 | 50 | 1 | 640x480 |
| 2020-09-04-0406\_9-Flat\_550GRN.avi | 0.999 | 50 | 50 | 1 | 640x480 |
| 2020-09-04-0409\_2-Flat\_685NIR.avi | 0.999 | 100 | 50 | 1 | 640x480 |
| 2020-09-06-0428\_0-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-09-06-0432\_0-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-09-06-0434\_4-Jupiter\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |

|  |  |
| --- | --- |
|  |  |
| 2020-09-06-0428\_0-Jupiter\_685NIR-Derotated.png | 2020-09-06-0432\_0-Jupiter\_550GRN-Derotated.png |
|  |  |
| 2020-09-06-0434\_4-Jupiter\_450BLU-Derotated.png | 2020-09-06-0431\_5-Jupiter-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

**SATURN**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-09-06-0445\_6-Saturn\_685NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-09-06-0449\_4-Saturn\_550GRN.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-09-06-0453\_5-Saturn\_550GRN.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-09-06-0457\_7-Flat\_450BLU\_1x1.avi | 0.999 | 50 | 50 | 1 | 640x480 |
| 2020-09-06-0500\_5-Flat\_450BLU\_2x2.avi | 0.25 | 50 | 50 | 2 | 640x480 |
| 2020-09-06-0501\_9-Flat\_550GRN\_2x2.avi | 0.2 | 50 | 50 | 2 | 640x480 |
| 2020-09-06-0502\_9-Flat\_550GRN\_1x1.avi | 0.5 | 50 | 50 | 1 | 640x480 |

|  |  |
| --- | --- |
|  |  |
| 2020-09-06-0445\_6-Saturn\_685NIR-Derotated.png | 2020-09-06-0449\_4-Saturn\_550GRN-Derotated.png |
|  |  |
| 2020-09-06-0453\_5-Saturn\_450BLU-Derotated.png | 2020-09-06-0449\_5-Hill-Saturn-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

**MARS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-09-06-0511\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-06-0511\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-06-0512\_6-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-09-06-0513\_8-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 320x240 |
| 2020-09-06-0622\_3-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-06-0622\_9-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-06-0623\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-06-0624\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-06-0625\_2-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-09-06-0626\_8-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-09-06-0627\_9-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-09-06-0629\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-06-0629\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |

|  |  |
| --- | --- |
|  |  |
| 2020-09-06-0511\_3-Mars\_685NIR-Derotated.png | 2020-09-06-0512\_6-Mars\_550GRN-Derotated.png |
|  |  |
| 2020-09-06-0513\_8-Mars\_450BLU-Derotated.png | 2020-09-06-0512\_6-Mars-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets-Str0to192.png |

|  |  |
| --- | --- |
|  |  |
| 2020-09-06-0625\_2-Mars\_685NIR-Derotated.png | 2020-09-06-0625\_2-Mars\_550GRN-Derotated.png |
|  |  |
| 2020-09-06-0627\_3-Mars\_450BLU-Derotated.png | 2020-09-06-0625\_9-Mars-R(685)GB-RGB.png |

### 2020-Sep-12 (Sep-13 UT): Jupiter, Saturn, and NGC7009 Imaging

Last updated 9/3/2020

Some smoke maybe?

### 2020-Sep-13 (Sep-14 UT): Jupiter, Saturn, and NGC7009 Imaging

Last updated 9/3/2020

Some smoke maybe?

### 2020-Sep-14 (Sep-15 UT): Jupiter, Saturn, and NGC7009 Imaging

Last updated 9/3/2020

Some smoke may affect photometry. Transparency 3/5?. Seeing ? 3/5?

**JUPITER**

Raw and processed files for 658NII are mislabeled as 501OIII in the filenames. The file naming has been corrected in stacked images.

\*May want to load scaled 16-bit FITS into WinJUPOS Jupiter (I did for Saturn). Here I loaded IEEE floating point FITS and they may be loaded in a way that decreases contrast.

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-09-15-0234\_4-Jupiter-940NIR-Stacked-Derotated-Wavelets2x5-Cont90pct.png | 2020-09-15-0226\_2-Jupiter-889CH4-Stacked-Derotated-Wavelets2x10-Cont80pct.png | 2020-09-15-0200\_1-Jupiter-658NII-Derotated-Wavelets2x5-Cont90pct.png |
|  |  |  |
| 2020-09-15-0157\_7-Jupiter-656HIA-Derotated-Wavelets2x5-Cont90pct.png | 2020-09-15-0202\_9-Jupiter-647CNT-Derotated-Wavelets2x5-Cont90pct.png | 2020-09-15-0200\_2-Jupiter-647+656+658-Derotated-Wavelets2x15.png |
|  |  |  |
| 2020-09-15-0213\_2-Jupiter-R(Reds)(G)B(889)-R(G)B-ClrSmth-WhtBal.png | 2020-09-15-0213\_2-Jupiter-R(889)(G)B(Reds)-R(G)B-WhtBal-Smth.png | 2020-09-15-0200\_3-Jupiter-R(647)(G)B(656)-R(G)B-ClrSmth-Sat400pct.png |

**SATURN**

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 2020-09-15-0336\_6-Saturn-940NIR-Derotated-Wavelets2x10-Cont85pct.png | 2020-09-15-0328\_5-Saturn-889CH4-Derotated-Wavelets2x10-Cont75pct.png | 2020-09-15-0306\_2-Saturn-658NII-Derotated-Wavelets2x10+Cont85pct.png |
|  |  |  |
| 2020-09-15-0302\_8-Saturn-656HIA-Derotated-Wavelets2x10-Cont85pct.png | 2020-09-15-0311\_2-Saturn-647CNT-Derotated-Wavelets2x10-Cont85pct.png | 2020-09-15-0306\_7-Saturn-647CNT+656HIA+658NII-Derotated-Wavelets2x10+Cont80pct.png |
|  |  |  |
| 2020-09-15-0332\_5-Hill-Saturn-R(940)(G)B(889)-R(G)B-Wavelets2x10-Cont75pct.png | 2020-09-15-0332\_5-Hill-Saturn-R(889)(G)B(940)-R(G)B-Wavelets2x10-Cont85pct.png | 2020-09-15-0307\_0-Hill-Saturn-R(647)(G)B(656)-R(G)B-WhtBal-ClrSmth-Sat400pct-Wavelets2x10-Cont80pct.png |

**NGC 7009 – SATURN NEBULA**

|  |  |
| --- | --- |
|  |  |
| NGC7009-658NII-sum9m40s-Log-Crop.png | NGC7009-656HIA-sum4m50s-Log-Crop.png |
|  |  |
| NGC7009-647CNT-sum8m15s-NoStar-5+10sec-Exposures-Log-Crop.png | NGC7009-6XX-RGB-Log-Crop-Smth.png |

### 2020-Sep-15 (Sep-16 UT): Jupiter and Mars Video

Last updated 9/3/2020

Very heavy smoke and haze. Transparency 1/5. Seeing was good 3/5.

**JUPITER**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-09-16-0227\_9-Jupiter\_685NIR.avi | 0.1 | 50 | 50 | 1 | 640x480 |
| 2020-09-16-0231\_7-Jupiter\_685NIR.avi | 0.1 | 50 | 50 | 1 | 640x480 |
| 2020-09-16-0234\_1-Jupiter\_550GRN.avi | 0.1 | 50 | 50 | 1 | 640x480 |
| 2020-09-16-0236\_2-Jupiter\_550GRN.avi | 0.1 | 50 | 50 | 1 | 640x480 |
| 2020-09-16-0238\_7-Jupiter\_450BLU.avi | 0.2 | 50 | 50 | 1 | 640x480 |
| 2020-09-16-0240\_8-Jupiter\_450BLU.avi | 0.2 | 50 | 50 | 1 | 640x480 |
| 2020-09-16-0244\_9-Jupiter+Moons\_685NIR.avi | 0.2 | 50 | 50 | 1 | 1280x960 |
| 2020-09-16-0247\_0-Jupiter+Moons\_685NIR.avi | 0.2 | 50 | 50 | 1 | 1280x960 |

|  |  |
| --- | --- |
|  |  |
| 2020-09-16-0237\_9-Jupiter\_685NIR-Stacked-Derotated-Wavelets.png | 2020-09-16-0235\_2-Jupiter\_550GRN-Stacked-Derotated-Wavelets.png |
|  |  |
| 2020-09-16-0239\_8-Jupiter\_450BLU-Stacked-Derotated-Wavelets.png | 2020-09-16-0237\_6-Jupiter-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

**MARS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-09-16-0517\_8-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-16-0518\_4-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-16-0519\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-16-0519\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-16-0520\_8-Mars\_550GRN.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-09-16-0521\_3-Mars\_550GRN.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-09-16-0523\_4-Mars\_450BLU.avi | 0.07 | 50 | 50 | 1 | 320x240 |
| 2020-09-16-0524\_2-Mars\_450BLU.avi | 0.07 | 50 | 50 | 1 | 320x240 |
| 2020-09-16-0524\_8-Mars\_450BLU.avi | 0.07 | 50 | 50 | 1 | 320x240 |
| 2020-09-16-0525\_3-Mars\_450BLU.avi | 0.07 | 50 | 50 | 1 | 320x240 |

|  |  |
| --- | --- |
|  |  |
| 2020-09-16-0518\_7-Mars\_685NIR-Derotated.png | 2020-09-16-0521\_1-Mars\_550GRN-Derotated.png |
|  |  |
| 2020-09-16-0524\_4-Mars\_450BLU-Derotated.png | 2020-09-16-0237\_6-Jupiter-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

### 2020-Sep-16 (Sep-17 UT): Jupiter Video

Last updated 9/18/2020

Very heavy smoke and haze. Transparency 1/5. Seeing was good 4/5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-09-17-0151\_3-Jupiter\_685NIR.avi | 0.1 | 50 | 50 | 1 | 640x480 |
| 2020-09-17-0153\_4-Jupiter\_685NIR.avi | 0.1 | 50 | 50 | 1 | 640x480 |
| 2020-09-17-0155\_6-Jupiter\_685NIR.avi | 0.1 | 50 | 50 | 1 | 640x480 |
| 2020-09-17-0157\_9-Jupiter\_685NIR.avi | 0.1 | 50 | 50 | 1 | 640x480 |
| 2020-09-17-0202\_1-Jupiter\_550GRN.avi | 0.1 | 50 | 50 | 1 | 640x480 |
| 2020-09-17-0204\_3-Jupiter\_550GRN.avi | 0.1 | 50 | 50 | 1 | 640x480 |
| 2020-09-17-0206\_5-Jupiter\_550GRN.avi | 0.1 | 50 | 50 | 1 | 640x480 |
| 2020-09-17-0210\_9-Jupiter\_450BLU.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-09-17-0213\_3-Jupiter\_450BLU.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-09-17-0215\_4-Jupiter\_450BLU.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-09-17-0217\_6-Jupiter\_450BLU.avi | 0.1 | 50 | 50 | 2 | 640x480 |

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| 2020-09-17-0154\_6-Jupiter\_685NIR-Stacked-Derotated-Wavelets.png | 2020-09-17-0204\_3-Jupiter\_550GRN-Stacked-Derotated-Wavelets.png |
|  |  |
| 2020-09-17-0214\_3-Jupiter\_450BLU-Stacked-Derotated-Wavelets.png | 2020-09-17-0204\_4-Jupiter-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

### 2020-Sep-23 (Sep-24 UT): Jupiter and Saturn Imaging

Last updated 9/18/2020

Some light smoke and haze. Transparency 1-3/5 maybe some later high clouds over Saturn.. Seeing was good 4/5.

### 2020-Sep-24 (Sep-25 UT): Jupiter and Saturn Imaging, Mars Video

Last updated 9/18/2020

Some light smoke and haze. Transparency 1-3/5 maybe some later high clouds over Saturn.. Seeing was good 4/5.

**JUPITER**

**SATURN**

Apparent cloud or obstruction for about half of the 647CNT, 656HIA, and 672SII images. I should reexamine the 940NIR and 889CH4 images for cloud contamination. But they are also probably non photometric.

**MARS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-09-25-0447\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-25-0449\_1-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-25-0449\_8-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-25-0450\_4-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-25-0451\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-25-0451\_6-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-25-0452\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-25-0452\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-09-25-0454\_0-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-09-25-0455\_1-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-09-25-0458\_8-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-09-25-0501\_1-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 640x480 |

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|  |  |
| 2020-09-25-0450\_5-Mars\_685NIR-Derotated.png | 2020-09-25-0454\_6-Mars\_550GRN-Derotated.png |
|  |  |
| 2020-09-25-0500\_0-Mars\_450BLU-Derotated.png | 2020-09-25-0455\_0-Mars-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

### 2020-Sep-29 (Sep-30 UT): Jupiter and Saturn Video

Last updated 9/18/2020

Some smoke and haze, starting light and getting heavy. Transparency 2-3/5. Seeing was good 4/5.

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| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-09-30-0155\_4-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-09-30-0157\_9-Jupiter\_55GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-09-30-0201\_8-Jupiter\_55GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-09-30-0206\_4-Jupiter\_450BLU.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-09-30-0207\_6-Jupiter\_450BLU.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-09-30-0237\_2-Flat\_450BLU\_2x2.avi | 0.5 | 50 | 50 | 2 | 640x480 |
| 2020-09-30-0238\_1-Flat\_550GRN\_2x2.avi | 0.5 | 50 | 50 | 2 | 640x480 |
| 2020-09-30-0240\_0-Flat\_550GRN\_1x1.avi | 0.999 | 50 | 50 | 1 | 640x480 |

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| 2020-09-30-0154\_4-Jupiter-685NIR-Stacked-Derotated.png | 2020-09-30-0159\_8-Jupiter\_55GRN-Stacked-Derotated.png |
|  |  |
| 2020-09-30-0207\_0-Jupiter\_450BLU-Stacked-Derotated.png | 2020-09-30-0200\_4-Jupiter-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-09-30-0218\_5-Saturn\_685NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-09-30-0220\_6-Saturn\_685NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-09-30-0222\_7-Saturn\_685NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-09-30-0225\_0-Saturn\_550GRN.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-09-30-0227\_2-Saturn\_550GRN.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-09-30-0229\_3-Saturn\_550GRN.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-09-30-0232\_1-Saturn\_450BLU.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-09-30-0234\_2-Saturn\_450BLU.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-09-30-0237\_2-Flat\_450BLU\_2x2.avi | 0.5 | 50 | 50 | 2 | 640x480 |
| 2020-09-30-0238\_1-Flat\_550GRN\_2x2.avi | 0.5 | 50 | 50 | 2 | 640x480 |
| 2020-09-30-0240\_0-Flat\_550GRN\_1x1.avi | 0.999 | 50 | 50 | 1 | 640x480 |

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|  |  |
| 2020-09-30-0223\_9-Saturn\_685NIR-Derotated.png | 2020-09-30-0227\_2-Saturn\_550GRN-Derotated.png |
|  |  |
| 2020-09-30-0233\_1-Saturn\_450BLU-Derotated.png | 2020-09-30-0228\_1-Hill-Saturn-R(685)GB-WhtBal.png |

## October

### 2020-Oct-04 (Oct-05 UT): Jupiter, Saturn, and Mars Video

Last updated 9/18/2020

Moderate smoke and haze. Transparency 2-3/5. Seeing was poor 2/5.

**JUPITER**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-10-05-0155\_6-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-10-05-0157\_6-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-10-05-0201\_2-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-10-05-0203\_2-Jupiter\_450BLU.avi | 0.02 | 50 | 50 | 2 | 640x480 |

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|  |  |
| 2020-10-05-0156\_6-Jupiter\_685NIR-Stacked-Derotated.png | 2020-10-05-0201\_2-Jupiter\_550GRN-Derotated.png |
|  |  |
| 2020-10-05-0203\_2-Jupiter\_450BLU-Derotated.png | 2020-10-05-0200\_3-Jupiter-R(685)GB-WhtBal-ClrSmth-Smth-Wavelets.png |

**SATURN**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-10-05-0211\_4-Saturn\_685NIR.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-10-05-0213\_7-Saturn\_550GRN.avi | 0.05 | 50 | 50 | 2 | 640x480 |
| 2020-10-05-0216\_0-Saturn\_450BLU.avi | 0.1 | 50 | 50 | 2 | 640x480 |

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| --- | --- |
|  |  |
| 2020-10-05-0211\_4-Saturn\_685NIR-Derotated.png | 2020-10-05-0213\_7-Saturn\_550GRN-Derotated.png |
|  |  |
| 2020-10-05-0216\_0-Saturn\_450BLU-Derotated.png | 2020-10-05-0213\_7-Hill-Saturn-R(685)GB-RGB.png |

**MARS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-10-05-0509\_8-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-05-0510\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-05-0511\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-05-0512\_6-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-05-0513\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-05-0514\_7-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-10-05-0515\_7-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 640x480 |
| 2020-10-05-0517\_0-Mars\_450BLU.avi | 0.02 | 50 | 50 | 1 | 640x480 |

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| 2020-10-05-0511\_5-Mars\_685NIR-Derotated.png | 2020-10-05-0515\_2-Mars\_550GRN-Derotated.png |
|  |  |
| 2020-10-05-0517\_0-Mars\_450BLU-Derotated.png | 2020-10-05-0514\_6-Mars-R(685)GB-WhtBal-ClrSmth-Smth-Wavelets.png |

### 2020-Oct-05 (Oct-05 UT): Venus Video

Last updated 9/18/2020

Conditions?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-10-05-1304\_7-Venus\_380NUV.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-10-05-1306\_8-Venus\_380NUV.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-10-05-1309\_1-Venus\_380NUV.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-10-05-1311\_2-Venus\_380NUV.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-10-05-1316\_1-Venus\_685NIRa.avi | 0.002 | 50 | 50 | 1 | 320x240 |
| 2020-10-05-1316\_6-Venus\_685NIRa.avi | 0.002 | 50 | 50 | 1 | 320x240 |

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| 2020-10-05-1316\_3-Venus\_685NIRa-Derotated.png | 2020-10-05-1312\_1-Venus-Hill-685(G)380-R(G)B.png | 2020-10-05-1308\_0-Venus\_380NUV-Derotated.png |

### 2020-Oct-06 (Oct-07 UT): Jupiter and Saturn Imaging

Last updated 9/18/2020

Moderate smoke and haze. Transparency 2-3/5. Seeing was fair 3/5.

### 2020-Oct-07 (Oct-08 UT): Jupiter and Saturn Imaging

Last updated 9/18/2020

Moderate smoke and haze. Transparency 2-3/5. Seeing was fair 3/5.

### 2020-Oct-08 (Oct-09 UT): Jupiter and Saturn Imaging

Last updated 9/18/2020

Moderate smoke and haze. Transparency 2-3/5. Seeing was fair 3/5.

### 2020-Oct-13 (Oct-14 UT): Jupiter Video

Last updated 9/18/2020

Fair transparency, no smoke, but high clouds moving in 2-3/5. Seeing was bad 1/5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-10-14-0140\_4-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-10-14-0142\_4-Jupiter\_685NIR.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-10-14-0144\_9-Jupiter\_550GRN.avi | 0.05 | 50 | 50 | 1 | 640x480 |
| 2020-10-14-0147\_2-Jupiter\_450BLU.avi | 0.02 | 50 | 50 | 2 | 640x480 |
| 2020-10-14-0149\_4-Jupiter\_450BLU.avi | 0.1 | 50 | 50 | 1 | 1280x960 |
| 2020-10-14-0152\_9-Flat\_550GRN\_640x480\_1x1.avi | 0.999 | 50 | 50 | 1 | 640x480 |
| 2020-10-14-0156\_0-Flat\_450BLU\_640x480\_2x2.avi | 0.3 | 50 | 50 | 2 | 640x480 |
| 2020-10-14-0157\_1-Flat\_450BLU\_1280x960\_1x1.avi | 0.999 | 50 | 50 | 1 | 1280x960 |

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| 2020-10-14-0141\_4-Jupiter-685NIR-Stacked-Derotated.png | 2020-10-14-0144\_9-Jupiter\_550GRN-Derotated.png |
|  |  |
| 2020-10-14-0148\_3-Jupiter\_450BLU-Stacked Derotated.png | 2020-10-14-0144\_9-Jupiter-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

### Fall 2020 Planning

* Observations
  + Planetary Nebulae
    - NGC6826 - Blinking
    - NGC7662 – Blue Snowball
    - M27 Emission line images (quantitative)
      * Blue group (550CLR, 467HeII, 486HIB, 501OIII, 540CNT)
      * Red group (550CLR, 647CNT, 656HIA, 658NII, 672SII)
      * Reddening group (550CLR, 486HIB, 540CNT, 647CNT, 656HIA)
  + Planets
    - COMET C/2020 M3 ATLAS?
    - **Mars opposition October 13th**
      * Polar cap recession
      * Detailed albedo map and surface features
      * Dust & water clouds
    - Uranus
      * Spectrum?
      * Photometric imaging, including moons?
      * Video for polar bright region?
    - Neptune
      * Spectrum?
      * Photometric imaging, including Triton?
  + Double Stars
    - BU648 with C11!
    - Others
  + Diffuse Nebulae?
    - M42
    - Horsehead with TKE130?
    - Flame with TKE130?
  + Galaxies
    - M33 additional imaging; maybe TKE130 with additional filters?
      * Reddening suite: 656HIA, 647CNT, 486HIA, 467HeII, 550OPN
      * Red suite: 656HIA, 672SII, 658NII, 647CNT, 550OPN
      * NIR suite: 656HIA, 647CNT, 685NIR, 742NIR, 550OPN
      * NUV suite: 380NUV, 467HeII, 486HIB, 501OIII, 550OPN
  + Filter Calibration; Star Analyzer 200
    - NIR and NUV needs **C11**
      1. **550OPN (ref), 685 (ref), 889 (ref), 940, 1000**
      2. 380NUV (ref), 550OPN (ref), 685 (ref), 742, 807
    - VIS lines can get sharper resolution with **Pentax**
      * 467, 486 (ref), 501, 505 comet, 550OPN (ref)
      * 540, 550OPN (ref), 647, 656 (ref), 658,
      * 450BLU, 550GRN, 550OPN (ref), 650RED, 672
* Analysis
  + General code cleanup and consolidation
    - Astrophysical target data codes
    - Observational metadata codes
    - Observational data codes
    - Plot setup codes
    - **Start deleting organic spectroscopic and EW codes**
  + Photometry updates
    - **Numeric output**
    - Catalog data input
    - Response and transformation to standard filters
    - Variable stars and time series plots
    - Blackbody fit and Wein’s law temperature
  + Spectroscopy updates
    - **Make codes, including Vega and M57, more generic**
    - **Blackbody fit and Wein’s law temperature (new code)**
    - Spline fit for normalization (create class or generic routine)
    - Integration into EW Utils
    - **Line-based temperatures (H I and Na II)**
    - Consolidate EW plotting codes, e.g., EW vs line strength or N vs line strength (Jupiter and Vega…)
    - Balmer thermometer?
  + Jupiter spectroscopy and atmospheric vertical modeling – need to wrap up analysis at a clearly documented stopping point.
  + Should figure out what to do with individual star analyses, e.g., Vega, Castor
  + Galaxy composition gradient analysis
    - M31 Multispectral Analysis *ala* M33, M81, M101 etc.
    - Update M81 analysis with new narrowband data
  + Solar Eclipse Movies, ratio analysis, etc.
  + Questions for OPT
    - GoTo Mounts
    - Motorized Focuser

### 2020-Oct-27 (Oct-28 UT): Mars Video

Last updated 9/18/2020

Couldn’t locate Vega due to finder misalignment, so changed to video, aligned on the moon then video’d Mars while resetting the finder alignment. Sky was clear: transparency 4/5. Seeing was 3/5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-10-28-0216\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0216\_6-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0217\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0218\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0219\_5-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0221\_2-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0222\_8-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0223\_9-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0225\_1-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 320x240 |

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|  |  |
| 2020-10-28-0217\_0-Mars\_685NIR-Derotated.png | 2020-10-28-0220\_3-Mars\_550GRN-Derotated.png |
|  |  |
| 2020-10-28-0223\_9-Mars\_450BLU-Derotated.png | 2020-10-28-0220\_4-Mars-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets-Str0to192.png |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-10-28-0529\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0529\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0530\_3-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0530\_9-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0532\_6-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0533\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0534\_5-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0535\_7-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0536\_9-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0539\_4-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0541\_5-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0544\_3-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0544\_8-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0545\_6-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0546\_6-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-28-0547\_1-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |

|  |  |
| --- | --- |
|  |  |
| 2020-10-28-0538\_4-Mars\_685NIR-Stack6600-Derotated.png | 2020-10-28-0535\_7-Mars\_550GRN-Derotated.png |
|  |  |
| 2020-10-28-0541\_5-Mars\_450BLU-Derotated.png | 2020-10-28-0538\_5-Mars-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets-Cont90pct.png |

### 2020-Oct-28 (Oct-29 UT): Vega Spectra and Mars Video

Last updated 10/29/2020

Some high clouds, but I think I got Vega mostly unobscured. Mars was unobscured after a cloud had passed. Seeing was 3.5/5

Vega spectra series

|  |  |  |
| --- | --- | --- |
| File Name | Exposure | Notes |
| 2020-10-29-0202\_5-Vega-Spectrum-550OPN-Focus1-sum2s.fit | 200ms | Vega in FOV, blue/NUV focus |
| 2020-10-29-0206\_7-Vega-Spectrum-550OPN-Focus2-sum2s.fit | 200ms | Vega in FOV, red/NIR focus |
| 2020-10-29-0209\_8-Vega-Spectrum-550OPN-Focus2-sum2s.fit | 200ms | Vega out of FOV |
| 2020-10-29-0216\_1-Vega-Spectrum-550OPN-Focus2-sum5s.fit | 5 sec | Vega out of FOV |
| 2020-10-29-0222\_3-Vega-Spectrum-1000NIR-Focus2-sum2m30s.fit | 5 sec | Vega out of FOV |
| 2020-10-29-0232\_6-Vega-Spectrum-742NIR-Focus2-sum3m00s.fit | 5 sec | Vega out of FOV **– all 742NIR** |
|  |  | 742 interleaved |
|  |  | 889 interleaved |
|  |  | 940 interleaved |
|  |  |  |
|  |  |  |
|  |  |  |

**MARS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-10-29-0331\_6-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-29-0332\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-29-0332\_8-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-29-0333\_4-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-29-0333\_9-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-29-0334\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-29-0335\_1-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-29-0335\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-10-29-0337\_0-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-10-29-0338\_1-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-10-29-0339\_2-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-10-29-0344\_0-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 320x240 |
| 2020-10-29-0346\_1-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 320x240 |
| 2020-10-29-0348\_7-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 320x240 |
| 2020-10-29-0350\_8-Mars\_450BLU.avi | 0.05 | 50 | 50 | 1 | 320x240 |

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| 2020-10-29-0333\_7-Mars\_685NIR-Derotated.png | 2020-10-29-0338\_1-Mars\_550GRN-Derotated.png |
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| 2020-10-29-0347\_4-Mars\_450BLU-Derotated.png | 2020-10-29-0339\_7-Mars-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |

### 2020-Oct-29 (Oct-30 UT): Vega Spectra

Last updated 10/29/2020

Conditions? Transparency 4/5. Seeing 4/5?

### 2020-Oct-30 (Oct-30 UT): Venus Video

Last updated 10/29/2020

Conditions? Transparency 4/5. Seeing 4/5?

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| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-10-30-1247\_7-Venu\_380NUV.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-10-30-1251\_6-Venu\_380NUV.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-10-30-1253\_8-Venu\_380NUV.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-10-30-1256\_5-Venu\_380NUV.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-10-30-1256\_8-Venu\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-10-30-1257\_1-Venu\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-10-30-1333\_7-Venu\_380NUV.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-10-30-1335\_9-Venu\_380NUV.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-10-30-1338\_1-Venu\_380NUV.avi | 0.1 | 50 | 50 | 2 | 640x480 |
| 2020-10-30-1339\_9-Venu\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-10-30-1340\_2-Venu\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |
| 2020-10-30-1340\_6-Venu\_685NIR.avi | 0.001 | 50 | 50 | 1 | 320x240 |

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| 2020-10-30-1318\_5-Venus\_685NIR-Derotated.png | 2020-10-30-1316\_0-Venus-Hill-685(G)380-R(G)B-WhtBal.png | 2020-10-30-1313\_5-Venu\_380NUV-Derotated.png |

## November

### 2020-Nov-01 (Nov-02 UT): Mars Video

Last updated 11/2/2020

Spectacular conditions. Seeing 4.5/5. Transparency 4/5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-11-02-0317\_1-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0317\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0318\_3-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0318\_9-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0319\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0320\_3-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0320\_9-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0321\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0322\_1-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0322\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0324\_4-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0325\_6-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0326\_7-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0327\_8-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0329\_1-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0333\_0-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0334\_0-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0335\_1-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0336\_3-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0337\_4-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-02-0342\_1-Mars\_380NUV.avi | 0.5 | 70 | 50 | 2 | 640x480 |
| 2020-11-02-0344\_3-Mars\_380NUV.avi | 0.5 | 70 | 50 | 2 | 640x480 |
| 2020-11-02-0346\_8-Mars\_380NUV.avi | 0.5 | 70 | 50 | 2 | 640x480 |
| 2020-11-02-0348\_9-Mars\_380NUV.avi | 0.5 | 70 | 50 | 2 | 640x480 |
| 2020-11-02-0351\_2-Mars\_380NUV.avi | 0.5 | 70 | 50 | 2 | 640x480 |
| 2020-11-02-0353\_5-Mars\_380NUV.avi | 0.5 | 70 | 50 | 2 | 640x480 |

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| 2020-11-02-0319\_9-Mars\_685NIR-Derotated.png | 2020-11-02-0326\_7-Mars\_550GRN-Derotated.png | 2020-11-02-0335\_2-Mars\_450BLU-Derotated.png |
|  |  |  |
| 2020-11-02-0347\_8-Mars\_380NUV-Derotated.png | 2020-11-02-0327\_3-Mars-R(685)GB-RGB-WhtBal-ClrSmth-Smth-Wavelets.png |  |

### 2020-Nov-02 (Nov-03 UT): Mars Video

Last updated 11/2/2020

Conditions?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-11-03-0359\_3-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0359\_9-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0400\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0401\_3-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0401\_9-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0402\_8-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0403\_4-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0404\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0404\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0405\_3-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0408\_9-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0410\_0-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0411\_2-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0412\_4-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0413\_6-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0414\_7-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0416\_8-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0417\_9-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0419\_0-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0420\_1-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0421\_3-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0422\_4-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0423\_5-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-03-0424\_6-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |

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| 2020-11-03-0402\_3-Mars\_685NIR-Derotated.png | 2020-11-03-0411\_8-Mars\_550GRN-Derotated.png |
|  |  |
| 2020-11-03-0420\_7-Mars\_450BLU-Derotated.png | 2020-11-03-0411\_6-Mars-R(685)GB-WhtBal-ClrSmth-Smth-Wavelets.png |

### 2020-Nov-04 (Nov-04 UT): Moon and Venus Video

Last updated 11/2/2020

Very good conditions. Seeing 3.5/5. Transparency 5/5.

Tried to image Venus about 90 minutes later after sunrise (around 15UT), but due to sky brightness lowering the contrast in the NUV, and glare on the laptop screen, focusing was very difficult. I ended up deleting those data.

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| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-11-04-1307\_3-Moon\_685NIR.avi | 0.01 | 50 | 50 | 1 | 640x480 |
| 2020-11-04-1311\_2-Moon\_685NIR.avi | 0.02 | 50 | 50 | 1 | 1280x960 |

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| 2020-11-04-1307\_3-Moon\_685NIR-Stack600-SingleAlign-Wavelets2x30-HalfSize.jpg | 2020-11-04-1311\_2-Moon\_685NIR-Stack200-SingleAlign-Wavelets2x20+3x10-HalfSize.jpg |

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| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-11-04-1328\_9-Venus\_380NUV.avi | 0.04 | 70 | 50 | 2 | 640x480 |
| 2020-11-04-1331\_0-Venus\_380NUV.avi | 0.04 | 70 | 50 | 2 | 640x480 |
| 2020-11-04-1333\_1-Venus\_380NUV.avi | 0.04 | 70 | 50 | 2 | 640x480 |
| 2020-11-04-1335\_2-Venus\_380NUV.avi | 0.04 | 70 | 50 | 2 | 640x480 |
| 2020-11-04-1337\_5-Venus\_380NUV.avi | 0.04 | 70 | 50 | 2 | 640x480 |
| 2020-11-04-1339\_6-Venus\_380NUV.avi | 0.04 | 70 | 50 | 2 | 640x480 |
| 2020-11-04-1342\_4-Venus\_685NIR.avi | 0.0005 | 70 | 50 | 1 | 320x240 |
| 2020-11-04-1343\_9-Venus\_685NIR.avi | 0.0005 | 70 | 50 | 1 | 320x240 |

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| 2020-11-04-1343\_3-Venus\_685NIR-Derotated.png | 2020-11-04-1338\_8-Venus-Hill-685(G)380-R(G)B-Sat150pct.png | 2020-11-04-1334\_2-Venus\_380NUV-Derotated.png |

### 2020-Nov-05 (Nov-06 UT): Mars Video

Last updated 11/2/2020

Very good conditions. Seeing 4/5. Transparency 5/5.

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| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-11-06-0327\_8-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0328\_4-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0329\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0329\_6-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0330\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0330\_8-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0331\_4-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0332\_1-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0332\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0333\_3-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0333\_9-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0334\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0335\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0336\_8-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0337\_9-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0339\_0-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0340\_1-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0341\_5-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0343\_2-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0344\_3-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0345\_5-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0347\_6-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0348\_7-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0349\_8-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0350\_9-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0352\_1-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0353\_5-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0354\_6-Mars\_450BLU.avi | 0.03 | 50 | 50 | 1 | 320x240 |
| 2020-11-06-0359\_2-Mars\_380NUV.avi | 0.1 | 100 | 50 | 2 | 640x480 |
| 2020-11-06-0401\_4-Mars\_380NUV.avi | 0.1 | 100 | 50 | 2 | 640x480 |
| 2020-11-06-0403\_5-Mars\_380NUV.avi | 0.1 | 100 | 50 | 2 | 640x480 |
| 2020-11-06-0406\_2-Mars\_380NUV.avi | 0.1 | 100 | 50 | 2 | 640x480 |
| 2020-11-06-0408\_5-Mars\_380NUV.avi | 0.1 | 100 | 50 | 2 | 640x480 |
| 2020-11-06-0410\_5-Mars\_Dark\_380NUV.avi | 0.1 | 100 | 50 | 2 | 640x480 |

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| 2020-11-06-0331\_5-Mars\_685NIR-Derotated.png | 2020-11-06-0339\_1-Mars\_550GRN-Derotated.png | 2020-11-06-0349\_2-Mars\_450BLU-Derotated.png |
|  |  |  |
| 2020-11-06-0403\_8-Mars\_380NUV-Derotated.png | 2020-11-06-0339\_9-Mars-R(685)GB-WhtBal-ClrSmth-Smth-Wavelets.png |  |

### 2020-Nov-12 (Nov-13 UT): Vega Spectra for Filter Calibration

Last updated 11/2/2020

Conditions?

### 2020-Nov-15 (Nov-16 UT): Mars Spectra and M42 Spectra

Last updated 12/1/2020

Fair conditions. Seeing 2/5. Transparency 4/5. The first two spectra (OPN 6 min and NUV 12 min) were done with auto-darks. The last two used dedicated darks. The 20 minute sum was done for the earliest part of the evening, showing more of the blue end of the spectra. The 2h19m integration incorporates those 20 mins, but due to pointing drift, doesn’t show the Hε line at 397nm.

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|  |
| M42-Spectrum-20201116UT-Focus1-550OPN-sum6m-Flattened-AlignedwithNUV-Cropped.jpg |
|  |
|  |
| M42-Spectrum-20201116UT-Focus1-380NUV-sum12m-AlignedwithOPN-Cropped.jpg |

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|  |
|  |
| M42-Spectrum-20201116UT-Focus3-550OPN-sum20m-Flattened-Cropped.jpg |
|  |
|  |
| M42-Spectrum-20201116UT-Focus3-550OPN-sum2h19m-Flattened-Cropped.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Nov-16 (Nov-17 UT): M42 Spectra and Mars Video and Spectra

Last updated 11/2/2020

Good conditions. Seeing 3/5. Transparency 4/5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-11-17-0254\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-17-0255\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-17-0256\_3-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-17-0257\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-17-0257\_6-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-17-0258\_6-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-17-0259\_3-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-17-0300\_6-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-17-0301\_7-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-17-0302\_8-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-17-0303\_9-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-17-0305\_7-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-11-17-0308\_3-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-11-17-0309\_4-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-11-17-0311\_5-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |

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| 2020-11-17-0256\_9-Mars\_685NIR-Derotated.png | 2020-11-17-0302\_3-Mars\_550GRN-Derotated.png |
|  |  |
| 2020-11-17-0308\_7-Mars\_450BLU-Derotated.png | 2020-11-17-0302\_6-Mars-R(685)GB-WhtBal-ClrSmth-Smth-Wavelets.png |

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| M42-Spectrum-20201117UT-Focus1-550OPN-sum1h35m-Flattened1-Cropped.jpg |

### 2020-Nov-17 (Nov-18 UT): Mars Video and M42 Spectra

Last updated 11/2/2020

Good conditions. Seeing 3/5. Transparency 4/5.

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| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-11-18-0511\_3-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-18-0511\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-18-0512\_3-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-18-0513\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-18-0513\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-18-0514\_1-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-18-0516\_0-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-18-0517\_1-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-18-0518\_3-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-18-0522\_3-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-11-18-0524\_2-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-11-18-0525\_3-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-11-18-0526\_4-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |

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|  |  |
| 2020-11-18-0512\_9-Mars\_685NIR-Derotated.png | 2020-11-18-0517\_3-Mars\_550GRN-Derotated.png |
|  |  |
| 2020-11-18-0524\_6-Mars\_450BLU-Derotated.png | 2020-11-18-0518\_3-Mars-R(685)GB-WhtBal-ClrSmth-Smth-Wavelets.png |

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|  |
| M42-Spectrum-20201118UT-Focus1-550OPN-sum36m-Flattened-Cropped.jpg |
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|  |
| M42-Spectrum-20201118UT-Focus1-742NIR-sum46m-Flattened-Cropped.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Nov-19 (Nov-20 UT): M42 Spectra

Last updated 11/2/2020

Fair conditions. Seeing 2/5. Transparency 4/5.

|  |
| --- |
|  |
|  |
| M42-Spectrum-20201120UT-Focus1-742NIR-sum1h30m-Flattened-Cropped.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Nov-21 (Nov-22 UT): Mars and M42 Spectra

Last updated 11/22/2020

Good conditions. Seeing 2/5. Transparency 4/5.

Ugh. Forgot to turn cooling on for Mars spectra, but got darks.

|  |
| --- |
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|  |
| M42-Spectrum-20201122UT-Focus1-742NIR-sum1h30m\_Rotated-Flattened-Cropped.jpg |

### 2020-Nov-24 (Nov-25 UT): M42 550OPN Spectra and Capella Spectra

Last updated 11/22/2020

Good conditions. Seeing 2/5. Transparency 4/5. Some odd contamination of the spectrum from scattered light? Maybe from the moon or neighbor’s yard light(s)?

|  |
| --- |
|  |
|  |
| M42-Spectrum-20201125UT-Focus1-550OPN-sum1h54m-Cropped.jpg |

### 2020-Nov-25 (Nov-26 UT): M42 742NIR Spectra

Last updated 11/22/2020

Good conditions. Seeing 2/5. Transparency 4/5.

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|  |
|  |
| M42-Spectrum-20201126UT-Focus1-742NIR-sum2h23m-Flattened-Cropped.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Nov-28 (Nov-29 UT): Mars and M42 Sulfur III and 940NIR imaging

Last updated 11/22/2020

Good conditions. Seeing 3.5/5. Transparency 4/5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-11-29-0238\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0238\_8-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0239\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0240\_1-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0240\_9-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0241\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0242\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0245\_1-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0246\_2-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0247\_3-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0248\_4-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0249\_8-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0250\_9-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0252\_0-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0253\_1-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0254\_2-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0255\_5-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0256\_1-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0256\_7-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0257\_3-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0257\_8-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-11-29-0258\_4-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |

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| --- | --- |
|  |  |
| 2020-11-29-0248\_6-Mars\_685NIR-Derotated.png | 2020-11-29-0246\_8-Mars\_550GRN-Derotated.png |
|  |  |
| 2020-11-29-0252\_0-Mars\_450BLU-Derotated.png | 2020-11-29-0249\_1-Mars-R(685)GB-WhtBal-ClrSmth-Smth-Wavelets.png |

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| --- | --- |
|  |  |
| M42-20201129UT-1000NIR-sum1h09m-Flattened-Log.jpg | M42-20201129UT-940NIR-sum0h40m-Flattened-Log.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Nov-29 (Nov-30 UT): M42 Sulfur III Imaging

Last updated 11/22/2020

Good conditions. Seeing 2/5. Transparency 4/5.

|  |  |
| --- | --- |
|  |  |
| M42-20201130UT-1000NIR-sum2h50m-Flattened-Log.jpg | M42-202011XXUT-1000NIR-sum3h59m-Flattened-Log.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

## December

### 2020-Dec-03 (Dec-04 UT): Capella Spectra and M42 Oxygen II Imaging

Last updated 12/4/2020

Very good conditions. Seeing 4/5. Transparency 5/5.

|  |
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|  |
| 2020-12-04-0332\_8-Capella-550OPN-sum05m00s-Aligned-Cropped.png |
|  |
|  |
| 2020-12-04-0342\_1-Capella-730OII-sum05m00s-Aligned-Cropped.png |
|  |
|  |
| 2020-12-04-0354\_7-Capella-550OPN-sum05m00s-Aligned-Cropped.png |

|  |  |
| --- | --- |
|  |  |
| M42-20201204UT-730OII-sum1h56m-Flattened-Log.jpg | M42-20201204UT-730OII-sum2h31m-softfocus-Flattened-Log.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Dec-05 (Dec-06 UT): M42 Oxygen II Imaging

Last updated 12/5/2020

Fair conditions. Seeing 3/5. Transparency 2/5. Started clear but high clouds moved in. Got 32 mins of imaging, with the last 3 or so having some cloud obscuration.

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| --- | --- |
|  |  |
| M42-20201206UT-730OII-sum0h32m-somecloudatend-Flattened-Log.jpg | M42-202012XXUT-730OII-sum3h03m-somecloudatend-Flattened-Log.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Dec-06 (Dec-07 UT): Mars Video and M42 658NII and 647CNT Imaging

Last updated 12/4/2020

Very good conditions. Seeing 3.5/5. Transparency 5/5.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-12-07-0334\_2-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-12-07-0334\_8-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-12-07-0335\_4-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-12-07-0336\_0-Mars\_685NIR.avi | 0.01 | 50 | 50 | 1 | 320x240 |
| 2020-12-07-0337\_0-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-12-07-0338\_1-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-12-07-0339\_2-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-12-07-0340\_5-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-12-07-0341\_6-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-12-07-0342\_7-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-12-07-0343\_8-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-12-07-0344\_8-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-12-07-0346\_3-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-12-07-0347\_4-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |

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| --- | --- |
|  |  |
| 2020-12-07-0335\_1-Mars\_685NIR-Derotated.png | 2020-12-07-0338\_1-Mars\_550GRN-Derotated.png |
|  |  |
| 2020-12-07-0343\_9-Mars\_450BLU-Derotated.png | 2020-12-07-0339\_0-Mars-R(685)GB-RGB-WhtBal-Smth-Wavelets.png |

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| --- | --- |
|  |  |
| M42-20201207UT-658NII-sum1h00m-Flattened-Log.jpg | M42-20201207UT-647CNT-sum1h25m-Flattened-Log.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Dec-07 (Dec-08 UT): Comet ATLAS (C/2020 M3) and M42 940NIR Imaging

Last updated 12/4/2020

Very good conditions. Seeing 4/5. Transparency 5/5.

Had multiple equipment issues. First, the filter wheel on the ST2000XM kept getting stuck. I opened and reassembled it a couple of times and then applied a tiny amount of WD40 to the axel pins. Ultimately, I removed the motor cover and that seemed to work initially, but then it jammed again. I believe the pin from the Pentax lens was actually impinging on some of the filters or the optical tabs, because rotating the lens – tightening it – seemed to be the ultimate solution.

The second problem was that the 505C2 filter showed large, diffuse halos around each star. More maybe around bluer starts. I don’t recall this from the imaging done on comet NEOWISE in the summer, but the exposures were shorter against a brighter sky. I also have a spectrum for this filter I believe, so I can look at out of band leakage. I ended up with a total of 4 usable minutes on the comet with the 505C2 filter, without wires causing major interference. Because of the large halos, there was no coma that was distinguishable. I also got 2 minutes of 656HIA. I need to get a flat for the 505C2.

|  |  |
| --- | --- |
|  |  |
| C2020M3-20201208UT-505C2-sum4m-Flattened-Log.jpg | C2020M3-20201208UT-656HIA-sum2m-Flattened-Log.jpg |

|  |  |
| --- | --- |
|  |  |
| M42-20201208UT-940NIR-sum1h56m-Flattened-Log.jpg | M42-20201XXXT-940NIR-sum2h36m-Flattened-Log.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

NIR742 = Cont742+775ARIII\*+907SIII\*+953SIII\*

NIR685 = Cont685+706HeI\*+714ARIII\*+730OII\*+775ARIII\*+905SIII\*+953SIII\*

If we can estimate the NIR742 continuum and the NIR685 continuum we can calculate:

953SII\*=953SIII-r×940NIR

907SIII\*=rS3×953SIII\*

Cont742=(w1×647CNT+w2×940NIR)/2

775ARIII\*=NIR742-(Cont742+905SIII\*+953SIII\*)

714ARIII=rAr3×775ARIII

Cont685=(w3×647CNT+w4×940NIR)/2

706HeI\*=NIR685-( Cont685+714ARIII\*+775ARIII\*+905SIII\*+953SIII\*)

Using default atomic parameters from PyNeb with Te=10000K and ne=1000cm-3

e5007,e4960,e5007/e4960

Out[25]:

(array(3.549258682892309e-21),

array(1.1894422075429347e-21),

2.983969006971861)

e9530,e9069,e9530/e9069

Out[26]:

(array(2.0406491660801267e-20),

array(8.26568175346877e-21),

2.4688213591380403)

Ar3=pn.Atom('Ar',3)

e7135=Ar3.getEmissivity(tem=1e4, den=1e3, wave=7135)

e7750=Ar3.getEmissivity(tem=1e4, den=1e3, wave=7750)

e7135,e7750,e7135/e7750

Out[27]:

(array(1.4946787315616976e-20),

array(3.606588180343792e-21),

4.1443010868494001)

### 2020-Dec-08 (Dec-09 UT): M42 C11 2800mm OII, OIII, and SIII Imaging

Last updated 12/8/2020

Very good conditions. Seeing 4/5. Transparency 5/5.

|  |  |
| --- | --- |
|  |  |
| M42-20201208UT-1000NIR-sum21m50s-ManualQuality-Log-Unsharp.jpg | M42-20201208UT-940NIR-sum19m50s-ManualQuality-Log.jpg |
|  |  |
| M42-20201208UT-730OII-sum25m40s-9arcsecFWHMand0.1round-Threshold-Log-Unsharp.jpg | M42-20201208UT-501OIII-sum13m20s-10arcsecFWHMand0.1round-Threshold-Log-Unsharp.jpg |
|  |  |
| M42-20201208UT-XXX-R(1000)G(730)B(501)-Log-Test-ClrSmth-Unsharp.jpg |  |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Dec-21 (Dec-22 UT): M42 C11 2800mm SIII Imaging

Last updated 12/8/2020

Very good conditions. Seeing 4/5. Transparency 5/5.

|  |  |
| --- | --- |
|  |  |
| M42-20201222UT-1000NIR-sum1h15m40s-ManualQuality-Flattened-Log-Unsharp.jpg | M42-202012XXUT-1000NIR-sum1h47m30s-Log-Unsharp.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Dec-23 (Dec-24 UT): M42 C11 2800mm 940nm Continuum Imaging

Last updated 12/8/2020

Very good conditions. Seeing 4/5. Transparency 5/5.

|  |  |
| --- | --- |
|  |  |
| M42-20201224UT-940NIR-sum1h47m40s-Flattened-Log.jpg | M42-202012XXUT-940NIR-sum2h07m30s-Flattened-Log.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Dec-24 (Dec-25 UT): M42 C11 2800mm OII Imaging

Last updated 12/8/2020

Very good conditions. Seeing 4/5. Transparency 5/5.

Note: There are two lines of satellites or aircraft lights crossing the nebula in tonight’s imaging. On crosses the Trapezium and the other crosses 𝜃2 Orionis. There’s a regular ‘flash’ to each track and they are roughly parallel. Impossible to say if they are a single high altitude aircraft or two geostationary satellites.

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|  |  |
| M42-20201222UT-1000NIR-sum1h15m40s-ManualQuality-Flattened-Log-Unsharp.jpg | M42-202012XXUT-730OII-sum2h24m30s-FWHM7.0-Round0.2-Log.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

### 2020-Dec-30 (Dec-31 UT): Mars Video and Lunar Video Minerology

Last updated 12/8/2020

Poor conditions. Seeing 2/5 based on imaging, even though the 300mb NAM suggested very good seeing. Transparency 2/5 – high clouds worsened through the evening.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-12-31-0328\_7-Mars\_730OII.avi | 0.1 | 50 | 50 | 1 | 320x240 |
| 2020-12-31-0330\_8-Mars\_730OII.avi | 0.1 | 50 | 50 | 1 | 320x240 |
| 2020-12-31-0332\_9-Mars\_730OII.avi | 0.1 | 50 | 50 | 1 | 320x240 |
| 2020-12-31-0335\_3-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-12-31-0336\_6-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-12-31-0337\_7-Mars\_550GRN.avi | 0.02 | 50 | 50 | 1 | 320x240 |
| 2020-12-31-0341\_8-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-12-31-0342\_8-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |
| 2020-12-31-0343\_9-Mars\_450BLU.avi | 0.04 | 50 | 50 | 1 | 320x240 |

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|  |  |
| 2020-12-31-0330\_8-Mars\_730OII-Derotated.png | 2020-12-31-0336\_5-Mars\_550GRN-Derotated.png |
|  |  |
| 2020-12-31-0342\_8-Mars\_450BLU-Derotated.png | 2020-12-31-0336\_7-Mars\_R(730)GB-Derotated.png |

For the lunar minerology, this was just a test to see if reasonable results could be obtained with the ASI120MM camera instead of the ST2000XM camera. No flat fields were taken, and the results show that to great disadvantage. However, despite the lack of calibration and the presence of clouds, the results showed potential. One item of note is that the focal length (~5600mm) may be too long to freeze the seeing since exposures of up to 500ms were required despite 2x2 binning. This might have been partially due to the clouds as well. Longer sequences with shorter exposures and shorter focal lengths would be better. The binned plate scale here is about 0.25 arcsec-pix-1.

Working with prime focus at 2800mm would cut the exposure time by a factor of four with 2x2 binning and retain a pixel scale of 0.5 arcsec-pix-1. However, that plate scale could also be achieved with the ST2000XM in unbinned mode. But the frame rate would be much, much slower.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Video File** | **Exposure** | **Gain** | **Gamma** | **Binning** | **Capture Area** |
| 2020-12-31-0354\_1-Moon\_730OII.avi | 0.03 | 50 | 50 | 2 | 1280x960 |
| 2020-12-31-0355\_7-Moon\_889CH4.avi | 0.2 | 50 | 50 | 2 | 1280x960 |
| 2020-12-31-0357\_9-Moon\_940NIR.avi | 0.5 | 50 | 50 | 2 | 1280x960 |
| 2020-12-31-0359\_3-Moon\_1000NIR.avi | 0.2 | 50 | 50 | 2 | 1280x960 |
| 2020-12-31-0403\_9-Moon\_380NUV.avi | 0.5 | 50 | 50 | 2 | 1280x960 |

**Multispectral and RGB Panel**

|  |  |
| --- | --- |
|  |  |
| 2020-12-31-0359\_3-Moon\_1000NIR-Stack75-Wavelets3x20-HalfSize.jpg | 2020-12-31-0357\_9-Moon\_940NIR-Stack25-Wavelets3x10-HalfSize.jpg |
|  |  |
| 2020-12-31-0355\_7-Moon\_889CH4-Stack75-Wavelets3x20-HalfSize.jpg | 2020-12-31-0354\_1-Moon\_730OII-Stack200-Wavelets3x30.png |
|  |  |
| 2020-12-31-0403\_9-Moon\_380NUV-Stack25-Wavelets4x20-HalfSize.jpg | 2020-12-31-0XXX\_X-Moon\_XX0-R(1000)G(730)B(380)-Wavelets4x5-ClrSmth-Sat200pct-HalfSize.jpg |

**Maturity Panel**

|  |  |
| --- | --- |
|  |  |
| RED: 2020-12-31-0354\_1-Moon\_730over380-HalfSize.jpg | GRN: 2020-12-31-0354\_1-Moon\_730over1000-HalfSize.jpg |
|  |  |
| BLU: 2020-12-31-0354\_1-Moon\_380over730-HalfSize.jpg | 2020-12-31-0XXX\_X-Moon\_XX0overXX0-Maturity-HalfSize.jpg |

**Mafic Panel**

|  |  |
| --- | --- |
|  |  |
| RED: 2020-12-31-0354\_1-Moon\_730over380-HalfSize.jpg | GRN: 2020-12-31-0354\_1-Moon\_730over1000-HalfSize.jpg |
|  |  |
| BLU: 2020-12-31-0357\_9-Moon\_730over940-HalfSize.jpg | 2020-12-31-035X\_X-Moon\_730overXXX-Mafic-HalfSize.jpg |

**Data Disposition:**

* Raw data is zipped is archived on the 4TB drive.
* Processed data is in appropriate project directories on the Astronomy SD card.

## References