The UCCI Observatory – an illustrated history of its creation and evolution

Wm. (Bill) Hrudey - May 2015

Opened in February 2012, the UCCI Observatory really had its origins in Edmonton, Canada in 1954. Wm. (Bill) Hrudey and his fellow teenage cohorts all had an interest in science and, astronomy in particular. They "hung out" at the University of Alberta's modest Observatory and fortunately were encouraged and mentored by professors from the Departments of Mathematics and Physics. The following photograph from 1954 shows some of these teens and, of the total of some 15 or 16, many eventually obtained post-graduate degrees.

It was during that time that Wm. (Bill) Hrudey began designing his version of the "perfect telescope". University, career, wives and children precluded this project until he retired in 1997 after a successful career in medical practice. Moving to the Cayman Islands and completing construction of his home, Bill began construction of his special scope – a 12.5" Newtonian reflector on a fork mount. Completed in May of 2004 it became a victim of Hurricane Ivan, which all but destroyed the Island on September 11, 2004. Most of the scope was under 3 feet of salty/muddy water and only the OTA was salvageable. On the left is the pre-Ivan scope followed by the shop interior post-Ivan.

For the next 4-5 years nothing much happened other than rebuilding the shop and revising the scope design, particularly as regards the mount. A split ring equatorial mount along the lines

of the Palomar scope was selected and in mid 2008, construction began. The mount consisted of a welded steel frame in the “horseshoe” as well as the “cage” supporting the Declination bearings. The following mages show various stages during construction.

Moving left to right in the images above, the first shows the welded steel frame embedded in the “horseshoe” complete with filler blocks which are being routed to a true circle. A one eight inch alluminum flat was was rolled to the correct radius and attached to the “horseshoe”. Here, a dial guage is being used to check the trueness of the “horseshoe” which turned out to be +/- 0.008”.

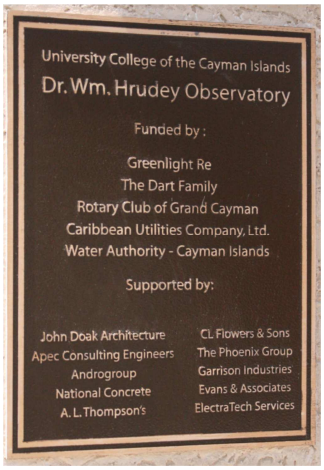
The next image shows a jig used to create the side panels of the cage during welding to both sides would be identical. In the following view, one can see the assembled cage on the base. The first vertical image shows how dead centre was identified using a plumb bob on a level surface. The next image shows the rear bearing – a 1-3/4” thrust bearing with some degree of adjustment for final alignment. Lastly, this image shows the assembled elements.

Once all the elements were assembed (more than shown above), a StellarCat drive and ArgoNavis guidance system were installed. For a comprehensive review of the result, a short viedeo can be seen on YouTube at:

https://www.youtube.com/watch?v=55j-x5mXJ68

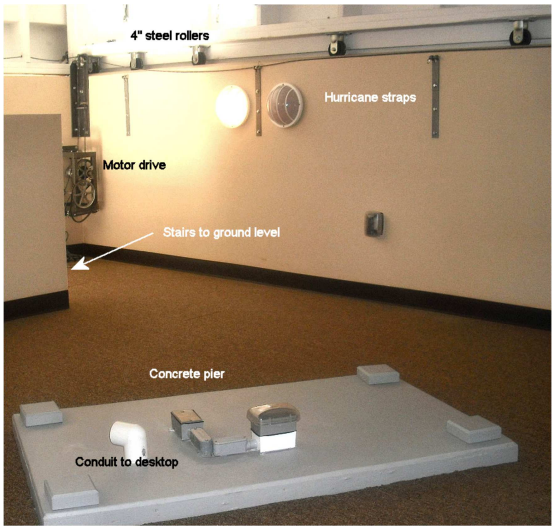
Upon completion in mid 2010, the scope was, as originally intended, offered in donation to the University College of the Cayman Islands as a means of promoting science in the educational system. UCCI President J. A. Roy Bodden was delighted as his vision for the University relied heavily on promoting science and technology. Through a variety of corporate and community entities, some CI$140,000 was raised in order to construct a permanent Observatory/Classroom on campus complete with a powered roll-off roof over the observing deck. The image on the left shows the Observatory exterior followed by a view of the classroom. The classroom, with a seating capacity of 18 has its own desktop PC which is networked to the main desktop in the observing deck – both can be used to project images from any of the several scopes onto a large screen for student groups.

A number of introductory Astronomy courses have been provided by Chris Cooke of the Cayman Islands, Astronomical Society; an ATM course was given by Wm. (Bill) Hrudey which resulted in six new 6” Dobsonian reflector scopes and in January 2015; a comprehensive hands on course on Digital Astro-Imaging was provided by Wm. (Bill) Hrudey. More and varied courses will be offered in the future.



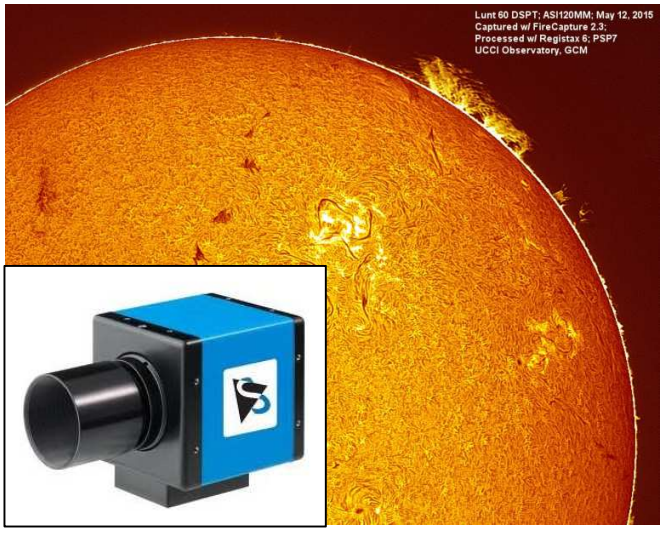
As an aside, construction began in September 2011 and the complex was completed in January 2012. Official Opening Ceremonies were had on February 22, 2012 complete with unveiling of the Observatory plaque.

The observing deck is elevated some 6 feet above the ground floor and, the 12.5" Newtonian scope is supported on its own independent concrete pier orientated to true North. Measuring some 16 feet square, the observing deck roll-off roof is provided with eight 4" V-grove rollers on each side and powered by a 1-1/2 hp electric motor equipped with an ingenius cable system and, provided with limit switches as well as other safety elements. Some of the above features are shown in the adjacent image. Being located in an Hurricane zone, very large and secure hurricane straps were designed and installed such that the roof could be secured during a storm.



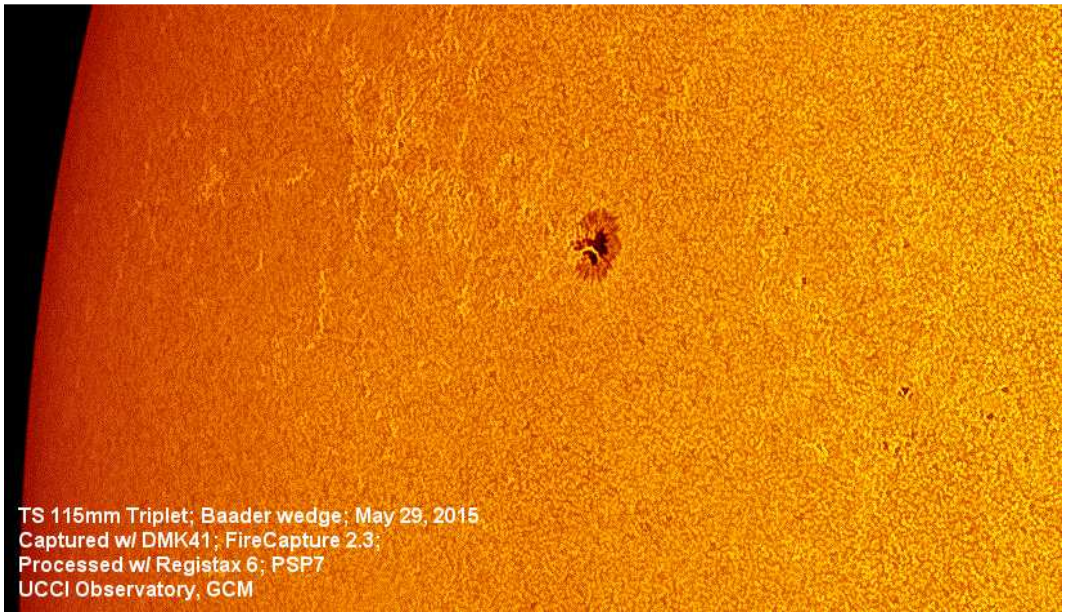
The observing deck is equipped with a number of amenities such as a full length counter for the desktop PC, scanner and laser colour printer; a small refridgerator, a coffe maker and bookcases for storage. Both white and red lighting is available. There is no air conditioning on this deck but a large floor fan runs 24/7 to keep the air moving. All computer connections to the scope are routed under the floor through conduit. Additional storage is availble in the counter pedestals. Overall, it is a very comfortable environment in which to work both during the day and at night.

In preparation for the Transit of Venus, which occurred on June 5, 2012, sufficient funds remaind for the purchase of a Lunt 60 PT solar scope. This was supplemented by a Celestron Nexus5 CMOS imaging camera which set the stage for subsequent solar hydrogen alpha imaging. Though adequate, the obtained images begged for improvement and, a second Lunt stack was purcahsed along with a DMK 41 USB imaging camera in October 2013. The image improvement was incredibly impressive and well worth the expenditure.



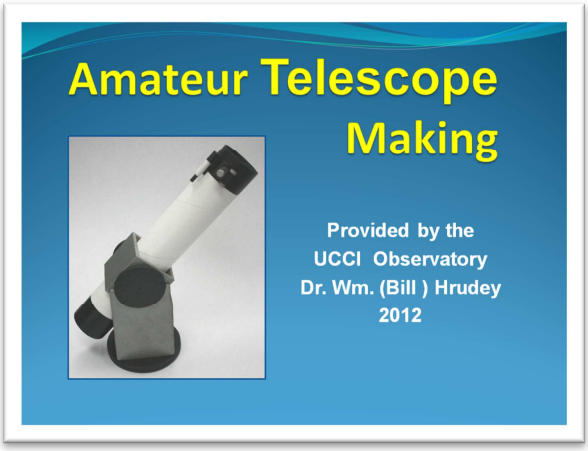
These events have led to a multitude of H1a solar images virtually on a daily basis with marked improvement seen in technique and image quality. Many of these images have been uploaded to wwwspaceweather.com and, a number can be found by simply Googling “Bill Hrudey”. During this time, Bill invested in both the monochrome and colour version versions of the ASI120 series. These proved to be a very capable imaging devices and served to supplement the DMK41. Not to leave DSLR’s out, Backyard EOS software was purchased to facilitate using Bill’s Canon EOS 1100D. All of these systems enable the composition and acquisition of images on the desktop or laptop screen.

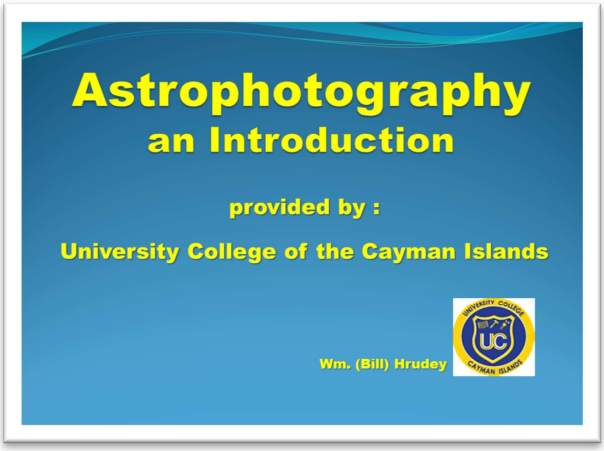
In November 2015, Bill purchased his TS 115mm APO triplet refractor and mounted it on an Orion Atlas-pro also equipped with an Orion autoguider. This was intended largely for DSO’s once properly ssetup. Meanwhile, an interested developed in white light solar imaging leading to the purchase of a 2” Baader Herschel wedge in May 2015. Efforts are now undeway to master this new technique and equipment and, following is an early image:

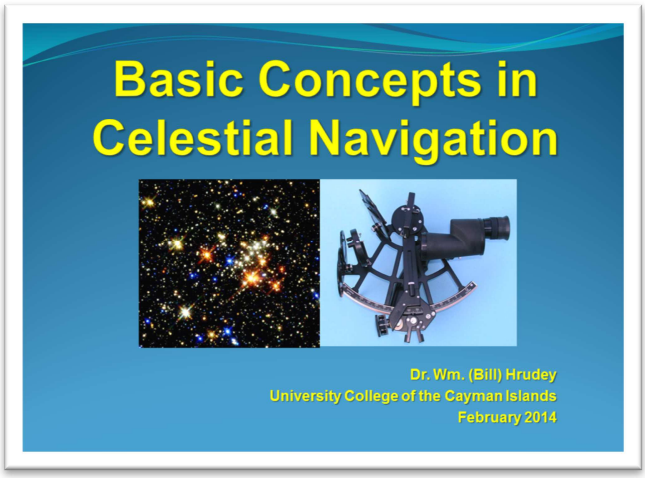


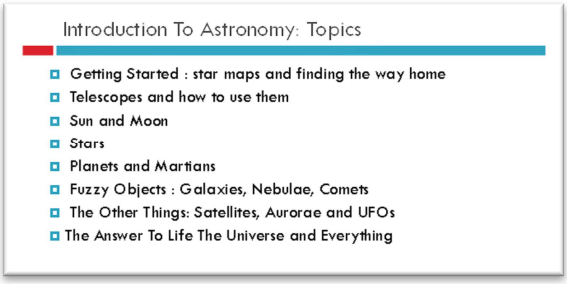
Events and programs:

- Student and community group tours – hundreds of school students and community groups have toured the Observatory facilities, the telescopes and images.
- STEM – recognizing that science is not given priority in the educational system, annual Conferences have been held since 2012 and further details can be found at our Website: stem.ky Both International and local speakers provide inspiring presentations on a variety of science related topics over the 3 day program.
- Courses – a number of astronomy related courses have been given over the last few years and include:





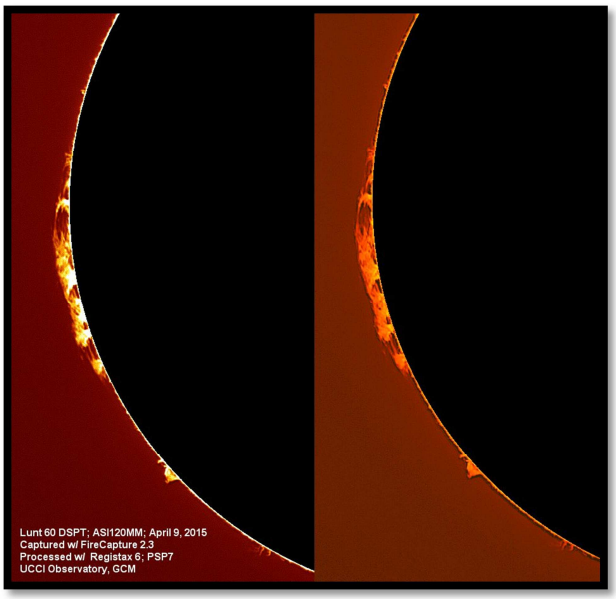


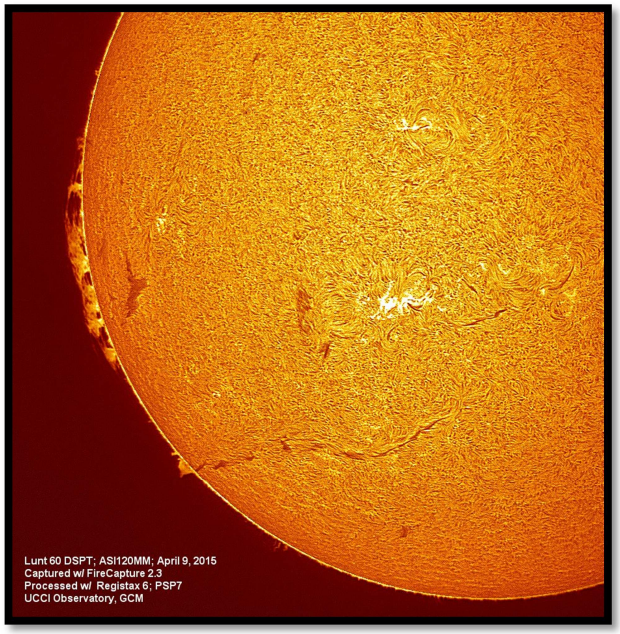


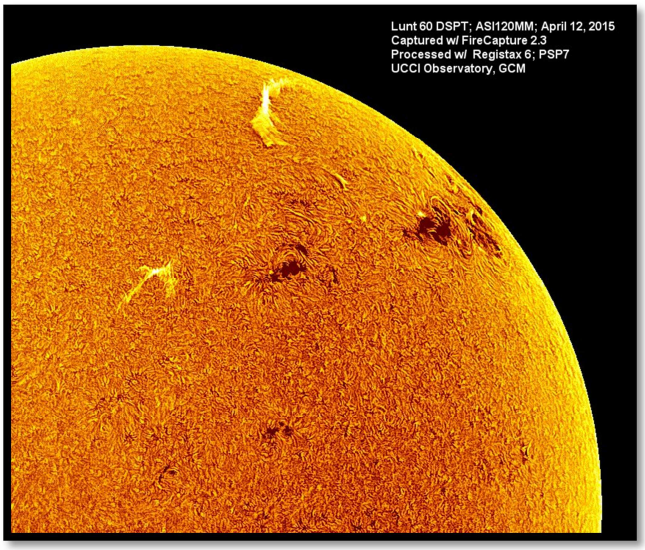
Sample images from the UCCI Observatory:

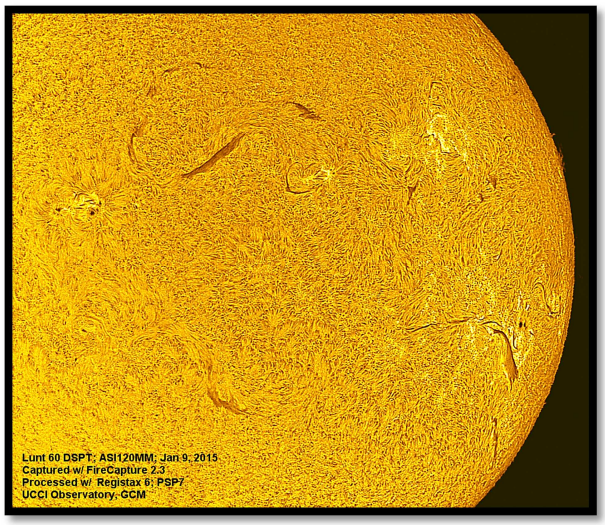
Over the years, thousands of astronomical images have been captured and, following is a potpourri of examples

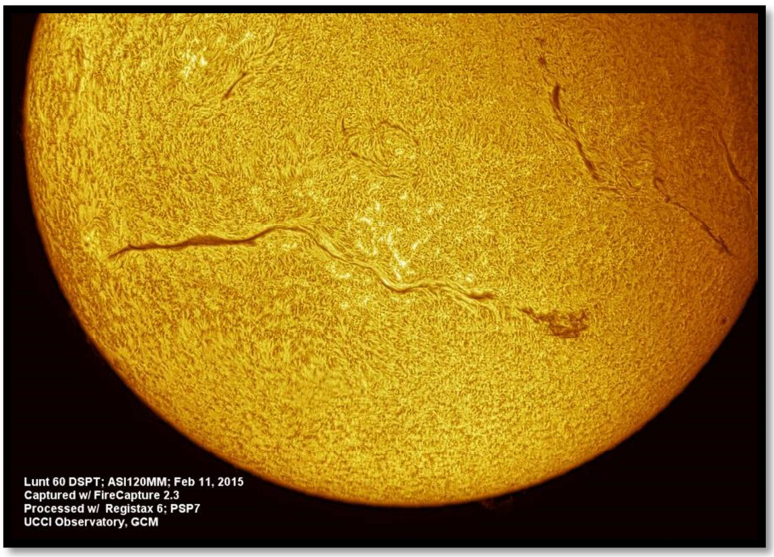
Solar in Hydrogen alpha 1:

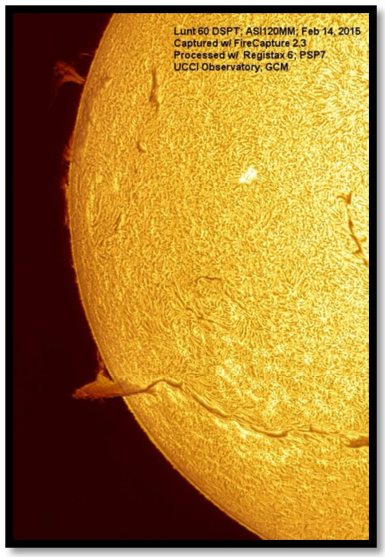


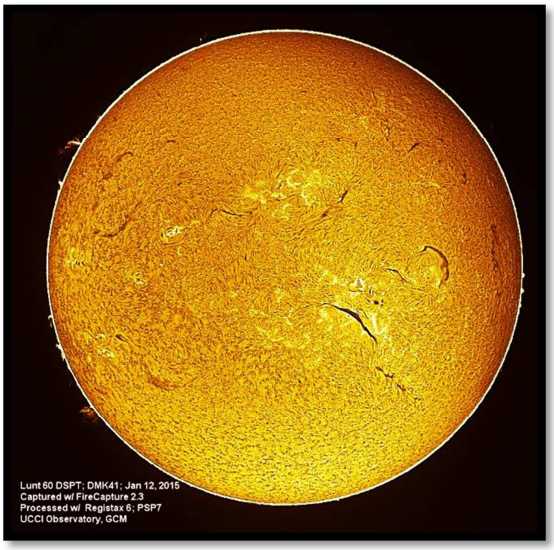


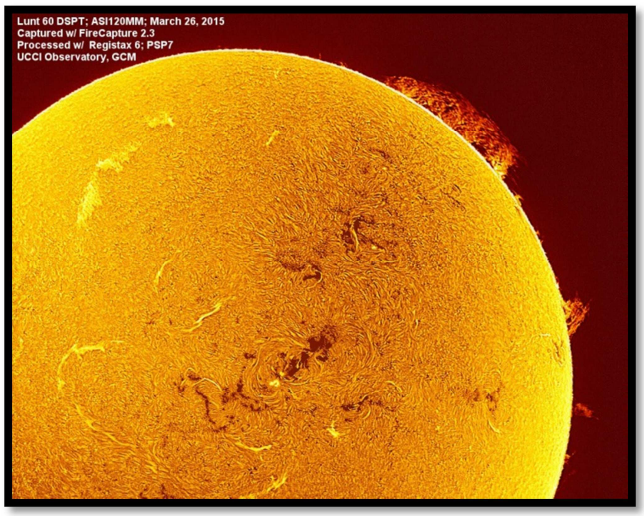




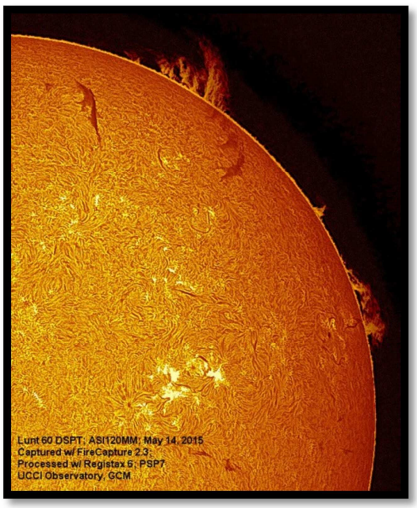

Lunt 60 DSPT; ASI120MM; Feb 11, 2015
Captured w/ FireCapture 2.3
Processed w/ Registax 6; PSP7
UCCI Observatory, GCM


Lunt 60 DSPT; ASI120MM; Feb 14, 2015
Captured w/ FireCapture 2.3
Processed w/ Registax 6; PSP7
UCCI Observatory, GCM

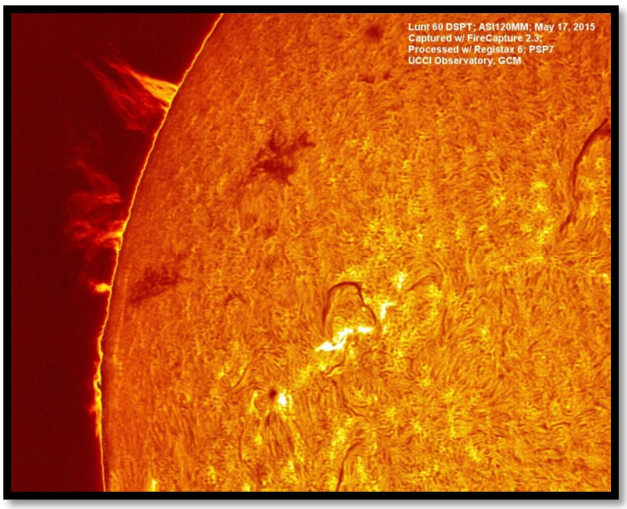

Lunt 60 DSPT; DMK41; Jan 12, 2015
Captured w/ FireCapture 2.3
Processed w/ Registax 6; PSP7
UCCI Observatory, GCM

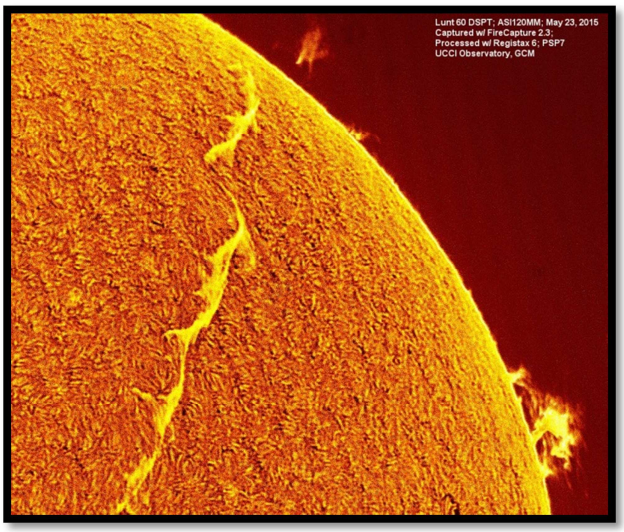

Lunt 60 DSPT; ASI120MM; March 26, 2015
Captured w/ FireCapture 2.3
Processed w/ Registax 6; PSP7
UCCI Observatory, GCM


Lunt 60 DSPT; ASI120MM; May 8, 2015
Captured w/ FireCapture 2.3;
Processed w/ Registax 6; PSP7
UCCI Observatory, GCM


Lunt 60 DSPT; ASI120MM; May 14, 2015
Captured w/ FireCapture 2.3;
Processed w/ Registax 6; PSP7
UCCI Observatory, GCM


Lunt 60 DSPT; ASI120MM; May 14, 2015
Captured w/ FireCapture 2.3;
Processed w/ Registax 6; PSP7
UCCI Observatory, GCM


Lunt 60 DSPT; ASI120MM; May 17, 2015
Captured w/ FireCapture 2.3;
Processed w/ Registax 6; PSP7
UCCI Observatory, GCM


Lunt 60 DSPT; ASI120MM; May 23, 2015
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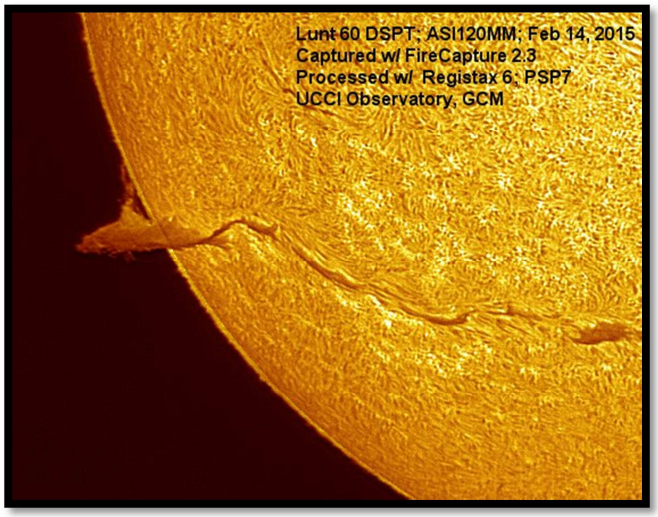
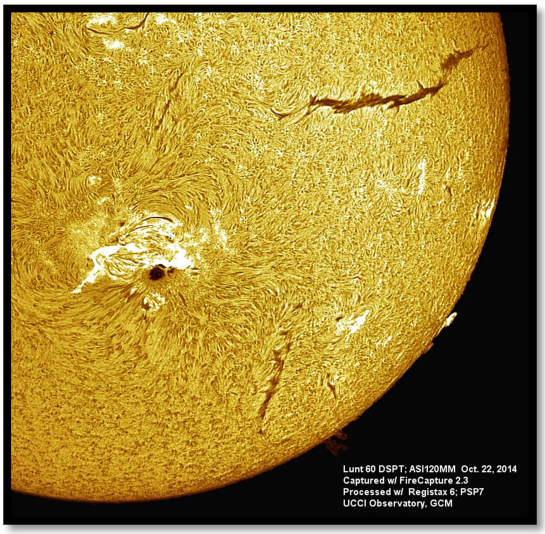
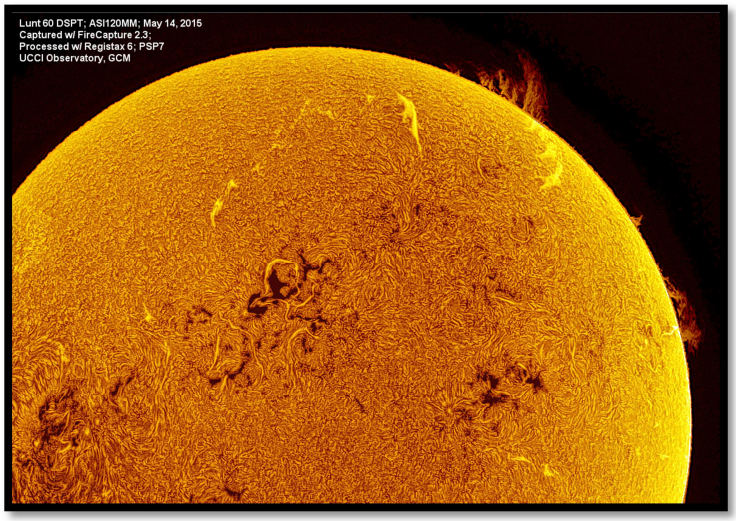
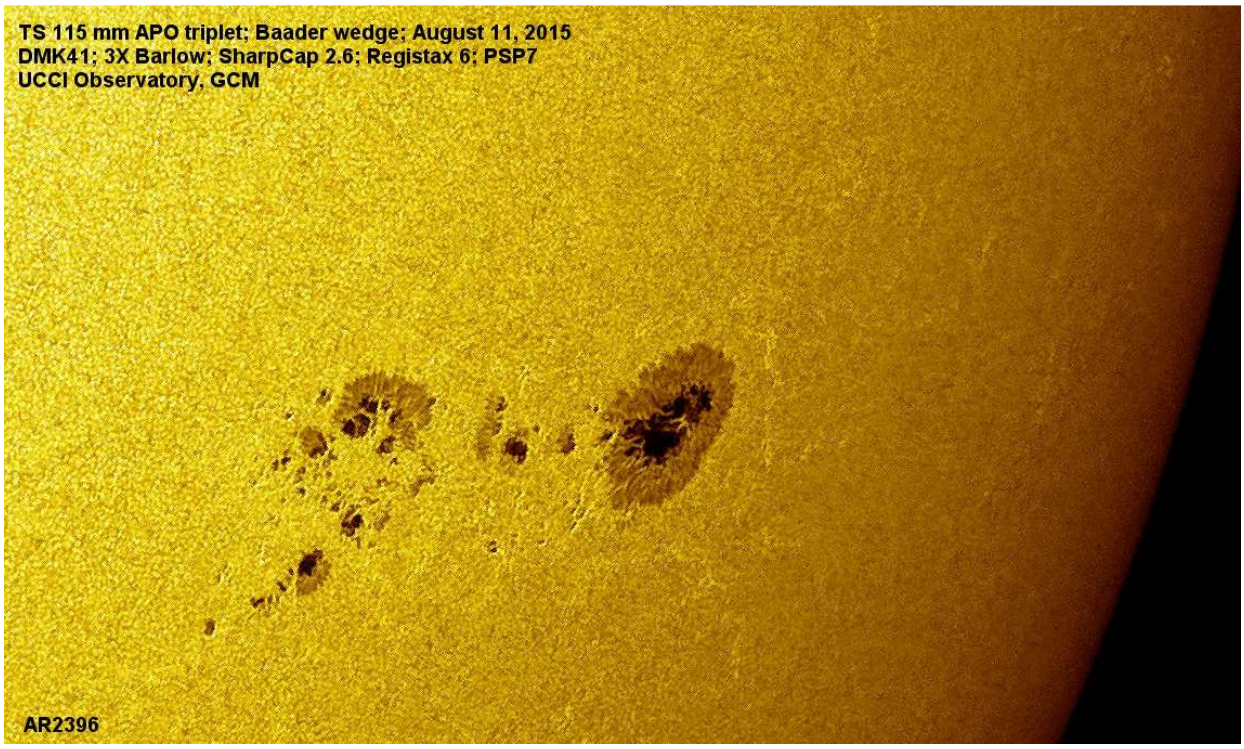
UCCI Observatory, GCM

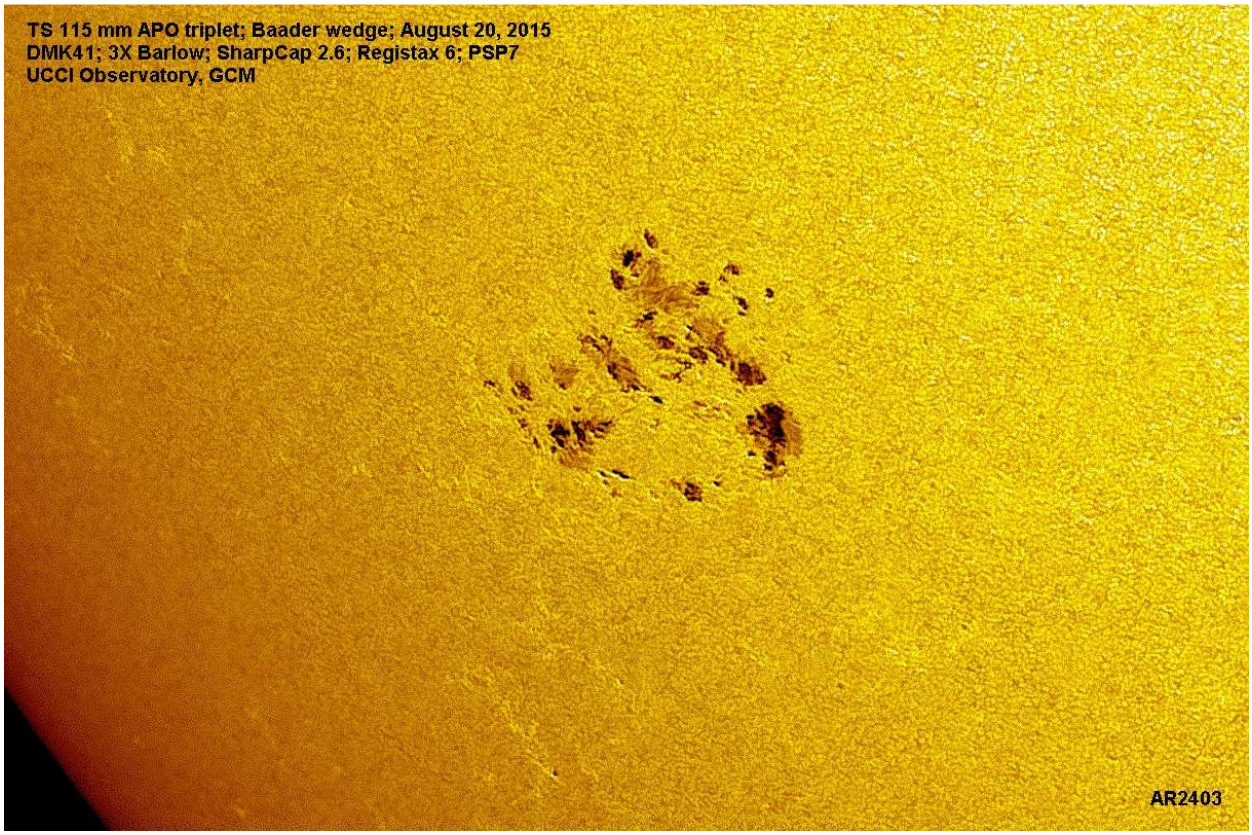

Lunt 60 DSPT; ASI120MM; Feb 14, 2015
Captured w/ FireCapture 2.3
Processed w/ Registax 6; PSP7
UCCI Observatory, GCM

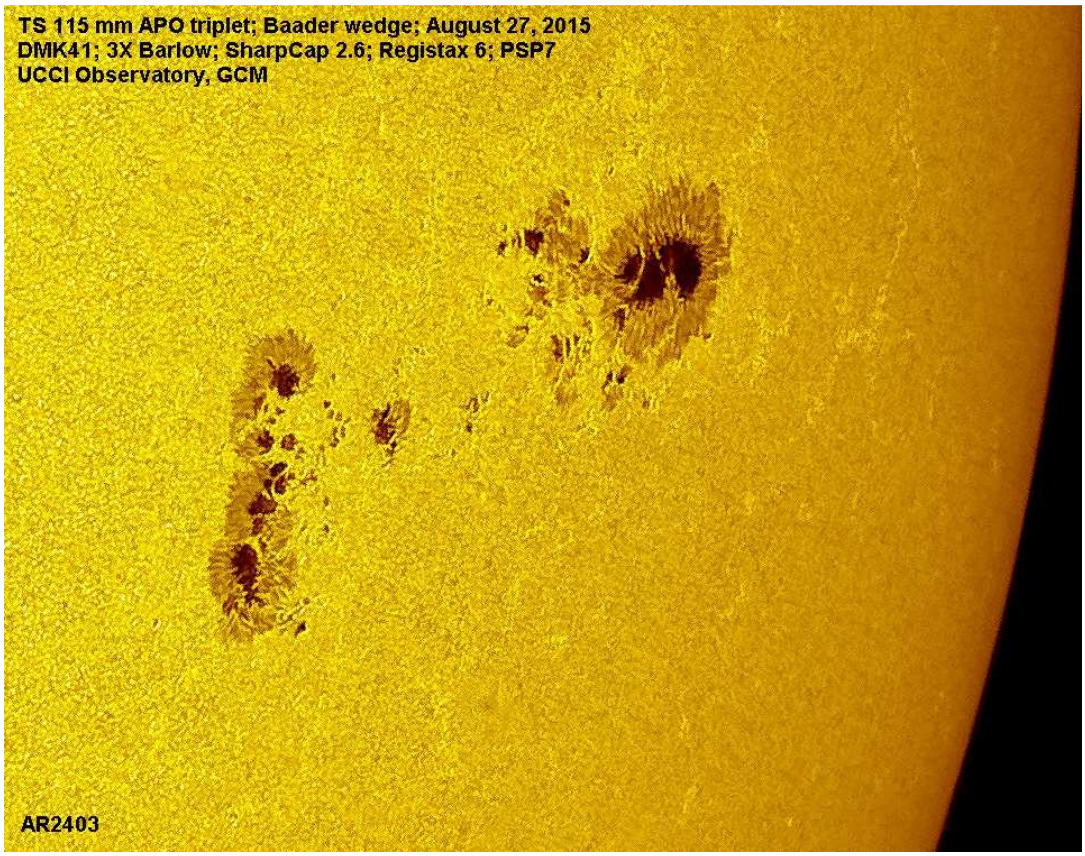

Lunt 60 DSPT; ASI120MM Oct. 22, 2014
Captured w/ FireCapture 2.3
Processed w/ Registax 6; PSP7
UCCI Observatory, GCM

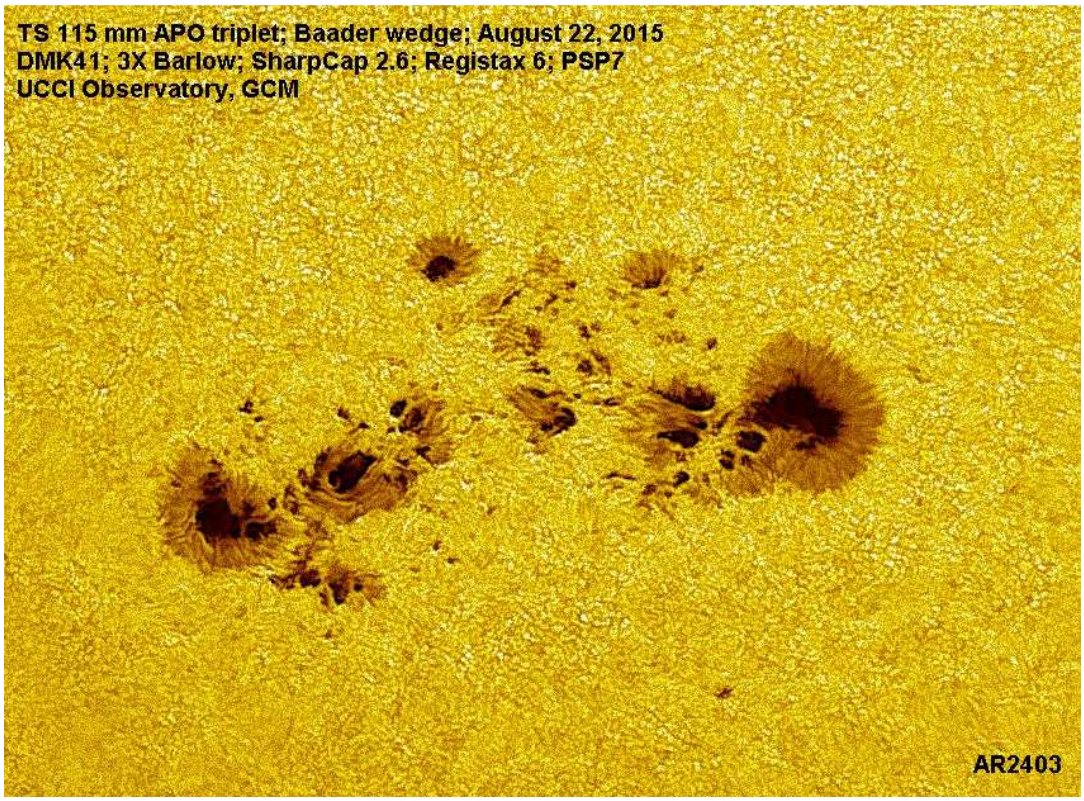

Lunt 60 DSPT; ASI120MM; May 14, 2015
Captured w/ FireCapture 2.3;
Processed w/ Registax 6; PSP7
UCCI Observatory, GCM

Solar in white light with the TS 115mm APO triplet and Baader/Herschel wedge:

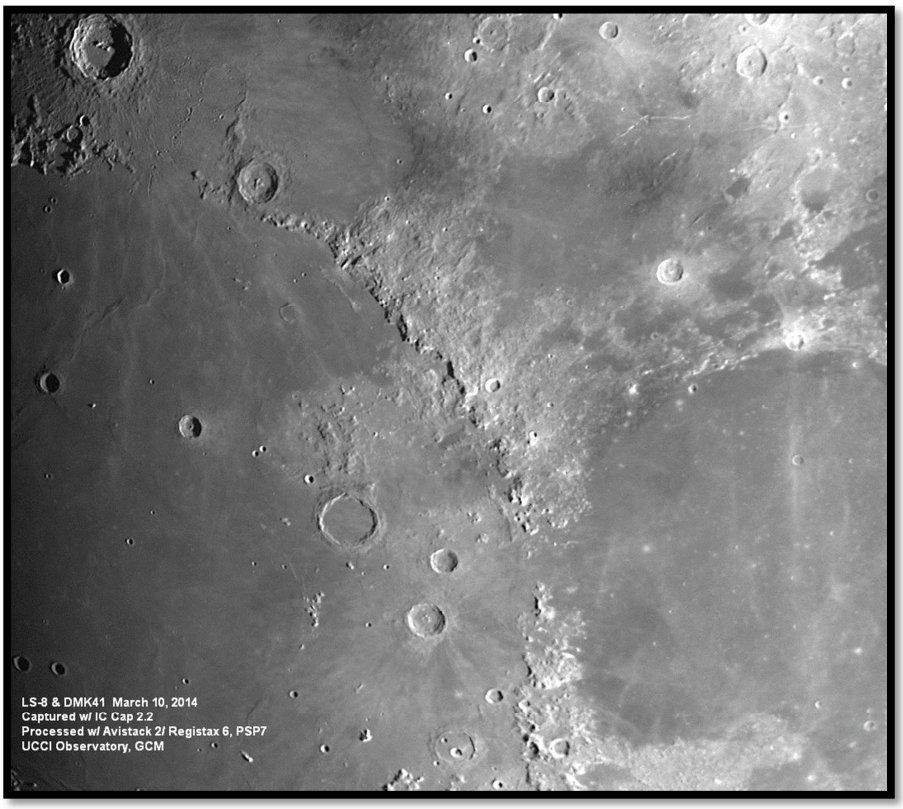


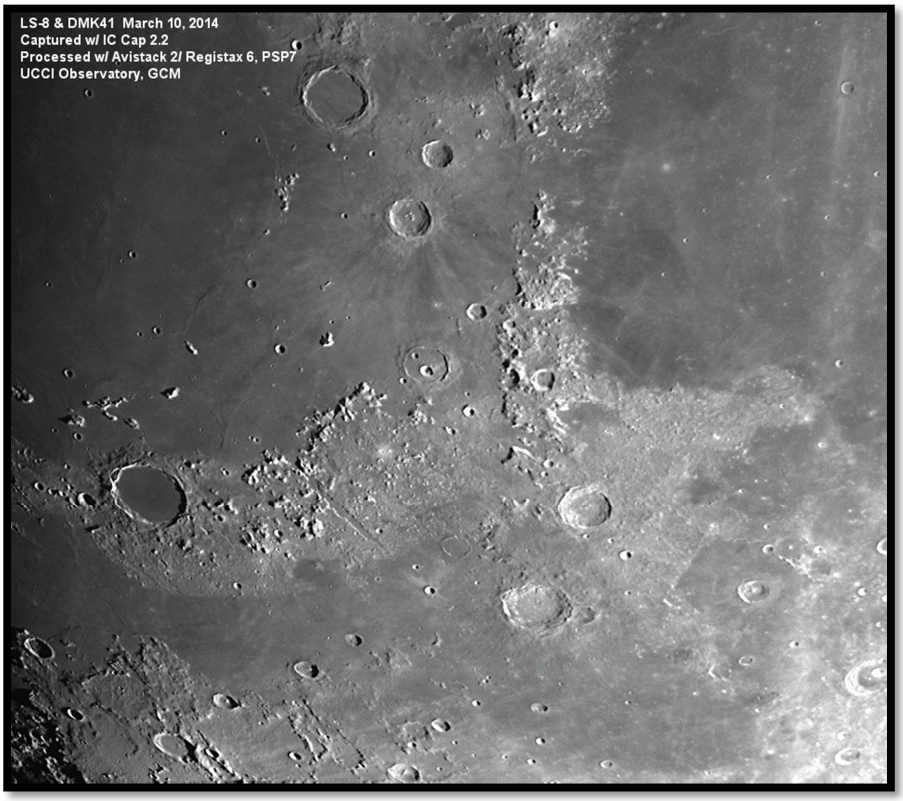



TS 115 mm APO triplet; Baader wedge; August 27, 2015
DMK41; 3X Barlow; SharpCap 2.6; Registax 6; PSP7
UCCI Observatory, GCM
AR2403


TS 115 mm APO triplet; Baader wedge; August 22, 2015
DMK41; 3X Barlow; SharpCap 2.6; Registax 6; PSP7
UCCI Observatory, GCM
AR2403

Lunar:


LS-8 & DMK41 March 10, 2014
Captured w/ IC Cap 2.2
Processed w/ Avistack 2/ Registax 6, PSP7
UCCI Observatory, GCM


LS-8 & DMK41 March 10, 2014
Captured w/ IC Cap 2.2
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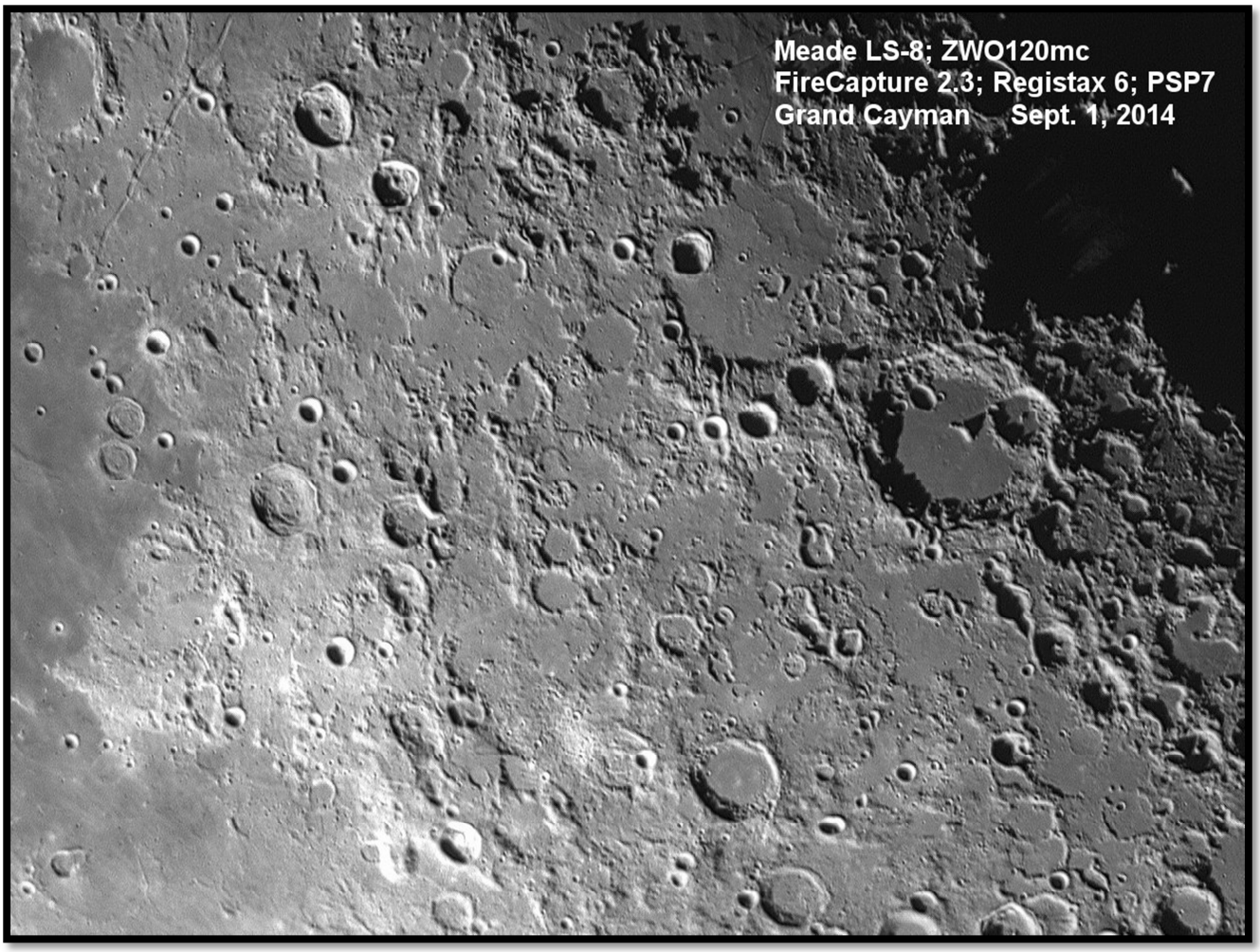
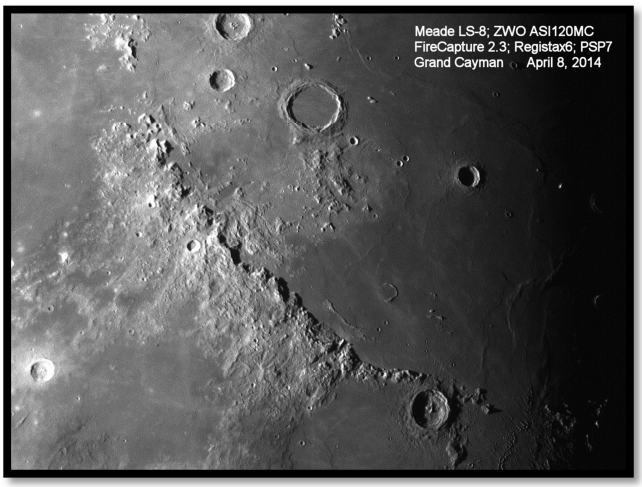
UCCI Observatory, GCM

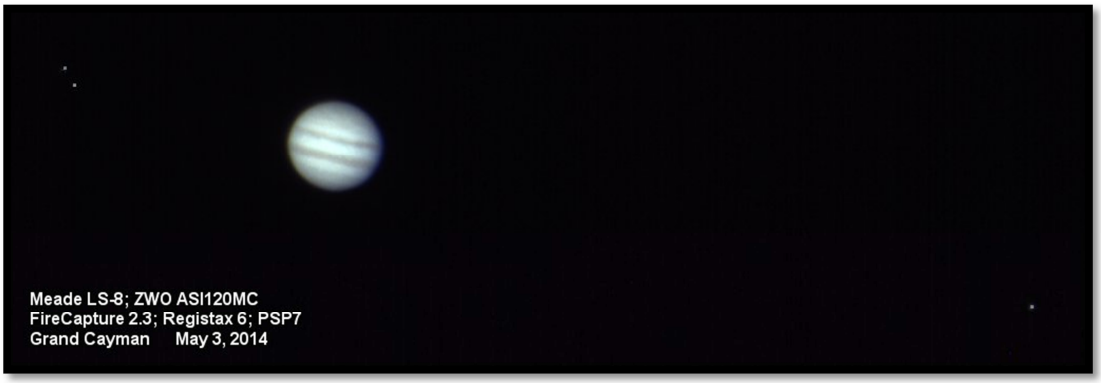

Meade LS-8; ZWO120mc
FireCapture 2.3; Registax 6; PSP7
Grand Cayman Sept. 1, 2014

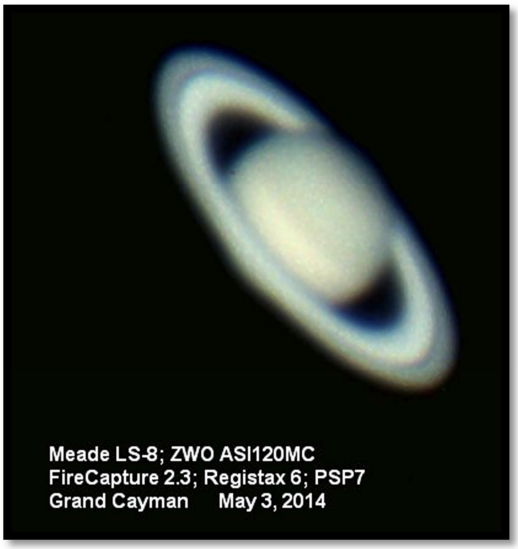

LS-8 & DMK41 March 10, 2014
Captured w/ IC Cap 2.2
Processed w/ Avistack 2/ Registax 6, PSP7
UCCI Observatory, GCM


Meade LS-8; ZWO ASI120MC
FireCapture 2.3; Registax6; PSP7
Grand Cayman April 8, 2014

Planetary:


Pixie Twinkle; ASI120MM; Feb 17, 2015
Captured w/ FireCapture 2.3
Processed w/ Registax 6; PSP7
UCCI Observatory, GCM


Meade LS-8; ZWO ASI120MC
FireCapture 2.3; Registax 6; PSP7
Grand Cayman May 3, 2014


Meade LS-8; ZWO ASI120MC
FireCapture 2.3; Registax 6; PSP7
Grand Cayman May 3, 2014


Meade LS8; ASI120MM; June 29, 2014
Captured w/ FireCapture 2.3;
Processed w/ Registax 6; PSP7
UCCI Observatory, GCM

The Future:

Given sufficient funding and interest, a full time Lecturer in Astrophysics, who could also fill in in math and physics, will be necessary. Moreover, this individual would need to become proficient in the use of all the Observatory facilities – a long and steep learning curve.

The Observatory has a transmission diffraction grating and RSpec software such that spectroscopy is possible though, this avenue has yet to be explored. It does, however, open doors to potentially fascinating research.

STEM will continue to be a major annual event at UCCI and is currently integrating participants from the annual Rotary Central Science Fair both as speakers and, to display their wining projects. With funding from Cayman Enterprise City, the STEM Ambassador Club, originally a STEM component, will become a full time group with mentoring from school teachers and UCCI faculty.

Liaison with the Cayman Islands Astronomical Society will provide more outreach events and further courses in Basic Astronomy.

Thus, one can see great potential for encouraging science through astronomy in the educational system as well as the general public.

UPDATE:

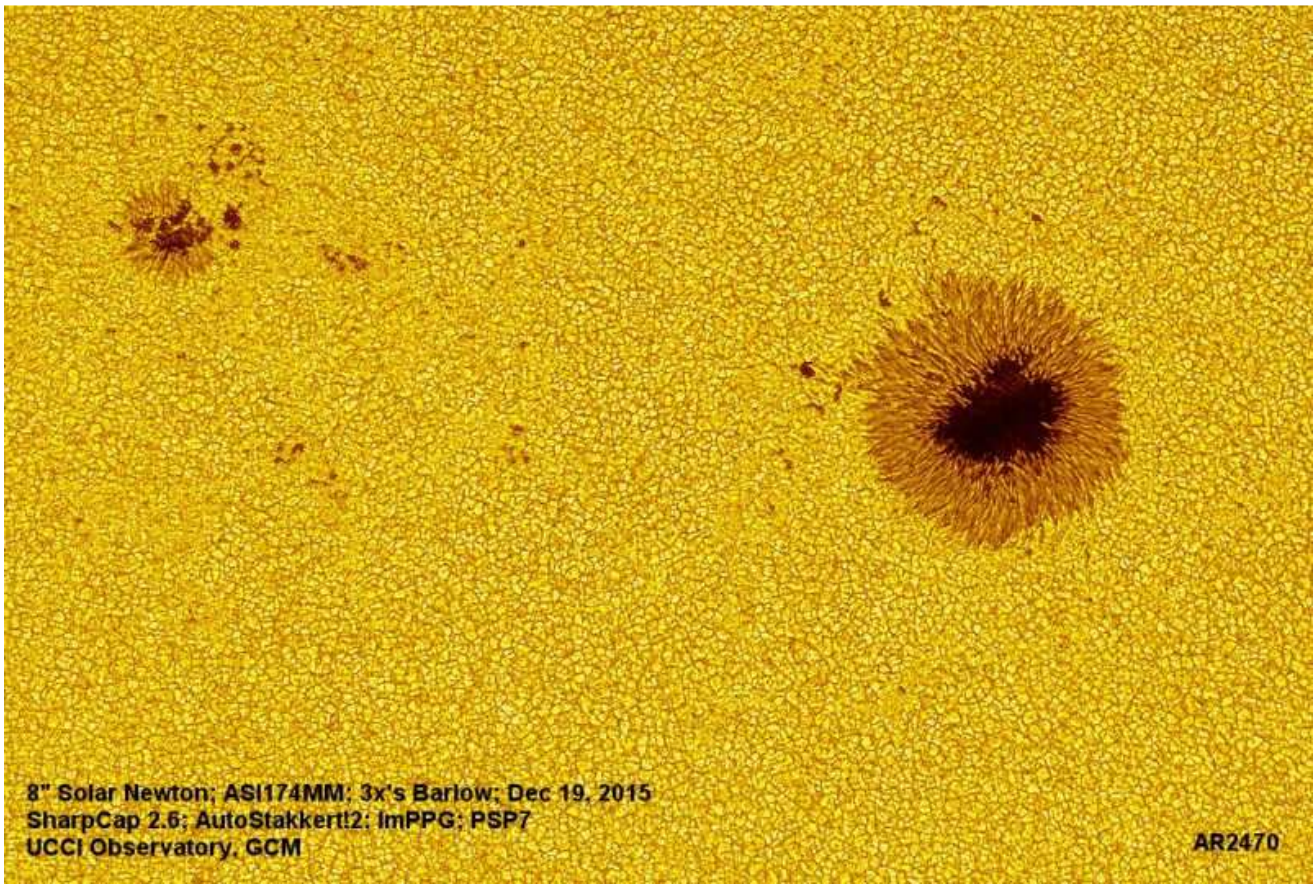
After capturing many white light solar images with the 115mm refractor, it became evident that its resolution had maxed out based on Dawes limit. The alternative was to use a larger objective but, as a refractor this would entail a substantial investment.

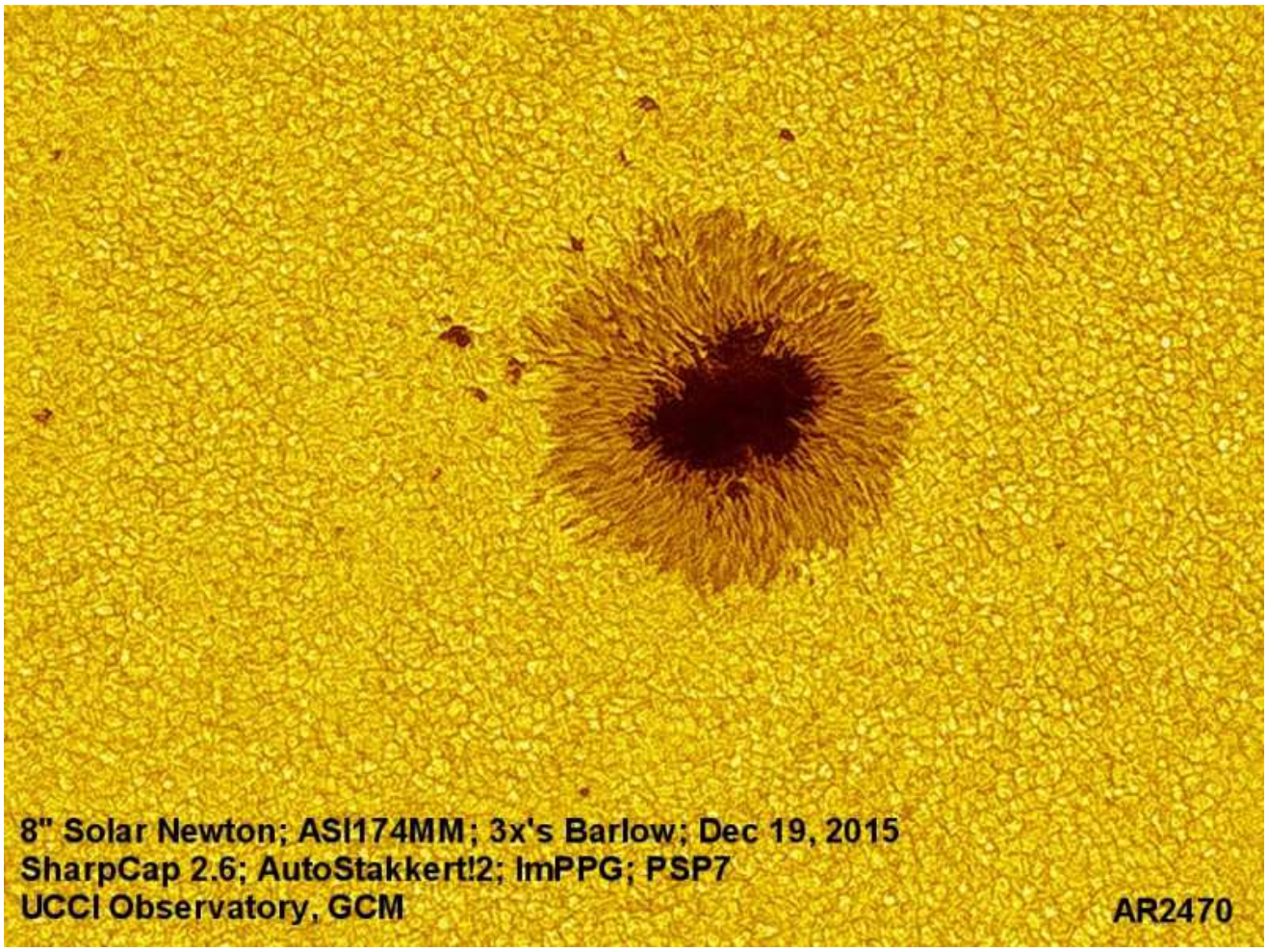
After researching the topic, Bill decided upon a Solar Newton design utilizing a de-aluminized 8” mirror and a filter pack in the eyepiece holder composed of the following: a Baader Solar Continuum filter which admits light in the 540nm band, an IR/UV cut filter and a Neutral Density 3 filter. This arrangement in effect duplicates the Baader Herschel wedge in principle. After several weeks in his workshop, the new scope was completed in early fall 2015. Much greater resolution of solar granules and sunspots became possible. The scope utilized an open truss design and was mounted on an EQ6 GEM mount for tracking. A high resolution digital camera (ASI174MM) was added which used the USB standard for increased capture rate. Cooling fans were provided for both the mirror and the digital camera.

The following images show the Solar Newton in action as well as sample images recently captured.

This scope is so sensitive that ideal viewing conditions are necessary for best results. In addition, revised post processing software has been added in the form of ImPPG for deconvolution – this allows for greater granule resolution.

During the last weekend of October 2015, the UCCI Observatory was privileged to have two UWI, St. Augustine students visit and learn digital solar imaging techniques for a study they are conduction on Fractal interpretation of sunspots. Both Darnelle Hamilton and Garvin Brathwite were a delight to work with and hopefully will soon be able to begin capturing white light solar images in Trinidad.





With its focus on solar imaging, the UCCI Observatory is probably the best equipped facility for such observations. The Lunt 60 DSPT scope is great for hydrogen 1 alpha imaging; the TS 115mm APO triplet with Baader Herschel wedge covers the middle ground for white light solar imaging and, the new 8” Solar Newton provides for high resolution solar images. The latter is one of probably fewer than 30 such telescopes in the world.