Jupiter in 2013/14: Interim report no.4

John Rogers (British Astronomical Association), 2013 Dec.22

As Jupiter comes up to opposition on Jan.5, here is a brief review of the atmospheric features so far, with a set of 4 maps attached (Fig.1). Many thanks to all the observers, who continue to produce many superb images, and to the JUPOS team for producing maps and longitude charts. All longitudes and drift rates are quoted in System II, as of Dec.10 unless otherwise stated. Fig.4 shows a set of recent images: v-hi-res images and methane and UV images, showing the four anticyclonic reddish ovals as well as other interesting details.

S.S. Temperate Region:

There are now ten AWOs forming stable arrays around the circumference. V-hi-res images have revealed details in the cyclonic regions between them.

Between A3 and A4, a cyclonic white oval developed in early Nov., which was reported by Manos Kardasis on Nov.9 as a methane-bright spot. This was unusual if not unprecedented, as cyclonic spots are always dark in methane unless undergoing a vigorous convective outburst; but even more remarkably, it has remained methane-bright into Dec. (Fig.4). This perhaps demonstrates what new phenomena can be uncovered now that image derotation allows observers to obtain such hi-res methane-band images.

Several SSTBn jet spots have been recorded, mostly prograding up to the dark spots in STZ Sf. the dark STB segment, where they decelerate and are lost. One pair prograded up to the STB Ghost (see below), where one disappeared, while the other reversed its drift to retrograde (with oscillations) in the STZ (Figs.2 & 3).

S. Temperate Region:

Oval BA is still strongly orange (with a white centre), and the STB segment f. it is long and dark with internal turbulence in v-hi-res images. Oval BA accelerated greatly during solar conjunction, as predicted [see report, ref.1], and has maintained this high speed of DL2 = -14.3 deg/month. The intense outbreak of dark spots on the STBn prograding jetstream is also continuing.

The other substantial, though inconspicuous, feature of the S.Temp. domain is the 'STB Ghost', a faint oblique structure which has been passing the GRS in Nov-Dec. SSTBn jet spots were unable to pass it, one recirculating into STZ (see above). It is conspicuously methane-dark (Figs.2 and 4). All these characteristics confirm that it is an exact copy of the STB Remnant from a few years ago.

Thus the present STB cycle is playing out just as we described for previous cycles, and is presently in the same state as in 2005 [ref.2].

S. Tropical Region:

The GRS is a strongly orange oval, at L2 = 204.

The STropZ is narrowed by dark grey streaks which occupy most of its northern half, and recently, light brown shading has also filled the southern half of the zone p. the GRS.

The mysterious light yellowish patch in the SEB approached the p. end of the Red Spot Hollow in August but then halted there. A bright streak of identical colour developed which appeared to connect it with the N edge of the Red Spot Hollow, but the oval outline of the light patch has remained visible in hi-res images, suggesting that it is still a cyclonic circulation. Consistent with this, in methane images it is slightly darker than the surrounding SEB (Fig.4).

The SEB f. the GRS shows intense rifting activity. Sometimes one of the new, bright white convective plumes is methane-bright. A striking example was noticed on Oct.8 by M.Delcroix;

also caught on Oct.11 by P.Maxson and Oct.13 by C.Pellier (Fig.2). Another was recorded on Dec.10 by C. Pellier (Fig.4).

Equatorial Region:

The NEBs still carries a prominent array of dark bluish 'projections', almost stationary in L1, with elaborate festoons into the EZ.

N.Tropical Region:

The NEB has narrowed as the NEBn has retreated following last year's great NEB Revival. Bright rifts are quite plentiful within it. With internal convective activity plus prominent projections along the NEBs edge, I believe the NEB is not yet ready for another full cycle of fading and revival, but this could change within the next year or two.

The NEBn edge is ragged with few prominent features. Two dark barges were rapidly converging, partially driven by white spot Z (WSZ) approaching from the f. side, but they were not seen to merge as the smaller one disappeared just before they collided. The larger one soon disappeared as well, as WSZ prograded alongside it. WSZ has now decelerated to DL2 = -15 deg/month.

WSZ has attracted attention, first because it had become strikingly methane-bright by the start of this apparition (and has remained so since), and secondly because it has developed reddish colour. It became faintly brownish-grey during the autumn, and on Nov.24 Chris Go reported that it had become more distinctly reddish in its N half. This has progressed since so it is now a complete, weakly reddish-grey oval (which could be called Red Oval Z, as Chris Go has proposed, if it persists). We have just posted a detailed report on WSZ's history and characteristics and recent changes [ref.3].

N. Temperate Region:

Following last year's great NTB Revival, the NTB(S) is bland and pale orange, while the NTB(N) is dark grey with complex features. The whole N.Temperate domain looks as it did in 2009, at the same stage of the NTB cycle [ref.4].

A dark sector of NTZ, from L2 ~260-300, can be called a N.Temperate Disturbance (NTD) [ref.4], and is probably being generated by turbulent convective activity in a rifted region p. it. On the maps in Fig.1, the NTD is labelled along with this rifted region (feature 1). Another rifted region of NTB (feature 3) also seems to be generating dark material in the NTZ f. it. Between them is an array of streaks and ovals, the longest of which (feature 2) was a very dark grey streak in Aug-Sep., then turned orange-brown in Oct., the faded until it is now a bright cream-coloured lozenge. This was a classic instance of a dark cyclonic feature turning red before it fades. Immediately f. it are a cyclonic white oval and an AWO. In methane images, the AWO is very weakly methane-bright, the cyclonic features are not.

N.N. Temperate Region:

The NNTBs jet, which revived in late 2012, developed a major outbreak with numerous dark jetstream spots at all longitudes in 2013 Aug-Sep. There are now fewer of them. The JUPOS chart shows that no new ones have been produced since early Oct., while 6-9 of the previous spots have merged into two large ones. The two large ones are reddish and methane-bright (* on Fig.1), and slower-moving (DL2 ~-67 deg/mth, as against ~-82 deg/mth for the earlier smaller spots). Spots like these have been seen before on the NNTBs jet (there was a pair in the Galileo image of the region, shown in ref.5), but they are not common.

In the NNTZ, NN-LRS-1 [ref.5] (L2 = 156) is still strongly reddish, with a dark brown collar.

References to our previous reports:

[1] Rogers J (2013). 'Jupiter in 2013/14: The new apparition begins.'
http://www.britastro.org/jupiter/2013_14report01.htm

[2] Rogers J, Adamoli G, Hahn G, Jacquesson M, Vedovato M, & Mettig H-J (2013). 'Jupiter's South Temperate domain: Behaviour of long-lived features and jets, 2001-2012.'
http://www.britastro.org/jupiter/stemp2013.htm

[3] Rogers J (2013 Dec.) 'White spot Z: its history and characteristics, 1997-2013.'
http://www.britastro.org/jupiter/2013_14report03.htm

[4] Adamoli G & Rogers J (2010),
'Jupiter's North Temperate Region in 2009: The nature of the North Temperate Disturbance.'
http://www.britastro.org/jupiter/2009report08.htm

[5] Rogers JH, Adamoli G & Mettig H-J (2011 Feb.) JBAA 121 (no.1), 19-29.
'Jupiter's high-latitude storms: A Little Red Spot tracked through a jovian year.'
http://www.britastro.org/jupiter/2012_13/JBAA%202011_NNTZ-ovals_Rogers%20proof2.pdf

Figure 1:

Maps of Jupiter, 2013 Aug.-Dec., produced by Marco Vedovato, labelled by M.V. & J.H.R. *[JUPOS team / British Astronomical Association]*

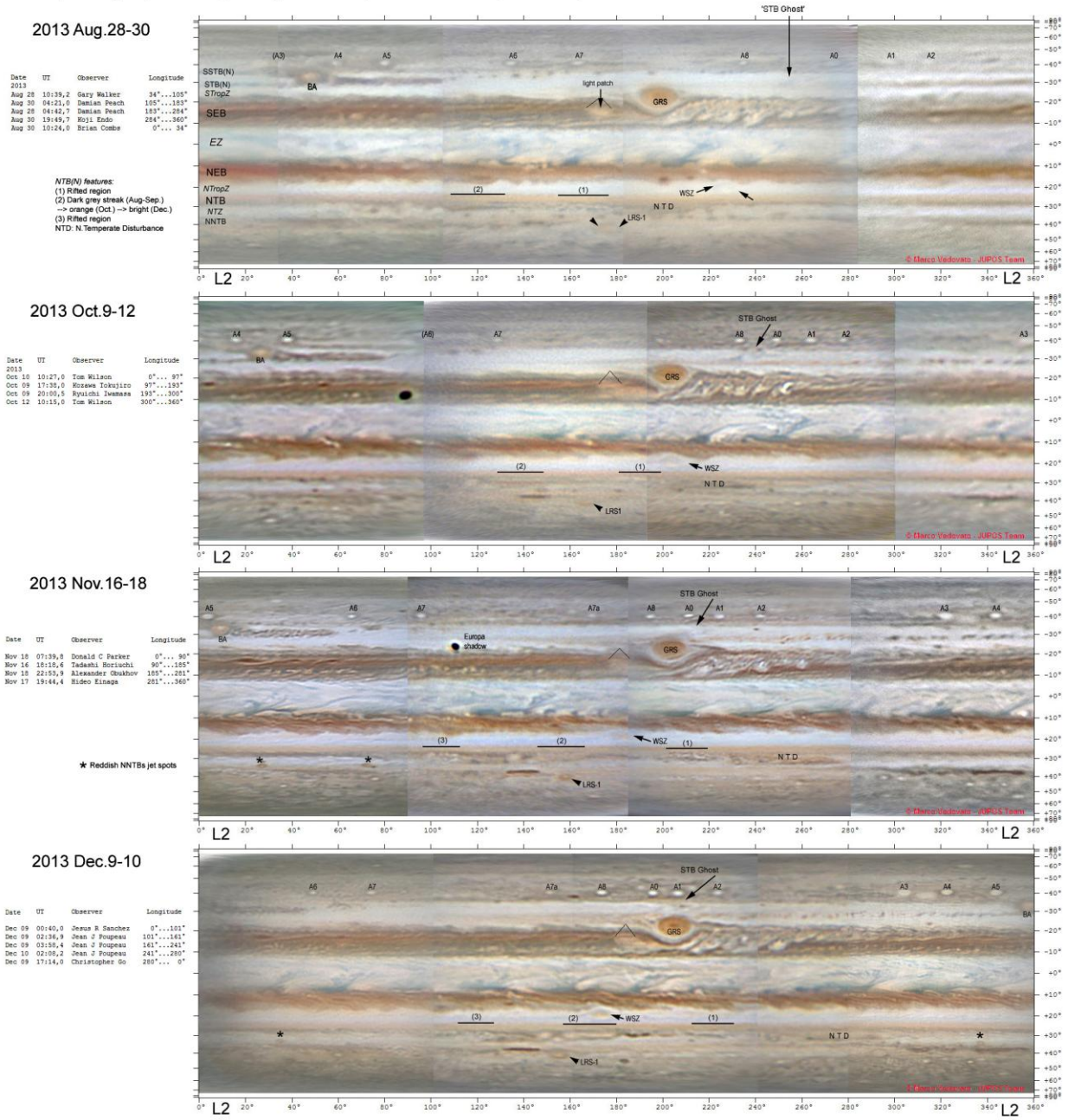


Figure 2:

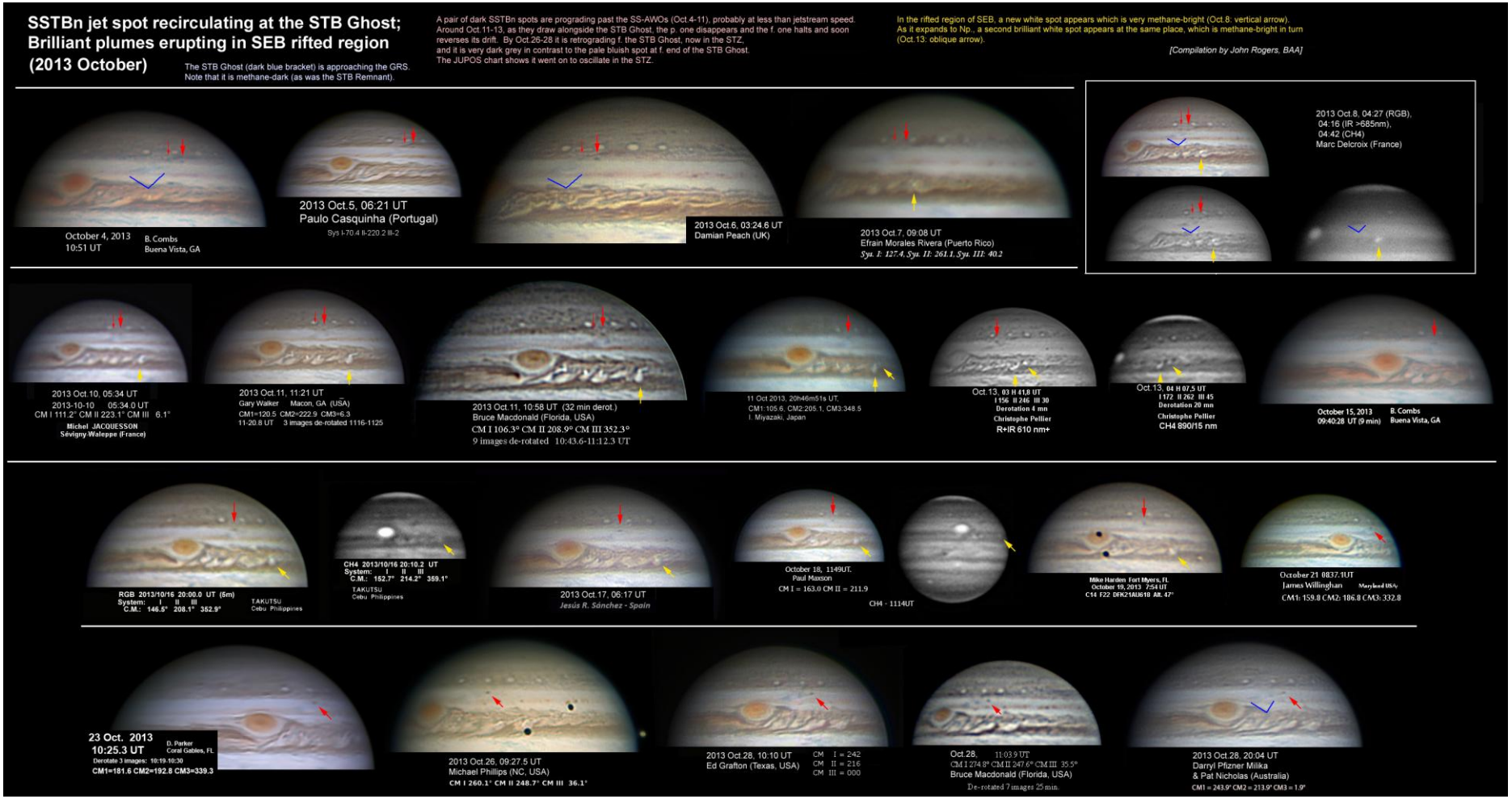

SSTBn jet spot recirculating at the STB Ghost;
Brilliant plumes erupting in SEB rifted region
(2013 October)
The STB Ghost (dark blue bracket) is approaching the GRS.
Note that it is methane-dark (as was the STB Remnant).
A pair of dark SSTBn spots are prograding past the SS-AWOs (Oct.4-11), probably at less than jetstream speed.
Around Oct.11-13, as they draw alongside the STB Ghost, the p. one disappears and the f. one halts and soon
reverses its drift. By Oct.26-28 it is retrograding.f. the STB Ghost, now in the STZ,
and it is very dark grey in contrast to the pale bluish spot at f. end of the STB Ghost.
The JUPOS chart shows it went on to oscillate in the STZ.
In the rifted region of SEB, a new white spot appears which is very methane-bright (Oct.8: vertical arrow).
As it expands to Np., a second brilliant white spot appears at the same place, which is methane-bright in turn
(Oct.13: oblique arrow).
[Compilation by John Rogers, BAA]
October 4, 2013
10:51 UT
B. Combs
Buena Vista, GA
2013 Oct.5, 06:21 UT
Paulo Casquinha (Portugal)
Sys I-70.4 II-220.2 III-2
2013 Oct.6, 03:24.6 UT
Damian Peach (UK)
2013 Oct.7, 09:08 UT
Efrain Morales Rivera (Puerto Rico)
Sys. I: 127.4, Sys. II: 261.1, Sys. III: 40.2
2013 Oct.8, 04:27 (RGB),
04:16 (IR >685nm),
04:42 (CH4)
Marc Delcroix (France)
2013 Oct.10, 05:34 UT
2013-10-10 05:34.0 UT
CM I 111.2° CM II 223.1° CM III 6.1°
Michel JACQUESSON
Sévigny-Waleppe (France)
2013 Oct.11, 11:21 UT
Gary Walker Macon, GA (USA)
CM1=120.5 CM2=222.9 CM3=6.3
11-20.8 UT 3 images de-rotated 1116-1125
2013 Oct.11, 10:58 UT (32 min derot.)
Bruce Macdonald (Florida, USA)
CM I 106.3° CM II 208.9° CM III 352.3°
9 images de-rotated 10:43.6-11:12.3 UT
11 Oct 2013, 20h46m51s UT,
CM1:105.6, CM2:205.1, CM3:348.5
I. Miyazaki, Japan
Oct.13, 03 H 41.8 UT
I 156 II 246 III 30
Derotation 4 mn
Christophe Pellier
R+IR 610 nm+
Oct.13, 04 H 07.5 UT
I 172 II 262 III 45
Derotation 20 mn
Christophe Pellier
CH4 890/15 nm
October 15, 2013
09:40:28 UT (9 min)
B. Combs
Buena Vista, GA
RGB 2013/10/16 20:00.0 UT (5m)
System: I II III
C.M.: 146.5° 208.1° 352.9°
TAKUTSU
Cebu Philippines
CH4 2013/10/16 20:10.2 UT
System: I II III
C.M.: 152.7° 214.2° 359.1°
TAKUTSU
Cebu Philippines
2013 Oct.17, 06:17 UT
Jesús R. Sánchez - Spain
October 18, 1149UT.
Paul Maxson
CM I = 163.0 CM II = 211.9
CH4 - 1114UT
Mike Harden Fort Myers, FL
October 19, 2013 7:54 UT
C14 F22 DFK21AU618 Alt. 47°
October 21 0837.1UT
James Willingham
CM1: 159.8 CM2: 186.8 CM3: 332.8
23 Oct. 2013
10:25.3 UT
D. Parker
Coral Gables, FL
Derotate 3 images: 10:19.10:30
CM1=181.6 CM2=192.8 CM3=339.3
2013 Oct.26, 09:27.5 UT
Michael Phillips (NC, USA)
CM I 260.1° CM II 248.7° CM III 36.1°
2013 Oct.28, 10:10 UT
Ed Grafton (Texas, USA)
CM I = 242
CM II = 216
CM III = 000
Oct.28, 11:03.9 UT
CM I 274.8° CM II 247.6° CM III 35.5°
Bruce Macdonald (Florida, USA)
De-rotated 7 images 25 min.
2013 Oct.28, 20:04 UT
Darryl Pfizner Milika
& Pat Nicholas (Australia)
CM1 = 243.9° CM2 = 213.9° CM3 = 1.9°

Figure 3:
JUPOS chart showing spots in S.Temperate domain and SSTBn jet.
Inset, oval BA on a compressed scale showing its sudden acceleration during solar conjunction.

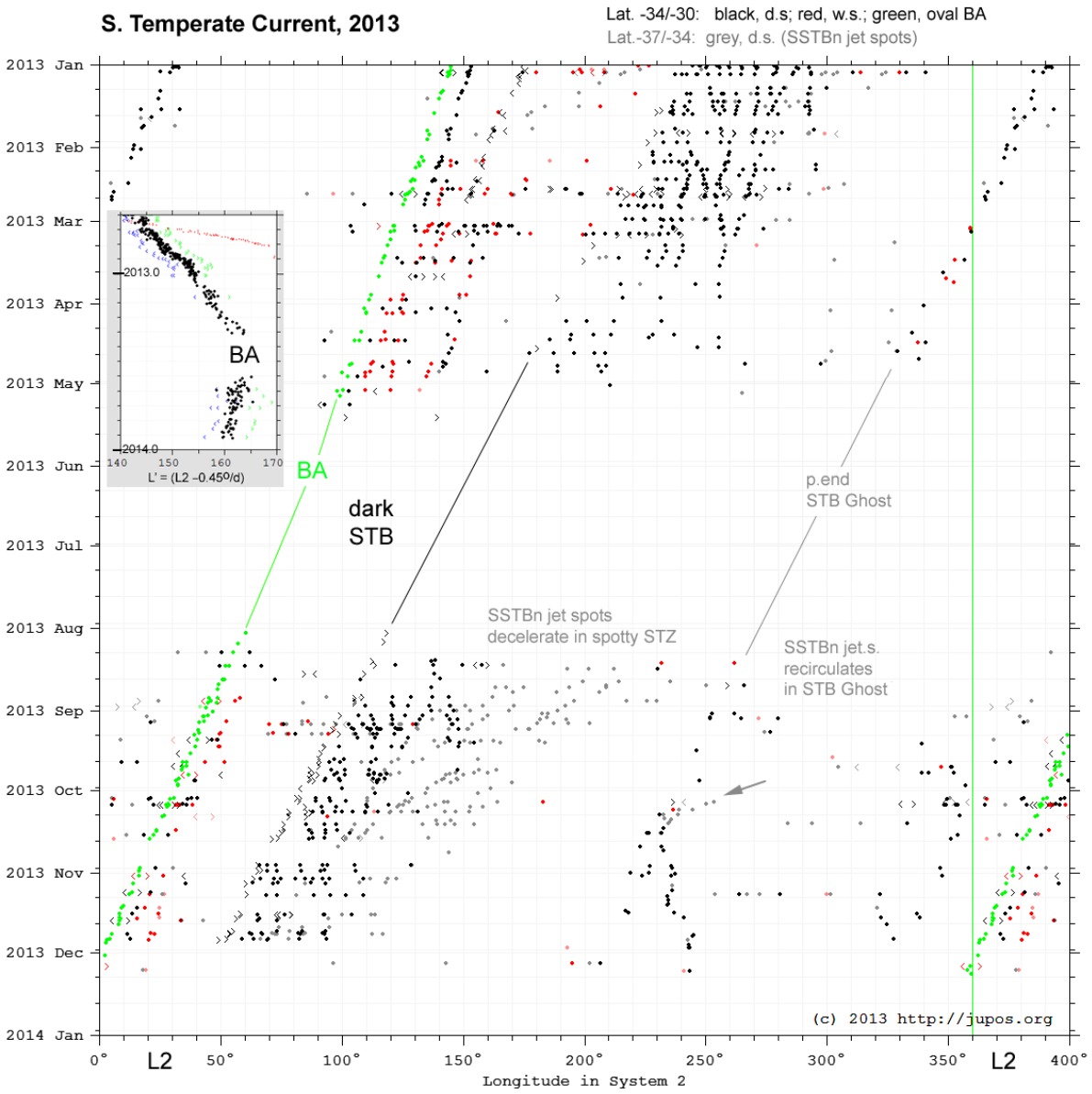


Figure 4A:
Sets of v-hi-res images, & methane & ultraviolet images, 2013 Dec.

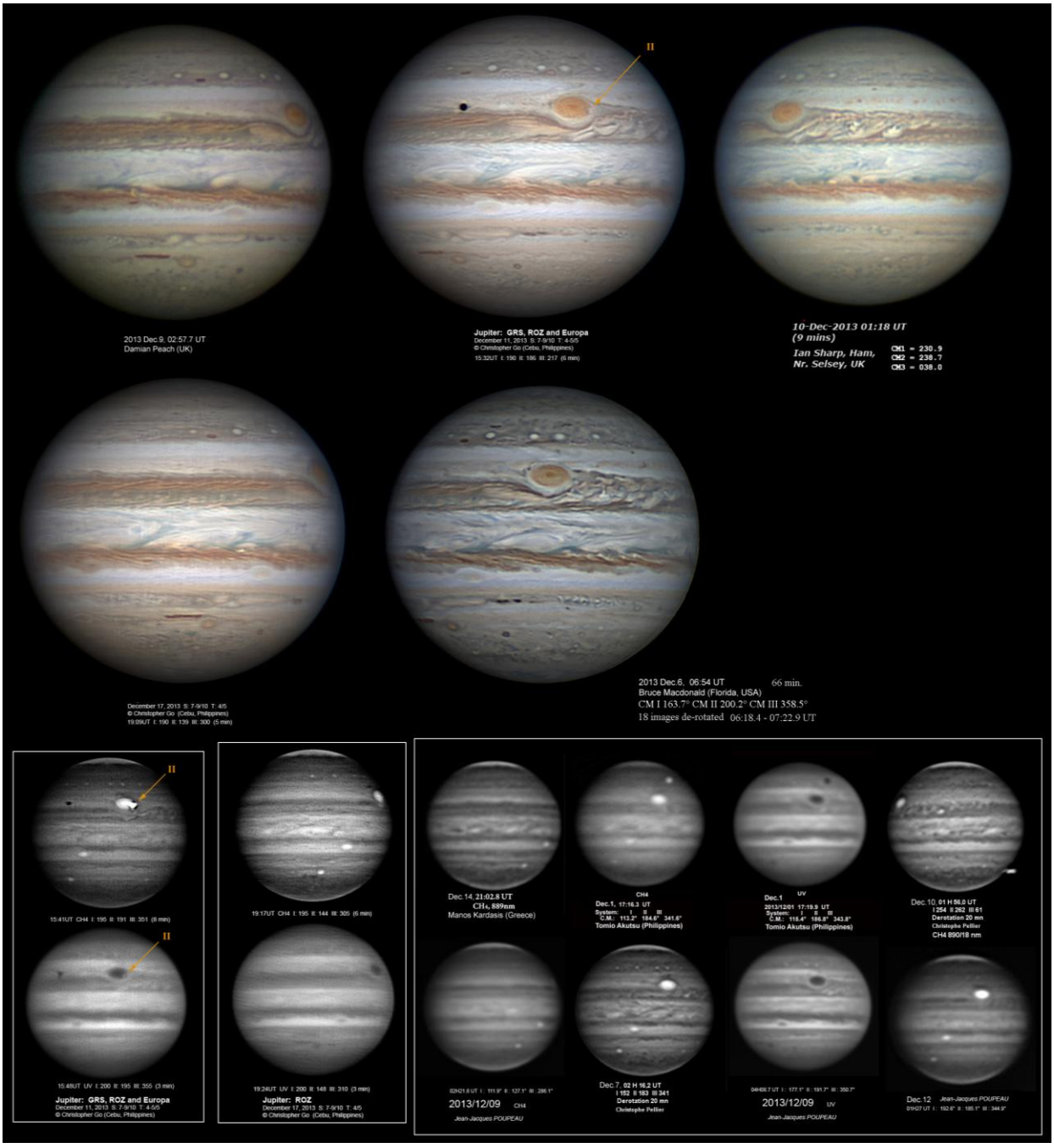
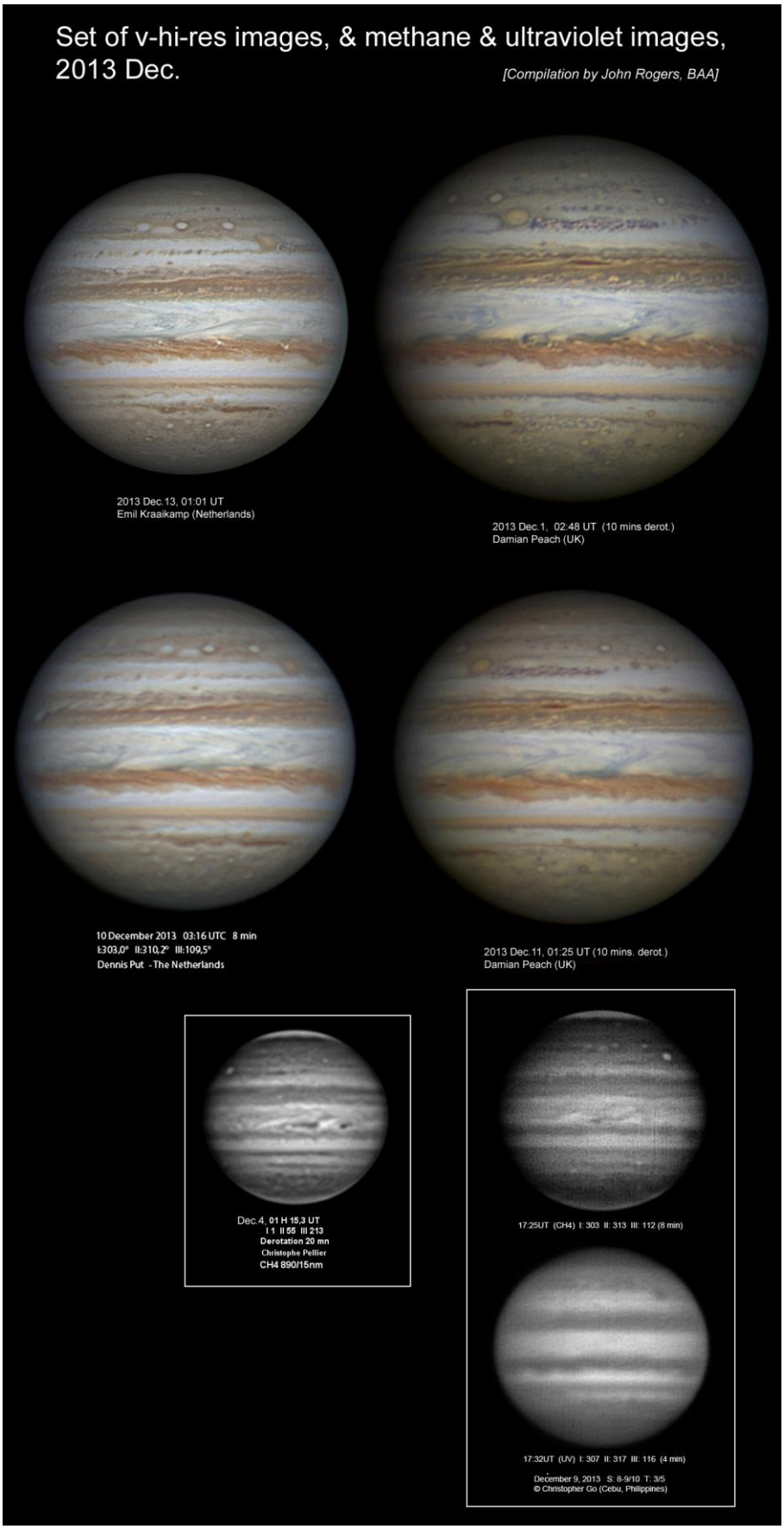


Figure 4B:


Set of v-hi-res images, & methane & ultraviolet images, 2013 Dec.
[Compilation by John Rogers, BAA]
2013 Dec.13, 01:01 UT
Emil Kraaikamp (Netherlands)
2013 Dec.1, 02:48 UT (10 mins derot.)
Damian Peach (UK)
10 December 2013 03:16 UTC 8 min
Ł303,0° II:310,2° III:109,5°
Dennis Put - The Netherlands
2013 Dec.11, 01:25 UT (10 mins. derot.)
Damian Peach (UK)
Dec.4, 01 H 15.3 UT
I 1 II 55 III 213
Derotation 20 mn
Christophe Pellier
CH4 890/15nm
17:25UT (CH4) I: 303 II: 313 III: 112 (8 min)
17:32UT (UV) I: 307 II: 317 III: 116 (4 min)
December 9, 2013 S: 8-9/10 T: 3/5
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