JANUS
THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

June 2021 EDITION

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Editorial

Welcome to the June edition of Janus.

Firstly, an apology. A reader pointed out to me that there were errors in my solar system notes last month. This caused me to look more carefully at my usual data source, and I have now decided it's not as reliable as I thought it was. I'll be more careful in future!

Those who belong to the WhatsApp group will be aware that a group observing session was planned for 30th May, but quickly cancelled when it was realised that the brightness of the sky at this time of the year would mean a very late start (or very short session)! But such sessions are obviously now a possibility, and thoughts are turning to a return to physical meetings in September. Fingers crossed for this but, in the meantime, virtual meetings will continue.

Elsewhere, Gary reports seeing the latest batch of Starlink satellites appearing as a very visible chain in the sky. This large constellation is but one of many planned LEO constellations giving rise for concern to both satellite operators and astronomers. OneWeb - in which the UK Government has invested heavily - recently launched a further batch of satellites and, in late May, the Chinese Government announced plans for their own LEO constellation of 13,000 satellites to provide broadband communications.

Finally, an event to look out for this month is a Partial Solar Eclipse (20% coverage of Sun) lasting for approximately 2 ¼ hours from 10:09 BST on 10th June. Maximum obscuration of the Sun will be at 11:13:16. Let's hope for a sunny, cloudless day!

John

SkyUpdate
What's up this month?

The Solar System June

MERCURY: will soon pass in front of the Sun as it heads towards inferior solar conjunction on 11th June. At the beginning of the month, it will not be readily observable since it is very close to the Sun, at a separation of only 13° from it. After passing inferior conjunction, it will remain not observable, reaching its highest point in the sky during daytime and being 1° below the horizon at dawn.

VENUS: recently passed behind the Sun at superior solar conjunction and, throughout the month, will be extremely difficult to observe. It will reach its highest point in the sky during daytime and be no higher than 6° above the horizon at dusk.

MARS: is currently an early evening object, now receding into evening twilight. At the beginning of the month, although low in the sky, it may be visible from around 21:30 UT above the WNW horizon. It will be close to the crescent Moon on 13th June but, again, difficult to see. By the end of the month, it will not be visible, being no higher than 1° above the horizon at dusk.

JUPITER: is visible throughout the month. It begins the month visible in the dawn sky, rising at 00:35 UT– 3 hours and 13 minutes before the Sun – and reaching an altitude of 20° above SE horizon before fading from view as dawn breaks around 03:24. By the end of the month it rises at 22:43 UT and reaches an altitude of 26° above the S horizon before fading from view as dawn breaks around 03:20. It will be close to the Moon on 1st and 28th June.

SATURN: is also visible throughout the month. It begins the month visible in the dawn sky, from 23:56 UT – 3 hours and 52 minutes before the Sun – and reaches an altitude of 18° above the SE horizon before fading from view as dawn breaks around 02:56. By the end of the month, it becomes accessible around 23:28 UT, when it reaches an altitude of 10° above the SE horizon. It will then reach its highest point in the sky at 02:27, 20° above the S horizon, before being lost to dawn twilight around 02:56, 20° above the S horizon. It will be close to the Moon on 27th June.

URANUS: recently passed behind the Sun at solar conjunction. At the beginning of the month, rising around 02:30 UT, it will be extremely difficult to see before twilight intervenes. By the end of the month, although rising earlier at around 00:46, it will remain difficult to see.

NEPTUNE: is currently emerging from behind the Sun. It begins the month rising in the E at around 01:00 UT but will be difficult to see – it will reach its highest point in the sky during daytime and be no higher than 3° above the horizon at dawn. By the end of the month, it will rise earlier - around 23:45 UT - and should reach sufficient elevation to be visible before dawn breaks.

MOON PHASES:

Full Moon	26 May
Last Quarter	2 June
New Moon	10 June
First Quarter	18 June
Full Moon	24 June

Notable Events:

Observation of some of these events may require a telescope, although some will be visible with the naked eye. More information at https://in-the-sky.org

June

1 Conjunction of the Moon and Jupiter
2 M13 is well placed
3 M12 is well placed
5 M10 is well placed
10 Partial solar eclipse - 20% coverage of the Sun
Daytime Arietid meteor shower 2021
11 M92 is well placed
13 Conjunction of the Moon and Mars
18 15P/Finlay at perigee
IC4665 is well placed
20 Jupiter enters retrograde motion
21 June solstice
23 NGC 6530 is well placed
25 Neptune enters retrograde motion
27 Conjunction of the Moon and Saturn
June Bootid meteor shower 2021
28 Conjunction of the Moon and Jupiter
NGC 6633 is well placed

Collected Observations (and thoughts) – Gary Walker

Mercury - 4, 5 and 8 May

On the early evening of 4th May, I observed Mercury. One always gets a good evening viewing of this planet in the Spring.

Earlier this year, to my great joy, a neighbour in the next house but one from me, finally cut down their Leylandii hedge! Over many years this had grown into several trees, which blocked out a lot of my view to the West. Now that it has gone, it is much easier to see objects in the WNW, as the next lot of trees must be about 100 yards away.

Mercury always appears very small in angular size (it was only 6.1' arcseconds!), and it never gets bigger than 12' arcseconds at maximum. It appeared white in colour, rather than the usual pinkish colour it has near sunset. I could just about see the gibbous phase, despite the blurring due to our atmosphere. The phase was about 71%. It is astonishing that Mercury was much higher in the West than Venus, as the opposite is usually the case!

I observed Mercury also on 5th and 8th May. On these dates, I definitely, and clearly, saw Mercury with the naked eye. I don't think that I have ever managed to do that before, only in telescopes and binoculars.

It has been said that only 1% of the world's population has ever seen Mercury, visually. Regardless of whether or not this is true, Mercury is clearly about the most elusive planet. It never strays very far from the Sun (being, as it is, the closest planet to the Sun), which means that even when it is visible, it's always low down, in the evening, or morning skies and prone to obstruction by inconveniently located trees or houses. Its (relative) closeness to the Sun also makes it the fastest moving planet, with an orbital period of only 88 days, so it never stays in one place for long. Its magnitude can change quickly, as the phase wanes, and it is never visible in a truly dark sky, so it has to be observed, at best, in a twilight sky. Despite all these difficulties, it can be one of the brightest planets; on May 8th, it was - 0.5.

The recent removal of the neighbours Leylandii hedge/trees has made such observations much easier. Previously, I had to keep shifting my position in my garden to look around the sides of those trees, to see if I could see whatever I was trying to find.

Of course, having found Mercury, there then comes the problem of actually observing it. It's angular size on 8th May was still only 6.6' arcseconds and, as stated earlier, it never gets larger than 12' arcseconds.

If you think that observing Mars is frustrating and disappointing, wait until you try and observe Mercury! Usually, at best, only the phase can be picked out, whilst surface detail is extremely hard to discern. That said, some amateur astronomers have imaged surface features, with nearly as good definition as was imaged by the Messenger Probe!

To add to all these problems, if you are observing Mercury low down, the view of it will be badly affected by atmospheric turbulence. Thus, Mercury is a planet of contradictions!

In my telescope, on 8th May, the phase was hard to see as it only appeared as an oval blob. The planet appeared off-white to pinkish in colour. Despite all the difficulties, I was able to see and observe it for quite a long time until at least 9.25pm.

Mercury can also be observed in daylight, when it is high in the sky, and many amateurs prefer to do that so as to avoid atmospheric turbulence. I have managed to do this, a number of times.

Nova v1405 Cas and other observations - 10 May

I have been watching this Nova since 30th March, and it has been of about the same magnitude as a star “below” it. It was about magnitude 7.6. However, after 8th May, I noticed that the nova was now much brighter than its “companion” star. It was now about magnitude 6, or even brighter! It still appeared white in colour.

The Sun was presently active with several small to large spots on it.

On 10th May, I could see Mercury as a half-phase.

Starlink satellite chain - 18 May

At about 12.15 am, on 18th May, I went outside and spied a long chain of satellites crossing the sky, high up. The leading satellites were bunched up close together and I counted at least 23 of them, with further, more widely spaced, satellites following on behind in a shorter chain, separated from the main chain.

The whole effect appeared like an illuminated string, crossing the sky, or a chain of pearls. They appeared quite beautiful, but many astronomers would have been cursing them! They were bright - maybe about magnitude 2, or so, - and were yellow in colour. The whole chain covered a number of degrees in length. I have seen Starlink chains before, but nothing like this!

At the same time, I also saw the International Space Station passing overhead, some way to the North of the Starlink satellites. However, because of the spectacular Starlink chain, I took little notice of the ISS!

The Winchcombe Meteorite 18 May

This has been in the News again. On 16th May it was stated that the meteorite has been placed on display in the Natural History Museum, just in time for its re-opening on 17th May, following the easing of COVID restrictions. It has been placed in the "Vault" in the Mineralogical Gallery of the museum.

This meteorite is remarkable for several reasons, most notably because it is a rare type - a Carbonaceous Chrondite. Of the more than 60,000 meteorites discovered on Earth, only about 5% of them, are of this type, meaning that there are less than 500 of them! Carbonaceous Chrondites are composed of largely unaltered and pristine material from the formation of the solar system.

As it was widely observed and, even more importantly, imaged by cameras spread across the country by the UK Fireball Alliance, its path could be tracked, and its impact point located. Only 51 such meteorites have been seen to actually fall, and this was the first (known) example in the UK!

This type of meteorite is fragile in nature, so the fact that the fragments were located very quickly was critical, so as to avoid contamination by the Earth's environment! Needless to say, many meteorites have fallen unobserved or, even if they were, they may have been impossible to find - they can often land in the sea, or in a lake!

Venus and Mercury - 29 May

I saw Venus via my telescope on 29th May, and it appeared as a round globe, only pinhead-sized at 62X, but appearing relatively large at 222X and higher powers.

It was at its greatest distance from Earth, only 10.3' arcseconds in size, and at 96% phase.

On looking back through my notebook, exactly one year previous, Venus was near Inferior Conjunction, and was a large and beautiful thin crescent! Whenever you see it through a telescope, it is worth noting that Venus is about the same size as the Earth, so from the distance of Venus, one can see what the size of the Earth would be!

Mercury was only one degree below Venus, but I couldn't see it in my scope, so it must have faded down. In all, I saw Mercury on a total of 7 evenings, between 4th and 19th May. After that, the weather changed again and, annoyingly, there were patchy clouds getting in the way on subsequent evenings, even though there were some breaks. Either that, or the clouds only cleared away after Mercury had gone down!

The Top 7 Brightest Stars in the Sky - John Davey

How do we measure the brightness of a star?

As readers will be aware, astronomers measure the brightness of stars, planets, and other space objects using a magnitude scale. There are two types of magnitude — apparent and absolute. Apparent (or visual) magnitude is the brightness of an object as it appears in the night sky from the Earth. Apparent magnitude depends on an object's intrinsic luminosity, distance, and other factors reducing its brightness. The lower its apparent magnitude, the brighter an object appears to observers. Space bodies with negative magnitude numbers are exceptionally bright.

Absolute magnitude is an apparent magnitude an object would have if it were located at a distance of 10 parsecs. For example, the apparent magnitude of the Sun is -26.7 - it's the brightest celestial object we can see from the Earth. However, if the Sun were 10 parsecs away, its apparent magnitude would be only 4.7. By considering stars at a fixed distance, astronomers can compare the real (intrinsic) brightness of different stars.

What are the brightest stars as seen from Earth?

Based on apparent magnitude, the Sun is the brightest star as viewed from the Earth. However, we should note that not all lists of the brightest stars include the Sun, since many lists consider only the stars observable in the night sky. Thus, they designate Sirius as the brightest star.

The 2nd brightest star, Sirius, has an apparent magnitude of -1.46 and is visible worldwide. This dazzling star is located in the constellation Canis Major; it is the Alpha star of this constellation. Sirius is about 8.6 light-years away from us, which is much closer than the next member of the list.

Canopus or Alpha Carinae is the 3rd brightest star in the night sky. This star shines at a visual magnitude of -0.74 in the constellation Carina which (unfortunately for us!) is best visible in the Southern Hemisphere. Canopus is placed further than any other star in this list - around 310 light-years away from the Sun!

Alpha Centauri is a closer but fainter star that occupies 4th place in the list. This star is actually a system consisting of three stars, the brightest of which is also known as Rigil Kentaurus. Alpha Centauri is placed in the constellation Centaurus shining with a visual magnitude of -0.1. Lying at a distance of just 4.4 light-years from us, this star system is the closest neighbour to the Sun. The system is in the Southern sky and isn't visible to observers above the latitude of 29° north.

The 5th brightest star is Arcturus, the main member of the Bootes constellation. Having an apparent magnitude of -0.05, Arcturus is best visible in the winter sky from the Northern Hemisphere. This orange giant is placed about 37 light-years away.

Vega takes 6th place, is the brightest star in the northern constellation of Lyra, and also a part of the Summer Triangle asterism. This star lies 25 light-years away from our Solar System. Vega was originally taken as "zero value" to reference the other star magnitudes, but this isn't the case anymore - further studies measured its magnitude as 0.03. For visual observations, Vega still can be used as the zero point, but for more advanced observations, an elaborate calibration system is used.

The last member of the list Is Capella — the 7th brightest star of the entire sky. It's visible in the Northern Hemisphere most of the year. Capella is the brightest star of the constellation Auriga and designated Alpha Aurigae. Located about 43 light-years from us, Capella is, in fact, a multiple star system consisting of two yellow binaries.

Measurement obstacles

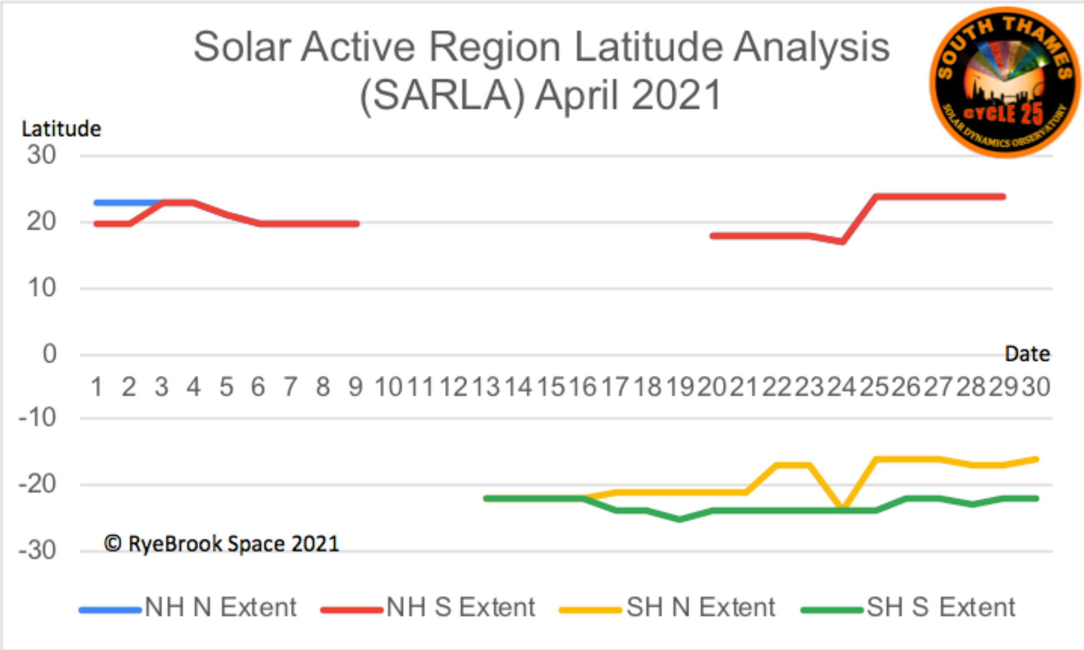
Just in case you think this is all pretty straightforward, it's only fair to point out that, due to some "obstacles", the exact order of the brightest stars can't be perfectly defined:

- First of all, traditionally, stellar brightness is based on the apparent visual magnitude perceived by the human eye. After the invention of telescopes, astronomers proved the existence of double stars and multiple star systems. Nowadays, stellar brightness could be expressed as either individual or combined magnitude. For example, the double star Alpha Centauri AB has a combined visual magnitude of -0.27, while its two components have magnitudes of 0.01 and 1.33.

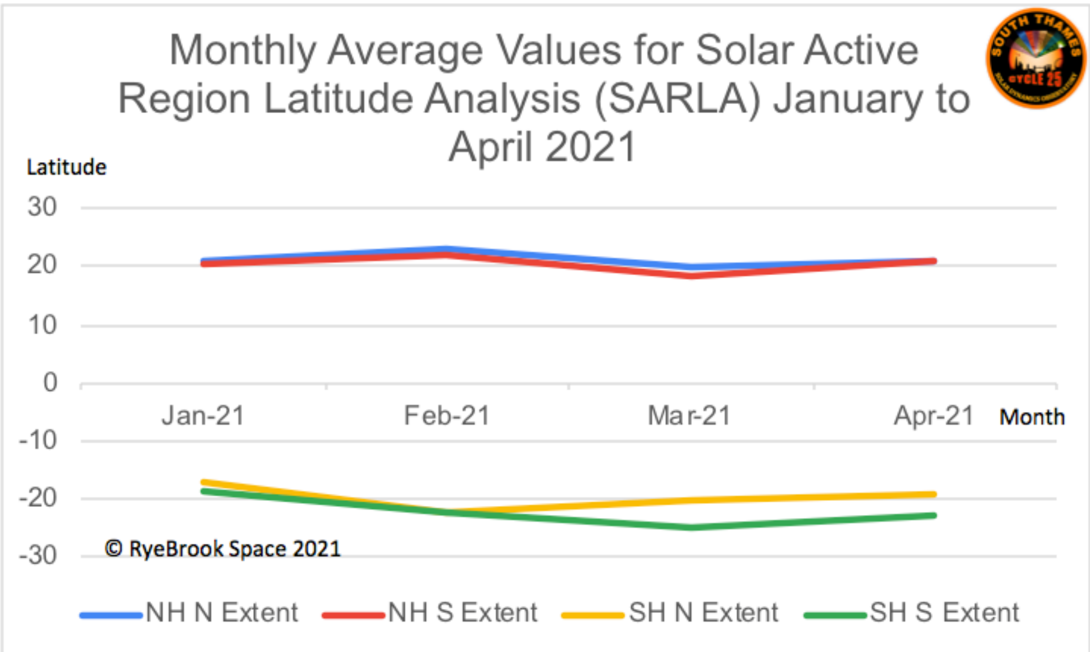
- New technologies can measure stellar magnitudes slightly differently — this may change the brightest stars' order. Also, scientists developed different kinds of magnitude systems based on different wavelengths, so apparent magnitude values can vary dramatically.

- There are variable stars, like Betelgeuse or Antares, which change their magnitude over days, months, or years. Usually, to exactly define an apparent magnitude, you should take either the repeated maximum brightness or a simple average magnitude.

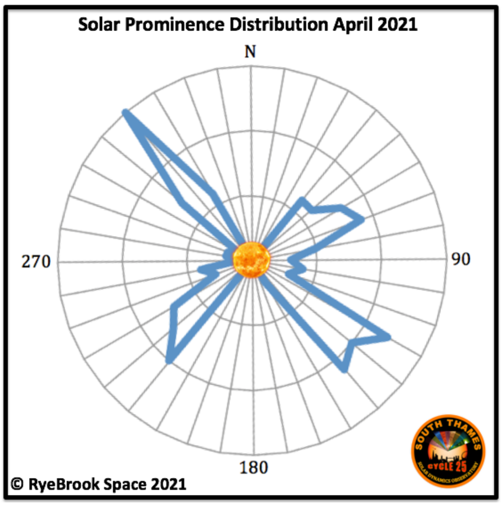
Solar Activity Report April 2021 - Stephen

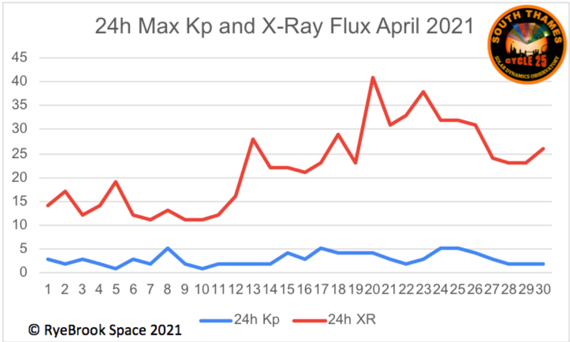


N/S Hemisphere asymmetry is again noted. In the NH there were 10 consecutive days without active regions, and in the SH there were 12 consecutive days without active regions, which was a continuation of 12 preceding days during March where there were also no active regions in the SH. Activity in the NH is grossly confined to a narrow band +17 to +24 degrees latitude, and in the SH to a band -16 to -25 degrees. The chart is entirely in keeping with the early stages of the solar cycle.



The smoothed monthly average distribution of solar active regions by latitude for the year so far, demonstrates no significant migration of active regions toward the solar equator. This is entirely in keeping with the early stages of the solar activity cycle.





Event Log:

2021-04-12: Large magnetic filament eruption & CME at SE limb. Described as a "flux rope CME". Resultant CME not Earth-directed.

2021-04-15: Kp5 (G1) geomagnetic event - short-lived <3h, but unexpected.

2021-04-17: Kp5 (G1) geomagnetic storm due to high solar wind speed (570.3 km/sec).

2021-04-17 17:00UT: B9.7 solar flare + CME from behind SE limb. Type II radio burst.

2021-04-19 23:49UT: M1.1 solar flare from AR2816 + CME not Earth-directed.

2021-04-22: C3.8 solar flare from AR2816 early hours of morning. HF radio blackout affecting South Asia. Earth-directed CME.

2021-04-23 20:00UT: C8 solar flare from AR2817 without CME.

2021-04-23: Kp5 (G1) geomagnetic storm - short-lived <3h.

2021-04-25: Brief Kp5 reducing to Kp4 geomagnetic event due to CME arrival from C8 flare of 2021-04-22.

2021-04-25: Magnetic filament eruption in SEQ + CME, not Earth-directed.

Daily Solar Dynamics Data are available on Twitter @RyeBrookSpace or on the RyeBrook Space website: *ryebrookspace.co.uk*

Recent Solar Activity - Ron Johnson

Following a very deep solar minimum the Sun has shown some reasonable activity (solar cycle 25) in recent months.

WARNING: YOU SHOULD NEVER LOOK AT THE SUN WITH THE NAKED EYE OR THROUGH ANY OPTICAL INSTRUMENT AS PERMANENT EYE DAMAGE OR BLINDNESS WILL RESULT.

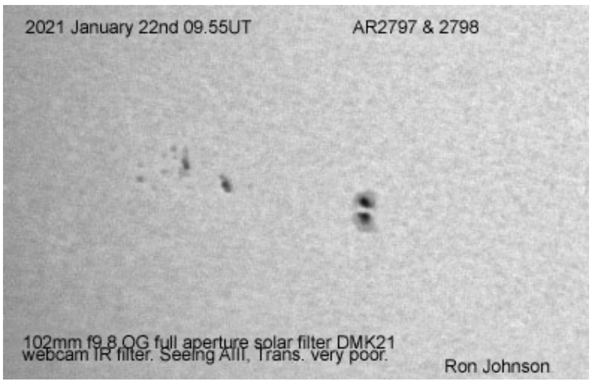
The set up:

102mm f9.8 refractor on a driven equatorial mount, full aperture solar filter, DMK21 monochrome webcam, IR or continuum filter, laptop computer shaded from sunlight. 60mm SolarMax II Hydrogen Alpha telescope mounted on the refractor.

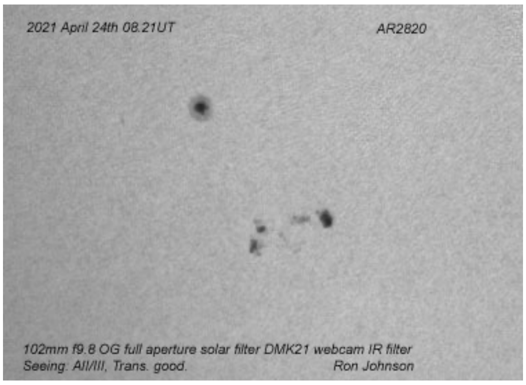
Images:

Some of the recent images of the sun are included below.

White light images

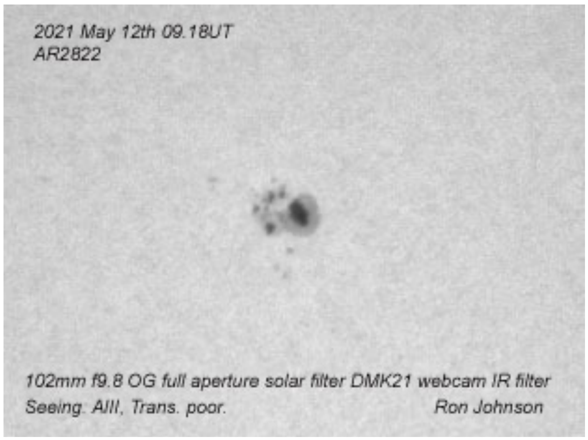


Active regions – sunspots



Active regions - sunspots

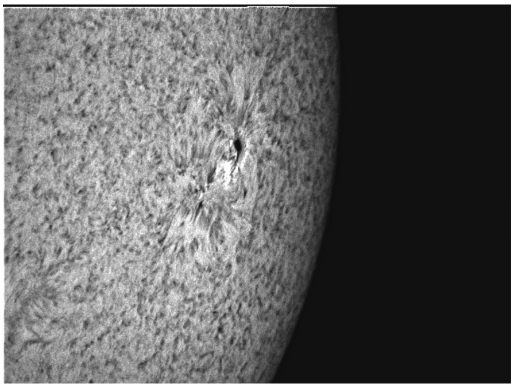
Active region – sunspots & faculae



Active region - sunspots

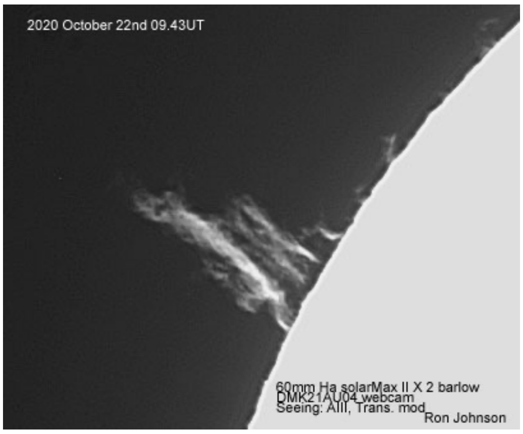
Ha images of active regions

Filament & sunspots

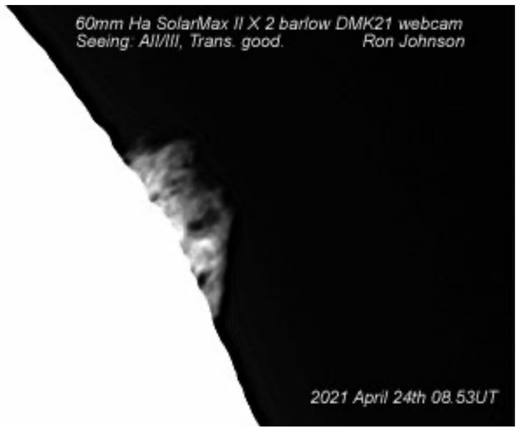


Sunspots

Ha images of prominences



Prominence rising 160,000 miles



“Hedgerow” prominence

Experiment to determine whether there is scientific benefit to imaging the Moon at Hydrogen-alpha wavelengths - Stephen

Background:

A previous informal test of the viability of imaging the Moon at the Hydrogen-alpha (Ha) wavelength, produced images that were suggestive of an albedo map of the Lunar surface. To understand this principle, it is important to realise that a Ha image of the Moon reveals only the very narrow band of light in the Ha range from the Sun, that is reflecting from the surface of the Moon, and that it therefore can give a very different view of the lunar surface to that seen in the normal visible wavelengths. Different types of rock are likely to have very different reflective indices, the effect of which could be masked by illumination under broadband visible light, as a surface that does not reflect Ha light, but does strongly reflect say Calcium K light, would be seen as a bright feature in broadband visible light, but a dark feature under Ha narrowband light. As well as reflective index, it is also important to consider that some surfaces may absorb certain wavelengths more than others. Of course, the only test source of light available to us is the broadband spectrum of sunlight, but through filtering, we can select various narrow band wavelengths through which to observe and image.

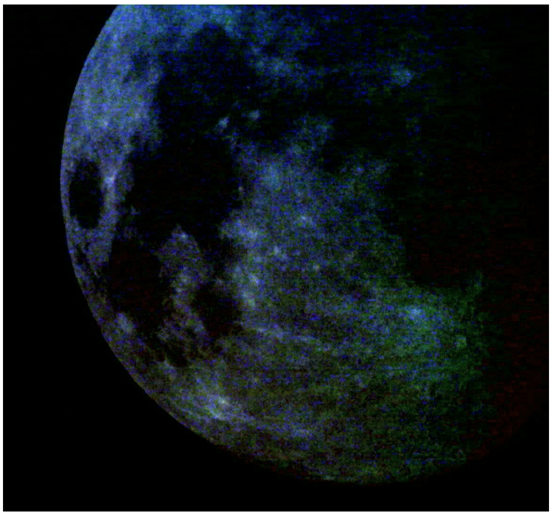
Method:

The blocking filter was removed from a Lunt 35/400mm Ha solar scope, and a CMOS camera was used to image the Moon through the telescope's etalon filter. A number of difficulties were encountered. Firstly, the blocking filter in this type of telescope is housed in the diagonal, and removing the diagonal causes two difficulties: 1. It includes the helical focuser for the instrument; 2. It reduces the physical focal length available. Insertion of a flip-mirror imaging diagonal, however, overcame both of these problems by both providing adequate focal length, and a means of focusing, because it has an integral helical focuser of its own. Secondly, aiming the instrument at the Moon was challenging, because the Ha telescope does not have an optical finder - only a solar finder. The Moon at that time being 86% illuminated, was quite bright, and was very faintly visible with the solar finder - enough to point the telescope grossly toward the Moon, but the final adjustment had to be made by removing the diagonal from the telescope and squinting up the inside of the telescope tube to assess the brightness of the circle of light seen through the aperture. This was a time-consuming and back-breaking process.

Processing of the images was achieved using the native level adjustments on the computer used to capture them, and primarily consisted of boosting the exposure and colour saturation, a minor adjustment of contrast and sharpening. No multi-image stacking was undertaken.

Findings:

The resulting image of the Moon was highly attenuated by the Ha filter, but was visible on the computer monitor, albeit only faintly. In addition, it is thought that the IR Cut filter in the CMOS camera provided further attenuation. Focus was adequately achieved by viewing on the monitor while adjusting, and sufficient focus was achieved to allow images to be captured. In addition to still images, some video was captured and, on review, this revealed a constant “twinkling” effect of bright features on the lunar surface, which is understood to be the effect of scintillation caused by unsteady seeing conditions.



When analysing the images several observations are immediately made:

1. The images lack resolution due to the low magnification and small objective size inherent in this telescope.
2. The maria are markedly dark.
3. Highland regions, particularly those in the NW are intensely bright.
4. A number of bright craters are seen.
5. An anomaly is seen transecting Mare Serenitatis, possibly associated with a crater ray.
6. The 86% illumination of the Moon at this time, results in uneven illumination of the southern highland region.

Impression:

Navigation of lunar topographical features under Ha wavelengths is challenging, due to the appearance of certain features being markedly changed by the filtering. The small size of the image, and the low resolution, add to this difficulty.

There are, without doubt, features visible under Ha filtering that are not apparent in normal broadband light, and the dichotomy of dark mare and bright highland features is dramatically enhanced. There may be potential for differential analysis of various rock types under Ha filtering.

However, the low magnification and resolution using this equipment limits the usefulness of the resulting image.

Conclusion:

Lunar imaging under Ha filtering may have some scientific benefit, and effectively produces an albedo map of the lunar surface, which is worthy of further investigation and development. Imaging a full Moon in the same manner will likely produce an improved result, as it ensures an even illumination of all sectors of the disk.

Plan:

1. Initially a further attempt at imaging using the same equipment and methodology should be carried out at full Moon, in order to assess the technique under improved conditions of illumination.

2. Although expensive, further Ha imaging of the lunar surface should be attempted using a deep sky Ha filter fitted to a larger telescope, which will yield increased magnification and resolution.

3. Ultimately, Ha images of the lunar surface could be compared with images captured under filtering at other wavelengths, such as OIII, Hydrogen beta, or other wavelengths for which filters are easily available at reasonable cost.

Up Next:

NEXT MEETING: Maurice Gavin Memorial Lecture.
8pm Friday 11 June 2021 - Virtual meeting via Zoom

Neil Phillipson will talk on "The New Space Race/Exploring the Solar System - the inside story of our most successful probes (and most spectacular failures)".

Ron Canham will also deliver his Sky at Night presentation for the month to come.

NEXT USER GROUP:

Suspended until further notice.

NEXT DENBIES OBSERVING SESSION:

Suspended until further notice.

AD HOC OBSERVING AT WARREN FARM:

These will be at short notice when the weather is favourable. Please watch our Whats App feed for alerts.