

MARS

No. **400**

25 July 2012

OBSERVATIONS

No. **26***Published by the International Society of the Mars Observers***Martian Terminator Projections Observed by the HST**

By

Christophe PELLIER

The 2012 apparition of Mars featured a surprising phenomenon, that had been observed previously but that won this year a widespread popularity: the detection of luminous activity beyond the enlightened visible Martian disk, in the night side of Mars. The discovery of an impressive example by Wayne Jaeschke on March 19th and its detection on following but also previous 2012 images raised many questions among astronomers.

On these columns we also recalled the discovery of a similar event 4th November 2003 by M. Minami (imaged on the following days by Y. Morita and I. Miyazaki). By good fortune, the HST imaged terminator protrusions years before. One is visible on one of the three images taken on 17th may 1997 and has been brought to the attention of the ISMO advisory board by observer Reiichi Konnai. Another one has been casually found by the author on a not publicly released series of images secured on 3rd March 1999¹.

Both HST runs provide high-res views of these projections and we propose here to make a case study on them. The purpose of this special note for the #400 issue of the CMO/ISMO review is to try to make out interesting facts about them.

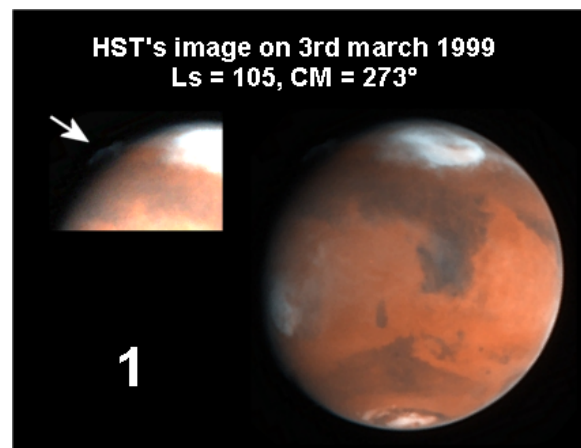
Identification on images

It is not uncommon to see on high-res profes-

sional images of Mars bright areas that look to protrude from the limb. Some, however, can be classical orographic clouds that shine brighter than the surroundings – they are though easy to identify. All the examples described here have the characteristic to be unrelated to a particular high relief feature, and to be projected quite away from the terminator. We assume in this essay that they all belong to the same kind of phenomena. The reader might however keep in mind that we lack clear evidences to be certain of this.

1 – 1999: a long series of a unique evening example

The 1999 run has been obtained on 3rd march of that year (Ls 105°, around two months before the opposition date on 24th April). This run is of the



highest interest for several reasons. An image processed from one RGB series of the set is presented on figure 1.

To the knowledge of the writer, this occurrence is the only example that is been found on the evening side. All other examples or candidates have been observed on the morning side (2012; 2003; 1997).

Then, we will note with interest that this 1999 protrusion is floating very close above the ground based coordinates of the examples observed in November 2003 and March 2012. Unless the recorded occurrences of HATC are statistically insignificant (and this could be the case), there might exist a preference for them to form above Eridania and Ausonia. But as we will see, the 1997 example appeared above a totally different site.

Finally, we must take a look in detail of the

whole data. This was a very long series of shots taken through three bands (F410M; F502N; F673N that were the usual RGB filters of the WFPC2 camera²) on a period of 4 hours, with images every 10-15 mn for each filters – with unfortunately two one hour gaps. As a result, we can see an *evolution* of the aspect of the projection. It is more easy to follow with the F410M images (blue light – we will comment on the albedo aspect with the 1997's study); the figure 2 is a compilation of stereographic polar projections made under WinJupos with the first nine blue images (out of 11; the last two don't show it anymore).

The formation of the feature is not easy to describe. It develops clearly on the 00H29 and 00H40 frames, maybe from a small white cloud that was visible at (221°; 41°S – arrowed on the 00H02 frame).

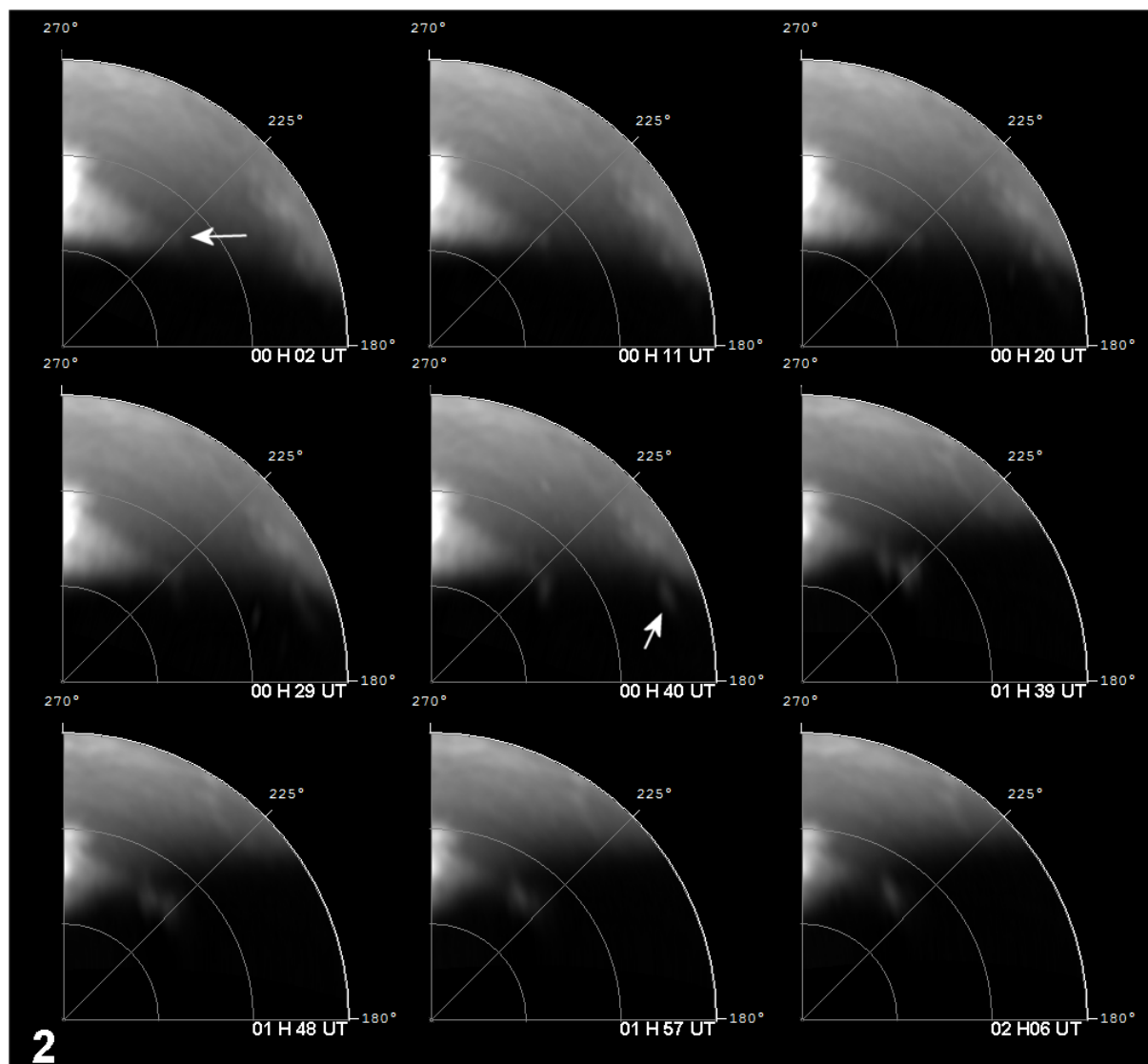


Fig. 2: WinJupos polar map projections of consecutives F410M images taken by the HST.

The link between that daytime cloud and the projection is however not certain. What looks to be certain however is that the fully developed phenomenon (started from 01H39 – the one hour gap before is a real shame) looks more extended and complicated than any daytime cloud previously located above the same point – we can clearly see several nuclei of light.

The detailed evolution when it has formed completely is also interesting (01H39 – 02H17). From the original images (and also from the 2012 animations that as been made), it looks to follow exactly the rotation of the globe, as would do a ground detail. But the polar maps show that it moves slightly – as if it was trying to follow the sunset line. It also changes its shape very quickly with nuclei that fade or to the contrary strengthen, and even merge with each other in a matter of minutes (01H39 – 01H57).

A secondary projection?

The series shows another example of terminator phenomenon (arrowed in the 00H40 frame). This one has a similar aspect, but looks to be more traceable from faint daytime clouds present already in the 00H02 frame. Unfortunately we don't know anything of its subsequent evolution due to the one hour gap in imaging. It is not visible anymore at 01H39. Despite the apparent link with a daytime cloud, the feature is suddenly brightening at 00H40 in comparison with images from 00H29 or 00H20.

This series gives the feeling that the terminator projection is relatively short-lived, and in very fast evolution as ten minutes are enough to see obvious changes in the aspect/shape; it does not look to be daytime active. In 2012, the terminator protrusion can not be chased either when the corresponding longitudes come into daylight. Local Martian hour (LMH) measures tell that the nuclei of light fade around 1H15 after the corresponding ground longitude have passed the crepuscule line.

Now as we found this evening exemplar against so many morning ones, the question is whether the phenomenon disappears before entering the deep night or whether it survives. It does not look possi-

ble with the data to tell if the feature disappears because it's not sunlit anymore, or because it dissipates completely. However, during the lifetime of this exemplar, we can see rapid changes with nuclei that fade when others are strengthening, some are merging... and this does not support very well the idea that it could survive steadily during several hours in the night side.

II – 1997: a full multispectral series

There was another terminator projection observed by the HST on 17th May 1997 in the morning side, close to Valles Marineris. We have no evolution to review here but to the contrary of the 1999 set, it was a full multispectral set from UVB to deep IR (F255W (UVB), F336W (UVA), F410M (blue), F502N (green), F673N (red), F953N (IR), F1042M (IR)) and we can try to obtain some information about the relative aspect in different bands. The figure 3 is a RGB image and the figure 4 (next page) presents five bands with the protrusion arrowed.

The project was to measure its relative, photometric intensity compared with that of the whole disk in each band. This is simple to carry out and it tells us how does the albedo of the feature evolve in comparison with that of the whole planet. It does not tell anything about its absolute albedo, though. Results are presented in figure 5 (next page).

The relative photometric analysis confirms the feeling that gets the eye when looking at the images: the terminator projections are less and less visible as the wavelength increases. We know that the absolute mean albedo of Mars is a steep increase

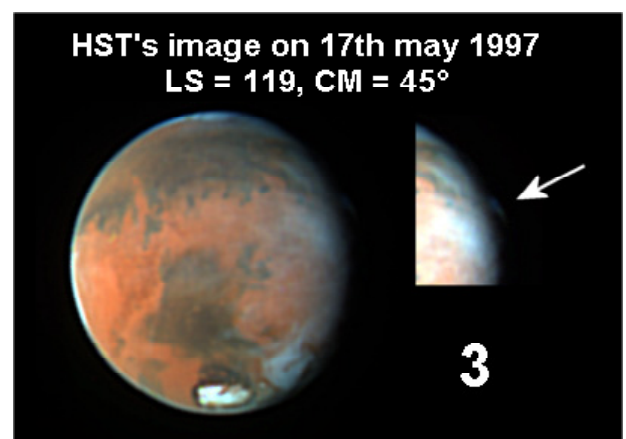


Fig. 3

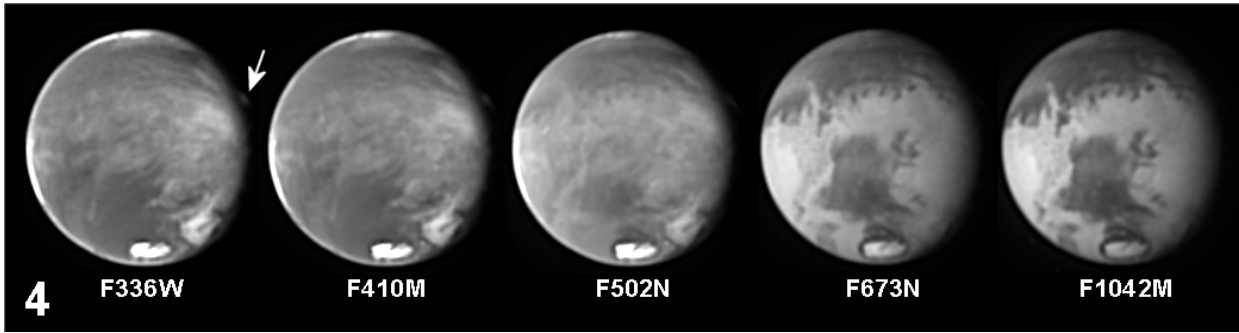
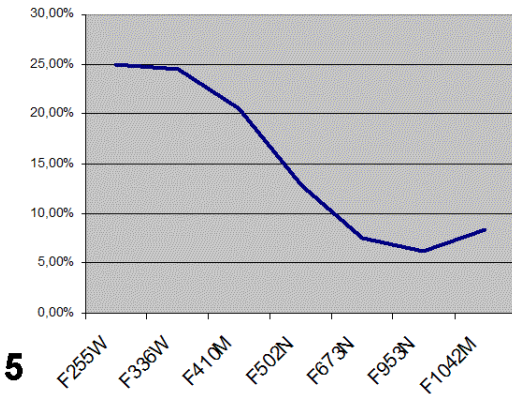


Fig. 4

↓ Fig. 5: relative albedo terminator protrusion / global disk brightness.



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from UV to red light (with a slight decrease after 700 nm in near infrared). This firms the luminosity of a quite reddish object. The projection does not follow this behaviour. We don't tell here where is its highest albedo; but we can say that its photometric behaviour looks quite coherent with that of all the usual white clouds of the planet, that are best visible in the short wavelengths (blue, UV). Indeed, the highest relative albedo is found with the two UV filters of the HST and even in blue light (F410M) the relative albedo looks to be declining already (the reason why the relative albedo looks to

increase slightly at 1042 nm is unknown).

If the terminator projection is a cloud, this brings elements of answer to decide if it is preferentially made of water components (vapour or with more confidence ice), or dust. The relative photometric behaviour of dust would have followed the main trend of the planet: brighter in red, less visible in blue. Here, the fact that it can still be detected in red and in infrared, as dust would do, should not be misunderstood: this is only because it projects on a black background and so there is no bright surface behind it anymore to make it invisible in red. As the reader can see on these HST images, the thick rest of polar cyclone near the north polar cap can still be outlined slightly at 1042 nm in the far near infrared; white clouds are still shining mildly in red light, but usually we don't see them because the surface underneath is too bright.

III - A few other examples

Looking back to the HST wide collections of images, other occurrences of projections detached from the illuminated disk beyond the terminator can be found. The 6th figure presents three ones that have been taken during opposition period in 1995,

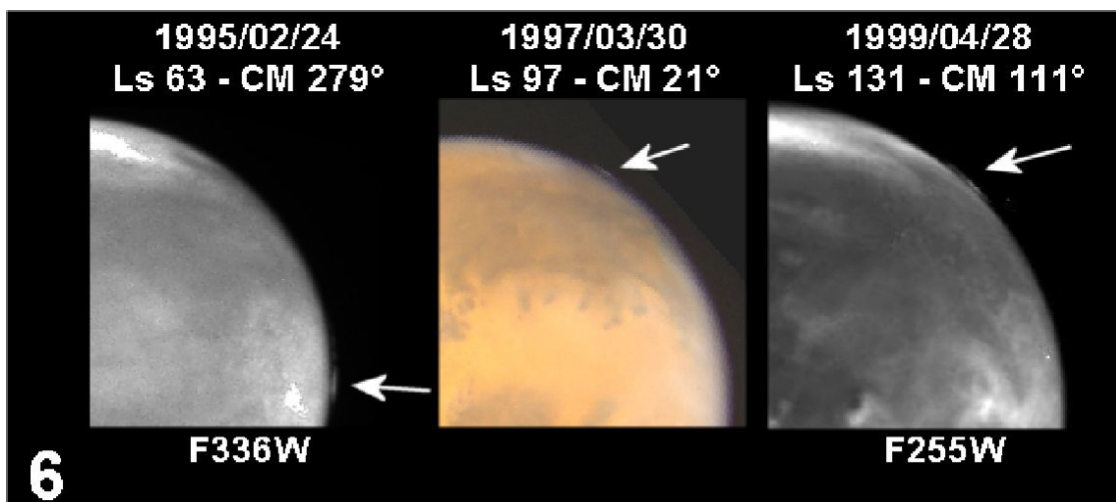


Fig.6

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1997 and 1999 (the last two ones were brought to the attention of the ISMO by R. Konnai again). Because of the angle of viewing they appear small and thin and might have gone unnoticed on amateur images.

They all look coherent with the albedo analysis of point II. For the 30th March 1997, the cloud looks bluish. For the 28th April 1999 and 24th February 1995, the cloud is best visible in UV light, and not anymore in R/IR.

IV - General mapping

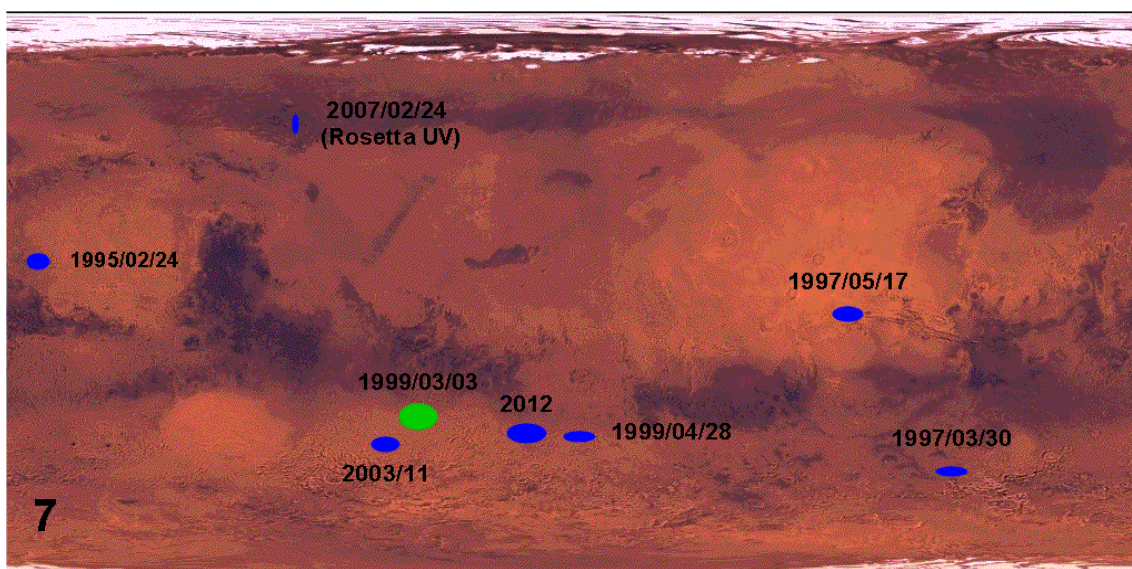


Fig.7:

general mapping with the recorded events. Blue is for morning events, green for evening occurrences.

Conclusion

The question of the nature of the Martian terminator projections still remains. Professional literature assumes that this is a cloud and it is the simplest hypothesis⁴. Arguments in favour of the cloud theory are:

1) The albedo of a terminator projection is coherent with that of the usual white clouds. It is more visible in UV, then in blue, and weakly observed in R/IR;

2) There is an apparent perfect correlation with the adjacent presence of white clouds in the sunlit neighbour region. The two exemplar imaged by the HST on 3rd March 1999 may have developed from daytime clouds. If the protrusion does not develop from an usual cloud, its existence would just

With all those examples of terminator protrusions we propose here a map of Mars where all occurrences have been projected against the classical ground details. We have added as well the one imaged in UV light (again) by the ROSETTA probe on 24th February 2007 (Ls = 189°).

The global map confirms the importance of the Ausonia/Eridania region that collects almost all the recorded events in the southern hemisphere. Two have been imaged next to the equator, and one only in the deep northern hemisphere (the Rosetta's one)

prove that the amount of available condensable water ice is good enough for a high altitude water ice haze;

3) There is a good correlation with the Martian seasons. Almost all occurrences are recorded during southern fall/winter, when the conditions favour the formation of water clouds.

4) The 2012 event looks to have been repeated during several weeks, as would do a white-cloud activity.

At this point, it should be enhanced that the 2003 event, if it verifies points 2) and maybe 4), do not respect point 3) (the season was southern summer) and do not seem to respect point 1) either: on every images taken in November 2003, the protrusion looks more visible in red than in blue (see 2003 CMO gallery). Some technical aspects could explain

that (the blue layer of the Toucam Pro, used by I. Miyazaki, is known to produce regularly unreliable B images), and at last, the author feels less confident that it does belong to the same class of phenomena.

However, the ISMO has also defended the idea that Martian terminator protrusions are not of cloud nature, but would be auroral-like phenomena related to Sun activity. There are also some good points in favour of this theory:

1) The 1999 examples show a very fast evolution; changes in shape can be noticed even after only 10 minutes. This is very, very fast when ones know how regular and gradual are the usual evolution of white clouds (of course we apparently know very little about high altitude clouds);

2) The correlation with the Martian magnetic field, stronger in the Ausonia/Eridania region, is also confirmed by this short study and this is where we have observed the best examples.

The correlation with solar activity would be another subject of research. The ISMO will also publish a 2012 note spotted on the spectacular occurrence of 2012 spring. Of interest would be as well to determine why this is mostly a morning activity (providing the recorded events are representative).

(Notes)

¹ The reader can have access to the raw HST images on the following URL: <http://archive.stsci.edu/hst/abstract.html>. The ID number of the 3rd march 1999 is 8391 and the ID of the 17th may 1997 is 6741 (this last one is for all 1997 observations).

² The nomenclature of the HST filters is simple to read: F is for filter; the number is the value of the transmission peak (502 = 502 nm = green light). The last letter describes how wide the pass band of the filter is: W = wide, N = narrow, M = medium.

³ The Rosetta's images are accessible at the following URL :

http://www.esa.int/esaCP/SEMUDT70LYE_index_2.html

⁴ Check out for example « Mars' mystery cloud explained » by Alan Boyle http://cosmiclog.msnbc.msn.com/_news/2012/03/30/10945735-mars-mystery-cloud-explained

CMO/ISMO 2011/12 Mars Report #12

2011/2012 Mars Observations in June 2012

♂..... This report treats the observations in June 2012: the 12th report of this season. During this month the planet moved from Leo to Vir and shined in the SW sky at the sunset time. The Martian season proceeded from $\lambda=118^\circ\text{Ls}$ to 133°Ls . The angular diameter decreased from $\delta=7.9''$ down to $6.6''$. The tilt stayed around $\phi=26^\circ\text{N}$ so that the npr largely faced to us. The phase angle ι was near 39° , and became maximal (39.4°) in mid-June. The rainy season visited the Japan islands at the beginning of June and the sky rather remained cloudy so that the observation became difficult.

♂..... In June we received reports from the following observers: The number of observers quite decreased.

KONNAÏ Reiichi (Kn) Ishikawa, Fukushima, Japan

4 Drawings (26, 27 June 2012) 750×30cm SCT

MELILLO, Frank J (FMI) Holtsville, NY, the USA

4 Colour Images (11, 18, 21, 28 June 2012) 25cm SCT with a ToUcam pro II

MORALES RIVERA, Efrain (EMr) Aguadilla, Puerto Rico

1 Set of LRGB Images (10 June 2012) 31cm SCT with a DMK21AF04

MORITA, Yukio (Mo) Hatsuka-ichi, Hiroshima, Japan

5 Sets of RGB + 5 LRGB Colour + 5 L Images (3, 7, 10 June 2012) 25cm speculum with a Flea3

PARKER, Donald C (DPk) Miami, FL, the USA

1 Set of RGB Images (12 June 2012) 36cm SCT @f/42 with a DMK21AU618.AS

WILLEMS, Freddy (FWI) Waipahu, Hawaii, the USA

2 Sets of RGB + 6 Colour + 1 R + 1 IR Images (12, 29 June 2012)
36cm SCT with a DMK21AU04.AS

♂.....Since the numbers of reports decreased we cannot write a lot. The aspect of Hellas was just checked by MORITA (*Mo*) on 3 June ($\lambda=120^\circ\text{Ls}$) at $\omega=294^\circ\text{W}$, $\omega=305^\circ\text{W}$ or on 7 June ($\lambda=121^\circ\text{Ls}$) at $\omega=264^\circ\text{W}$: It was bright from the morning. *Mo*'s image on 7 June also shows Elysium on the afternoon side. *Mo* next checked Elysium on 10 June ($\lambda=123^\circ\text{Ls}$) at $\omega=224^\circ\text{W}$ where Elysium was light on the morning side accompanied by a spread of mist.

The area around M Acidalium was checked by MORALES (*EMr*) on 10 June ($\lambda=123^\circ\text{Ls}$) at $\omega=067^\circ\text{W}$ as well as by PARKER (*DPk*) on 12 June ($\lambda=124^\circ\text{Ls}$) at $\omega=068^\circ\text{W}$ where Tanais was dark and Iaxartes was connected by the dark Hyperboreus L. On *DPk*'s image, a dark spot was caught among a mist near the morning terminator, maybe a poking out of a Tharsis ridge.

WILLEMS (*FWl*) observed also on 12 June ($\lambda=124^\circ\text{Ls}$) at $\omega=137^\circ\text{W}$, $\omega=139^\circ\text{W}$ and caught the Tharsis Ridges near the noon but images are difficult to read.

MELILLO (*FMI*) reported images on 11, 18, 21, and on 28 June, while the images are small to see the details.

KONNAĪ (*Kr*) observed on 26 June ($\lambda=130^\circ\text{Ls}$) at $\omega=060^\circ\text{W}$, $\omega=070^\circ\text{W}$ and on 27 June ($\lambda=131^\circ\text{Ls}$) at $\omega=051^\circ\text{W}$, $\omega=060^\circ\text{W}$. He noticed Argyre a bit light and the npc appeared to him to be fairly bright. The dawn Tharsis was fairly bright; whitish.

Every image in this period captured the brightness of the npc, and Olympia is light beyond Rima Borealis. At the end of June, the season reached $\lambda=133^\circ\text{Ls}$, and the diameter δ became quite smaller.

Masami MURAKAMI & Masatsugu MINAMI

Letters to the Editor

●.....*Subject: Mars - May 23rd, 23:29ut,*
Received; 1 June 2012 at 02:45 JST

Hi Mr. Murakami, Here is my latest session from May 23rd, under average conditions,

Clear Skies to All.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120523/EMr23May12.jpg>

○.....*Subject: Mars - June 10th*
Received; 21 June 2012 at 02:41 JST

Hi Mr. Murakami, Here is my latest session on Mars from the 10th of June, Clear Skies.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120610/EMr10June12.jpg>

Efrain MORALES RIVERA

(Aguadilla, PUERTO RICO)

●.....*Subject: Mars 2012.05.28*
Received; 1 June 2012 at 03:15 JST

Dears, Mars under good conditions:

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120528/MDc28May12.jpg>

<http://astrosurf.com/delcroix/images/planches/m20120528-MDe.jpg>

Surface is loaded with whitish zones - many clouds, also visible on the blue layer. Around the

polar cap there are 3 of those! Sincerely,

Marc DELCROIX (Tournefeuille, FRANCE)

<http://astrosurf.com/delcroix>

●.....*Subject: Mars images 23 may 2012*
Received; 4 June 2012 at 02:55 JST

Hi all, Here is my first set of images since 1st april. We had awful weather almost continuously from that date in France to mid-may !

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120523/CPI23May12.jpg>

http://www.astrosurf.com/pellier/M2012_05_23-CPE

Best wishes,

○.....*Subject: Next ISMO Note*
Received; 13 June 2012 at 04:40 JST

Dear Masatsugu, I'm currently working on my proposal for the first note of the 2012 apparition that deals with the Alba cloud case. Do we have something scheduled already for the next issue ?

Or can you give me a deadline? Best wishes,

○.....*Subject: Re: Next ISMO Note*
Received; 14 June 2012 at 07:36 JST

Dear Masatsugu, Thanks, I'll do my best to finish my article on time. I think it's a good idea to go on with general topics regularly. It will also give me

more time to work on the 2012 notes !

Hopefully your coming exams will help you to recover the best possible... Best wishes,

○...*Subject: Re: CMO/ISMO
Received; 18 June 2012 at 05:54 JST*

Dear Bill, Thank you for your encouragement. I can't imagine the CMO/ISMO to stop, even temporarily. The level of quality of the review as well as the adequate form of publication for amateurs is a wealth !

I have read with interest your comments about the Lowell's observatory project of pro/am cooperation. This kind of cooperation is getting more strength currently in the planetary domain, thanks of course to the great discoveries made by amateurs over the past years, especially on Jupiter but Saturn as well.

Two weeks ago I have been participating to a pro/am "school" organized in La Rochelle every three years by the CNRS (national council of the scientific research) and the AUDE association (that has been promoting for years the spectroscopy for amateurs), and this year for the first time they added a session dealing with possible cooperation projects about the gas giants - Marc Delcroix made a talk about Saturn, Jean-Luc Dauvergne on the new cameras and Ricardo Hueso Alonso, from the Sanchez-Lavega's group in Bilbao, presented the jovian climate.

Mars is not right now a subject for a cooperation of this kind but it could be. Yes monitoring dust storms is a subject, but there may be other topics as well. In september, the European planetary science congress (EPSC) will open for the first time an amateur session (with Marc and Ricardo), and I have chosen to propose an abstract for a talk about Mars, that I have added to this e-mail. It will be first an attempt to show what is the level of amateur studies today. Apart of dust storms I'd like to describe as well a precise study of the Tharsis spring/summer clouds.

I think that an ISMO essay about the Lowell's observatory projects would be very pertinent...

Best wishes to all of you,

○...*Subject: Re: Thank you for the article on Alba
Received; 22 June 2012 at 20:38 JST*

Dear Masatsugu, Very fine. Reiichi, again many thanks for the translation! For the next issue, I think that I will write a flash-back note, to study how the Alba cloud was visible in 2010. Just to see if there were some seasonal differences...

○...*Subject: CMO #400
Received; 25 June 2012 at 21: 19 JST*

Dear Masatsugu, I think I have answered too fast to your request for a special note for the #400. An essay about the Alba cloud observed in 2010 looks secondary to this respect.

I have the idea of writing something about the now famous "Wayne Jaeschke's cloud". Not about just this cloud, but about all those limb clouds that we have observed. We have many preceding references; like the 2003 one, or some found on HST shots (Reiichi looked one on a 2003 image; and I have casually found another in 1999 february - unreleased images).

I don't know if that essay will be able to propose some explanations. But at least there will be a record of all the detected events, with some remarks (preferred sites of apparition, frequency, observed albedo (filters)....) Do this sounds right to you?

Best wishes,

Christophe PELLIER (Nantes, FRANCE)

●...*Subject: Mars images (May 22nd, 2012.)
Received; 5 June 2012 at 22:35 JST*

Hi all, Mars from May 22nd in poor seeing conditions. Olympia looks bright and some clouds over Olympus and Elysium.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120522/DPc22May12.jpg>
http://www.damianpeach.com/mars1112/2012_05_22rgb.jpg

Best Wishes

○...*Subject: Mars images (May 24th, 2012.)
Received; 7 June 2012 at 05:35 JST*

Hi all, Fairly good seeing on this night with Olympus Mons and the Tharsis orographics nicely seen.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120524/DPc24May12.jpg>
http://www.damianpeach.com/mars1112/2012_05_24rgb.jpg

Best Wishes

○...*Subject: Mars images (May 27th, 2012.)*

Received; 9 June 2012 at 03:17 JST

Hi all, Fair seeing on this night with a cloud free Olympus Mons near centre.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120527/DPc27May12.jpg>
http://www.damianpeach.com/mars1112/2012_05_27rgb.jpg

Best Wishes

○.....**Subject: Mars in excellent seeing (May 28th),
Received; 10 June 2012 at 03:39 JST**

Hi all, Excellent seeing on this particular evening. Despite its diminutive size there is plenty visible. Extensive clouds across the planet. Arsia Mons looks dark and almost like a teardrop shape. No clouds flanking Olympus Mons. A bright patch of cloud just to the south of the NPC.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120528/DPc28May12.jpg>
http://www.damianpeach.com/mars1112/2012_05_28rgb.jpg

Best Wishes

○.....**Subject: Mars (May 30th, 2012.)
Received; 10 June 2012 at 23:37 JST**

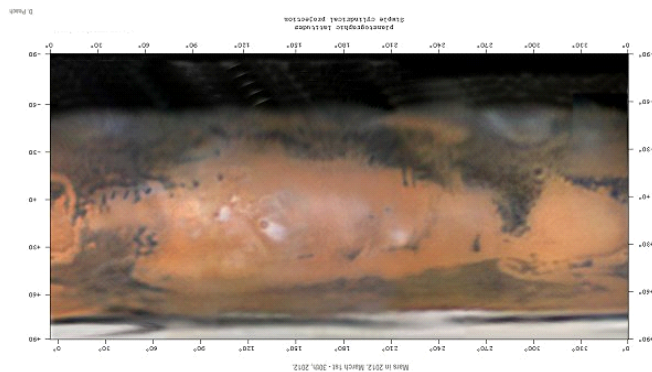
Hi all, Fair seeing on this evening. The Tharsis volcanoes are prominent. Weather has been dismal since with no further opportunities and with the planet fast sinking in the twilight this way will be it for this apparition!

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120530/DPc30May12.jpg>
http://www.damianpeach.com/mars1112/2012_05_30rgb.jpg

Best Wishes

○.....**Subject: The entire face of Mars in 2012.
Received; 25 June 2012 at 03:54 JST**

Hi all, Here is a full projection map of the entire face of Mars and also a full rotation movie obtained between March 1st-30th 2012. Also a six image montage of the varying faces of the planet.



Map: <http://www.damianpeach.com/mars1112/2012wholemap.jpg>

Movie: <http://www.damianpeach.com/mars1112/mars2012dp.wmv>

Six image montage:

<http://www.damianpeach.com/mars1112/mars2012.jpg>

This concludes my submissions for the 2011-12 apparition. Best Wishes

Damian PEACH (Selsey, WS, the UK)

Web: <http://www.damianpeach.com/>

FB: <http://www.facebook.com/peachastro>

●.....**Subject: MARS - May 19, 2012
Received; 11 June 2012 at 09:52 JST**

Oops found a set of Mars captures of May 19, 2012. Looks like seeing was not great that day.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120519/FW119May12.jpg>

○.....**Subject: Mars - June 12, 2012
Received; 18 June 2012 at 14:36 JST**

A small mars in variable conditions.

Maybe my last one.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120612/FW112June12.jpg>

Freddy WILLEMS (Waipahu, HI)

●.....**Subject: Mars: June 11, 2012
Received; 12 June 2012 at 14:19 JST**

Hi - I have attached my latest image of Mars June 11, 2012 at 1:37 UT to be posted.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120611/FM111June12.jpg>

Thanks,

○.....**Subject: Mars: June 18, 2012
Received; 19 June 2012 at 14:01 JST**

Hi - I have attached my latest image of Mars June 18, 2012 to be posted.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120618/FM118June12.jpg>

Thanks,

○.....**Subject: Mars: June 21, 2012
Received; 25 June 2012 at 08:42 JST**

Hi - I have attached my latest image of Mars June 21, 2012 to be posted.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120621/FM121June12.jpg>

Thanks,

○.....**Subject: Mars: June 28, 2012
Received; 28 June 2012 at 14:29 JST**

Hi - I have attached my latest image of Mars June 28th, 2012 to be posted.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120628/FM128June12.jpg>

Thanks,

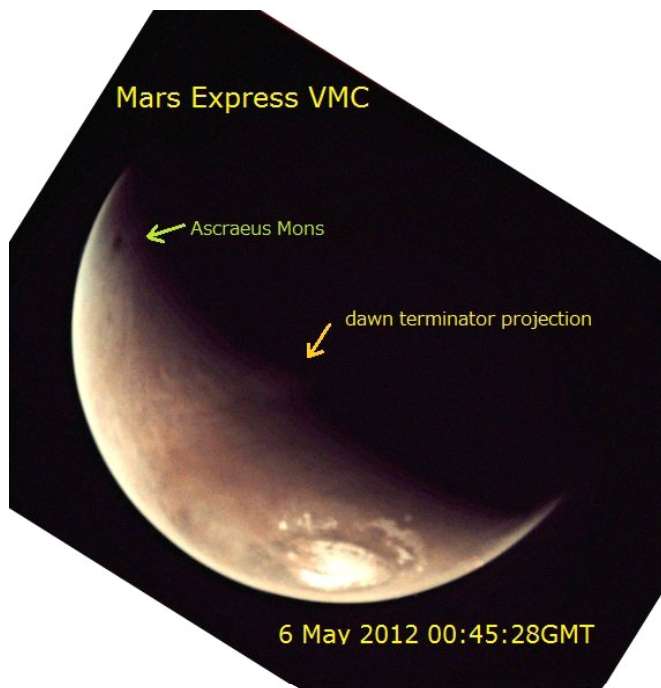
Frank J MELILLO (Holtsville, NY)

●.....**Subject: Drawings of Mars
Received; 12 June 2012 at 22:04 JST**

Dear Dr. Minami, My broken scanner/printer was finally fixed and sent back from the maker, so I have attached here my latest drawings of Mars.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120519/Kn19May12.jpg>

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120526/Kn26May12.jpg>



I am also attaching here the first test image of the ESA's Mars Express VMC (Visual Monitoring Camera) taken on 6 May 2012 00:45:28 GMT. The "Mars Webcam" has just woken up from a long sleep following the major anomaly occurred in the satellite's imaging system at the end of the last summer. The VMC image is very interesting; Ascraeus Mons poked out of morning mist, and an dawn terminator projection near Alba Mons are explicitly shown. Best Wishes,

Reiichi KONNAI (Fukushima, JAPAN)

●.....*Subject: Mars 12 June*
Received; 13 June 2012 at 08:00 JST

Hi All, I have attached RGB Mars images from 12 June. Numerous clouds persist.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmons/2011/120612/DPk12June12.jpg>

Best,

Don PARKER (Coral Gables, FL)

●.....*Subject: CMO/ISMO*
Received; 15 June 2012 at 08:49 JST

Dear Masatsugu and Christophe,

I am sorry to hear, Masatsugu, of your contin-

uing neurological difficulties, and am hoping with Christophe that the nuclear scan of your brain sheds some light on this. It must be very frustrating not to be able to keep up your usual workload. Christophe, I commend you for agreeing to fill in for Masatsugu in keeping CMO/ISMO up to date, and I am hoping to contribute an essay in due course, as soon as I get caught up with obligations.

The transit of Venus observations from Lowell Observatory were excellent; Paolo Tanga, whom you both met in Paris for our 2009 Mars observers meeting, brought two special coronagraphs, one used by Paolo to obtain CCD imagery and the other by myself visually. We were eager to record the aureole. Though there were a number of other instruments deployed internationally (the project was led by Paolo and Thomas Widemann of Paris Observatory), I personally think the Flagstaff results were the best.

At Lowell I spent some time in the archives and read through manuscript materials for the book that the Sole Trustee, Roger Lowell Putnam II, expected V.M. and E. C. Slipher and C.O. Lampland to write about Mars after Percival Lowell's death. It was quite interesting to see all this, and I think partly explains the distractions that V.M. experienced after he made the initial spectrograms of the nebulae in the nineteen teens. This would make an interesting CMO/ISMO essay.

Klaus Brasch and Kevin Schindler, who are both associated with Lowell Observatory, and I discussed a new pro-am initiative that is being organized through Lowell Observatory, and would like to make an announcement to CMO/ISMO to consider participating in the program. Lowell Observatory was for many years the leader in monitoring Mars, and perhaps through this program we can once again serve a role of coordinating amateur observations with those being made by professionals and space probes. The dust storm monitoring seems especially worthwhile, as well as creation of an organized data archive like that CMO has been organizing for many years. Best,

○...Subject: RE: For CMO#400
Received; 28 June 2012 at 00:29 JST

Dear Masatsugu,

On reading your note, I am hoping that your condition may be improving now. It seems that the Parkinson's syndrome came on quite suddenly, but I suppose it may have been gradual for some-time and only worsened now; was the strain and fatigue of a winter Mars opposition involved? I do know that with Parkinson's it is important to get a lot of rest and not to overdo. This will be something that will be difficult for someone like yourself.

I got back from Lowell Observatory three weeks ago. The transit observations (with Paolo Tanga's coronagraph, which I used visually; Paolo used another to image Venus with CCD) were entirely successful. We got splendid views of the aureole, and I also saw quite a dramatic Black Drop. I shall send you drawings from my home address. I also spent time with Dale Cruikshank, who recounted his experiences with Kuiper and other similar adventures, and I made some explorations of the geological sites associated with the training of astronauts during the Apollo era, including a descent into Meteor Crater

with Drew Barringer (grandson of the person who tried to mine the iron and nickel that he thought was buried at the bottom).

I have my transit observations to write up, and also an article with Jay Pasachoff disputing the claim that Lomonosov saw the aureole in 1761 has plunged me into controversy; these queries must be replied to sometimes. I am trying to finish work on a translation into English of James Lequeux's book on Le Verrier. Also of course I have many professional duties to attend to. So it is somewhat difficult to commit to an article for the CMO by mid-July, but I may suggest writing up something on the Mars book that the Trustee of Lowell Observatory wanted V. M. Slipher, E. C., and C. O. Lampland to write in the 1920s. A fair amount of work went into it, but it was never published; however, I did have a chance to look at these manuscripts in the archives at Lowell when I was there. Would this interest CMO readers? I shall try to write something on this for you in the spare hour.

With best wishes,

Bill SHEEHAN (Willmar, MN)

☆☆☆

ISMO 11/12 Mars Note (2)

The Dawn Protrusions Observed in 2012 Compared with Those in 2003

Masatsugu MINAMI & Masami MURAKAMI

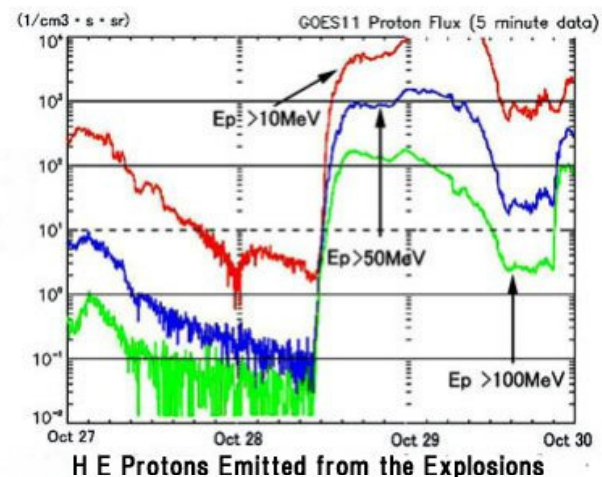
Among many Martian phenomena we experienced this apparition, some protrusions from the dawn terminator were quite conspicuous: These must not be strange when the sun activity is peculiar, and must be the unusual ones easily checked if the observations are made timely.

Those phenomena which we observed in November 2003 must have been the same phenomena though they were not so much talked about. Furthermore E M ANTONIADI observed the similar protrusions on 16 Mar 1929 and on 14 April 1933.

We consider these phenomena are not due to the dust clouds, but the phenomena caused by the

strong solar wind at those times. However, though the 2003 phenomenon occurred during the most active period of the Sun, but the one in 1929 occurred during the time the Sun activity was decreasing and in 1933 the activity was minimal. In 2012 also we can say the solar activity was duller, corresponding to the 1933 case.

In our opinion these phenomena are caused by the



activity of the CME (Coronal Mass Ejection) from the solar surface, but we must consider that the activity of CME does not have a regular periodicity like the sun spots, or we should say the CME does not follow suit the solar cycle. Some spontaneous appearances of the big sunspots may cause the case when the CME is vigorous.

In the case in 2003, the solar activity from the end of October to the beginning of November was strong, and the Earth also suffered from the big magnetic storms. The CME emitted on 28 October 2003 was the one associated with the high energy protons as observed by the space satellite: The figure here shows the explosion on 28 October.

The CME arrives a bit later. Furthermore it will further delayed on Mars. In 2003, we were aware of the dawn protrusion on 4 November which must have been caused by the arrival of the CME. We also saw it from the same angle on 7 November (drawings by M MINAMI). We of course were near the telescope every day but the sky was not necessarily idealistic. Fortunately we could catch the same angle $\omega=203^\circ\text{W}$ on both days. This shows that, though the protrusion must have been given rise to, after the passing of the CME at the protrusion

place, the protrusion remained there at least four days as a residual at the place near Hellas~Eridania. This is apparently different from the case of the dust clouds. We of course have some other data at the different angles: On 7 November, Yukio MORITA chased the protrusion from $\omega=211^\circ\text{W}$ to 224°W , and Isao MIYAZAKI observed on 8 November from $\omega=168^\circ\text{W}$ to 209°W : However density of the variations were not statistically checked.

Now the activity in this 2012 apparition was considered rather in a low level as an average. However the solar activity this year was slightly extraordinary; For example it is said this year there occurred a magnetic reversal on the Solar northern hemisphere. So this kind of variation may cause a spontaneous change around the Martian southern hemisphere where several magnetic mushrooms exist.

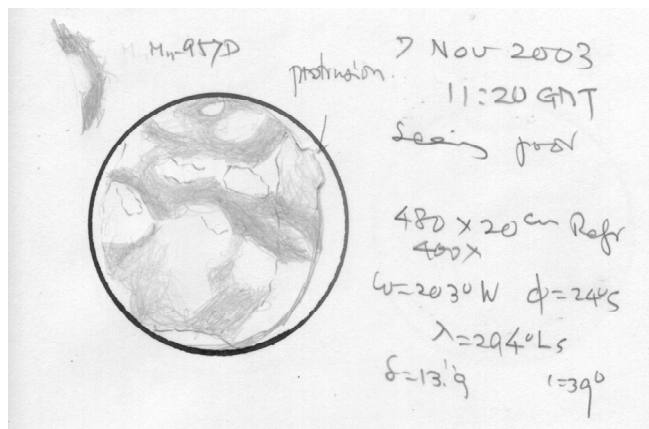
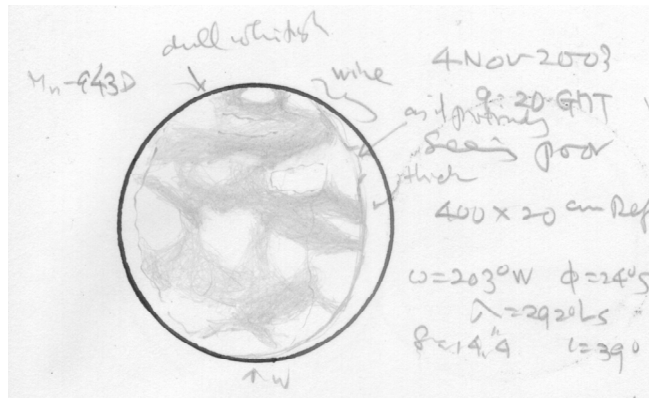
The following is a Table of the detections of protrusions:

- 12 March ($t=07^\circ$) Marc DELCROIX at $\omega=154^\circ\text{W}$
- 14/15 March ($t=10^\circ$) Damian PEACH at $\omega=152^\circ\text{W}$
- 20 March ($t=13^\circ$) Wayne JAESCHKE at $\omega=147^\circ\text{W}$
- 21 March ($t=14^\circ$) Don PARKER at $\omega=146^\circ\text{W}$
- 21 March ($t=14^\circ$) Jim PHILLIPS at $\omega=153^\circ\text{W}$
- 06 April ($t=24^\circ$) Don PARKER at $\omega=354^\circ\text{W}$
- 09 April ($t=26^\circ$) Yuri GORYACHKO at $\omega=184^\circ\text{W}$
- 12 April ($t=27^\circ$) Yuri GORYACHKO at $\omega=160^\circ\text{W}$
- 13 April ($t=28^\circ$) Damian PEACH at $\omega=185^\circ\text{W}$
- 25 April ($t=32^\circ$) William FLANAGAN at $\omega=180^\circ\text{W}$

(Notes) See the images in CMO Gallery except for

*1: As for the observation by W JAESCHKE (PA) (20 Mar) see <http://exosky.net/exosky/?p=1606>

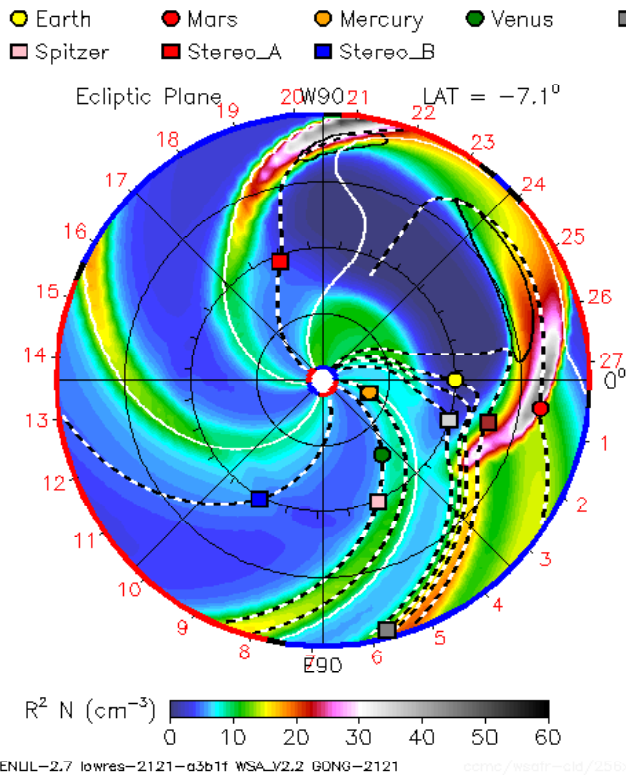
*2: As for Yuri GORYACHKO et al (Minsk) (09, 12 Apr), see http://www.astronominsk.org/Planets/Mars/2012/Mars20120409_en.html
http://www.astronominsk.org/Planets/Mars/2012/Mars20120412_en.html



As an example of a trend of CME this apparition we pick out here the case in which the proton flux started on 13 March 2012: This arrived the planet Mars on 17 March at 06:00.

http://www.kwasan.kyoto-u.ac.jp/~cmo/cmo/CME_2012Mar13_19.gif
 See the map here on 17 March at 6:00 which is an element of the following gif map which was cut off from the above moving gif map:

2012-03-17T06:00

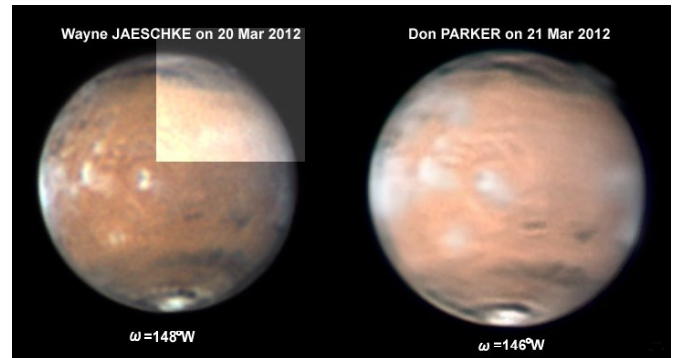


The protrusion which must correspond to the following:
 20 Mar ($\iota=13^\circ$) Wayne JAESCHKE at $\omega=147^\circ\text{W}$
 Unfortunately we have no report during the period from 15 Mar to 19 Mar and therefore it is natural to consider the explosion which reached on 17 March is the source. The protrusion thus created must be what was left behind after the passing of the CME wave and observed in the following:

21 Mar ($\iota=14^\circ$) Don PARKER at $\omega=146^\circ\text{W}$

21 Mar ($\iota=14^\circ$) Jim PHILLIPS at $\omega=153^\circ\text{W}$

The later observation by PHILLIPS was accompanied by successive G images from 2:40 GMT to 3:50 GMT (see LtE Now in #396) but except for a bit change of angles, there are no important suggestions. Rather it must have been better if the phenomenon was observed at the same angle on the next day and so on. As we consider, the position of the magnetic mushrooms on Mars does not so rapidly move, and hence it will stay similarly on the following days. At least it was important to choose the angle $\omega=148^\circ\text{W}$ of Wayne JAESCHKE to compare: In this sense the angle $\omega=146^\circ\text{W}$ chosen by Don PARKER on 21 March is interesting. They are



shown here as a comparison: Unfortunately no visual observations were reported and so it is not easy to compare the change of the aspect but the positions seem to remain the same. \square

Ephemeris for the Observations of the 2011/12 Mars. XIII

August 2012

Masami MURAKAMI

Date (00:00GMT)	ω	φ	λ	δ	ι	Π	D
31 July 2012	291.22°W	24.9°N	147.52°Ls	5.78"	37.3°	33.5°	-06°10'
01 August 2012	281.46W	24.8°N	148.03°Ls	5.75"	37.2°	33.7°	-06°24'
02 August 2012	271.69W	24.7°N	148.54°Ls	5.73"	37.1°	33.9°	-06°39'
03 August 2012	261.93W	24.6°N	149.05°Ls	5.71"	37.1°	34.1°	-06°53'
04 August 2012	252.16W	24.5°N	149.56°Ls	5.69"	37.0°	34.3°	-07°08'
05 August 2012	242.39W	24.4°N	150.07°Ls	5.67"	36.9°	34.5°	-07°22'
06 August 2012	232.62W	24.3°N	150.59°Ls	5.65"	36.8°	34.7°	-07°37'
07 August 2012	222.85W	24.2°N	151.10°Ls	5.63"	36.7°	34.9°	-07°52'
08 August 2012	213.07W	24.0°N	151.62°Ls	5.61"	36.6°	35.1°	-08°06'
09 August 2012	203.30W	23.9°N	152.13°Ls	5.59"	36.5°	35.3°	-08°21'
10 August 2012	193.53W	23.8°N	152.65°Ls	5.57"	36.4°	35.5°	-08°35'

11	August	2012	183.75W	23.6°N	153.17°Ls	5.55"	36.3°	35.6°	-08°50'
12	August	2012	173.98W	23.5°N	153.68°Ls	5.53"	36.2°	35.8°	-09°04'
13	August	2012	164.20W	23.4°N	154.20°Ls	5.51"	36.1°	36.0°	-09°19'
14	August	2012	154.43W	23.2°N	154.72°Ls	5.49"	36.0°	36.1°	-09°33'
15	August	2012	144.65W	23.1°N	155.24°Ls	5.48"	35.9°	36.3°	-09°48'
16	August	2012	134.87W	22.9°N	155.76°Ls	5.46"	35.8°	36.5°	-10°02'
17	August	2012	125.09W	22.8°N	156.28°Ls	5.44"	35.7°	36.6°	-10°17'
18	August	2012	115.32W	22.6°N	156.81°Ls	5.42"	35.6°	36.7°	-10°31'
19	August	2012	105.54W	22.5°N	157.33°Ls	5.41"	35.5°	36.9°	-10°46'
20	August	2012	095.76W	22.3°N	157.86°Ls	5.39"	35.4°	37.0°	-11°00'
21	August	2012	085.98W	22.2°N	158.38°Ls	5.37"	35.3°	37.2°	-11°14'
22	August	2012	076.20W	22.0°N	158.91°Ls	5.35"	35.2°	37.3°	-11°28'
23	August	2012	066.42W	21.8°N	159.44°Ls	5.34"	35.1°	37.4°	-11°43'
24	August	2012	056.64W	21.6°N	159.97°Ls	5.32"	34.9°	37.5°	-11°57'
25	August	2012	046.86W	21.5°N	160.50°Ls	5.30"	34.8°	37.6°	-12°11'
26	August	2012	037.08W	21.3°N	161.03°Ls	5.29"	34.7°	37.7°	-12°25'
27	August	2012	027.30W	21.1°N	161.56°Ls	5.27"	34.6°	37.8°	-12°39'
28	August	2012	017.52W	20.9°N	162.09°Ls	5.26"	34.5°	37.9°	-12°53'
29	August	2012	007.74W	20.7°N	162.62°Ls	5.24"	34.4°	38.0°	-13°07'
30	August	2012	357.96W	20.5°N	163.16°Ls	5.23"	34.3°	38.1°	-13°21'
31	August	2012	348.18W	20.3°N	163.69°Ls	5.21"	34.2°	38.2°	-13°35'
01	September	2012	338.40W	20.1°N	164.23°Ls	5.20"	34.0°	38.3°	-13°49'

TEN YEARS AGO (201)

--- CMO #262 (25 July 2002) pp3379~3402 ---

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmoms/cmo262/index.htm>

The period of observations was over, so that no report in this issue. The opening article is "2001 Mars CMO Note (8): The North Polar Hood During the Dust Clouded Period. II. The nph in mid to latter July 2001." As to the behaviour of the nph when the dust cloud appeared, we dealt with in CMO #260 Note (6). This time we treated the case in 2001 when the occurrence of the dust was earlier than expected: we so picked out the observations during the period from the beginning of the dust disturbance for about 19 days and concluded that there was no sign of the decay of the nph, and rather contrarily some bright projections were observed from the nph and thus the nph was very active: So this feature was quite different from for example the case in 1973.

<http://www.kwasan.kyoto-u.ac.jp/~cmo/cmomn3/262Note8/index.htm>

LtEs were received from Clay SHERROD (AR), Damian PEACH (the UK), Konrad DENNERL (Germany), Tom DOBBINS (OH), Francis OGER (France), Ed GRAFTON (TX),

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MARS

No. 262
25 July 2002

OBSERVATIONS Published by the OAA Mars Section

2001 Mars CMO Note (6) ■

The North Polar Hood during the Dust Clouded Period. II. The nph in mid to later July 2001
青雲發生中の北極帯
(その2: 七月中下旬の北極帯)

In Note (6) in CMO #260 p3329, we gave an Introduction to our analysis of the activity of the north polar hood (nph) when the 2001 global dust storm prevailed. As reported by Leonard J MARTIN, *North Polar Hood Observations during Martian Dust Storms*, Icarus 26 (1975) 341, the 1973 nph retreated northwardly and nearly vanished around Day 18 of the 1973b dust cloud, and in the case of 1977b, as reported by B M JAKOSKY and Terry Z MARTIN, *Mars: North-Polar Atmosphere during Dust Storms*, Icarus 72 (1987) 528, the upper atmosphere over the north polar region (npr) proved to gradually rise up in temperature and attained its highest around 19 days after the dust occurrence at 274° Ls. These imply that the temperature gradient due to an arrival of the heated airborne dusts at the npr must greatly influence the behaviour of the nph if it takes about 20 days after the dust occurrence to polewardly transmit the heat accumulation to the north pole area: The cases in 1973 and 1977 have a common characteristic to the extent that they were caused by the dust storms which were onset after the southern summer solstice (270° Ls), and in this respect the 2001 case was quite different;

it occurred when the season was much younger. As suggested there, and we shall prove in the following, the 2001 dust storm must have been milder at the npr, and the nph itself looked not so influenced by the storm: On the contrary the nph looked to have been rather active and have scavenged the dusty influence. Here we try to scrutinise the behaviour of the 2001 nph from mid July toward the end of July 2001 giving the data from our side.

Day 18 corresponded to 11 July in 2001, and so we first pick out the period from 7 July (Day 14) to 17 July (Day 24). We have a rich set of data from around 30 June to 4 July concerning the activity of the water vapour as well as the nph behaviour; as to which we shall treat separately

Schematic chart of the nph boundary on 9 July 2001

3 3 7 9

Bill SHEEHAN (MN), Maurice VALIMBERTI (Australia). Domestically we received for example from T KUMAMORI, T AKUTSU, T SATO, T HIKI, H ISHADOH, T IWASAKI, K HORIKAWA, T OSHIRO, T WAKUGAWA et al. HIKI's email was the invitation to the Mars Meeting which was planned to be held at Ina, Nagano, in the following summer.

TYA#083 was written by HIKI who treated CMO#119 (25 July 1992): Twenty years ago the planet Mars was at Ari in the morning sky, and thus the season came, but its angular diameter was just over 6 seconds. A few observers saw some markings and the spc at the season $\lambda=270^\circ$ Ls (southern summer). As an article, 1990 OAA Mars Section Note (7) wrote about "M Cimmerium at $345^\circ\sim 350^\circ$ Ls.

Mn also wrote about GALILEO GALILEI as a person who implicitly considered the Earth as a centre of the universe.

TSUNEMACHI's Antares corner counted 21st, and the last of this series: She reminded of Okinawa where she stayed to observe Mars the preceding summer and here talked about several old festivals in Okinawa, referring to the books by Ryotaro SHIBA and Taro OKAMOTO.

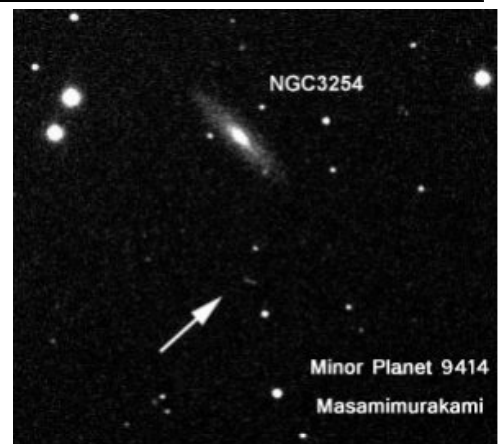
Mk's new literary calendar #2 picked out Mt Fuji just after the passing of a typhoon and also talked about his new place in Yokohama.

(Mk & Mn)

NEWS: Masami MURAKAMI (Mk), the present Director of the OAA Mars Section, did honour to us since his full name was put on a main belt asteroid whose official name is now 9414 Masamimurakami (1994 UV4). See the JPL page

<http://ssd.jpl.nasa.gov/sbdb.cgi?sstr=9414&orb=1>

M.P.C. 79909-79910 says that (9414) Masamimurakami was discovered on 25 October 1995 by T. KOBAYASHI at Oizumi. Masami MURAKAMI has been one of the leading observers within the Mars Section of the OAA since 1988. He has served the OAA since 1996 as its Mars Section webmaster and since 2010 as the Mars Section Director. In 2006 he received the OAA's Issei YAMAMOTO Prize.



The photo here was taken on 27 Mar 2012 at 13:23~14:05 by U. FUJIOKA by the use of an 8cm refractor. (Ed)

International Society of the Mars Observers (ISMO)

Advisory Board: Donald PARKER, Christophe PELLIER, William SHEEHAN, and Tadashi ASADA, Reiichi KONNAI, Masatsugu MINAMI

Bulletin: Kasei-Tsushin CMO (<http://www.mars.dti.ne.jp/~cmo/ISMO.html>)

CMO #400/ ISMO #26 (25 July 2012)

Editorial Board: Tadashi ASADA, Masatsugu MINAMI, Masami MURAKAMI, Takashi NAKAJIMA and Akinori NISHITA



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