

Jupiter in 2014/15: Final numerical report

*John Rogers (British Astronomical Association) & Gianluigi Adamoli (JUPOS team),
with data from the JUPOS team (GA, Michel Jacquesson, Marco Vedovato, Hans-Joerg Mettig,
& Grischa Hahn)*

TABLES & MINI-FIGURES

Tables of drift rates and positions of spots

These tables combine data on single spots and averages for groups.

In black: Single spots that were long-lived or otherwise notable.

In red: Average (with standard deviation below) for groups of spots representing the main currents or jets.

Columns:

Spot: Name or type of feature (in brackets if temporary designation for this apparition only).
W. white; d., dark.

Time interval: Dates for drift calculation (the feature may have been observed for longer).

L1(O) or L2(O): L1 or L2 at opposition on 2015 Feb.6.

DL1 or DL2: Drift in L1 or L2, in degrees per 30 days.

Lat.: Zenographic latitude.

n: For single spots, number of latitude measurements.

N: For averages, number of spots or track segments.

2014-15: Drift rates: Equatorial region						
<i>Spot</i>			<i>DL1</i>	<i>U3 (m/s)</i>		
SEB north edge	Mean:	-109,5	158			
	Estimated error:	2	1			
NEB south edge						
Persistent dark projections (generally at f. end of large formations such as plateaux)						
<i>Spot</i>	<i>Time interval</i>	<i>L1(O)</i>	<i>DL1</i>	<i>U3 (m/s)</i>	<i>Lat.</i>	<i>n: N</i>
A	Oct 14 - Feb 5	45	20	96,3	6,6	40
B	Nov 12 - Jan 24	94	8	102,0	6,5	37
C	Oct 24 - Mar 28	119	9	101,6	6,8	76
D	Oct 31 - Apr 28	147	9	101,3	7,4	106
E	Aug 31 - Feb 25	188	7	102,3	6,2	82
F	Dec 30 - Apr 28	226	12	99,9	6,9	65
		Mean:	10,7		6,7	6
		SD:	4,8		0,4	
Small prograding spots		Mean:	-16,3		6,9	12
		SD:	6,6		0,4	

2014-15: Drift rates and latitudes of spots: Southern hemisphere

<u>Spot</u>	<u>Time interval</u>	<u>DL2</u>	<u>SD</u>	<u>Lat.</u>	<u>SD</u>	<u>N; n</u>	<u>Notes</u>	<u>L2(O)</u>
S4 domain								
S4 AWOs:								
WS-1	Sep 28 - Nov 24	-44,1		-60,3		17	Long-lived Little Red Spot	
	Dec 12 - Jun 11	4,0		-58,5		97		
WS-2	Nov 8 - Mar 2	-2,1		-58,9		55	Slightly oscillating	
SPRn d. bar								
(d2)	Feb 9 - Mar 7	-22,9		-54,3		12	Overall tracked Nov-May.	
	Mar 19 - Apr 22	-31,1		-54,2		19		
S3 domain								
AWO (WS-1)	Sep - Jun	-7,5		50,1			Mean track is listed; oscillating: range DL2 +5.5 to -40, lat.-49.5 to -51.1	
Retrograding d.ss.		Mean 10,8	3,3	-49,0	0,50	10		
Prograding d.s.	Sep 30 - Nov 1	-25,5		-46,0		8	Reddish in last part of track	
	Dec 19 - Jan 10	-41,6		-45,4		7		
S2 domain								
AWOs		Mean -28,5	2,0	-40,7	0,05	9		
S2 jet								
SSTBn d.ss. (f. Ghost)		Mean -71,6	2,7	-35,0	0,15	3		
S. Temperate (S1) domain [from separate report]								
STZ retro. d.ss f. BA		Mean (all) 16,7	7,3	-31,7	0,40	9		
		Mean (subset) 19,0	3,0	-31,7	0,36	5		
Structured segment at oval BA:								
Oval BA	Aug 21 - Nov 10	-13,4		-33,1	0,36	33		
	Nov 15 - Dec 27	-17,7		-33,4	0,21	29		
	Dec 30 - Mar 17	-11,7		-32,9	0,31	58		
	Mar 19 - May 21	-13,3		-33,0	0,31	44		
F. end of dark STB segment	Oct 5 - May 6	-16,1		-30,7	0,28	43		L2(O) = 180
Ring (small AWO)	Dec 28 - Feb 14	-12,7		-33,5	0,25	9		L2(O) = 209
	(w1) Feb 19 - Mar 17	-8,4		-33,0	0,20	15		
	Mar 27 - May 16	-16,0		-33,5	0,25	11		
Other structured segment(s):								
Grey triangle (Np. end of STI)	Aug 20 - Jun 12	-15,7		-29,5	0,70	119		L2(O) = 340
Dark spot p. BA (DS5)	Dec 6 - Mar 16	-17,6		-31,0	0,38	38		L2(O) = 124
	Mar 30 - Jul 8	-13,9		-31,1	0,31	49		
STBn jet d. spots								
[from separate report]		Mean (all) -87,1	10,5	-28,0	0,70	37		
		Mean (early) -79,6	5,1	-28,5	0,20	17	Tracks 40-80 deg. p. BA	
		Mean (late) -100,1	5,7	-27,7	0,16	7	Tracks 108-150 deg. p. BA	
STropZ & SEBs [from separate report]								
Set:								
A -- Dark spots		Mean: 11,3	10,2	-22,9	0,51	(N = 5)	Nearly stationary. Early. Mostly p. GRS.	
B -- Dark spots		Mean: 50,3	12,7	-22,0	0,37	(N = 4)	High latitude; moderate speed.	
C - White spots		Mean: 112,0	7,9	-21,1	0,27	(N = 5)	Full jet speed	
E -- Dark spots		Mean: 126,0	5,6	-19,7	0,19	(N = 5)	Full jet speed (f. GRS)	
F - White spots		Mean: 89,2	14,4	-18,3	0,18	(N = 7)	Northern, within SEBs, slower	
D - White bays (waves, slow):								
		<u>DL2</u>	<u>SD</u>	<u>Lat.</u>	<u>SD</u>		Mean speed & latitude for each wavetrain;	
Series w1:	Feb 17 - Mar 5	69,8	(2,5)	-20,1	(0,14)	N = 5 w.spots measured; n = 7-11 per spot.		
Series w2:	Feb 10 - Mar 7	83,0	(1,6)	-20,1	(0,33)	N = 4 w.ss & 5 d.ss measured; n = 7-12 per spot.		
Series w9:	Jan 20 - 31	86,7	(1,6)	-20,3	(0,21)	N = 7 w.spots measured; n = 9-13 per spot.		
Series w18:	Feb 19 - Mar 7	84,4	(4,1)	-20,3	(0,12)	N = 9 w.spots measured; n = 8-14 per spot.		
w7	Jan 17 - Feb 10	82,0		-19,8		N = 1 w.s.; n = 10		
S. Tropical domain								
GRS		1,2	0,03	-22,5	0,3		L2(O) = 223. Oscillating, P = 90 d.	
SEB mini-barges		Mean: 9,3	5,0	-16,9	0,2	(N = 6 spots, 11 track segments)		

2014-2015 Positions and drifts - N. Hemisphere

Spot	Time interval	L2(O)	DL2	Lat.	N; n	Notes
N. Tropical domain						
WSZ	Aug 20 - Jan 26	11	-7,2	18,4	50	Oscillating throughout
	Jan 31 - Jun 15	9	-8,8	18,7	98	
d. projections		Mean	8,4	17,7	18	
(humps) NEBn		SD	10,7	0,42		
w. bays NEBn		Mean	12,4	16,7	15	
		SD	6,9	0,43		
N.Temperate (N1) domain						
Prograding d.s. (NTC-B)						
(d6)	Apr 1 - May 11	--	-54,2	27,8	31	
(NTC-A):						
d. spots						
big d. bar	Oct 15 - Nov 25		16,7	29,8	25	
(d0)	Dec 2 - Apr 12	204	11,8	29,9	57	
p. & f. ends of dark/(red) streaks						
(p.d9)	Jan 16 - Mar 15	256	12,9	29,3	20	
(f.d9)	Jan 16 - Mar 25	281	22,0	29,7	45	
(p.d7)	Oct 6 - Feb 7	321	11,5	29,6	42	
(f.d8)	Oct 16 - Jan 5		14,8	29,6	17	
(f.d8)	Feb 1 - Mar 25	9	10,4	29,6	40	
(d2)	Feb 18 - Mar 31	94,1	16,7	29,9	24	
w. spots:						
(w3)	Oct 28 - May 30	14	12,7	32,0	89	LRS in Jan.
(w2)	Jan 19 - Apr 19	76,0	15,5	31,8	34	
N2 jet:						
d. spots		Mean	-80,9	34,6	20	Excluding two fast, northerly spots
		SD	5,1	0,39		
w. spots		Mean	-74,6	34,2	9	
		SD	8,4	0,45		
N2 domain (NNTC)						
NNTBn d.ss:		Mean	6,3	38,4	9	
		SD	5,2	0,7		
NNTZ AWOs:						
LRS-1	<-- Sep 1 - Dec 28	75,9	0,5	39,7	21	
	Jan 28 - Apr 26	60,9	-6,5	40,7	32	
	May 13 - Jun 11 -->	280,7	2,3	39,5	9	
WS-4	<-- Aug 21 - Nov 21	140,3	-11,8	40,3	22	
	Dec 26 - Apr 29	144,3	-9,4	40,9	37	
WS6	Feb 10 - Mar 25	13,7	-16,4	41,2	30	
	Mar 28 - May 30	2,1	-9,7	41,0	22	
WS-a	Sep 30 - Nov 8	194,8	-8,6	40,6	15	
	Mar 14 - Apr 19	224,3	-16,9	41,0	9	
(WS-b)	Oct 17 - Nov 1	197,2	12,6	39,6	8	
(WS-c)	Oct 1 - Dec 5	313,4	13,5	40,0	15	
N3 domain (N3TC)						
W. spots		Mean	-20,6	45,2	7	
		SD	4,0	0,25		
D. spots		Mean	-16,4	44,7	10	
		SD	3,9	0,57		
N4 domain:						
W. & d.spots (N4TC):		Mean	5,4	50,6	6	
		SD	3,6	0,7		
AWOs :						
AWO-a	Oct.18-Dec.6		-6,7	nd		
	Dec.6-Feb.21	298	-30,8	53,9	34	oscillating
	Mar.10-Apr.21		-4,7	53,4	31	
	May 12-Jun.12		-17,1	53,7	10	oscillating
AWO-b	Oct.22-Nov.10		5,7	nd		ill-defined
	Dec.5-Jan10		-40,0	nd		
	Jan.10-Mar.31	46	-22,3	53,9	37	oscillating
	Apr.1-May 22		8,0	nd		
AWO-c	Nov.9-Feb.21		-14,4	nd		
	Feb.26-Mar.16	225	0,0	53,3	9	
	Mar.16-May 12		-41,4	nd		ill-defined
N5 domain:						
	Feb 8 - Mar 7	161	-24,8	62,6	12	

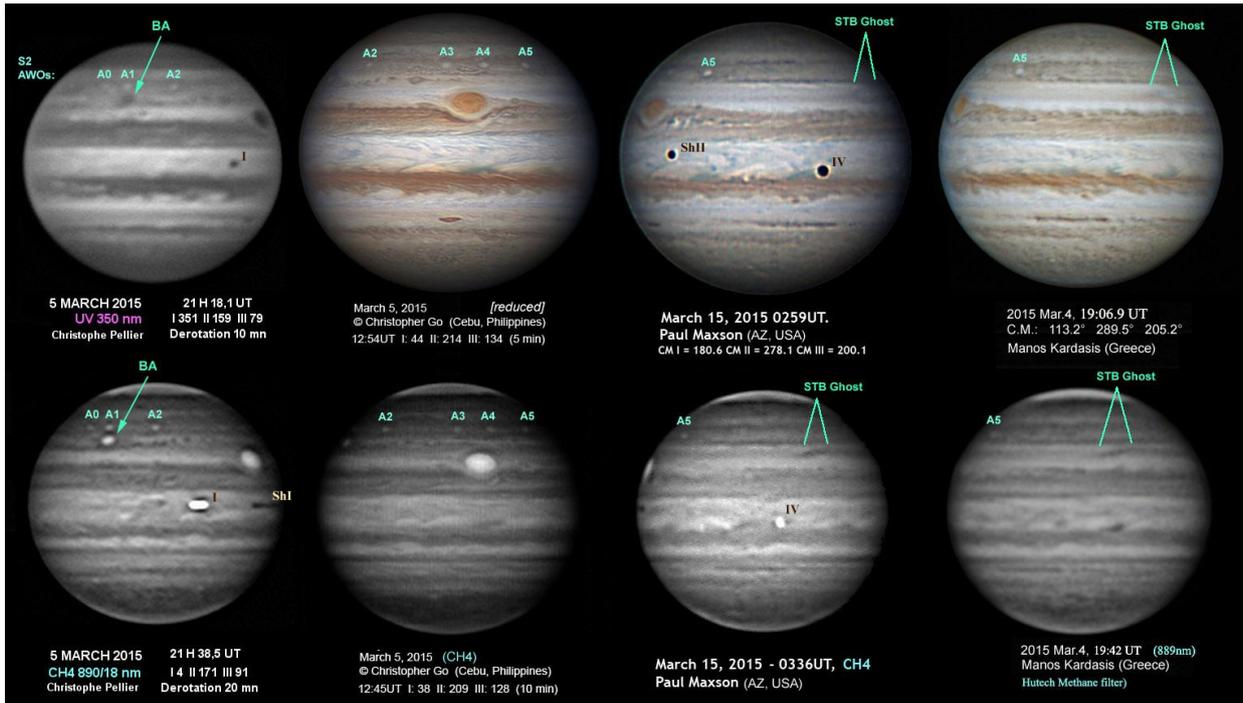


Fig.2: Set of images in 2015 March. Top row: UV (first image) and visible colour. Bottom row: methane band. (For more methane images of the GRS, see Fig.6.)

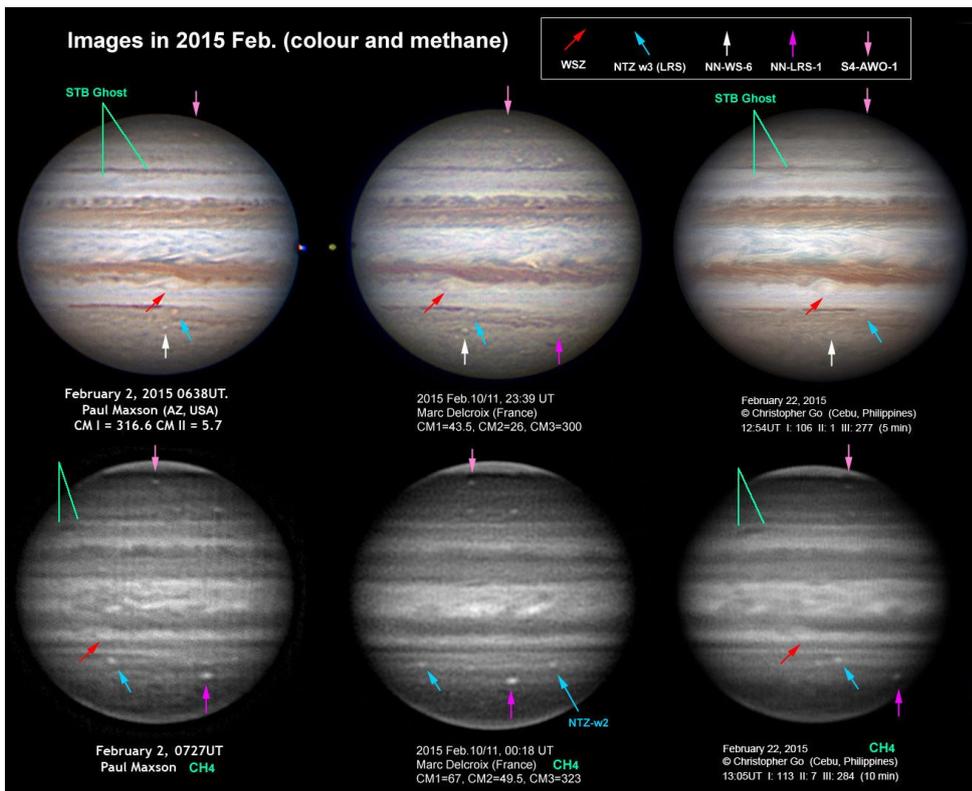


Fig.3: Three pairs of images in 2015 Feb. Top, visible (RGB); bottom, methane band (889 nm). (Earlier methane images, up to Jan.28, were in Report no.3.) They include the major long-lived ovals in N. Tropical domain (White Spot Z) and the S4 and N2 domains, as well as the STB Ghost.

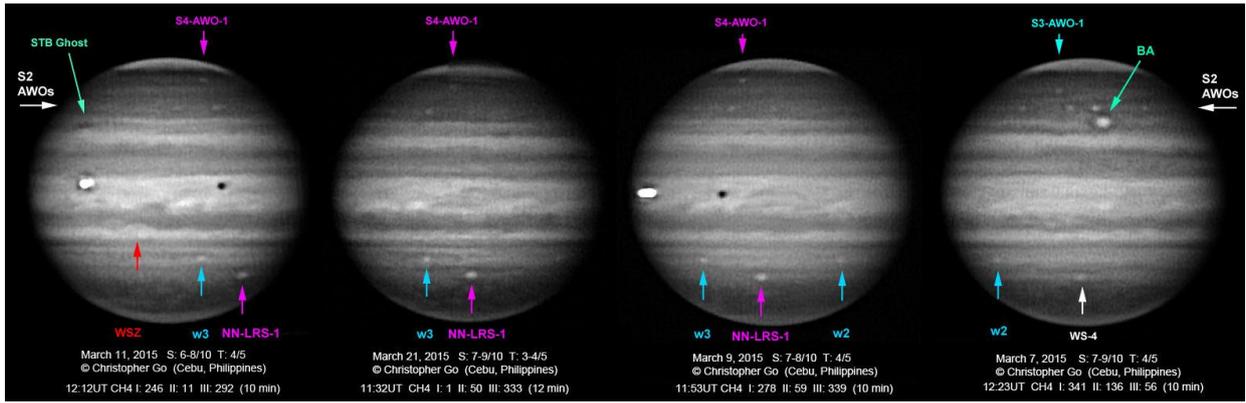


Fig.4: Another set of methane images, 2015 March, all by C. Go (filter width 18 nm). Methane-bright AWOs are indicated in the S4, S2, S1, N1 and N2 domains. They include NTZ spots w3 (LRS in Jan.) and w2 (more weakly), and NN-LRS-1 and NN-WS-4.

2015 March 5-6

Images by T. Olivetti & C. Go (& B. Macdonald, L2 0-30); Map by M. Vedovato

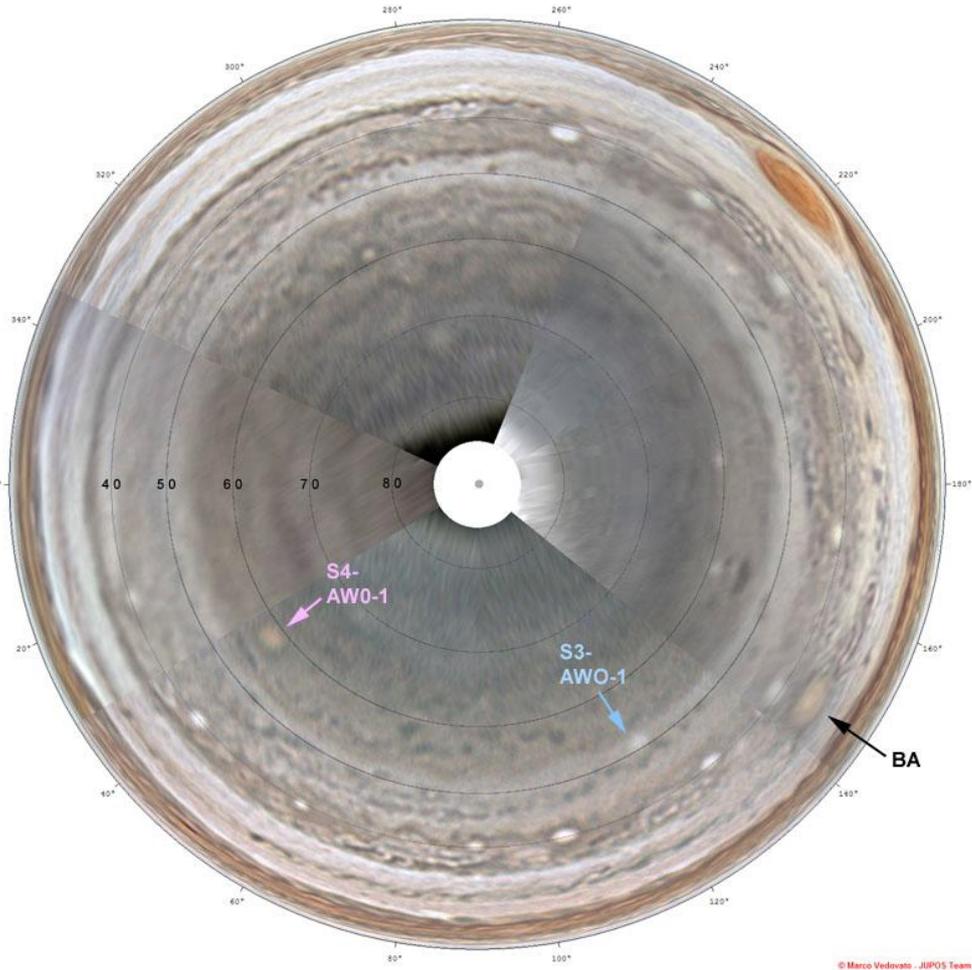


Fig.5: Polar projection map of the southern hemisphere on 2015 March 5-6, from images by Go & Olivetti, as in Fig.1.

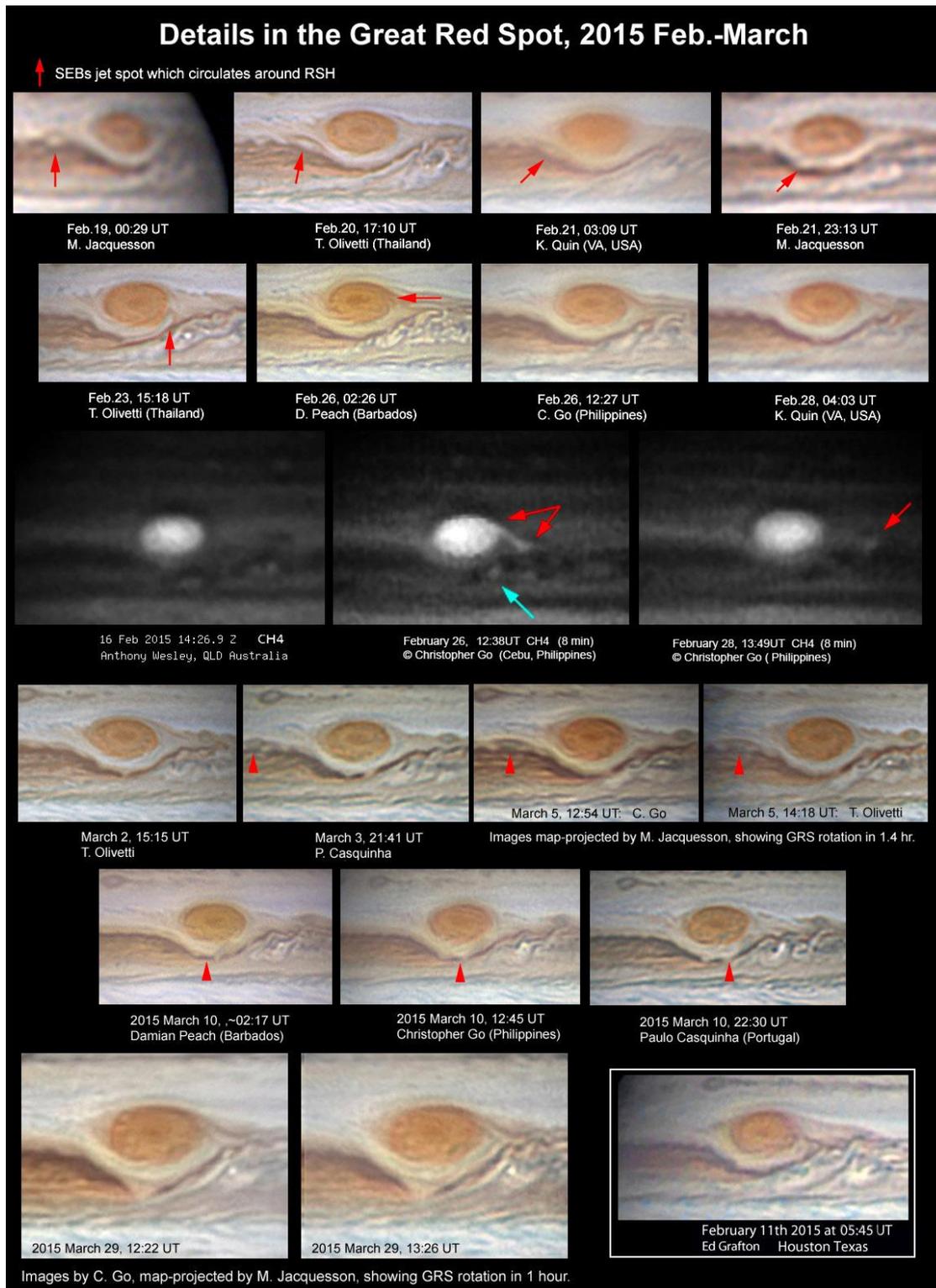


Fig.6: V-hi-res images of the GRS in 2015 Feb-Mar., including 3 methane-band images. Red arrow indicates vortex R9 retrograding on the SEBs jet and being swept around the RSH to the f. end, where it forms a methane-bright streak. It seems likely that this was the vortex being pulled apart (as in the Voyager movies), with one part being swept into the GRS, and the other part escaping to retrograde on SEBs. Vortex R18 enters the RSH on March 8, but is not obvious thereafter; it may be the white streak tracked on March 10 (red arrowhead). Contrast in the methane images has been enhanced to show that the centre of the GRS is more methane-bright than the periphery. Also note only small-scale activity in the SEB f. the GRS, although one small bright spot is weakly methane-bright (cyan arrow).

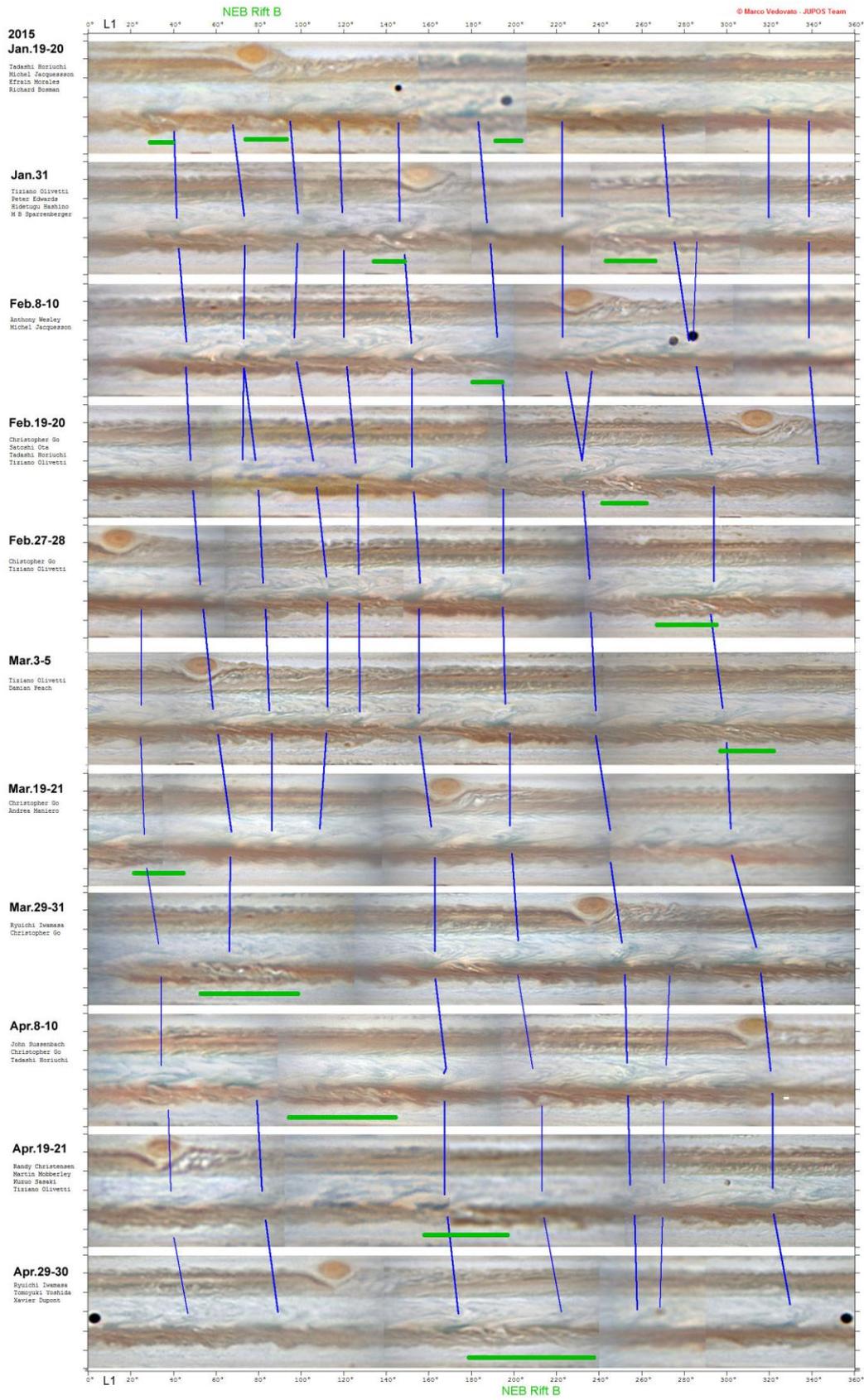


Fig.7: Maps of the equatorial region aligned in System I, from 2015 Jan.-April. The major NEBs dark formations are tracked by blue lines. NEB rifts are underlined in green.

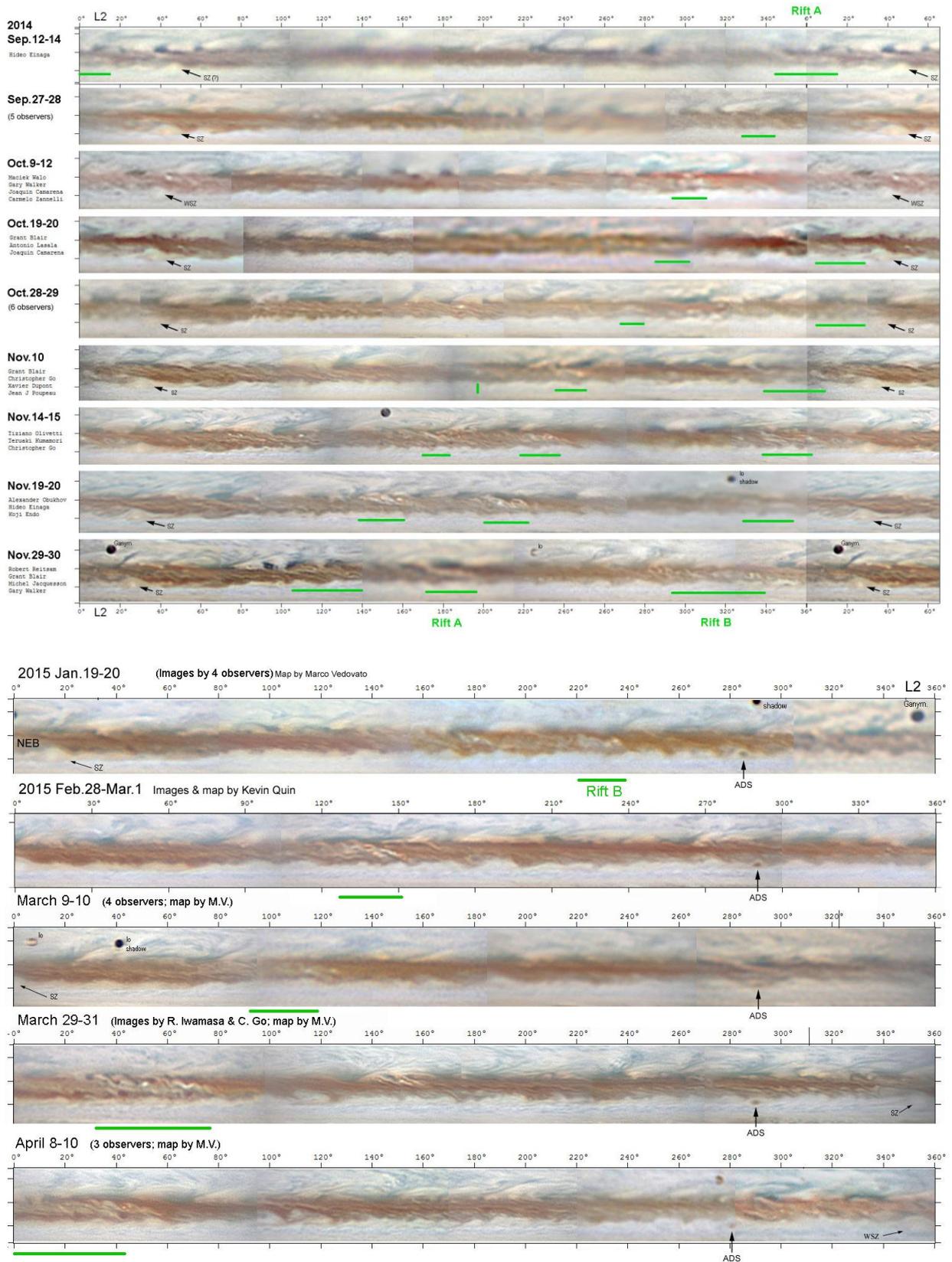


Fig.8: Maps of the NEB: (A) 2014 Sep-Nov; (B) 2015 Jan-April. Green line(s) below each maps mark the approximate extent of the rift(s). SZ is white spot Z. All maps made by Marco Vedovato unless otherwise stated.

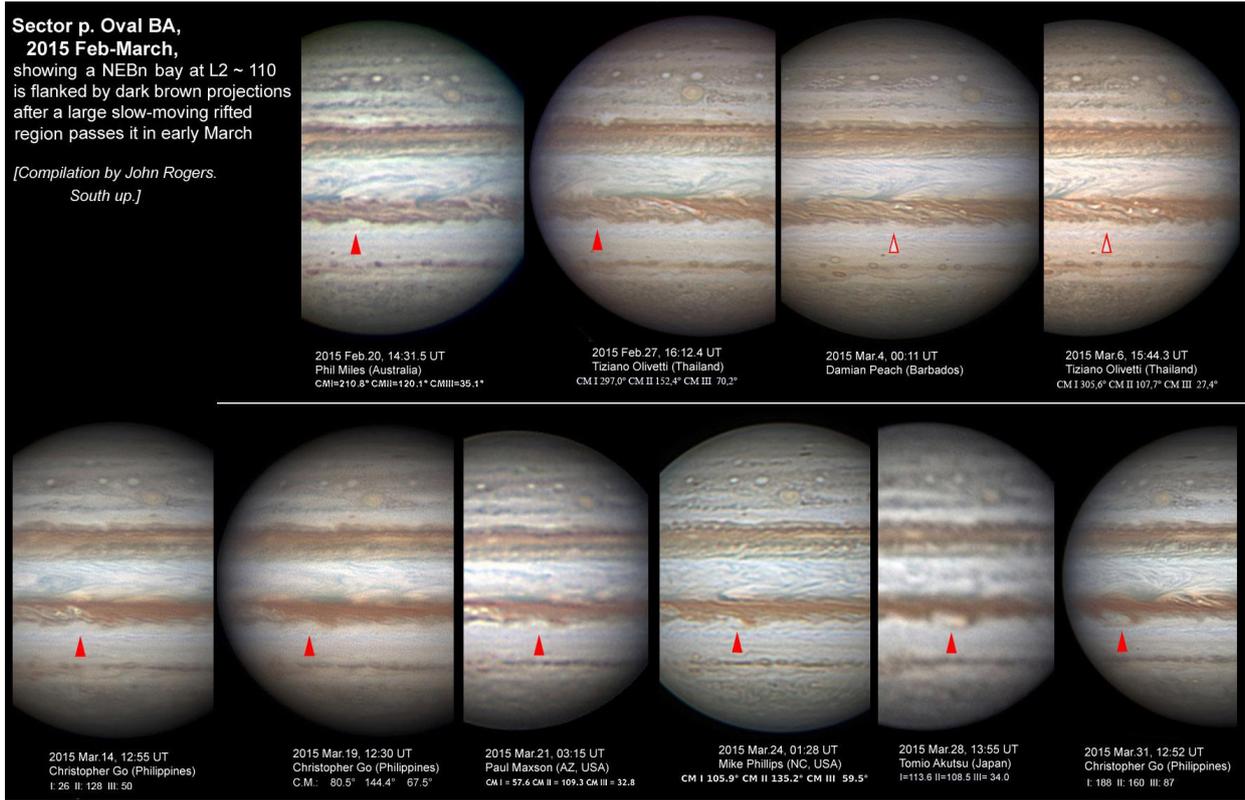


Fig.9: Images showing oval BA and the sector p. it in 2015 Feb-March. A bay in NEBn (red arrowhead) becomes temporarily enclosed by dark brown projections after a large rifted region passes it.

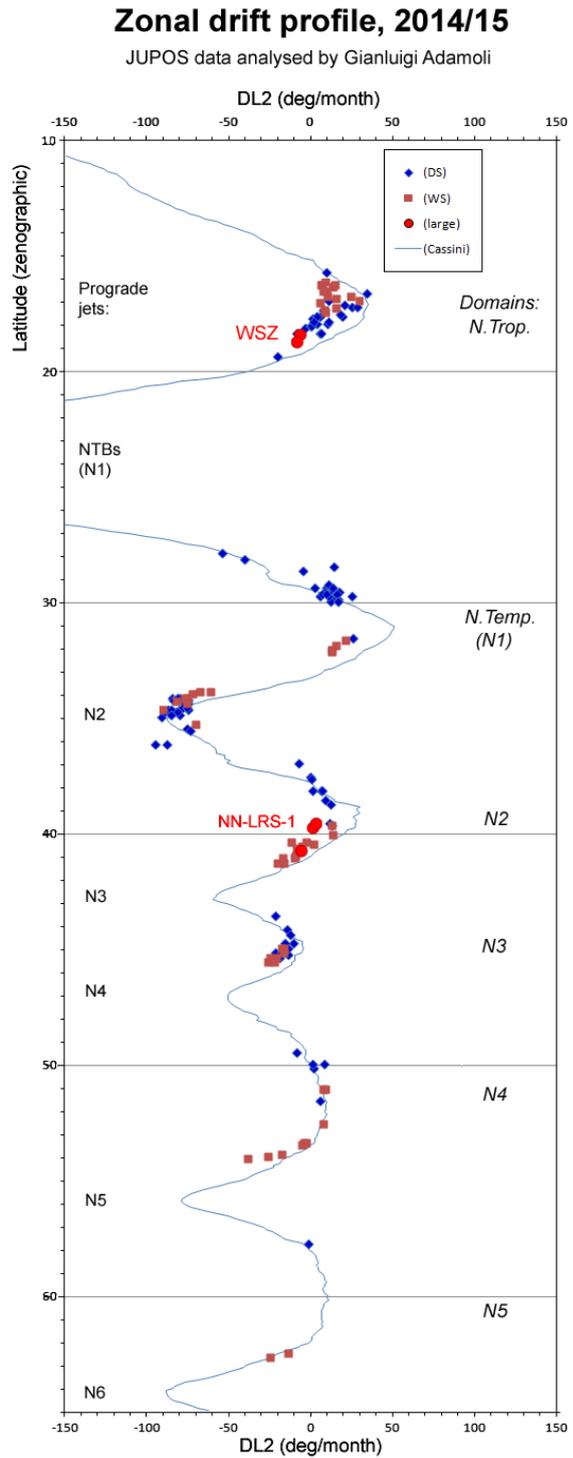
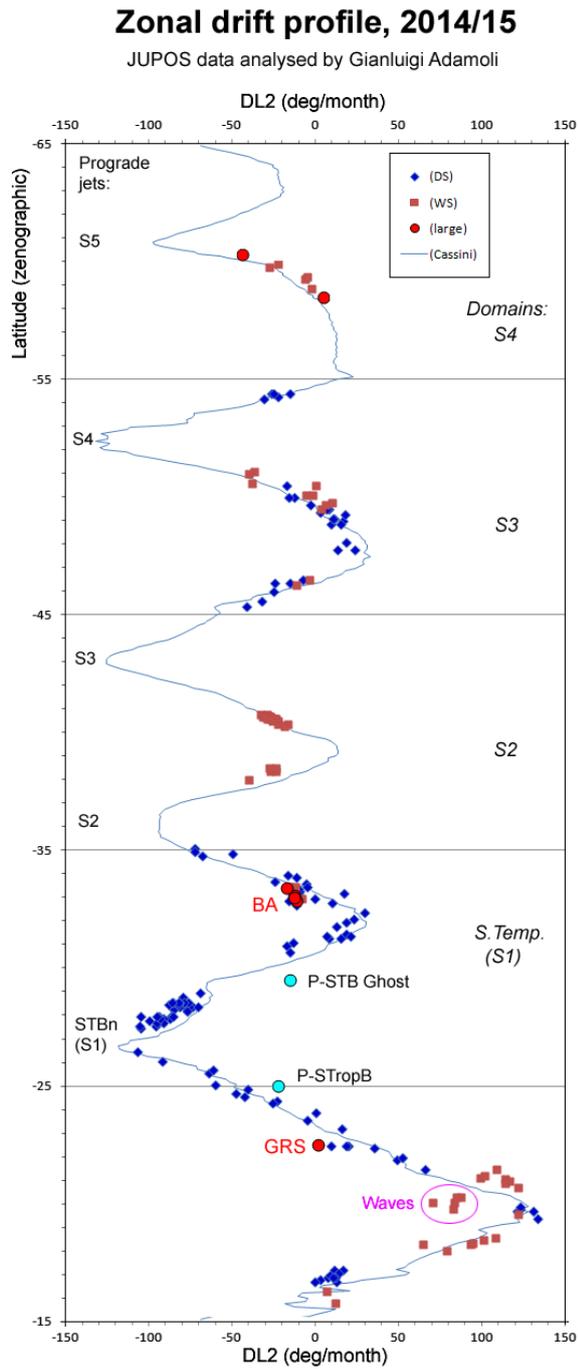


Fig.10 (L): ZDP for the southern hemisphere; **Fig.11 (R):** ZDP for the northern hemisphere, with Cassini ZWP [from Ref.22] for comparison.

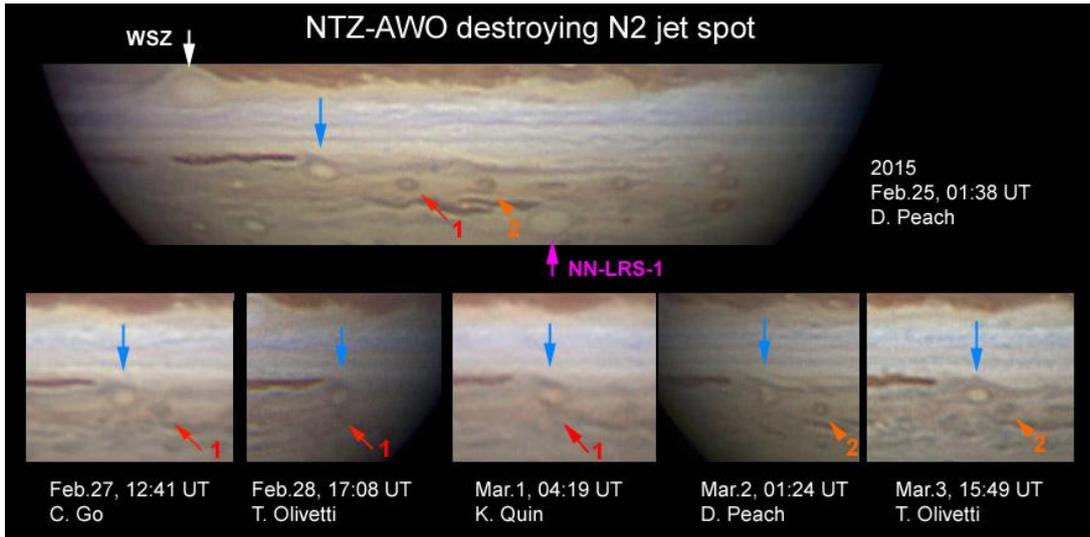


Fig.14: V-hi-res images showing N2 jet spot no.1 interacting with the NTZ white oval w3. Note that w3 appears double on March 2 during the interaction.

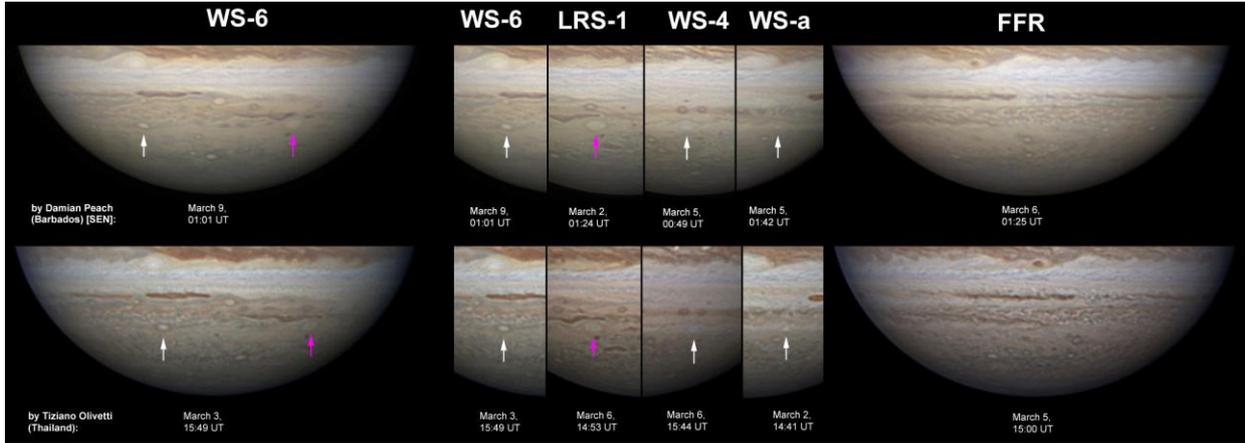


Fig.15: V-hi-res images of the major features of the N2 domain: four AWOs, and the giant FFR.

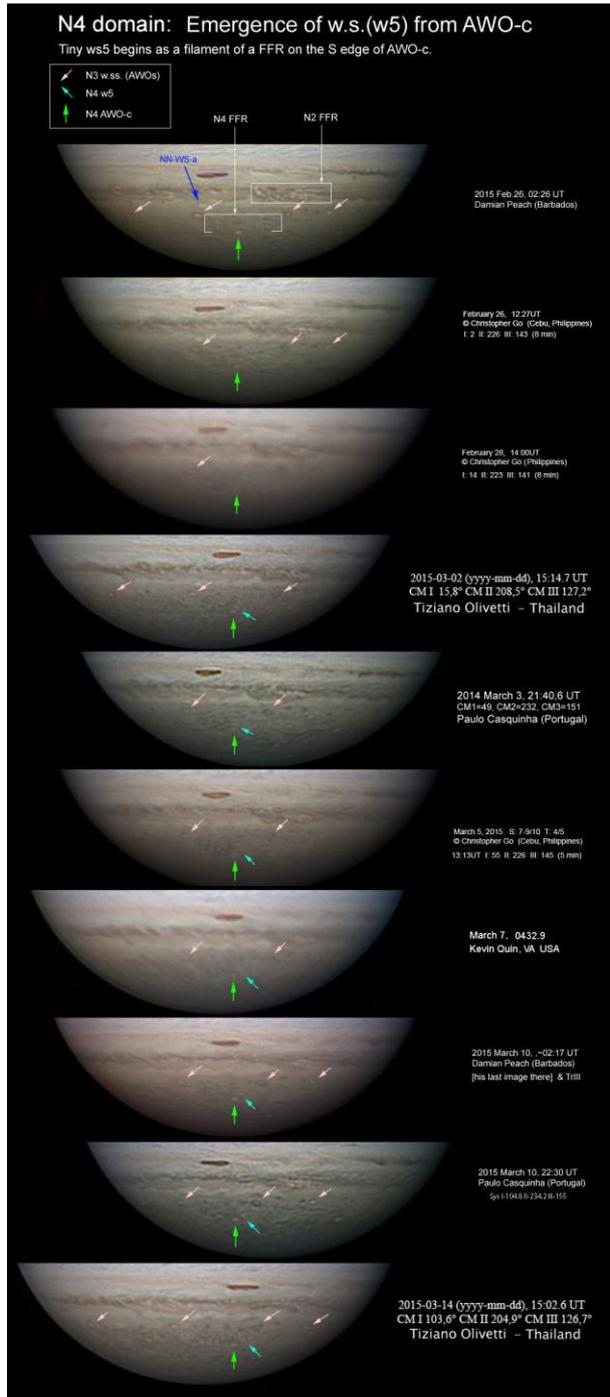
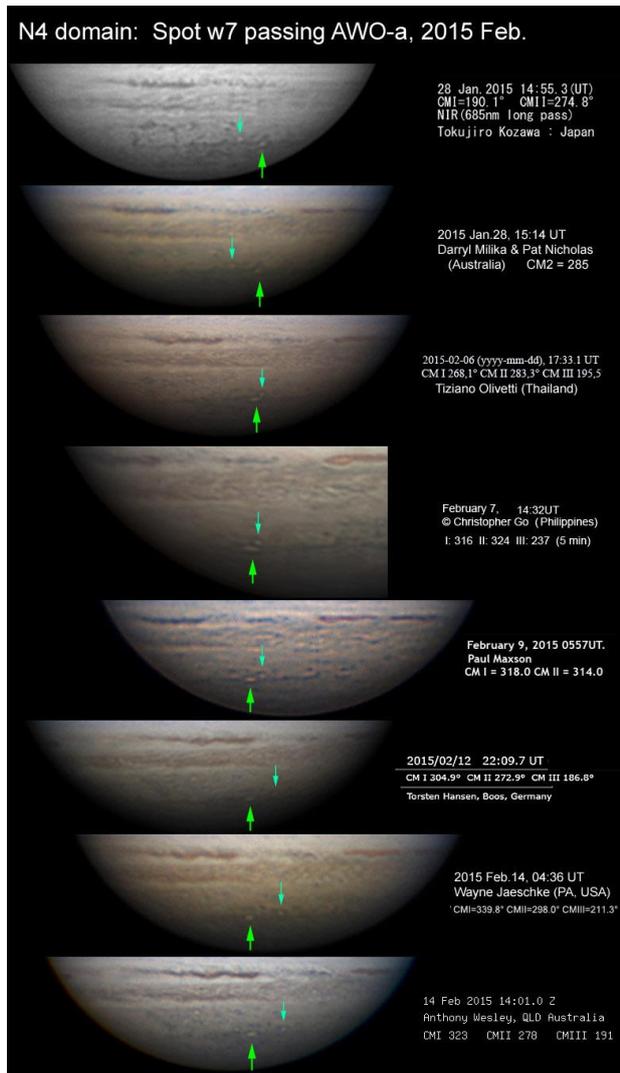


Fig.16 (L): A retrograding tiny white spot [w7] passing AWO-a in the N4 domain, 2015 Feb.
Fig.17 (R): A tiny white spot [w5] appearing at AWO-c in the N4 domain, 2015 March. It begins as a filament of a FFR on the south edge of AWO-c.

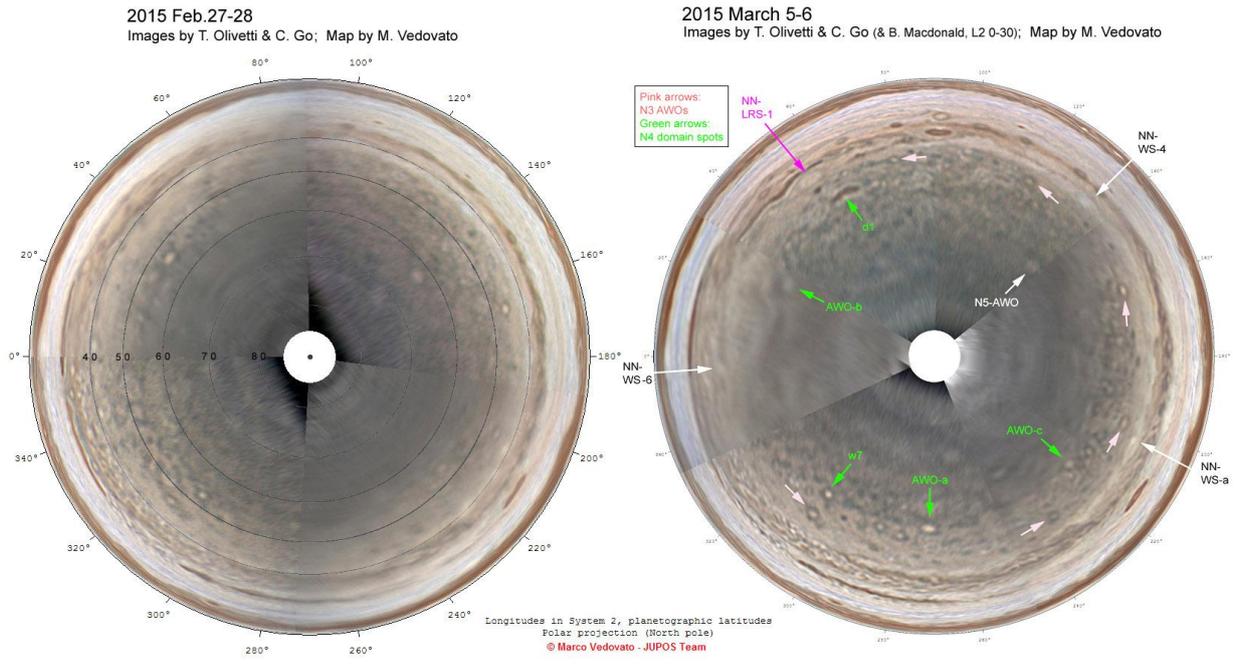


Fig.18: Polar projection maps of the northern hemisphere, made by M. Vedovato from images mainly by T. Olivetti and C. Go, as in Fig. 1.