

The Astronomers' Bulletin

Newsletter of the Sydney City Skywatchers

Volume 10, Issue 7 Jul/Sep 2019

Moon Landing Broadcast Donated by CSIRO

As the 50th anniversary of the Apollo 11 Moon landing approaches on 21 July, CSIRO and the National Film and Sound Archive of Australia have ensured the original TV broadcast will be preserved for future generations.

NASA gifted the only official copy of the footage held outside of the United States to CSIRO, Australia's national science agency, in recognition of Australia's crucial role supporting the Apollo 11 mission.

To mark the anniversary, a new digitally restored version of Australia's official copy of the broadcast was donated by The Minister for Industry, Science and Technology, to The Minister for Communications, Cyber Safety and The Arts at an event at Parliament House. A delegation of NASA officials led by Mr Badri Younes, Deputy Associate Administrator for Space Communications and Navigation, were present to witness the donation.

Ground stations in Australia played an essential role in the success of the Apollo 11 mission, receiving and relaying images to the world, tracking spacecraft and monitoring astronauts' health. Sharing this historic event, which was seen by over 600 million people around the world, would not have been possible without this strong US and Australia partnership.

Communicating with the Apollo 11 lunar module Eagle and sharing news of the 'giant leap' was made possible by the technology and teams at NASA's tracking stations at Goldstone, California and Honeysuckle Creek near Canberra,



The Parkes telescope tracking the Moon during a test several weeks before Apollo 11.

and CSIRO's Parkes radio telescope in NSW.

For the first nine minutes of the broadcast, NASA switched from Goldstone to the signals from Honeysuckle Creek – the latter capturing the first foot-step on the Moon. The strong signal being received by CSIRO's Parkes radio telescope - with its large surface area and sensitive technology – was then used to share the remainder of the two-and-a-half-hour broadcast with the world.

Executive Director of CSIRO's space programs Dr Dave Williams said Australia's unique geographical location made it a natural

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choice for NASA to establish ground tracking stations, which need to be located at equal distances around the world to maintain constant contact with spacecraft.

"Our collaboration with NASA extends for almost sixty years," Dr Williams said. "Australia continues to play a pivotal role in NASA's Deep Space Network, tracking more than 40 spacecraft from the Canberra Deep Space Communication Complex – which CSIRO manages on NASA's behalf – and lending our Parkes radio telescope to support missions such as Voyager 2, which recently entered interstellar space.

"It was an honour to receive the official copy of the footage from NASA in recognition of the support Australia provided to the Apollo 11 mission, and to donate this footage to the National Film and Sound Archive for the benefit of future generations."

CEO of the National Film and Sound Archive Jan Müller said in addition to a significant scientific and engineering achievement, the broadcast of the moonwalk was a powerful collective experience for those watching here on Earth.

"Nearly fifty years ago, the world came together to watch these images and celebrate a landmark human achievement. The broadcast had huge impact inspiring others to follow their passion in science and engineering, and to make a difference to the world," Ms Müller said. "Today we're delighted to accept this donation from CSIRO to add to our collection, which preserves key moments in Australia's history."

Vision of the moonwalk was transmitted via a 66cm radio dish on top of the lunar module that used just 20 watts of power – the same energy output as two LED light bulbs. The faint signals then travelled 384,000 kilometres to Earth where they were received and converted to a signal



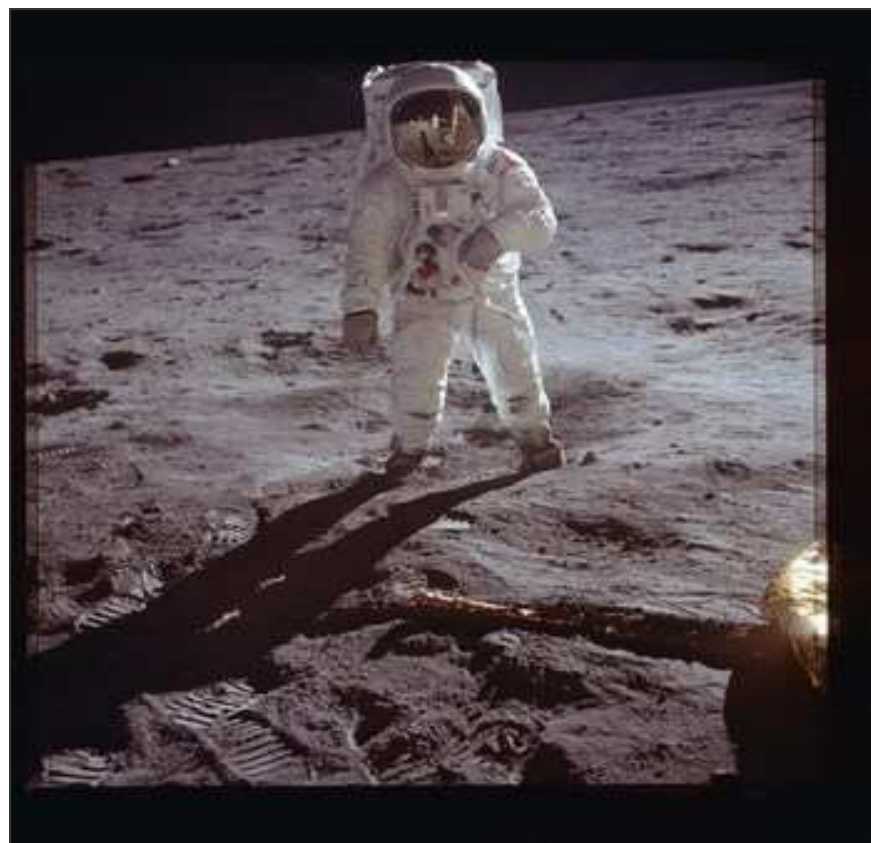
The Parkes control room staff watch the moonwalk.

normal TVs could receive. The conversion meant TV audiences never saw the comparatively high-quality video direct from the Moon that engineers at Goldstone, Honeysuckle Creek and Parkes witnessed.

Decades later, NASA worked with Hollywood film restoration specialists to enhance the footage, which is now included in the collection of the National Film and Sound Archive of Australia, ensuring its ongoing preservation.

CSIRO July, 2019

Image credit: CSIRO, NASA



Buzz Aldrin photographed by Neil Armstrong.

Solar Observations

by Monty Leventhal OAM & SCS President

March 2019 Solar Report

For the month of March, 2019 though solar activity was still very low, a few Sunspot groups did appear. The first seen was on the 5th UT when a Cki group was observed in AR12734. It contained 2 spots within the Penumbra and one just outside of it. It was still visible on the 7th only now it had a faint Filament close to it.

No observations were made until the 11th due to constant bad weather when the solar disc was seen to be clear of all activity. Again no further observations were made until the 17th due to very bad weather. On that day no Sunspots could be seen.

On the 18th March a new small Cso group was seen in AR12735. Again bad weather prevented observations until the 22nd when a Cki group of spots in AR12736 was seen close to the NW limb. It produced a type 2-B Flare which was already active at the start of my observation at 21.00 hrs. It peaked at 21.20 and ended at 22.30, it had an X-ray class of C1. By the 23rd this group had rotated to the limb of the Sun.

No further Sunspot activity was seen for the rest of the month.

Prominences. Prominences for the whole month were few and mostly faint. Most significant was on the 7th on the SW limb when a single column type curved Prominence reached a height of about 65,000km. A triple Arched Prominence on the 26th reached an approximate height of

56,000km and stretched across the NE for about 130,000km. All other Prominences seen were small and very faint.

The Sun appeared to be clear of all activity on the 2nd 4th 11th 28th & 30th

A total of 17 observation were made with the remaining 14 days either cloud covered and/or rain. This included 11 days when no Sunspot activity could be seen. The total average classification value was 10.1 and the relevant total Sunspot number was 5.

Solar Observations

by Monty Leventhal OAM & SCS President

April 2019 Solar Report

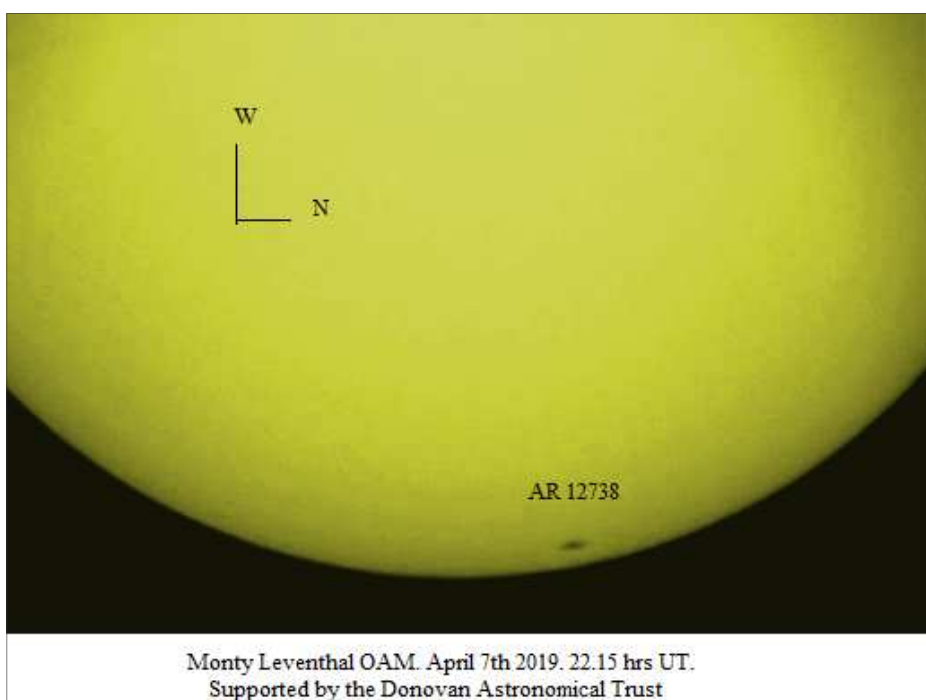
For the month of April, 2019, though solar activity was still very low, a few Sunspot groups did appear. The first seen was on the 1st UT when the small Bxi (3) group AR12737 continued to be visible following on from the end of March. The following day the same group had grown to a CV of Dao (19) with Penumbra around each spot. It was still visible on the 3rd but it could hardly be seen.

No Sunspots could be seen on the 5th or 6th but on the 7th a large Cki group containing 2 spots within a Penumbra appeared close to the NW limb in AR12738. This area became more active the following day showing a Filament and quite a lot of Plage. Also emanating from the Sunspot area was a surge. This started at 22.30 and ended at 22.35 hrs UT.

By the 12th April the group in AR12738 had grown to a CV Hkx (37) and remained the only sunspot group on the solar disk.

On the 17th a new Cai (9) group of Sunspots appeared in AR12739 with some Plage. Also on the same day a bright red spot was seen emanating from the now Chi (42) group in AR12738. By the 20th the only group of spots on the Sun was a single Axx (1) spot close to the western limb. No further Sunspot activity was seen for the rest of the month.

Prominences. On the NE limb of the Sun on the 1st April an unconnected type



of Prominence was observed reaching a height of about 126,000km

On the 8th on the NW limb a double column Prominence reached an approximate height of 65,000km. By the following day it had become a single arched Prominence with a height of about 74,000km. The same day on the NE limb another arched Prominence at about the same height had a base across the limb of around 158,000km.

A double arched Prominence on the NE limb at 47,000km high and another single arch at 56,000km high was observed on the 23rd on the NW limb. All other Prominences throughout the month were quite small and faint.

The Sun was clear of all activity on the 26th and 27th.

No Flares were observed for the whole month of April 2019.

Summing up there was a total of three Sunspot groups in the north and a total of 11 Sunspots also in the north.

A total of 23 observations were made with the remaining 7 days either cloud covered and/or rain. This included 8 days when no Sunspot activity could be seen. The total average classification value was 15.3 and the relevant total Sunspot number was 7.

Solar Observations

by Monty Leventhal OAM & SCS President

May 2019 Solar Report

For the month of May, 2019, though solar activity was once again was still very low, a few

Sunspot groups did appear.

Due to bad weather no observations were made until the 4th. On that day a single Hsx spot was observed close to the NE limb with a latitude of plus 4° and longitude of 312° in AR (active region) 1240. This Sunspot became more active on the 5th showing some Plage around it and omitting a Surge which lasted about 15 minutes before disappearing.

The following day on the 6th a new single Hsx spot was seen very close to the NE limb with a latitude of plus 6° and longitude of 275° in AR12741. The now leading Sunspot in AR 12740 showed some Plage and three very faint Filaments.

On the 7th the group in AR12740 had grown to a CV of Cki and contained two spots within the Penumbra and one spot without. By the 11th the group in AR12741 had also grown much large to a CV of Dki (46) also with two spots within its Penumbra.

On the 13th the spot in AR12740 had diminished in size to a CV of Axx (1) and by the 14th had faded away leaving only a single group on the Sun until the 17th. From the 18th May to the 31st no further Sunspots could be seen.

Prominences. Most Prominences during May were small and faint, however on the 8th an Arch type Prominence reached an approximate height of 74,000km and on the 28th a Fork type Prominence reached a height of about 84,000km.

The only other significant Prominences were observed on the 30th, one a Curved type column Prominence the NE limb reached a height of about 93,000km. On the SE limb a double Unconnected Arch Prominence reached an approximate height of 47,000km.

The Sun was clear of all activity on the 21st and 22nd of May and no Flares were observed.

For the month of May a total of 24 observations were made with the remaining 7 days either cloud covered or rain. This included 12 days when no Sunspot activity could be seen.

Summing up there was a total of two Sunspot groups in the north with a total of 6 Sunspots all in the north. The total average classification value was 16.8 and the relevant total Sunspot number was 9.



AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS
 SYDNEY CITY SKYWATCHERS, AUSTRALIA.
 BRITISH ASTRONOMICAL ASSOCIATION
 SOLAR OBSERVERS SOCIETY, POLAND
 Lat. 33° 54'S – Long. 151° 15'E

E.A.S.T. DATE 23rd March 2019. TIME 07+1hrs 00mins.

U.T. DATE 22nd March 2019. UT: 21hrs 00mins.

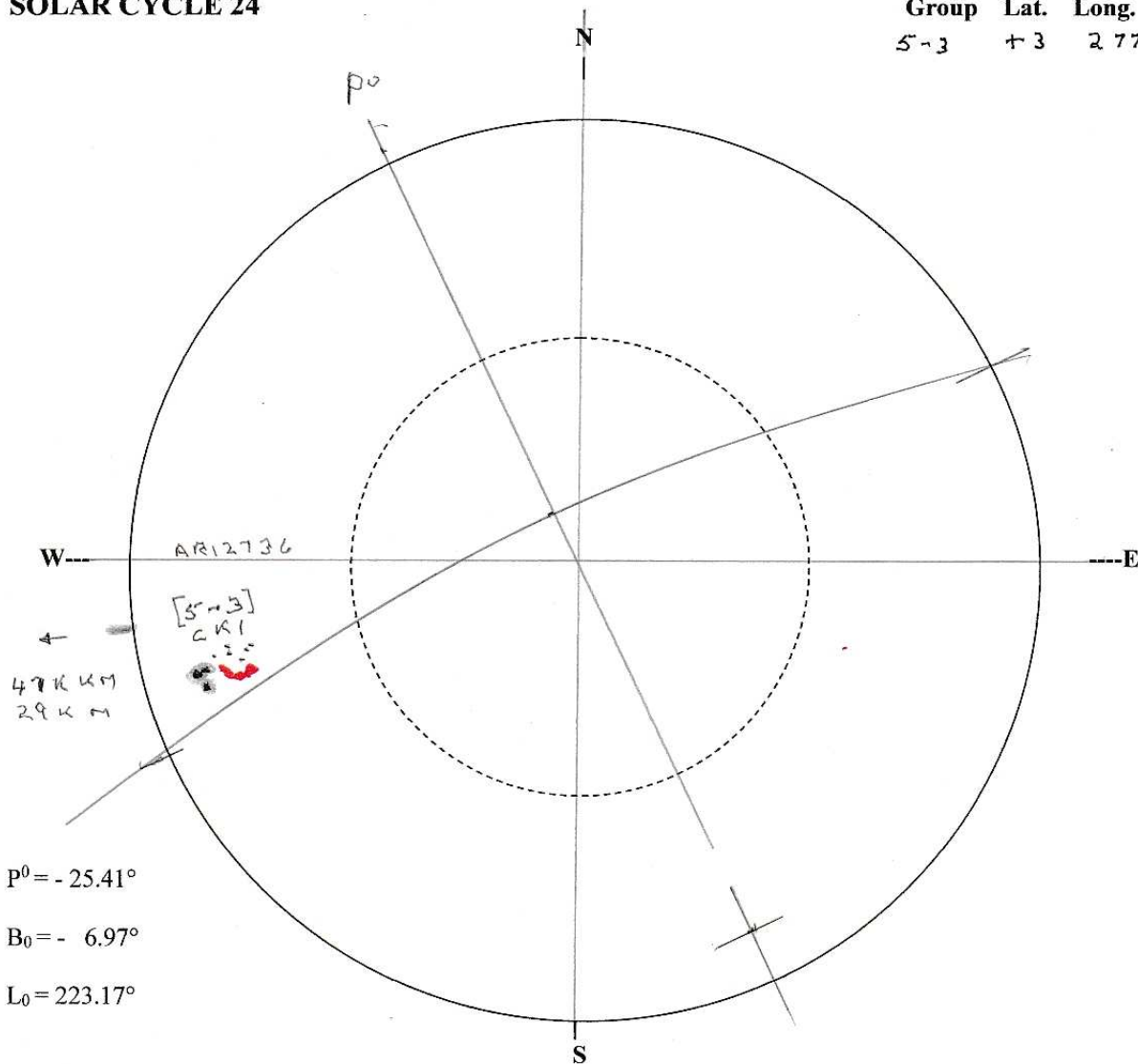
INSTRUMENT: S.C.T. 10". F=2,500 mm. f/ 10. 40 mm Eyepiece. Full Aperture filter & 6Å H-alpha filter, f/ 32. Mag: X62.5

ROTATION No. 2215 (at 00.00hrs). Synodic Rotation No. 10. CONDITIONS (3) Fair. WIND: NW 12 – 17km/h

TRANSPARENCY: (3) Fair, 60% Cirrus cloud. CURRENT TEMP.: 20°C. 68°F.

SOLAR CYCLE 24

Group Lat. Long.
 5-3 +3 277



Sun: 1,392,000 km. dia.

Earth: 12,713 km. dia. Average distance to the Sun 150,000,000 km

NOTES: Region Nos. above Group Nos. for year – month in brackets above groups.

Flares: 0 Prominence's: 1 Filaments: 0 Faculae: 0 Plage: 0 Surges: 0 Active areas incl.: 2
 Total Sunspot groups: 1. Total single Sunspots: 0 Total Sunspots: 9. R = 19 C.M.E: 0. Total C.V. = 39
 Sun limb in medium motion. Total Q. CV = 3

www.sydneycityskywatchers.org

Orange = Plage. Yellow = Faculae Red = Flare

NAME: Monty Leventhal OAM

Supported by the Donovan Astronomical Trust.

FLARE TYPE 2-B. ACTIVE AT START OF OBSERVATION, PEAKED AT 21.20 AND ENDED AT 22.30. X-RAY CLASS C1

AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS
 SYDNEY CITY SKYWATCHERS, AUSTRALIA.
 BRITISH ASTRONOMICAL ASSOCIATION
 SOLAR OBSERVERS SOCIETY, POLAND
 Lat. 33° 54'S – Long. 151° 15'E

E.A.S.T. DATE 9th April 2019.

TIME 07hrs 55mins.

U.T. DATE 8th April 2019.

UT: 21hrs 55mins.

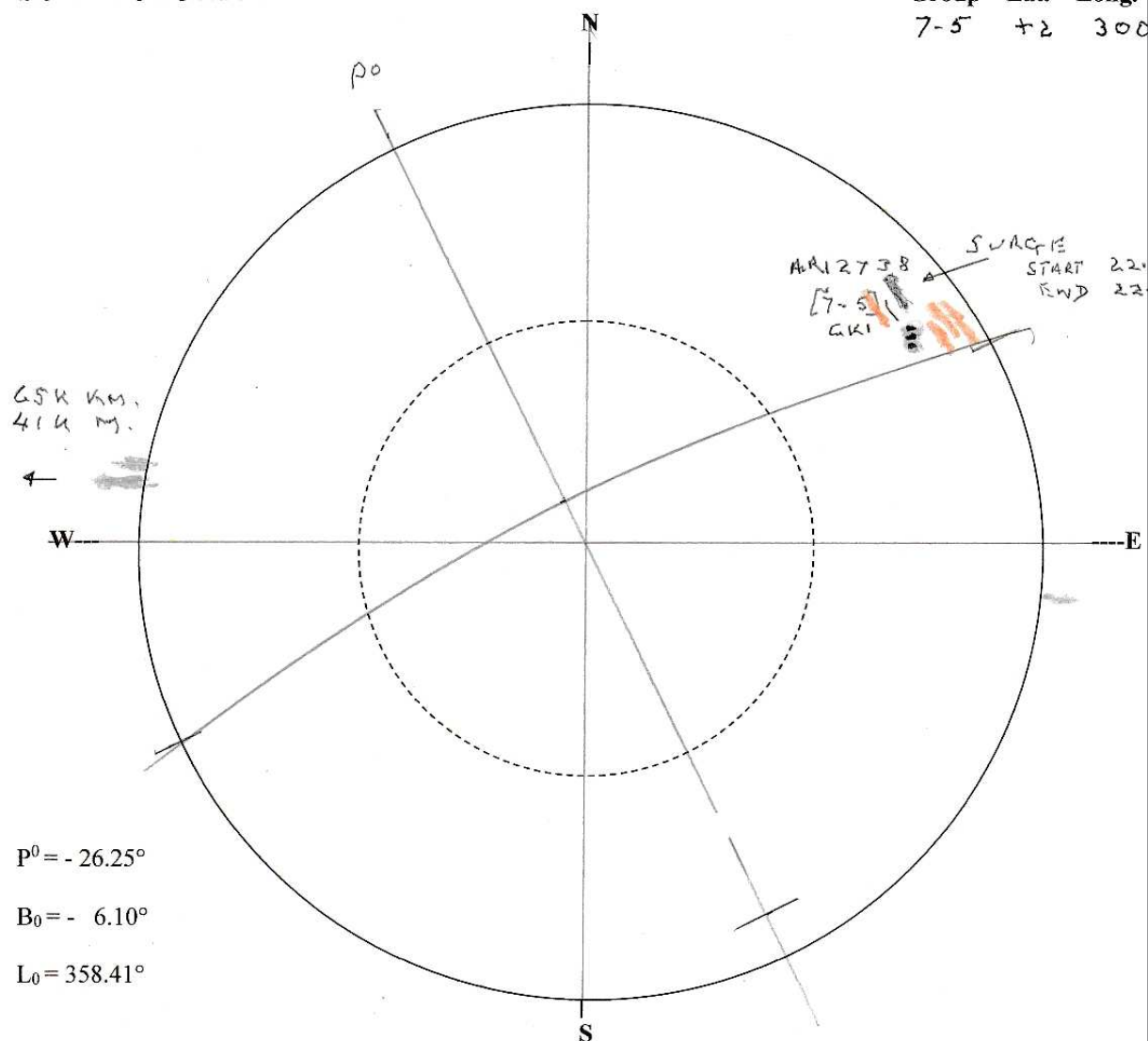
INSTRUMENT: S.C.T. 10". F=2,500 mm. f/10. 40 mm Eyepiece. Full Aperture filter & 6Å H-alpha filter, f/32. Mag: X62.5

ROTATION No. 2216 (at 00.00hrs). Synodic Rotation No. 0. CONDITIONS (3) Fair WIND: NW 12 - 15km/h

TRANSPARENCY: (3) Fair. 50% Altostratus cloud. CURRENT TEMP.: 24°C. 75°F.

SOLAR CYCLE 24

Group Lat. Long.
 7-5 +2 300



Sun: 1,392,000 km. dia.

Earth: 12,713 km. dia. Average distance to the Sun 150,000,000 km

NOTES: Region Nos. above Group Nos. for year – month in brackets above groups.

Flares: 0 Prominence's: 2 Filaments: 1 Faculae: 0 Plage: 1 Surges: 1 Active areas incl.: 3
 Total Sunspot groups: 1. Total single Sunspots: 0. Total Sunspots: 3. R = 13 C.M.E. 0. Total C.V. = 39
 Sun limb in medium motion. Total Q. CV = 3

www.sydneycityskywatchers.org

Orange = Plage. Yellow = Faculae Red = Flare

NAME: Monty Leventhal OAM

Supported by the Donovan Astronomical Trust.

AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS
 SYDNEY CITY SKYWATCHERS, AUSTRALIA.
 BRITISH ASTRONOMICAL ASSOCIATION
 SOLAR OBSERVERS SOCIETY, POLAND
 Lat. 33° 54'S – Long. 151° 15'E

E.A.S.T. DATE 31st May 2019.

TIME 08hrs 40mins.

U.T. DATE 30th May 2019.

UT: 22hrs 40mins.

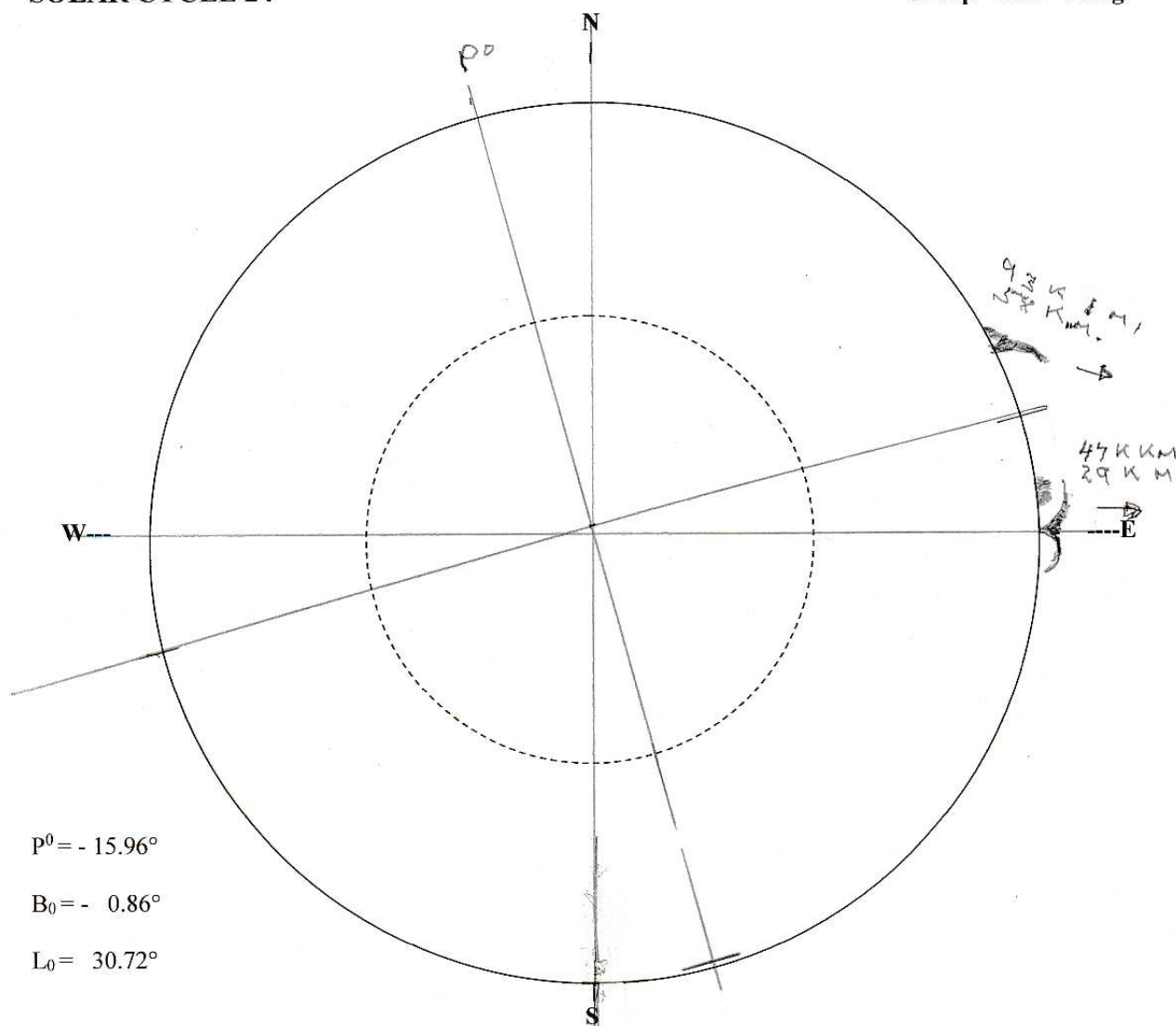
INSTRUMENT: S.C.T. 10". F=2,500 mm. f / 10. 40 mm Eyepiece. Full Aperture filter & 6Å H-alpha filter, f / 32. Mag: X62.5

ROTATION No. 2217 (at 00.00hrs). Synodic Rotation No. 25. CONDITIONS (2) Good. WIND: W. 20 - 22km/h

TRANSPARENCY: (2) Good. 50% Altostratus cloud, clearing. CURRENT TEMP.: 12°C. 54°F.

SOLAR CYCLE 24

Group Lat. Long.

 $P^0 = -15.96^\circ$ $B_0 = -0.86^\circ$ $L_0 = 30.72^\circ$

Sun: 1,392,000 km. dia.

Earth: 12,713 km. dia. Average distance to the Sun 150,000,000 km

→●←

NOTES: Region Nos. above Group Nos. for year – month in brackets above groups.

Flares: 0 Prominence's: 2 Filaments: 0 Faculae: 0 Plage: 0 Surges: 0 Active areas incl.: 2

Total Sunspot groups: 0. Total single Sunspots: 0. Total Sunspots: 0. R = 0 C.M.E: 0. Total C.V: = 0

Sun limb in slight motion.

Total Q. CV: = 0

www.sydneycityskywatchers.org

NAME: Monty Leventhal OAM

Orange = Plage.

Yellow = Faculae

Red = Flare

Supported by the Donovan Astronomical Trust.

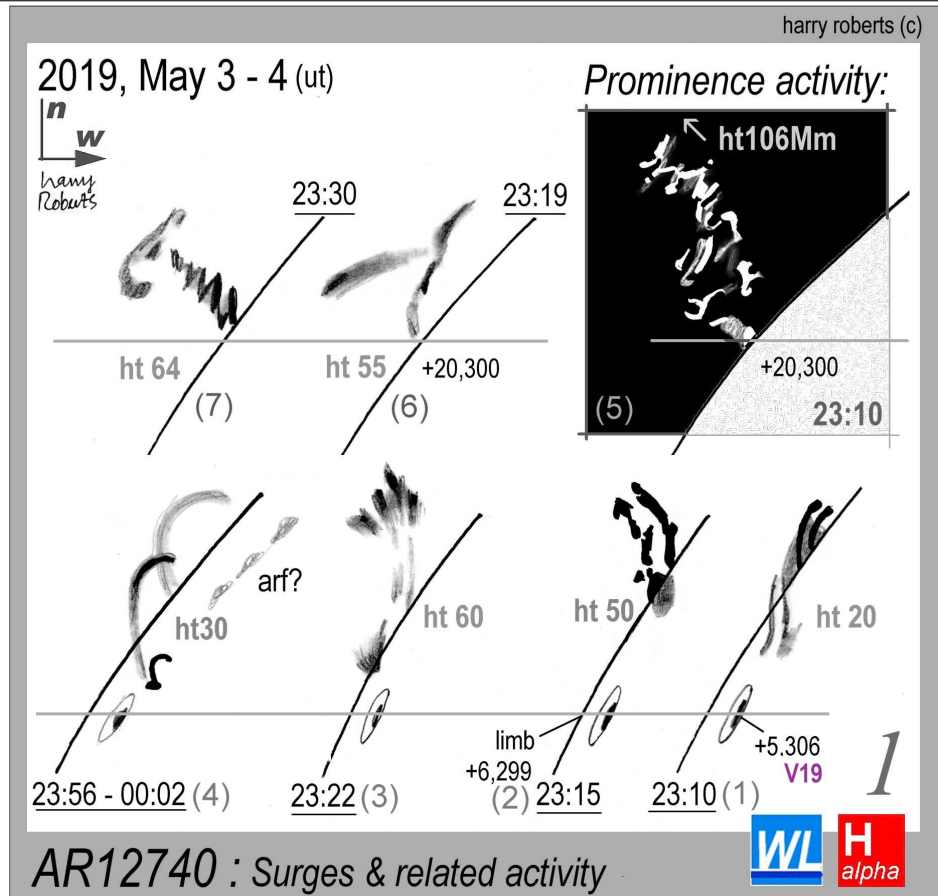
AR12738 Returns: Surging Renewed!

In Sirius; It had been a while since any spot group made a second passage of the Sun's disc. AR12738 farewelled us with impressive displays of bright ejections (surges mostly) as it passed behind the west limb on 2019, April 19. The big simple spot, likely the only survivor of a complex bipolar group, had a vast train of plage, faculae, filaments and surges, over 15° of longitude, in its wake; an impressive sight on its first transit. The big spot lay at lat +7, long.298 (+7,298).

Its return was uncertain; but such spots are the longest lived, as I recall. Two weeks later, May 5, a new and very similar spot was logged, at +5, 306. Allowing for a little westward proper motion – normal for such spots – it was clear that 2738 was back; attended by a rich mix of solar transients (Fig1). It was renamed AR12740.

This time limb activity was stronger than on first limb transit (April 6th), with multiple centres on the limb (Fig). At lat +13 to +15 surges and other ejections hurled bright material above the limb. H-alpha brightness estimates are made relative to the chromospheric disc which has value 1.0. A solar flare has value twice the disc and can be much more. No flares were seen. Most ejecta had brightness between discx0.8 to 1.0.

H-alpha logs began at 23:10 – when a superb prominence was seen: thin thread-like material



(like Mandarin calligraphy) rose to >100Mm Fig1(5), not collimated like a surge, it lay at Lat +20, well away from the spot. Yet this material soon faded and rapidly evolved, (6) and (7), into more regular shapes: adjacent coronal fields at work maybe. This prominence may have been a quiet region filament (QRF) that was reshaped by ejecta from the sunspot.

Meanwhile, conventional surges (collimated ejected from the big spot) were erupting; one seemed spray-like, Fig1(3): “*ejecta of a flare*” (Zirin, p298.) A GOES C1 flare at 23:31 went unseen; a limb event maybe?

The Fig shows four spot-site events (1 to 4) below – and events at 10 - 15 deg. latitude higher Fig1(5 to 7) above. All sites rapidly evolved from one form into another.

Indeed, activity was spread across a vast area. With further rotation the train of AR features was seen to still cover 15deg longitude from the (p) spot: surprising longevity!

Surges: viewed from above (Fig2). So far we have viewed these solar transients side-on, at the limb, when they appear as arches or jets of bright material against the black sky and the host spot is barely visible.

Viewed from above, with the spot say 30deg from the limb (Fig2, 2019 May5 -6), the site looks very different. During its first transit 2740 showed many surges in action – but on May 5 it had a storm of surges. Zirin(p278) notes that surges are Doppler-shifted about ‘*minus-one Angstroms*’ as line-of-sight velocity is ~50km/s – and searching the band (tuning) will usually show them. Fig2 shows nine (Roman Numerals), with some omitted for clarity (field notes very cluttered)!

Of the surges shown most were dark, slender and curved. One (I) was sheet-like. One or two were bright (1.5Xdisc). Video of such events would be useful. The tuning was in constant use. All were transient; only an active region filament (ARF) S of the spot was stable throughout.

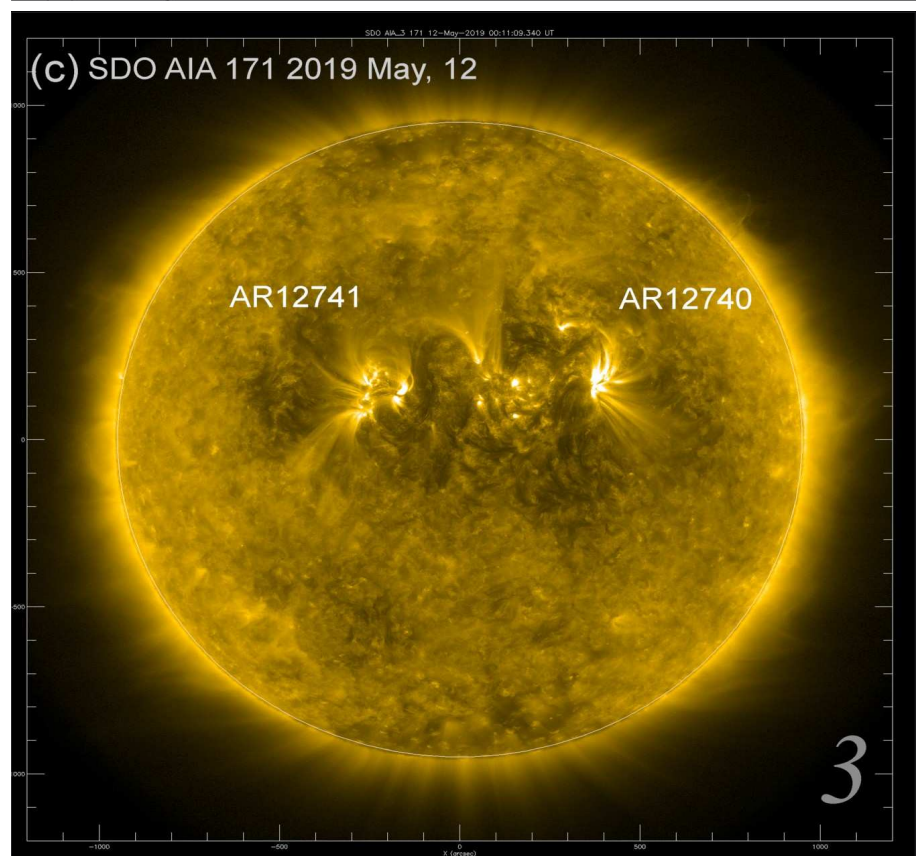
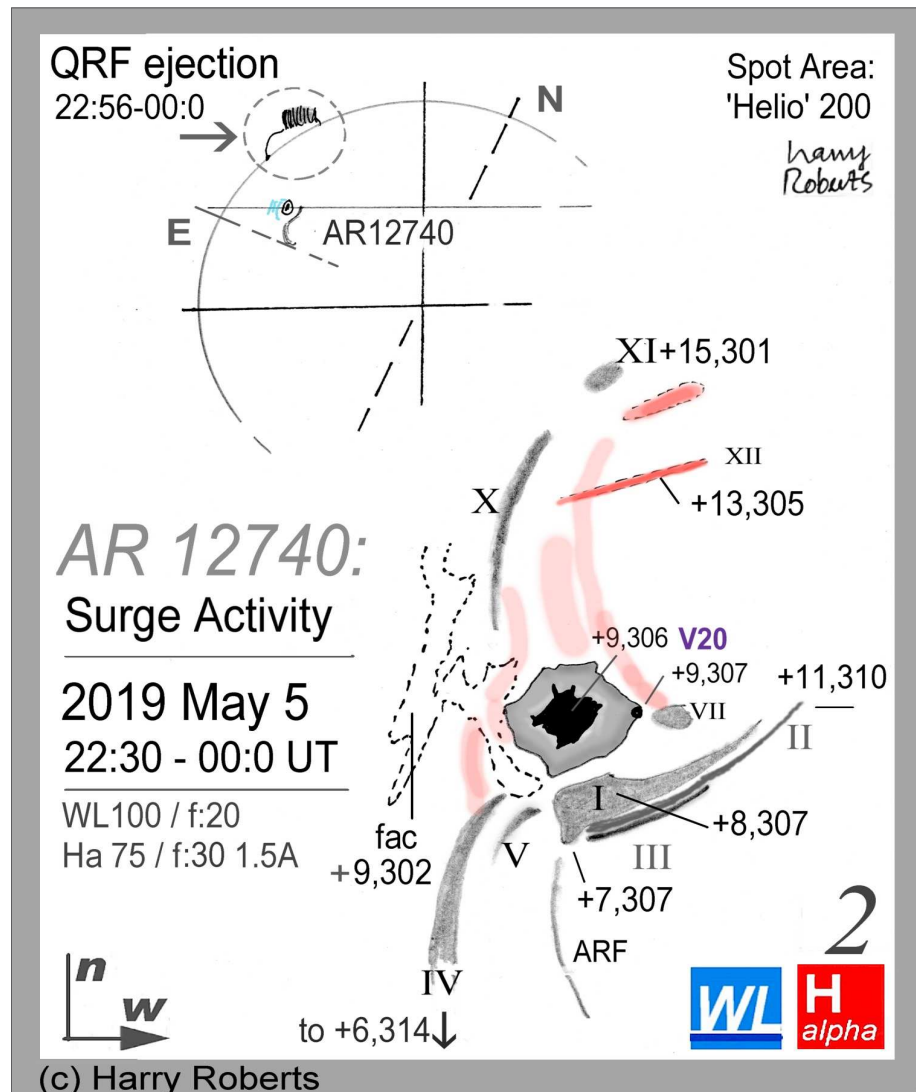
QRF Ejection: Quiet region filaments (aka Quiet Prominences) are rare at present – yet a bright one lay between lat.20 – 30 deg at 22:56 (Fig2). It was quite unstable – lifting off slowly for 64 minutes, to 63Mm high, when it was almost invisible: a pretty sight! Recall the tall prominence of May 3, Fig1(5) at lat.+20deg). Was spot activity responsible for both ejections – effects that extended over 30° lat.?

Coronal Hole/s. We noted that 2740 was sited in a coronal hole during its first transit (April, as 2738). By May 6 (UT) it is joined by a new larger spot (2741) 35 deg E of it at similar latitude. SDO 171Å log, Fig3, shows BOTH apparently in an enlarged "Hole"; or has a new hole joined the old one? This is likely unusual. We note both spots are Violet (V) polarity – perhaps the holes are the same.

The SDO Fig3 shows that the spots coronal loops like to connect to solar surface fields outside their hole! Further work is needed on this.

Events here presented show just a small part of the activity recorded between April 7 to May 19, 2019, in the writers time zone. A GOES M1 flare on May 6, 05:09UT went unrecorded. An anomalous event of almost zero duration, it suggests instrument error. No other records seem to have been made.

Harry Roberts



AR12738 and 12740: Salvoes of Surges

While levels of solar activity are at cyclic lows, the Sun always has a trick or two up its sleeve!

On 2019, Apr. 6, 23:06 (UT), a blank disc in white light came as no surprise. After a few minutes for routine chord transits, at 23:20, H-alpha was opened.

Some minor prominences were logged around the disc, as well as two fairly bright loops low in the NE.

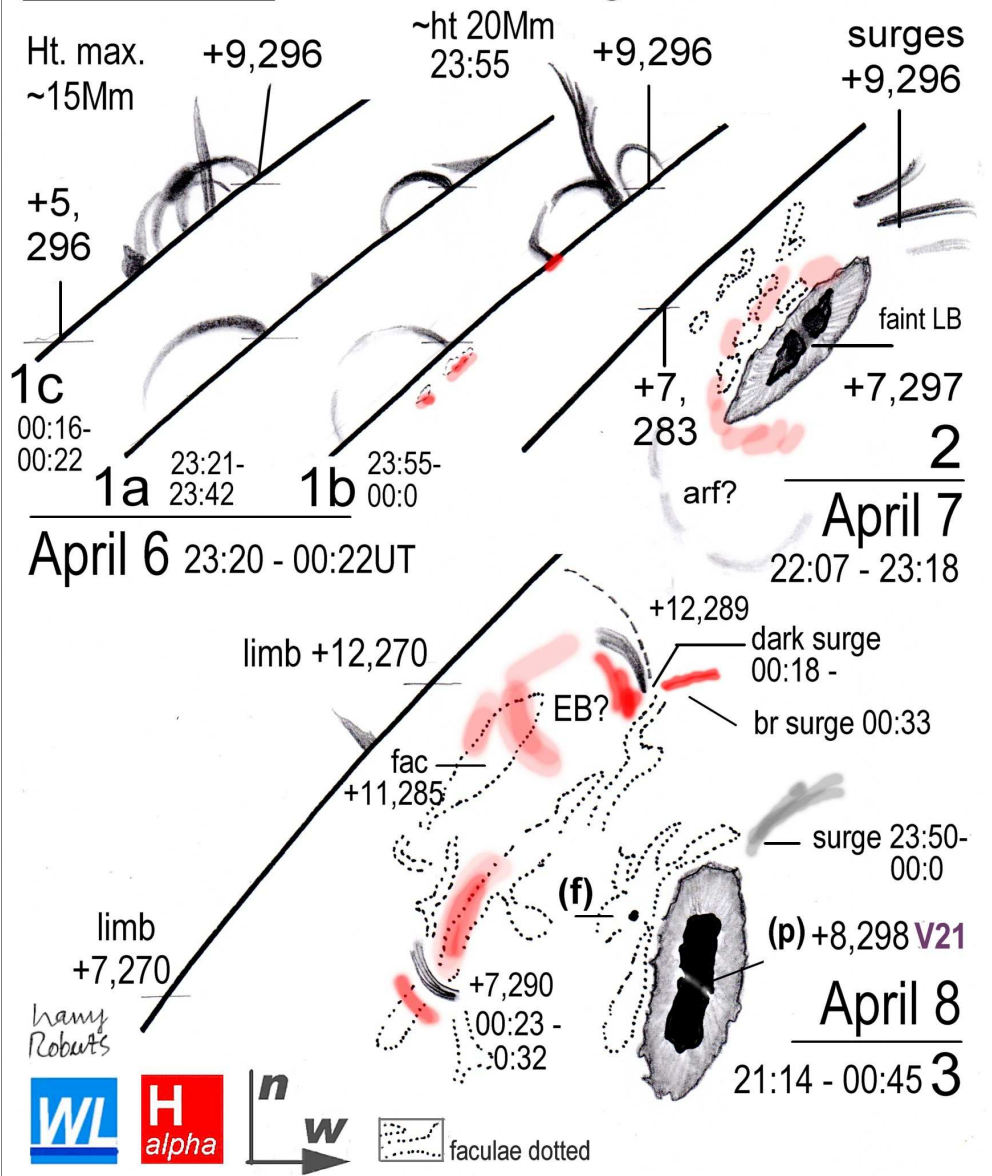
It was soon clear these were active arches – and three detail logs were made (Figs 1a, b and c). They reached ~20Mm high and implied that a large simple spot lay just behind the limb at ~+7,296.

Next morning, April 7, as expected, a large round spot now lay 14 deg from the limb (Fig 2). It had an area ~400 units, with some dark surges on its N side and a surprisingly large area of very bright faculae and plage on its following (f) side – that seemed to stretch to the limb.

This was an unusual feature for a Hale alpha-class spot – unless that spot was sole-survivor of an earlier large beta group. No limb surges were recorded this session.

April 8 (Fig 3) revealed a much more complex

AR12738 : active surges



scene; one not typical of current spot activity. A small (f) spot lay just E of the (now) (p) big spot, still with a faint light bridge (LB) from the day before. But bright faculae were sited at +11,285 some 13° behind the big (p) spot – with plage at the same site.

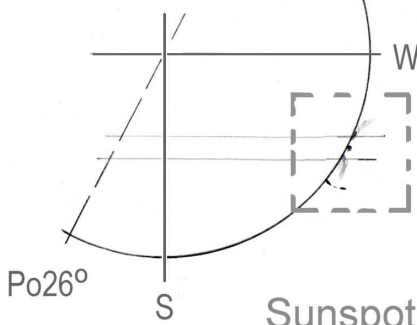
Surges, both bright and dark, were erupting at +12,289, some 9° behind the (p) spot! Another site 8deg behind the (p) was also active.

This intense activity covered a very large area – indeed would continue throughout the big spot's disc transit. Yet no large flares occurred, but a GOES B4.5 lit up the whole following region of the big spot on Apr 11 at 12:34UT (outside my time zone) though the region of bright plage and some surges were logged 23:00UT.

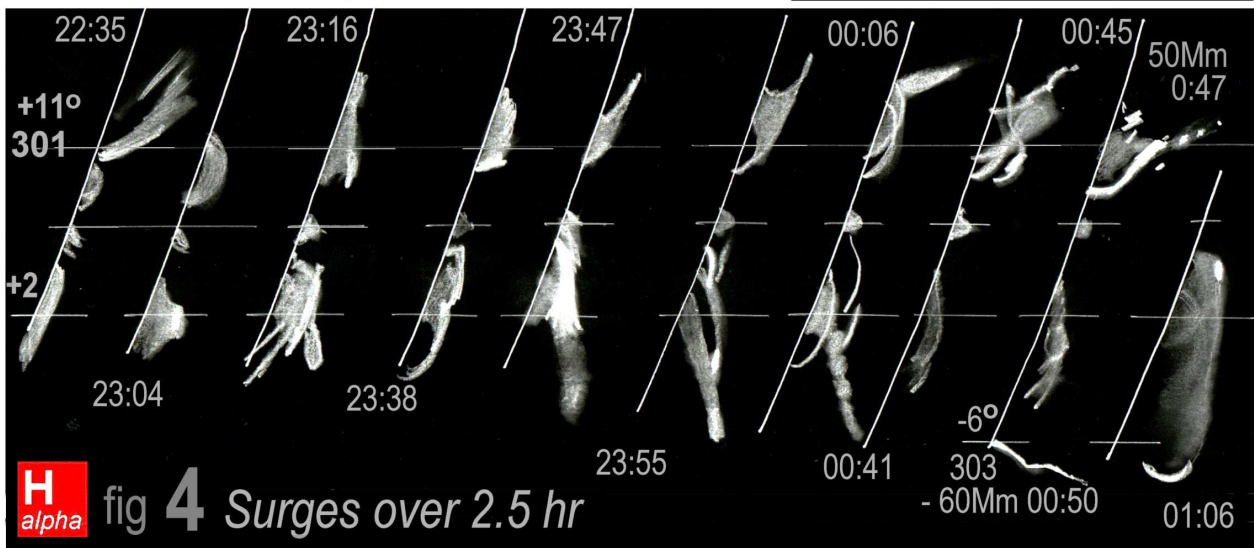
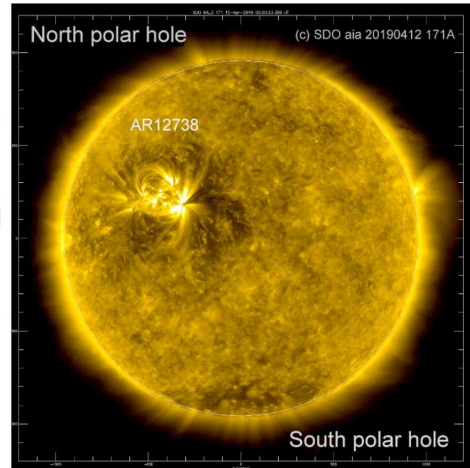
April 19 (Fig 4) shows the remarkable display of surges when the spot lay on the Sun's west limb. Now unseen, the big spot is sited centrally at lat.+7° – while the "crown" of surges erupt both north and southward! The spot will return for more surging two weeks later. The April 12 SDO(c) 171A image shows the spot and its coronal loops nearing central meridian transit.

AR12738: Surges at the SW limb

see detail below: 2019, Apr. 19 to 20.



The AR is sited in a coronal hole during transit. SDO (c)



Ten logs of surges over 150 min. Heights av. 30Mm, some to 50 & 60Mm

What are surges? Zirin (1986, P290-) tells us: in H-alpha “...surges are collimated eruptions normally produced by small flares at their base. Helen Dodson-Prince always felt the surge had to retrace its steps in order to qualify as a surge but nowadays we are not always so strict. When a surge does fall back we see a splash in the chromosphere”. (Helen's Wiki page is worth a look: she is not so well known.)

So, surges arise near big round spots where flare ejecta shoots out as a narrow jet collimated by the big spot's magnetic fields; as Helen said, they mostly pause at the end of their trajectory before returning the way they came.

They can be funny to watch! Our big spot, AR12738, was to host dozens of surges both bright and dark during its two weeks on the Sun and – on its return as AR12740 – dozens more.

Mostly surges move at ~100km/sec., so fast it causes strong Doppler-shifts in their wavelength; we need a filter with a good tuning range to see them. Remember, on the Sun, nothing is static; even stable

things are moving at ~ +/-5km/sec!

Quickly tuning through the filter's full range will often show surges in action that are not seen in H-alpha centreline. The beauty of our Fabry-Perrot filters is that they are tuned by tilting, something we can do in real time.

Note that SDO EUV images (171A) show that our big spot (now on its second disc transit) is sited inside a large coronal hole; something we don't often see – and that might account for the spot's longevity and its strong surging. Enjoy H-alpha.

Sunny skies!

Harry Roberts

Sydney City Skywatchers

www.sydneycityskywatchers.asn.au

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Sydney City Skywatchers Club Meetings

Ordinary Meeting: 6:30 pm, 1st Monday of each month, Sydney Observatory.

Committee Meeting: 6:00 pm, 3rd Wednesday of each month, Sydney Observatory

Membership Fees

\$40.00 Individual

\$20.00 Family/Junior/Concession

Everyone is invited to submit articles, reports and photos of astronomical interest.

Items should be about 500 to 1000 words (plain text format if on CD/email).

Diagrams must be in black ink.

Contributors wishing their work returned must supply a S.A.S.E. for hardcopy submissions.

Your feedback about The Astronomers' Bulletin is needed and appreciated.

Members may submit advertisements (For sale, Wanted, etc approx 5 lines) free of charge, which will be published for 3 issues unless withdrawn or renewed.