[Final version, 2015 March 16]

JUPITER IN 2005 AND 2006

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using results from the JUPOS team (Hans-Joerg Mettig, Gianluigi Adamoli, Michel Jacquesson, Marco Vedovato, Grischa Hahn)

III. EQUATORIAL REGION

FIGURES 23-31

CHARTS J8-J9

TABLES 5-6

FIGURE LEGENDS & MINIATURES

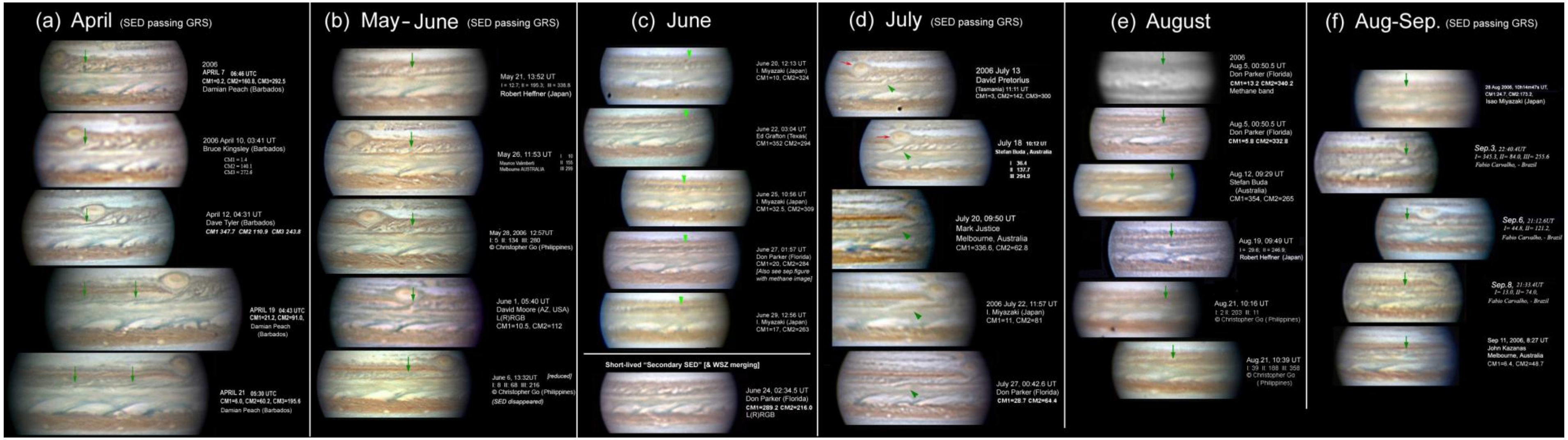


Fig.23. Images showing the S. Equatorial Disturbance (SED) in its various manifestations throughout 2006. The SED is mainly identified as a rift in SEB(N), which reappears each time the locus passes the GRS, but sometimes is ~30-40º preceding its previous track.

(a) April, passing the GRS and duplicating. One SEB(N) rift (L1 = 338) passes the GRS on April 11. A second rift (L1 = 16 --> 26) then forms across the SEB(N) just after passing the GRS. Either of these could be on the SED track as extrapolated from 2005.

(b) May-June, passing the GRS. The SED was identified by H-J. Mettig as the prominent feature at L1 ~ 10 on May 21-28, with rift and brown veil in EZ(S), approaching the GRS. However it became less conspicuous after passing the GRS on June 2.

(c) Late June. The same feature remained visible (L1 ~30), with the typical SED rift, plus the brown veil. A smaller duplicate of it can be seen ~40º p., which presumably developed into the main SED in mid-July. *Bottom:* 'Secondary SED' at lower longitude.

(d) July, passing the GRS on July 18. The SED was prominent, but at L1 ~ 0, 35-40º p. its previous track. [Also see v-hi-res infrared images from Hawaii on July 13 (Gemini Obs.) and 20 (Keck Obs.).]

(e) August. The same SED feature, with a white spot at the mouth of the rift increasingly prominent as the EZ(S) darkens around it. *Top:* Methane image, showing the typical SED pattern of a dark patch coinciding with the SED with darkened EZs p. it *[Refs,9 & 25]*. By reference to the structure of the SED as shown in previous spacecraft images, the methane-dark patch probably coincides with the anticyclonic gyre, with the visible rift at its p. end and brown veil over its f. end.

(f) September, passing the GRS on Sep.3. The SED was again distinct but 25-30º p. its previous track.

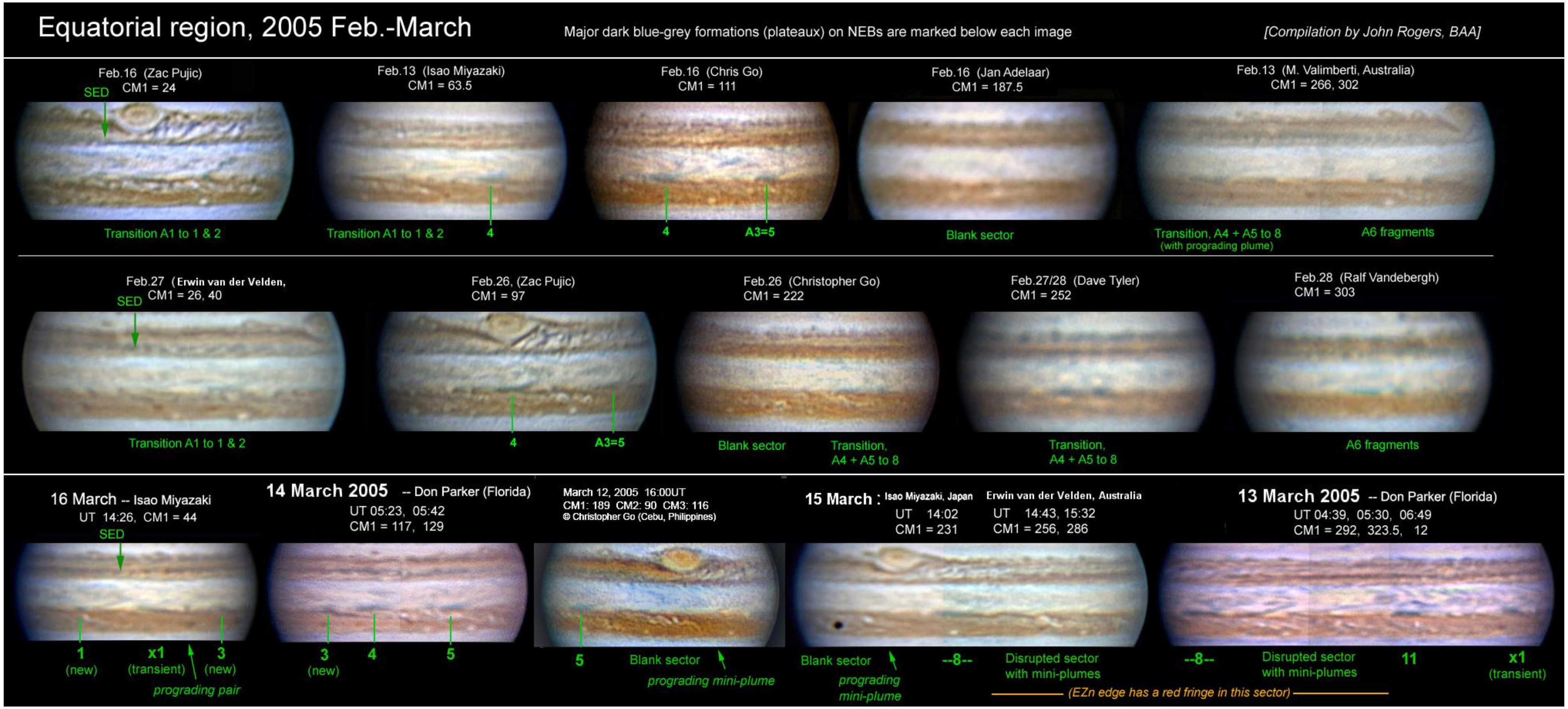


Fig.24: Images in 2005 Feb. & March, roughly aligned in L1. The major dark NEBs formations are labelled in green below the images. Detailed notes:

In 2005 Feb., only one of the six large formations clearly persisted (A3, which became no.5). The other tracks on the JUPOS chart had all terminated around the end of Jan., and these images in Feb. suggest that these disruptions were due to the passage of large NEB rift systems, as seen alongside the chaotic remnants of A1 and A4-A5.

The March image set shows five of the new set of dark formations soon after they appeared; they were well-defined, very dark plateaux. A sixth (no.1) formed between March 13-16 as a small dark projection, as a bright white spot in the NEB passed. Two long sectors still lacked major formations, but contained mini-plumes; at least one of these was prograding (DL1 = -8.5). These two sectors were alongside long rifts, and only as the rifts moved on did new large formations appear in them, in April (nos.6,7,9,10).

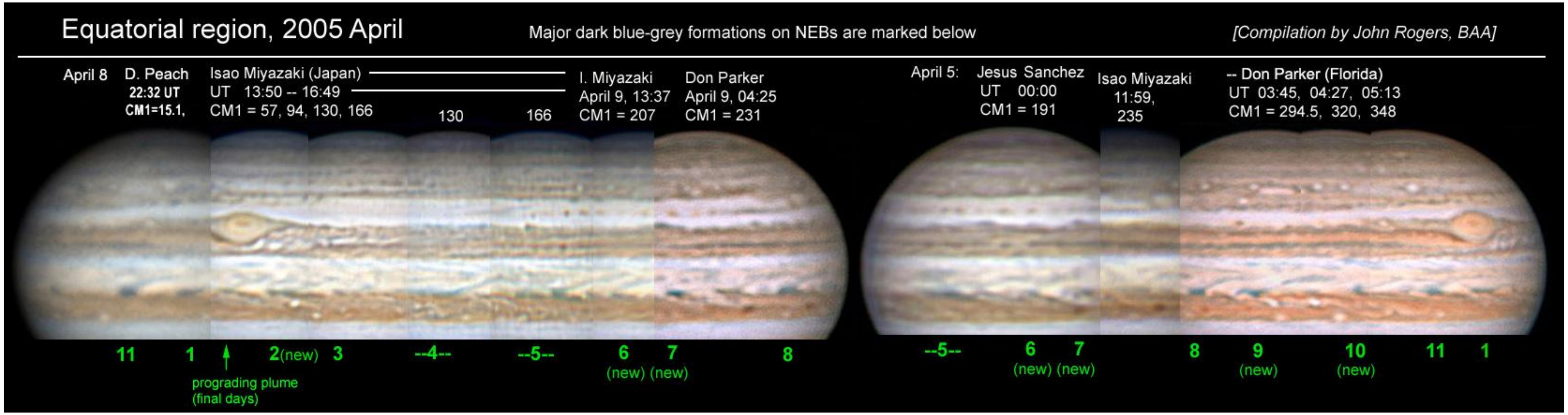


Fig.25: Images in 2005, early April. The major dark NEBs formations are labelled in green below. New dark formations 2,6,7,9,10 are mostly distinct and dark although still quite small. Nos.2,7,10 are still involved with rifts.

[NEXT PAGE]:
Fig.26: Hi-res images & maps from 2005 April 20 to May 1, by Peach, aligned in L1 to show short-term changes within the overall pattern. The 11 major dark NEBs formations are labelled in green below the images. Several phenomena can be seen:
--At this time, seven of the dark formations had temporary quasi-stationary p. ends (see Table); but there was nothing morphologically distinctive about them.
--Two projections (nos.4 and 11) expanded hugely due to interactions with NEB rifts.
--One projection (no.7) was split by a white cloud and its p. end then became a prograding small projection.

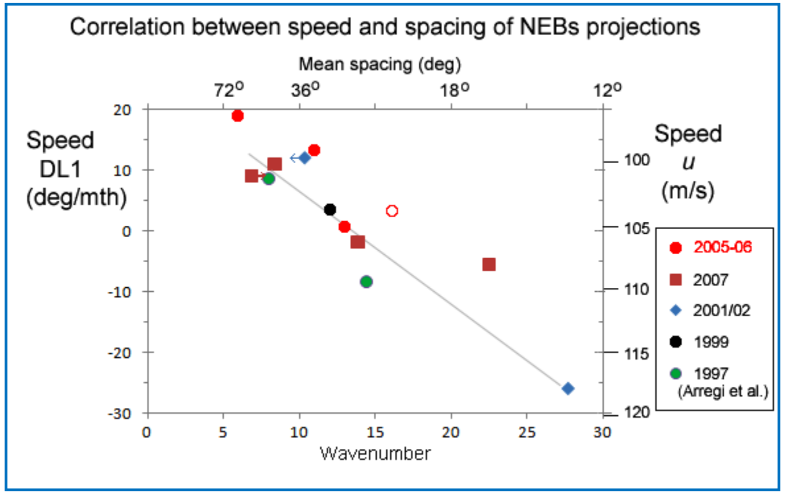


Fig.27: Chart of drift rate vs spacing (or speed vs wavenumber) for the dark NEBs formations. Data for the 2005 and 2006 apparitions have been added to the chart already published in our 2007 report *[Ref.1]*.

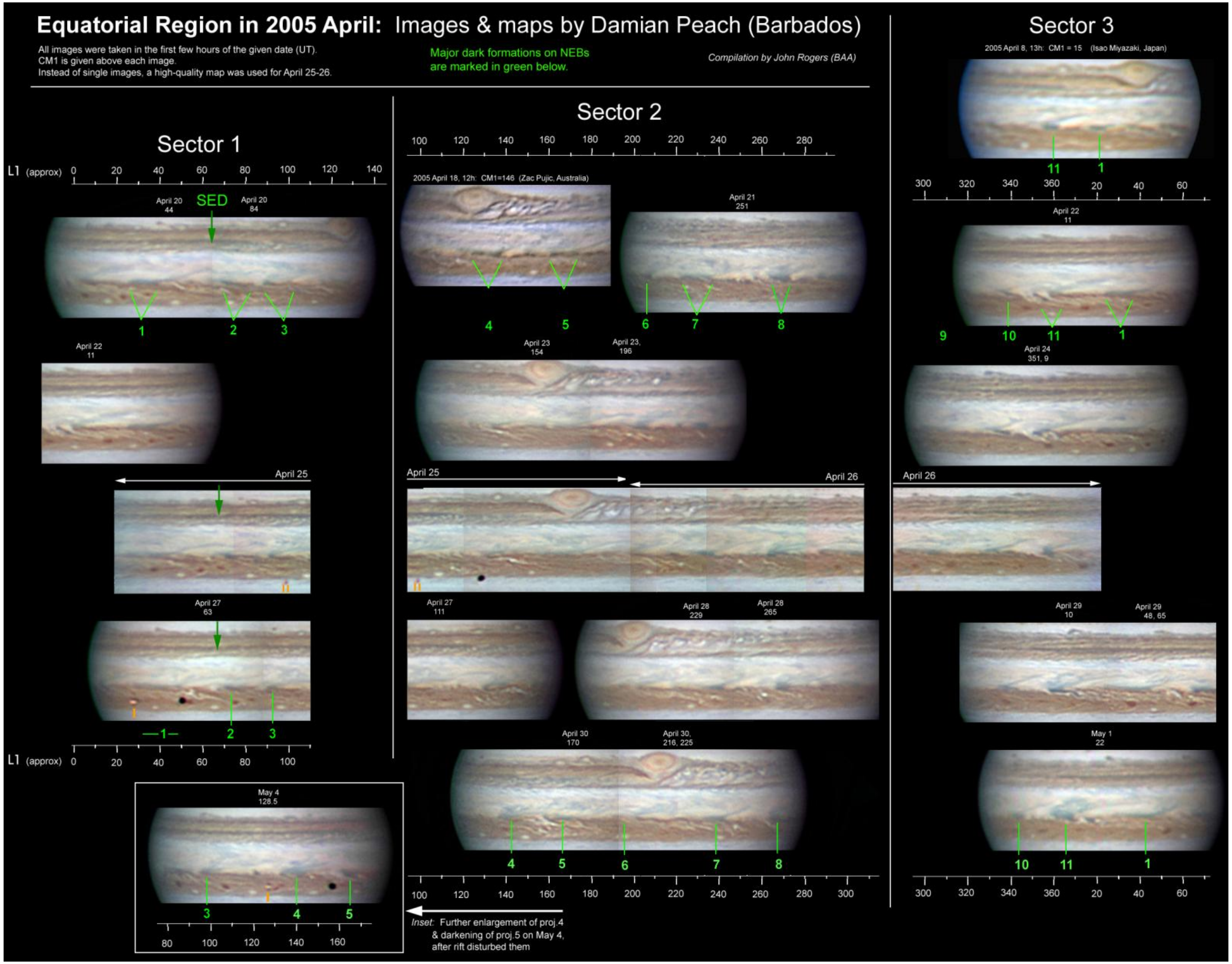

Equatorial Region in 2005 April: Images & maps by Damian Peach (Barbados)
All images were taken in the first few hours of the given date (UT).
CM1 is given above each image.
Instead of single images, a high-quality map was used for April 25-26.
Major dark formations on NEBs are marked in green below.
Compilation by John Rogers (BAA)
Sector 1
L1 (approx)
April 20 44
SED
April 20 84
April 22 11
April 25
April 27 63
Sector 2
2005 April 18, 12h: CM1=146 (Zac Pujic, Australia)
April 21 251
April 23 154
April 23, 196
April 25
April 26
April 27 111
April 28 229
April 28 265
April 30 170
April 30, 216, 225
Sector 3
2005 April 8, 13h: CM1 = 15 (Isao Miyazaki, Japan)
April 22 11
April 24 351, 9
April 26
April 29 10
April 29 48, 65
May 1 22
May 4 128.5
Inset: Further enlargement of proj.4 & darkening of proj.5 on May 4, after rift disturbed them

Fig.26

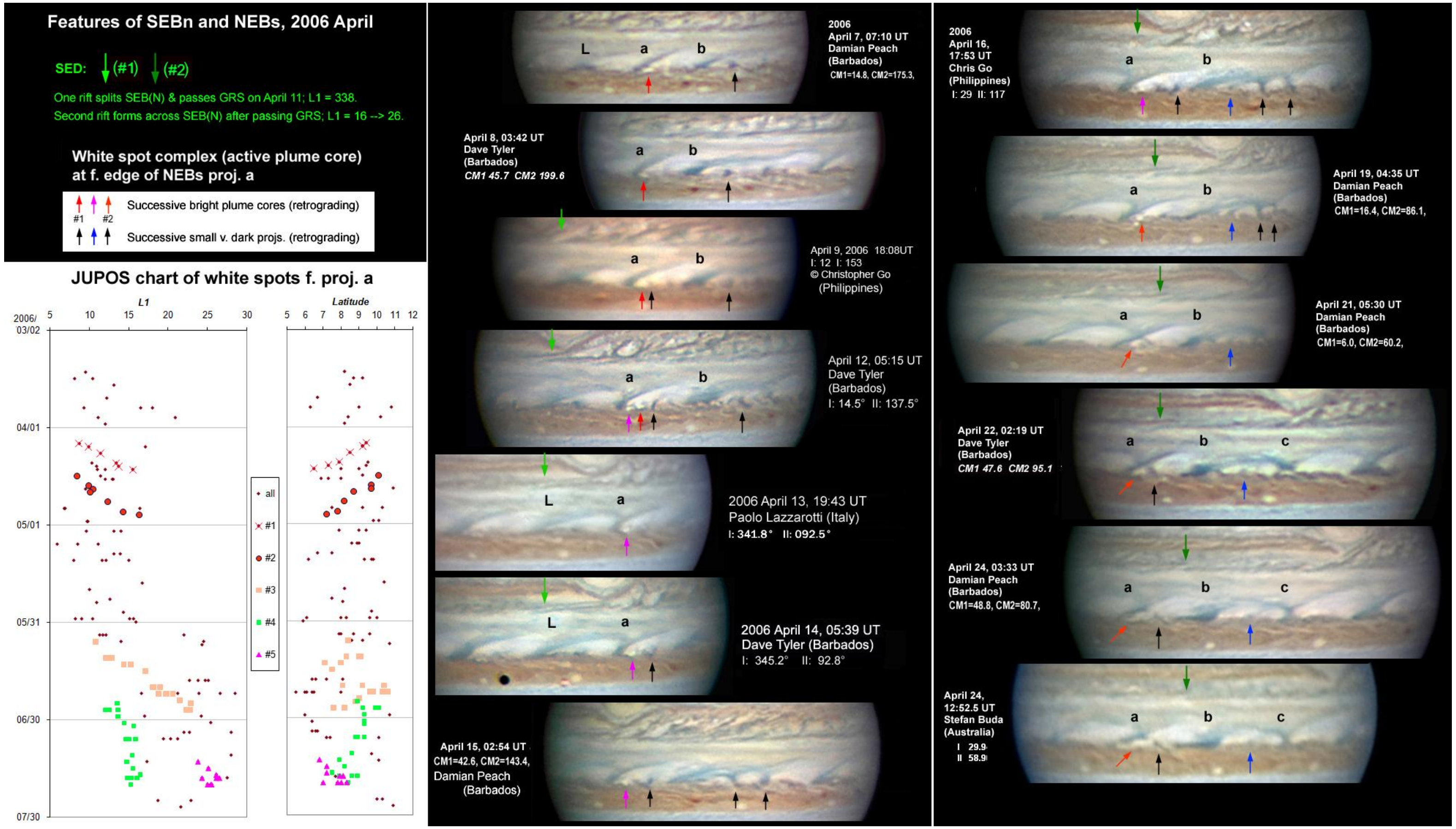


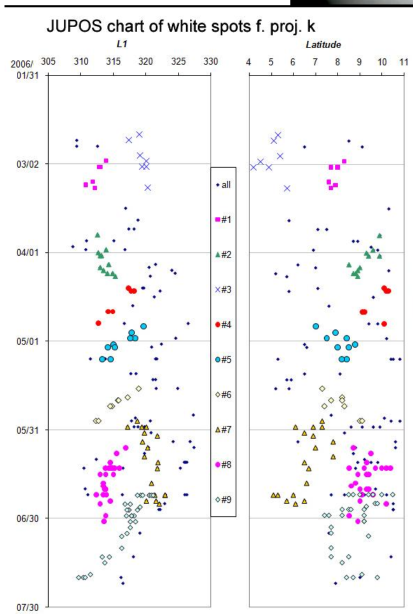
Fig.28. Image set showing NEBs phenomena in 2006: Retrograding white spots in NEBs break through into EZ.
Left: Enlargement of JUPOS chart, with parallel chart of latitude vs time, showing white spots on NEBs, individually colour-coded. *Right:* Image set.

Following proj. **a** (L1 = 5), the JUPOS analysis showed a succession of short-lived white spots with retrograding drifts: three were adequately tracked but there were probably 8 of them from March to June. Their speeds were DL1 = +18 to +23 deg/mth, and the latitude of each spot rapidly decreased from 9-10.5ºN (when first detected) to ≤7ºN. I.e., these were bright white plume-heads which erupted within the southern NEB, accordingly having positive DL1, but moved south and broke through the NEBs edge into the EZ(N). These images also show several retrograding small dark projections f. projs. **a** and **b**, on the visible NEBs at 8.3 (+/-0.2) ºN. (More such examples are in Figs.17 & 31.)

Fig.29. Image set showing NEBs phenomena in 2006: Prograding white plume cores.

Left: Enlargement of JUPOS chart, with parallel chart of latitude vs time, showing white spots on NEBs, individually colour-coded. *Right:* Image set.

Following proj.**k** (L1 = 310), the JUPOS analysis showed a succession of short-lived white spots with remarkable prog-rading drifts, at ~8ºN. Two in May were well defined [nos.5 & 6]: DL1 = -17, at 8.1ºN; but there may have been two others in June and July. The images show that each of these was a new small brilliant spot in EZn just f. the base of the festoon, which formed a transient bright plume core f. it, pushing Np. against it. The second then split to produce a new brilliant spot on its f. side which remained in the southern NEB.



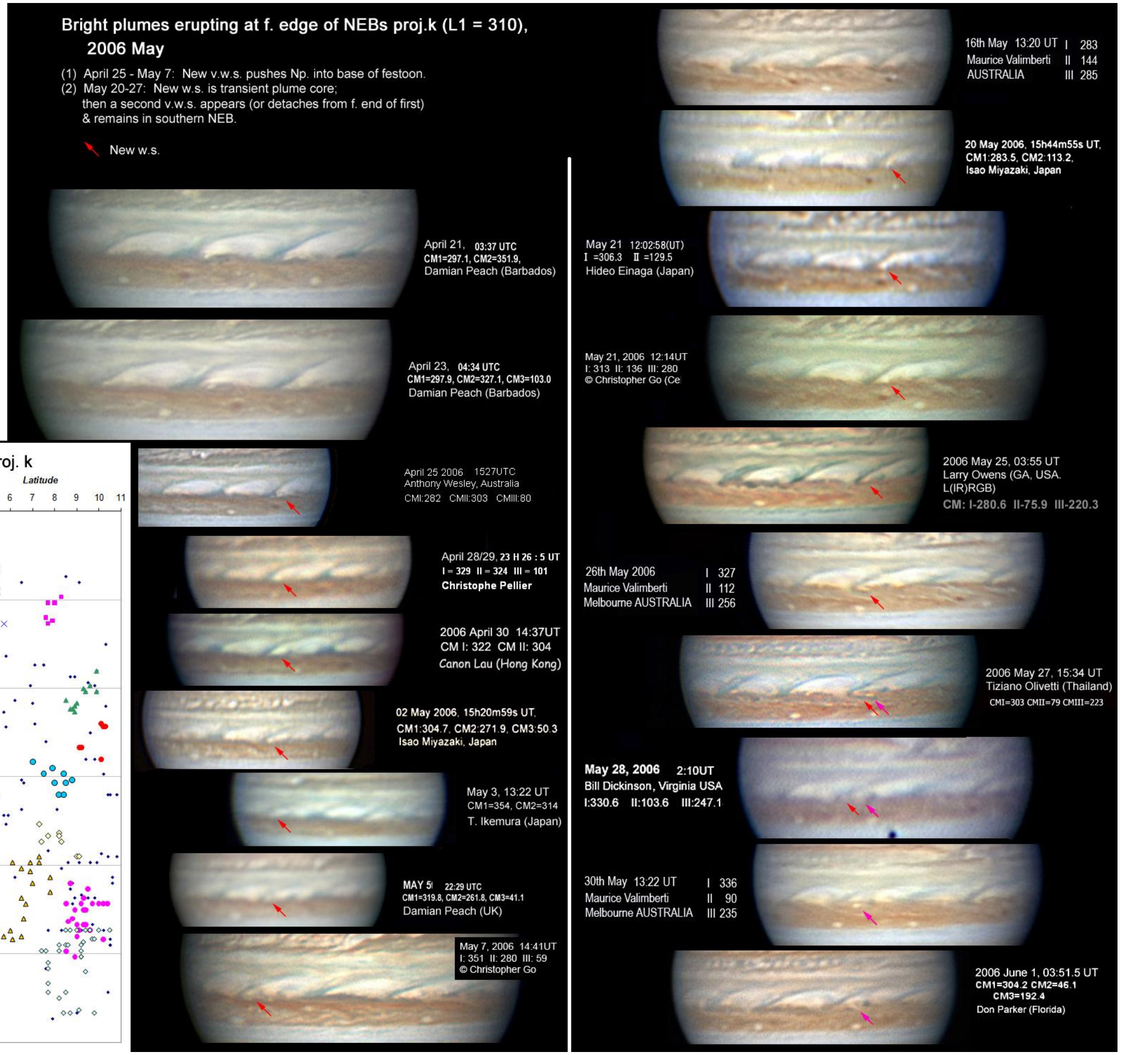
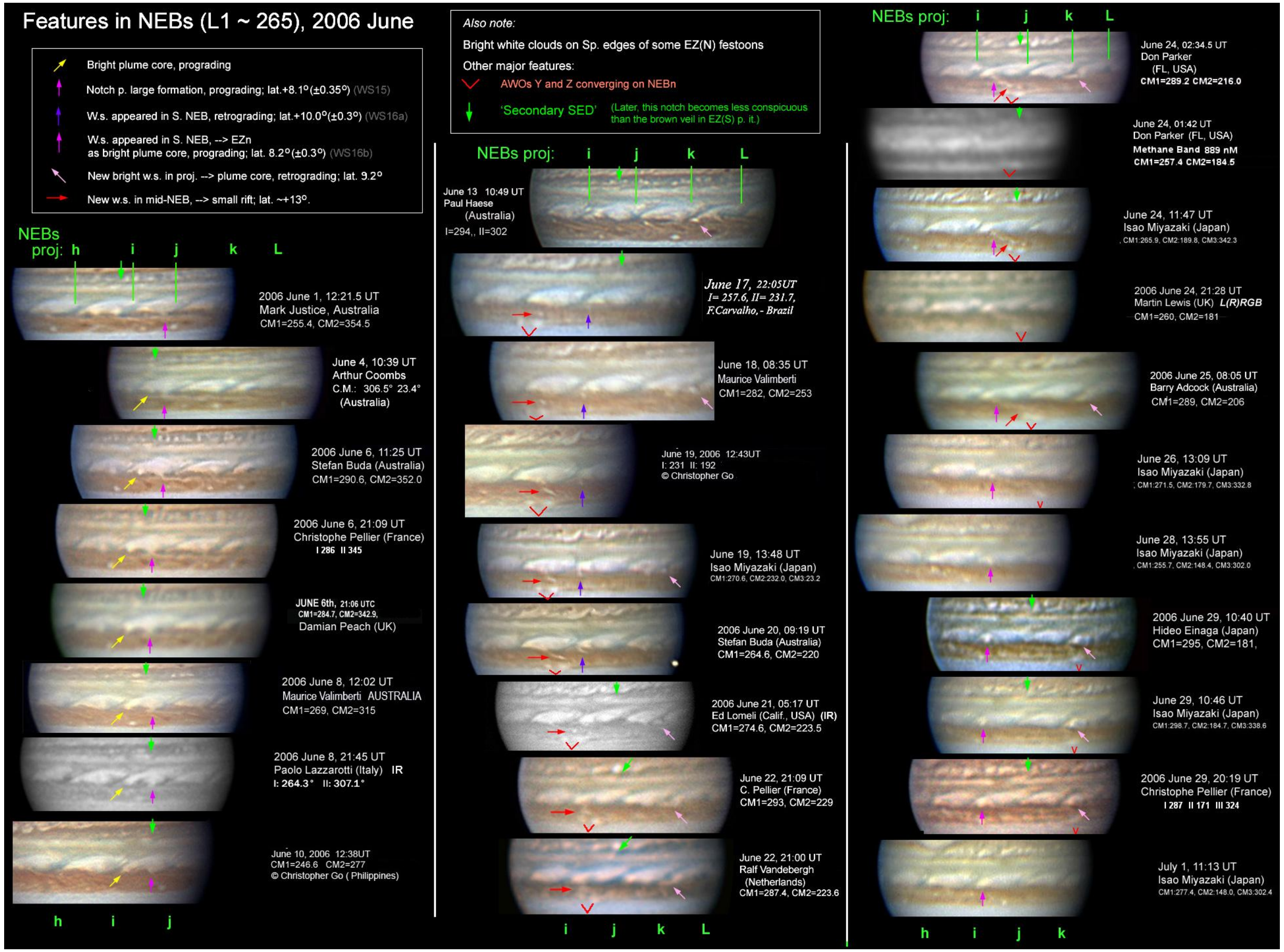


Fig.30. Image set showing NEBs phenomena in 2006: More prograding white spots.

Between projs. **i** and **j**, several rapidly prograding white spots were recorded within NEBs; two were tracked, DL1 = -26 to -28, at 8.2ºN. WS15 was a prograding notch, starting at the p. edge of large dark formation **j**; it was at lat.+8.1º (+/-0.35); it was not a plume core and may resemble prograding features in other years. There were also 3 successive white spots in June-July which comprised a rapidly prograding plume core of proj.**i.** This image set shows two of them; one prograded from L1 = 268 to 264, June 4-10. The second appeared in southern NEB on June 24 (possibly developing from the first), broke thru into EZn and became a brilliant prograding plume core, lat. +8.2 (+/-0.3) ºN, merging with the previous plume core.

However, not all bright plume cores were prograding. One [pink arrow] erupted as a bright w.s. within the base of proj.**k** (June 13, L1 = 314), and elongated f., becoming a new brilliant plume core (June 29, L1 = 319) [nos.8&9 respectively as plotted in Fig.29.]



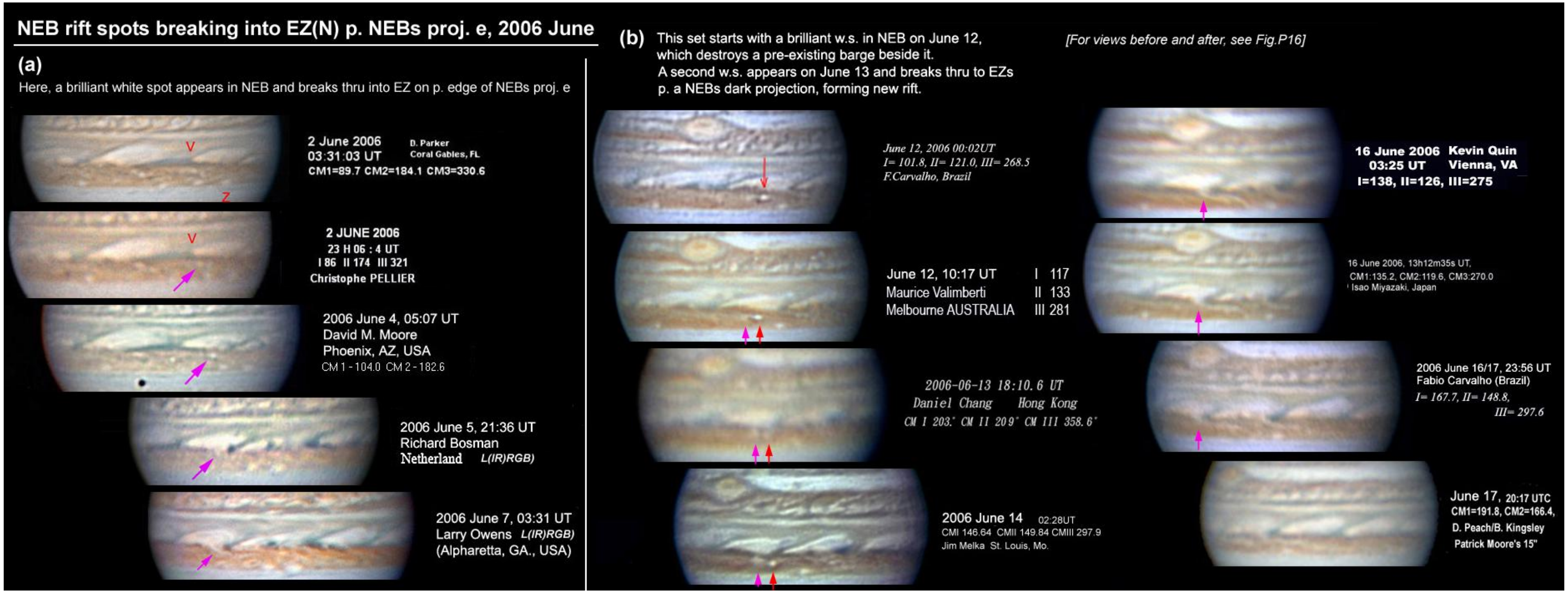
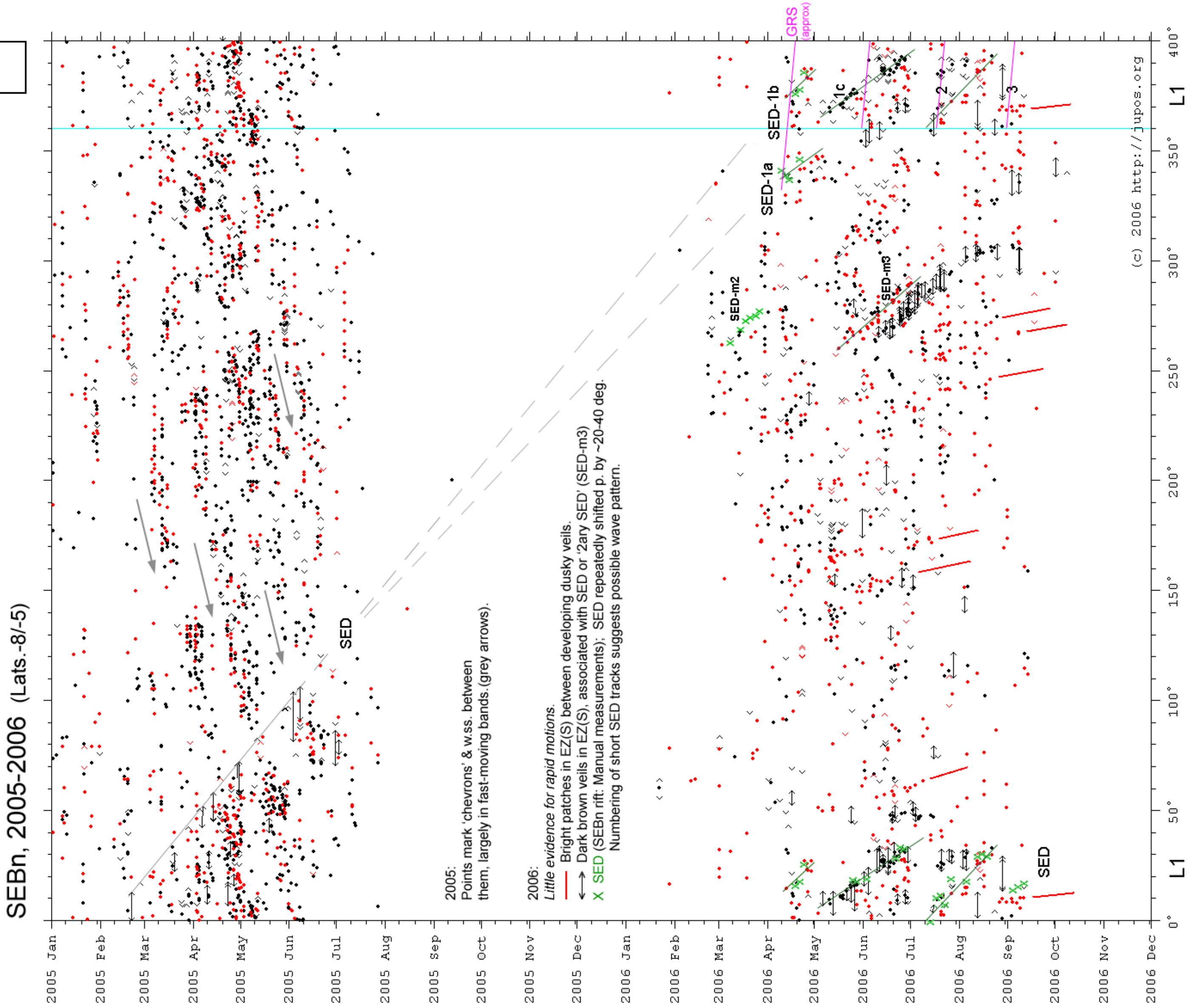


Fig.31. Image set showing NEBs phenomena in 2006: Retrograding white spots in NEBs break through into EZ.

This set shows two examples of brilliant white spots which appear within southern NEB and break thru into EZ(N) just p. NEBs proj.**e** (L1= 135), on June 5 and 13. Also note the appearance of an adjacent white spot in NEB on June 12, which destroys a pre-existing barge beside it (L2~135).

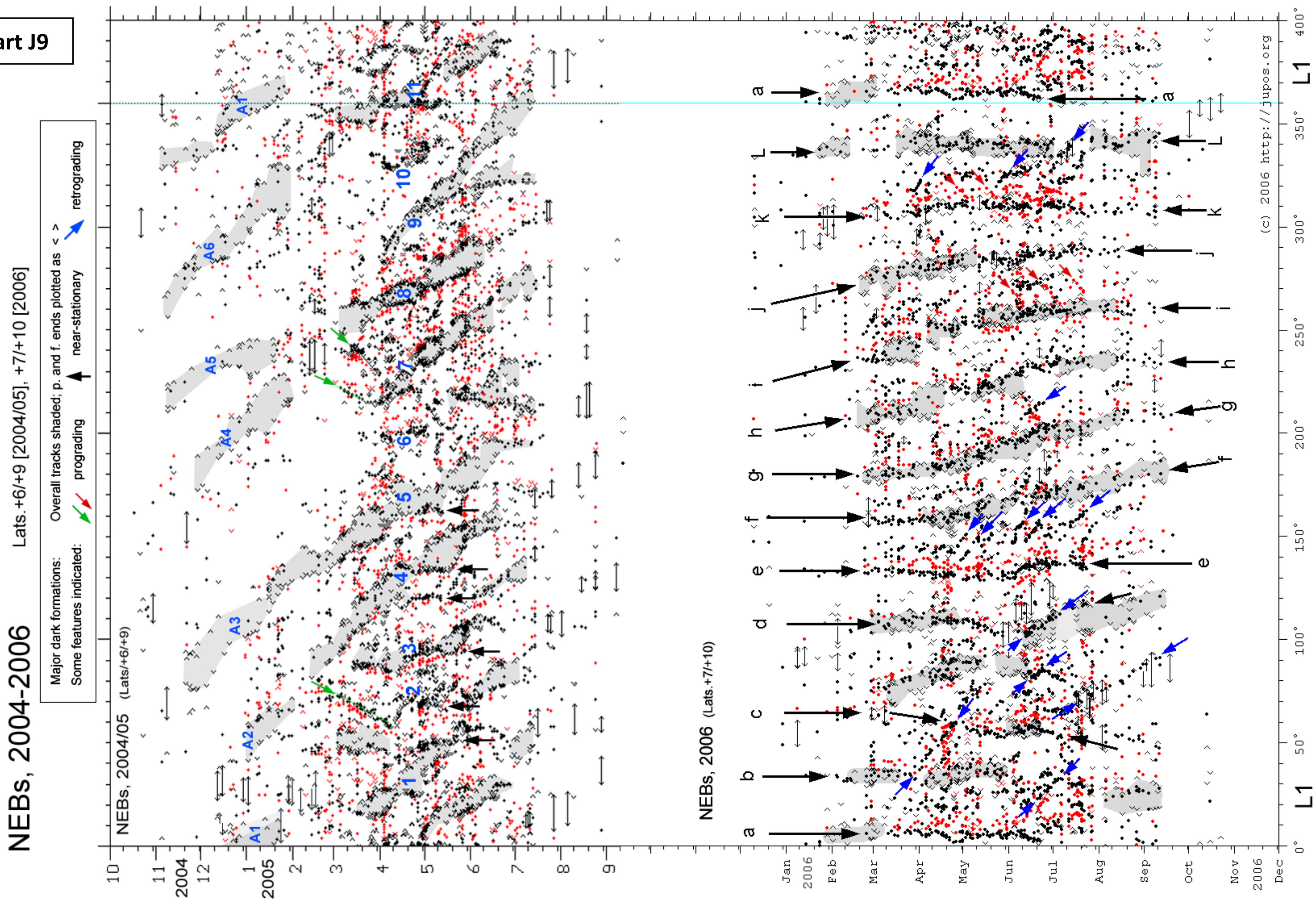
This figure continues the series shown in *[Ref.5 no.8]* which showed a similar brilliant spot in southern NEB in late May which merged with the EZ(N) just f. proj.**d** (at L1 = 110).

Chart J8



SEBn, 2005-2006 (Lats.-8/-5)
2005:
Points mark 'chevrons' & w.ss. between
them, largely in fast-moving bands.(grey arrows).
2006:
Little evidence for rapid motions.
Bright patches in EZ(S) between developing dusky veils.
Dark brown veils in EZ(S), associated with SED or '2ary SED' (SED-m3)
X SED (SEBn rift: Manual measurements); SED repeatedly shifted p. by ~20-40 deg.
Numbering of short SED tracks suggests possible wave pattern.
SED
SED-1a
SED-1b
1c
2
3
SED-m2
SED-m3
GRS
(approx)
L1
L1
SED
(c) 2006 http://jupos.org
0°
50°
100°
150°
200°
250°
300°
350°
400°
2005 Jan
2005 Feb
2005 Mar
2005 Apr
2005 May
2005 Jun
2005 Jul
2005 Aug
2005 Sep
2005 Oct
2005 Nov
2005 Dec
2006 Jan
2006 Feb
2006 Mar
2006 Apr
2006 May
2006 Jun
2006 Jul
2006 Aug
2006 Sep
2006 Oct
2006 Nov
2006 Dec

Chart J9



NEBs, 2004-2006
Lats.+6/+9 [2004/05], +7/+10 [2006]
Major dark formations: Overall tracks shaded; p. and f. ends plotted as < >
Some features indicated: prograding near-stationary retrograding
NEBs, 2004/05 (Lats/+6/+9)
NEBs, 2006 (Lats.+7/+10)
(c) 2006 http://jupos.org
L1

2005 longitudes and drifts: EZ(S)/SEBn

Table 5

[Data from Ref.9: JBAA 118, 326]

Description	*Name*	*Lat.*	*L1 (2005)*	*DL1 (deg/30d)*	*Dates / N*	*Notes*	*u3 (m/s)*
SED	SED	[-4.8]	49 (April 3)	+26	Jan-Jul	Lat. for f. end of d.streak in EZ(S)	93.1
Long-lived bands	**mean**	**-7.2**		**-104**	(N=3)	Long-lived sectors	155.2
	SD	0.1		4		of many chevrons	2
Dark spots	**mean**	**-7.2**		**-56.3**	(N=8)		132.4
('chevrons')	SD	0.1		6.4		DL2 Range: -47 to -63	3

2006 longitudes and drifts: EZ(S)/SEBn

Description	*Name*	*Lat.*	*L1 (2006)*	*DL1 (deg/30d)*	*Dates*	*Notes*	*u3 (m/s)*
SED	SED-1c	[-6.4]	26 (June 13)	+16	May - Jun	Rift & p.end SEB(N)	98.0
	SED-2		10 (July 13)	+23	Jul-Aug	Rift & p.end SEB(N)	94.6
Dark veil	SED-m3	-5.9	270 (Jun 13)	+19	Jun - Aug	Length ~8 deg.; '2ary SED'	96.5
Whte spot	SED-m3	-6.7	277 (Jun 13)	+21	May - Jul	Assoc. with '2ary SED'.	95.6
White patches	**mean**	**-6.4**		**+5,8**	(N=4)		102.8
	SD	0.2		1.0			0.5

2005 longitudes and drifts: EZ(N)/NEBs

Table 6A

Overall drifts of large formations *[estimated by JHR from JUPOS chart]:*

Most of the features did not follow smooth tracks with these drift rates, but alternated between faster and slower drifts at one or both ends. But comparison with the images and maps shows that these were indeed large persistent features despite their variability.

('Discon.', discontinuous track, no sustained drift.) All drifts positive; all at lat ~+8 deg.

2004 Nov. to 2005 Jan:	*Name*	*L1(Feb.1)*	*DL1*	*Dates*
Large dark formations	A1	4	13	Nov-Jan
	A2	56	23	Dec-Jan
	A3	122	21	Nov-Feb
	A4	215	21	Nov-Feb
	A5	(251)	14	Nov-Dec
	A5	240	3	Dec-Jan
	A6	315	23	Nov-Jan
	Mean		**19.2**	(omitting late stages of A4)
	SD		4.1	

2005 April to July:	*Name*	*L1(Apr.3)*	*DL1*	*Dates*
Large dark formations	1	24	16	Mar-May
	2	--	discon.	Apr-May
	3	88	10	Apr-June
	4	123	15	Mar-Aug
	5	160	11	Mar-June
	6	199	discon.	Apr.1-30
	7	239(May 1)	16	Apr-July
	8	264	12	Mar-July
	9	288	23	Apr-July
	10	(330)	transient	Apr.1-30
	11	360	13	Mar-June
	Mean		**13.3**	(omitting no.9)
	SD		2.2	

2006 longitudes and drifts: EZ(N)/NEBs

Table 6B

Description		*Name*	*Lat.*	*L1(0) (May 4)*	*DL1 (deg/30d)*	*Dates / N*
Big projections:		**a**	9.2	4	-1	Mar - Jun
		c'	8.2	57	-5	May
		c"	8.8	59 (Jun 12)	-6	Jun
		d	7.6	109	(-1) --> -8	Mar - May
		e'	8.4	131	-2	Mar - Apr
		e	9,2	128	5.1	May 24 - Jul 9
		f	7.7	160	+2 --> (+4)	Mar - Sep
		g	8.1	189	0 to +8	Feb - Sep
		h	7.4	222	+6 to +1	Apr - Sep
		i	8.0	255	+8 to +1	Jan - Sep
		j	7,5	283	2.1	Feb 27 - Aug 26
		k	8,8	311	+3 to -1	Feb - Oct
		Mean	**8.2**		**1.0**	(N=12)
		SD	0.6		4.4	
Short-lived stationary projs:						
		Mean	**8.2**		**0.5**	(N=9)
		SD	0.2		7.3	
Short-lived retrograding projs:						
	(Lat.<8.0 N)	Mean	**7.5**		**11.6**	(N=4)
		SD	0.2		2.2	
	(Lat.>8.0 N)	Mean	**8.4**		**20.9**	(N=10)
		SD	0.2		6.8	
EZ(N)/NEBs w. spots:						
		w1	+8.2 --> +8.7	135	-2 --> +2	Mar - Aug
		w2	6.3	168	+3 --> +10	Mar - May
		w14	6.2	266 (Jun 15)	1	Jun - Aug
		w16	8.2	272 (Jun 26)	-28	Jun - Jul

Table 6C: Spacing and speed of NEBs dark formations

Dates	n	mean spacing (deg.)	mean DL1 (deg/mth; *approx.*)
2004 Dec-2005 Jan.	6	60	+19
2005 April-May	11	32.7	+13
2005 May (stat. features)*	(6/111˚)	22.2	+3
2006 March-July	13	27.6	+1

(n, number around the planet)

*The chart shows a series of quasi-stationary features from L1 ~ 50-220 in 2005 May, interrupting the overall retrograding drift of the large formations; they were mainly p. ends of the large plateaux, or smaller projections. These features were fairly evenly spaced, allowing for one or two gaps, so they could represent an additional super-imposed wave pattern. However this entry (open red circle in **Fig.27**) does not fit very well with the overall correlation.
