

MARS

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OBSERVATIONS

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By

Christophe PELLIER

One year after my first participation to the European planetary science congress (Nantes, 2011 - read a short report in CMO#391¹⁾), I have participated in late September to the last EPSC that took place in Madrid, Spain. The EPSC 2012 brought something new: in this professional congress, and for the first time, was opened a session dedicated to amateur astronomy. Its purpose was to work on possible cooperations in planetary astronomy between the two worlds. Over the past years, amateur contribution to planetary science has gradually improved thanks to constant technical progress in image quality, and to the quantitative strength of so many backyard telescopes imaging the planets and this is now catching real attention among some scientists.

The topics presented during this first amateur session were observations of the Venus 2012 transit in Norway and Australia, a fireball network in Poland (not presented), a Belgian project to characterize meteors with radio techniques, the occultation of 45 Cap by Jupiter in 2009, the Great white spot of Saturn in 2011, the observation of the martian climate by amateurs and finally a presentation of the JUNO mission by Glenn Orton²⁾. The convener of the session was even supposed to be supported by an amateur, Marc Delcroix, but re-

grettably he has been unable to attend the meeting at the very last minute.



My own contribution was to describe how amateurs can now observe the climate of the planet Mars from the Earth. I focused on four main topics: the “cross-equatorial” dust storms, the stability of dust clouds within one martian day, the hourly evolution of Martian white clouds during the aphelical seasons, and of course, the observations of Martian terminator protrusions in 2012, and before. The conclusion being that amateurs can now observe every large-scale meteorological events on Mars, with their usual strengths, but under the terrestrial limits of observations (we can not observed a full martian year in a short range of time).

Of course, the quality of our data on Mars has improved just the way it improved for any other

planet, and in these columns, we always try to show in detail all that can be seen on, or derived from, amateur images, and there is a lot to say. However, the level of quality offered by the presence of long-live orbiters above Mars for many years now do not really open any space for a interesting amateur contribution to the study of the martian climate, with probably the noticeable exception of the terminator protrusions. Attending to other Mars conferences also showed how advanced is the science of Mars now, obviously more advance than it is on a planet like Venus, for which there is more room for us to participate.



There was also a poster program of the amateur session, where I have especially noted the poster by Manos Kardasis, "The use of technology in capturing details on Jupiter's system with small telescopes"³⁾.

On the other side, the contribution of amateur observations to Saturn and above all Jupiter studies was obvious. On Saturn, the talk that Marc was supposed to give (and finally performed by co-author Georg Fischer⁴⁾ from Space Research Institute, Austria academy of sciences) showed a detailed description of the development and fate of the 2011 Great White Spot thanks to amateur im-

ages (and I must say that it's very impressive to see how detailed are now amateur images of a planet that looked devoid of spots during so many decades). On Jupiter, the team around Agustin Sanchez Lavega from University of Bilbao/Euskal Herriko Unibertsitatea (Ricardo Hueso Alonso, Naiara Barrado Izagirre, Santiago Perez-Hoyos, Jon Legarreta...), is working with amateur images thanks to the Planetary Virtual Observatory & Laboratory⁵⁾ database. N. Barrado Izagirre presented results of measurement of jovian winds thanks to the PVOL⁶⁾. A new tool developed by A. Gallardo (amateur from Asociacion cielo del Guadaira), called Jovianwind, allows to find pairs of images to make those measurements inside the database⁷⁾.

Finally, and despite horrible french-like weather on the last day, I have gone to a few hours of walking through the city of Madrid, enjoyed the beauty of streets of the Barrio de las letras (block of letters), and the pleasure to speak again Spanish after so many years. The next EPSC meeting will take place in London in September 2013, and for amateurs it should be another great astronomical moment in another superb European capital.

1) <http://www.hida.kyoto-u.ac.jp/~cmo/cmomn4/CMO391.pdf>

2) For more information about the authors, abstracts and full online presentations, please refer to the EPSC homepage :

<http://meetingorganizer.copernicus.org/EPSC2012/sessionprogramme/AM>

3) <http://meetingorganizer.copernicus.org/EPSC2012/EPSC2012-927.pdf>

4) « Saturn northern hemisphere's atmosphere after the 2010/2011 Great White Spot». Delcroix M., Fischer G., Barry T. Available here : http://presentations.copernicus.org/EPSC2012-934_presentation.pdf

5) PVOL: <http://www.pvol.ehu.es/pvol>

6) « Monitoring Jupiter's atmospheric general circulation with ground-based observatons obtained with small telescopes". N. Barrado-Izagirre, J. F. Rojas, R. Hueso and A. Sánchez-Lavega. Read abstract here:

<http://meetingorganizer.copernicus.org/EPSC2012/EPSC2012-545.pdf>

7) Read abstract:

<http://meetingorganizer.copernicus.org/EPSC2012/EPSC2012-145-1.pdf>

□

CMO/ISMO 2011/12 Mars Report #15

2011/2012 Mars Observations: We Further Received in 2012

♂.....Before reviewing the work in the present apparition of M KARDASIS (*MKd*), which was sent to us in October 2012, we shall first briefly summarise total numbers of the observations submitted to the CMO/ISMO during this apparition.

♂.....(This paragraph was written by M MURAKAMI (*Mk*):) In the 2011/2012 apparition from May 2011 to August 2012, we received a lot of results despite the aphelic apparition. The domestic ten members

joined with a total 752 observations, and the abroad 45 members sent their work of 807 observations (258 from the American continents, 389 from Europe, 107 from Hawaii-Oceania, 53 from Iran). We here counted as usual for CCD images as one observation just when they are separated by 20 minutes or by 10° W in degrees. The images are mostly shown in the CMO/ISMO Gallery column of the CMO/ISMO.

Domestically the regular observers joined, including the visual observers. We regret however that our veterans at Fukui, namely M MINAMI (*Mn*) and T NAKAJIMA (*Nj*) were stopped at the end of March 2012 because of their diseases: *Mn* collapsed just after the observations on 27 Mar ($\lambda=089^{\circ}$ LS, $\delta=12.9''$). He seems to have lost the clear memory of those difficult days, but he was informed later by the medical doctors that he was suffering from a Parkinson disease. When he a bit recovered, he tried to go up the observatory on 23 April and took a couple of drawings, but thereafter he took a long rest on the safe side. In fact he seems to have given up driving his car. Up until the days however he took a total of 192 drawings of Mars by use of the 20 cm refractor of the Fukui City Observatory. Since the planet was at opposition on 3 Mar, he checked fortunately the planet before opposition. On 27 March the planet showed that the defect of illumination had already moved to the morning side.

We don't hear yet from the other veteran *Nj* at Fukui, but, according to *Mn*, he seems also to have taken a rest at the same time because his diabetes became heavy. As *Mn* remembers, *Nj* took almost the same number of drawings since *Mn* assures they were always a pair at the Observatory at least up until 15 March. In fact *Mn* and *Nj* with A NISHITA (*Nj*) made the printed version of #395 (25 Mar 2012 issue) on 18 March at Mikuni, and on the night *Nj* went to the post office in Fukui to send out the printed versions to the foreign countries when his car crashed with something and the left door of the car was broken, proving that *Nj* seemed to be very tired. *Nj* went to hospital to check his brain on the following day but at that time Doctor said it was not so serious, but *Nj* soon found that he was suffering from diabetes.

On the other hand, this apparition we were happy because Rei-ichi KONNAI (*Kn*) joined us. And Ichiroh KOHZAKI (*Kz*) was usually active so that our visual observations remained so-so. The present writer (*Mk*) also visually observed until 27 May ($\lambda=116^{\circ}$ LS, $\delta=8.1''$) 2012 and obtained 64 drawings. *Kn* obtained a total of 73 fine drawings until 5 Aug ($\lambda=150^{\circ}$ LS, $\delta=5.7''$). *Kz* obtained 59 drawings by 12 Apr ($\lambda=096^{\circ}$ LS, $\delta=11.5''$). And Tomio AKUTSU, Teruaki KUMAMORI, and Yukio MORITA continued to be the CCD imagers.

Abroad, the observers (including the CCD imagers) went as follows: 15 numbers of observers from Northern America, 27 from Europe, 2 from Oceania, 1 from the Middle East. The great effort of Efrain MORALES RIVERA (*EMr*) from Puerto Rico was impressive. After the end of the season, a report from Greece came to us (as mentioned below in this column). It is good we can hear from the area which connects Asia with Europe; Sadegh GHOMIZADEH (*SGh*) is another candidate. As the area which connects the American continents with Asia, it will be nice if we continue to obtain the observations from Hawaii and Oceania.

In this apparition, several phenomena were observed which were associated with the migration of the water vapour due to the sawing of the npc since the Northern spring. The orographic clouds which cover the higher mountains, and the summits of the higher mountains as the shadowy spots which poked out of the morning mist were frequently observed. Also the seasonal change of Hellas and the activity of dust clouds at the area of the npc were checked. In March and April, the protrusions from the morning terminator were observed several times, and as in November 2003 they were supposed as the interaction

of the residual magnetism and the passing of the CME.

Checking whole images contributed to the ISMO, we understand the recent good development of the camera, the associated technique and procedure have been remarkable, but we felt that the final results of the images were given precedence to the preceding resolved images: We were disappointed when we encounter the image set which discarded the original RGB single colour components from their images. At least the B image should be accompanied since we are chasing the Martian global meteorology. If one don't have any special objective, the IR image should be said unnecessary since it just catches the light and shade of the ground seen through the atmosphere: We are of the opinion that the gradation of the ground is no more than the index to show us the mechanical position of the phenomenon. Similarly we don't evaluate so much the pseudo-coloured images and those taken by the CCD colour cameras. We expect in the future apparitions the reports associated with the sets by RGB; of course they are free from the IR components. [Up to here written by MURAKAMI (*Mk*). The following are the joint work by *Mk* and MINAMI (*Mn*).]

♂.....**We Further Received** several images from M KARDASIS (*MKd*) in Greece recently:

KARDASIS, Manos (*MKd*) Glyfada-Athens, GREECE

21 Sets of RGB + 3 Colour + 8 IR Images

(15, 16 August 2011; 2, 3, 8, 14~21, 24, 27, 31 March; 1, 12, 19, 22, 25, 26 April; 5, 6 May 2012)

28cm SCT with a DMK21-618

Here mostly the images after opposition are reported. The quality is standard, but the sizes of images are not unified and data is rather lacking. Notable is the images on 12 Apr 2012 which show the protrusion at the morning terminator which was also observed at $\omega=162^\circ\text{W}$ by the observers at Minsk.

We now pick out the images by *MKd*: On the images taken on 2 Mar 2012 ($\lambda=078^\circ\text{Ls}$) at $\omega=193^\circ\text{W}$, the orographic cloud is seen on the evening limb. This cloud is unseen on the IR image. On 8 Mar ($\lambda=081^\circ\text{Ls}$) at $\omega=144^\circ\text{W}$, Olympus Mons is near the centre, but the shadowy spot seems to exist. On 14 Mar ($\lambda=083^\circ\text{Ls}$) at $\omega=092^\circ\text{W}$, 100°W , the Olympus Mons is visible through the morning mist. The image set on 15 Mar ($\lambda=084^\circ\text{Ls}$, $\delta=13.7''$) at $\omega=097^\circ\text{W}$ is a good one; Olympus Mons is nicely described. The three decomposition images are a good set; Just the wavelength of the B image should be shorter. The images on 16 Mar ($\lambda=084^\circ\text{Ls}$) at $\omega=090^\circ\text{W}$ show a good component in B, but the limb of the longer wave-length images look strange including some ghosts. Olympus Mons and Tharsis are interesting. The images on 17 Mar are similar, but the images separated just by 10 minutes do not imply much. The images on 18 Mar ($\lambda=085^\circ\text{Ls}$) at $\omega=031^\circ\text{W}$ show the dark Hyperboreus L and the three colour decomposition is interesting; especially the B image shows the equatorial mist belt. The case of 24 Mar ($\lambda=088^\circ\text{Ls}$) at $\omega=342^\circ\text{W}$ and at 026°W look strange: Both are too far separated. On the images on 27 Mar ($\lambda=089^\circ\text{Ls}$) at $\omega=321^\circ\text{W}$, Hellas is thick in B, but also seen in R. The images on 31 Mar ($\lambda=091^\circ\text{Ls}$) at $\omega=285^\circ\text{W}$ show Hellas in an interesting shape; maybe related with the inside topography of Hellas. The images on 12 Apr ($\lambda=096^\circ\text{Ls}$) at $\omega=158^\circ\text{W}$, 162°W are important: The later one shows the protrusion at the morning terminator which was also checked by the Minsk station at the same time near at 18h GMT: It will be interesting to check how it looked at $\omega=158^\circ\text{W}$. It is important to check the same angle on the following days. Another important point these images convey is that we can see the wine-coloured belt between Olympus Mons and the Tharsis series. It is conspicuous in B. This kind belt was observed in Fukui in 1980s. On 19 Apr ($\lambda=099^\circ\text{Ls}$) at $\omega=108^\circ\text{W}$ and on 22 Apr ($\lambda=101^\circ\text{Ls}$) at $\omega=097^\circ\text{W}$, the images show Olympus Mons' shadowy spot poking out associated with the aureole in the early morning. The image on 26 Apr ($\lambda=102^\circ\text{Ls}$) at $\omega=045^\circ\text{W}$ is single, but shows Iaxartes in an interesting shape and colour. This must be accompanied by the three

colour decompositions. After this image, *MkD* just took on 5 May, and further on 6 May ($\lambda=107^\circ\text{Ls}$) at $\omega=328^\circ\text{W}$: We however know that on 6 May ($\lambda=107^\circ\text{Ls}$) at $\omega=334^\circ\text{W}$, and 341°W , Damian PEACH (*DPc*) still produced better images.

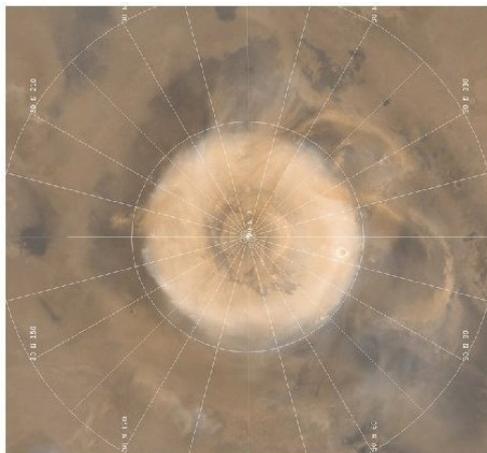
(M MINAMI & M MURAKAMI)

ISMO 11/12 Mars Note (6)

Polar Dust Crawl at the Area of Utopia
at $\lambda=050^\circ\text{Ls}\text{--}065^\circ\text{Ls}$

Masatsugu MINAMI

At the area of the north polar cap (npc), the MOC/MGS shows that several pieces of dust rise high from the season of the Northern spring equinox. For example, the image here cited clearly shows how the pieces of dust occur at the particular



26 May 2002

MGS MOC 018-019 Ls MSSS/NASA

region. This was taken by MOC on 26 May 2002 at the season of near $\lambda=020^\circ\text{Ls}$, just after the spring equinox. This looks like showing the aspect of the blown-out dust strings. The polar cloud (the nph) has disappeared to show up the npc; and the polar district being covered by the high-pressure atmosphere and the air-mass descending over the npc. It thus shows how the polar region plays the important rôle at the grand circulation of the air.

This kind of the dust streaks seem to stay long and were checked also in 2012, by our ISMO members at the period from $\lambda=050^\circ\text{Ls}$ to $\lambda=065^\circ\text{Ls}$.

First of all, we here employ an image made by Bill FLANAGAN (*WFI*) on 30 Dec 2011 ($\lambda=050^\circ\text{Ls}$) where a delicate spread of dust is shown over the area of Utopia. This further shows that the



edge of the npc is an important area concerning the origin of the polar dust. Freddy WILLEMS (*FWI*)'s image tells us that the dust spread at morning to noon look nappy reacting to the edge of the npc.

Damian PEACH (*DPc*)'s image a bit later



shows the still active surface at Utopia and proves that the edge of the npc works. The image of Efrain MORALES (*EMr*) also shows that the dust looks to rise from the edge of the npc and each of the sandy stream elements near the npc has a broader width. Note that the inside of the npc proves a bit reddish.

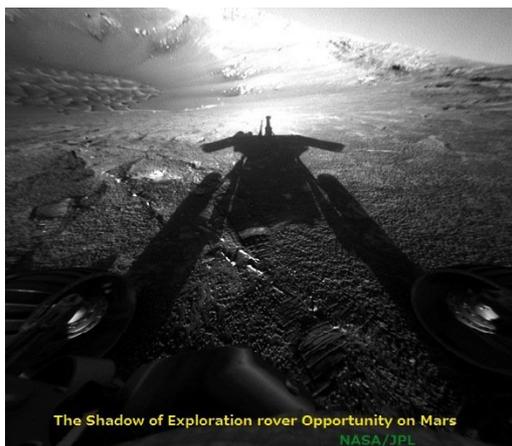


This suggests a view that at the central area of the pole was blown by the descending air mass so that the remaining area of the npc should show a slightly wine-coloured tint. This implies that the thickness of the snowy drift at the centre of the npc must have been reduced.

Letters to the Editor

●.....*Subject: Retroreflection on Mars*
Received; 05 October 2012 at 12:27 JST

Dear Dr. Minami, all areoholics, Attached here is a snapshot by the exploration rover Opportunity in Meridiani Planum showing its own shadow cast on the dust-covered Martian ground. Note its shadow (more accurately its camera's) is surrounded by a bright aureole.



On the other hand, if we can observe the situation for a long time we will see there is no more than a few change during the day time on any single day. However, since the npr receives the sunlight more than at the equatorial region, some further change may be expected.

Similar activity was further observed in March and April 2012. For example see the following at p393 of the preceding issue (CMO/ISMO #403):

DPk on 3 Feb ($\lambda=066^\circ\text{Ls}$)

Km on 12 Feb ($\lambda=070^\circ\text{Ls}$)

Ak on 18 Feb ($\lambda=072^\circ\text{Ls}$)

DPc on 29 Feb ($\lambda=077^\circ\text{Ls}$)

CPl on 29 Feb ($\lambda=077^\circ\text{Ls}$)

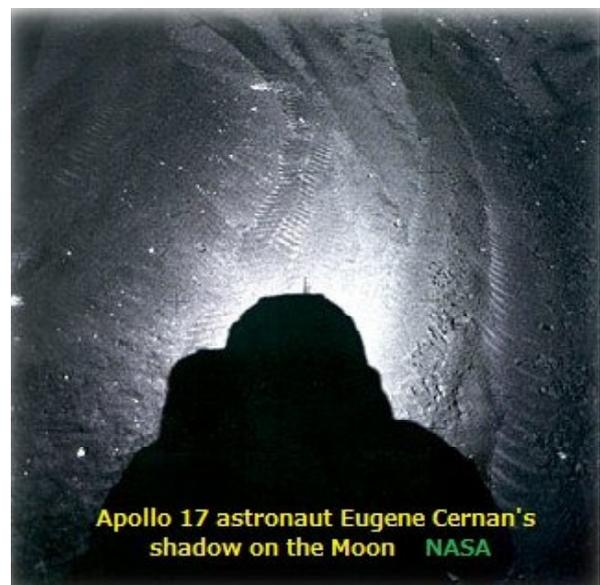
MDc on 1 Mar ($\lambda=078^\circ\text{Ls}$)

DPk on 10 Mar ($\lambda=081^\circ\text{Ls}$)

DPc on 5 Apr ($\lambda=093^\circ\text{Ls}$)

where *DPk* implies Don PARKER, *Km*: Teruaki KUMAMORI, *Ak*: Tomio AKUTSU, *DPc*: Damian PEACH, *CPl*: Christophe PELLIER, *MDc*: Marc DELCROIX. □

The prominent anti-solar brightneing just looks like the ones photographed on the Moon (see also attached another photo by Apollo 17 astronaut Eugene Cernan) suggesting the strong retroreflectivity of Martian dust which might have retroreflective properties comparable to those of Lunar regolith including coherent backscattering.



The remarkable retroreflectivity of Martian dust, I

guess, may be responsible for the "Nix Olympica" phenomenon, presumably a special opposition surge occurs on the gigantic volcano Olympus Mons only observable under near zero phase angle condition. Best Regards,

○.....Subject: Another record of Nov 2003 terminator protrusion? Received; 27 October 2012 at 22:17 JST

Dear Dr. Minami, Christophe, When I was searching in the 2003 CMO Mars Gallery the other day for



unintended Martian stereo pair images, I stumbled across another candidate for the record of the prominent terminator projection observed in Nov. 2003, a color drawing by Mario FRASSATI on 17

Nov. 2003. I have attached here a montage including his drawing. How was the solar activity then?

Best Regards,

Reiichi KONNAI (Fukushima, JAPAN)

●.....Subject: Mars 2011/12 obs Received; 25 October 2012 at 17:13 JST

Hello, congratulations on the great work you are doing on CMO.

I am sending you, rather delayed, my obs from last Mars observational period.

Manos KARDASIS (Glyfada-Athens, GREECE)

●.....Subject: RE: Mars 2011/12 obs Received; 25 October 2012 at 17:37 JST

Many thanks Manos !

Christophe PELLIER (Nantes, FRANCE)



TEN YEARS AGO (211)

--- CMO #266 (25 November 2002) pp3463~3482 ---

<http://www.hida.kyoto-u.ac.jp/~cmo/cmohk/cmo266/index.htm>

From this issue, a series entitled "CMO 2003 Great Mars Report" started. The first observations made at the period of the later half of October. Those by NAKAJIMA and MINAMI in Fukui were made on 25 Oct 2002 when $\delta = 3.7''$. At the beginning of November, MURAKAMI visited Fukui and thus began his observations of the 2003 apparition. The Martian season on 25 Oct was at $\lambda = 086^\circ \text{Ls}$.

<http://www.hida.kyoto-u.ac.jp/~cmo/cmohk/2003repo/01/01.html>

Next as 2001 Mars CMO Note (12), MINAMI wrote about "Mons Argenteus" by alluding to the image taken by Don PARKER on 24 Oct 2001 ($\lambda = 258^\circ \text{Ls}$) where a triangular bright part is found near the spc. Tsuneo SAHEKI once picked out a drawing made by Eitaroh DATÉ in 1939 and said that a triangular bright part on the drawing must be Argenteus Mons. This is the one named by E M ANTONIADI in 1924/25 whose centre was picked down around at $\Omega = 030^\circ \text{W}$, 70°S . At that time it was observed during the period from $\lambda = 197^\circ \text{Ls}$ to $\lambda = 247^\circ \text{Ls}$, and supposed to be due to a snowfall or a frost covering. This time the season is so a bit late. Unfortunately no other data about Argenteus Mons was found, though we were interested in the effect of the globular 2001 dust cloud. Around at $\lambda = 200^\circ \text{Ls}$, the snowline of the spc was near 60°S so that it must have been inside the



spc and hence it will not be detached from the spc at the season. We tried to see the position through the grid: Then the triangular part on PARKER's image was checked down to 40°S, and so it must have been a part of Argyre. Our conclusion was that the triangular bright part was a part of Argyre, so that it was not Mons Argenteus: The triangular part outside the spc was already observed also by MINAMI on 2 June 1986 ($\lambda=181^\circ\text{Ls}$) at $\omega=016^\circ\text{W}$. Next occasion will soon come

<http://www.hida.kyoto-u.ac.jp/~cmo/cmohk/266Note12/index.html>

Lastly as "Great 2003 Mars Coming (4)", an illustration "Grid Disks with Relative Sizes and Phases in 2003. I" was given by Akinori NISHITA who wrote the disks in grids up to March 2003.

<http://www.hida.kyoto-u.ac.jp/~cmo/cmohk/coming2003/04.html>

LtE came from Clay SHERROD (AR) Frank J MELILLO (NY), Bill SHEEHAN (MN), Brian COLVILLE (CANADA), Dave MOORE (AZ), Sam WHITBY (VA), David STRAUSS (MI), Ed GRAFTON (TX), Damian PEACH (the UK), and also received domestically from T OSHIRO, H ISHADOH, Isao MIYAZAKI, Toshio SATO, and Yukio MORITA.

As the column articles, MURAKAMI's essay (6) and TYA #087 were given: MURAKAMI's essay was about his preliminary inspection of the Lowell road at Oyashiradzu-Koshiradzu for the coming Lowell Conference in 2004.

TYA (087) was written by Toshiaki HIKI about CMO #123 (10 Nov 1992) and CMO #124 (25 Nov 1992): The top of #124 was about McKIM's BAA report of the 1990 apparition titled "The Opposition of Mars, 1990" (*JBAA* 102 (1992) 248).

The observation report picked out the aspect of Mars twenty years ago: At that time the planet shined at mid-night at Gem and the Martian season was around $\lambda=350^\circ\text{Ls}$; the diameter exceeded 11" enough for us to observe. A total number of the domestic observers was counted nine. MINAMI's series essay in Japanese "Yogoto-Yogoto" counted (31).

M MURAKAMI and M MINAMI

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