Jupiter's South Temperate Domain, 2018-2024

APPENDICES & TABLES

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Table 1. Speeds of retrograding spots in STBs flow & jet

Table 2. Drift rates of long-lived features

Table 3. Speeds of STBn jetstream spots

Appendix A. Additional background information [from Refs.R1-R4, etc.]

Section 3.1: ***Wind patterns Sf. quiescent structured sectors.*** *[Adapted from Ref.R3.]*

(i) The recirculation loop: Recirculation from the SSTBn jet (prograding) to STBs (stationary or retrograding) was repeatedly observed Sf. the STB Remnant [Ref.R1], STB Ghost [2013-2017], and STB Spectre; each developed an anticyclonic 'recirculation loop' Sf. it, as described esp. in [Ref.R3]. This was defined by ground-based observations of small spots recirculating [Ref.R3].

(ii) *Altered speed and ZDP Sf. the sector:* Moreover [Ref.R3], the retrograding speeds f. the Ghost in 2014/15 were unusually high (up to DL2 = +22), and f. the Spectre in 2015/16 they were exceptionally high (+24 to +35). These are typical of the full STBs jet speed recorded by spacecraft (+20 to +42 deg/mth), and are more positive than usually observed (except for the Sf. tail of segment A in 2005-2007). Our ZDP for 2015/16 [Fig.26 herein] showed that these points were also anomalously far south; indeed, the whole ZDP for the SSTBn jet and STZ in this sector was displaced southwards. We had observed the same anomaly for recirculated spots f. the STB Remnant in 2004-2007 [Ref.R1].

Section 4.1: ***Sf tails of STB segments*** *[Adapted from Ref.R1:]*

A dark STB segment always has a Sf. extension or 'tail', except for Segment A when it is just a very dark oval. The STB Remnant did not have one either, so the Sf. extension apparently arises from an 'open' cyclonic segment but not from a closed circulation.

Sf. extensions can become longer and darker under two circumstances. First, the two collisions of STB segments with segment A each resulted in many spots being emitted into the Sf. extension. Secondly, when an STB segment has just passed the GRS, the Sf. extension sometimes elongates so that its f. end remains roughly south or Sf. of the GRS for some months.

The dark spots in these tails are usually slower-moving than the STC, having DL2 ~ -4 to +12 deg/30d, although they only rarely approach the speed of the STBs jet as measured by spacecraft (**Table1**). However there have been notable variations from year to year, possibly as a result of the collisions of other structured sectors with Segment A, as described in sections 4.2 & 5.

Section 4.2: ***Speeds on the retrograding current following STB segment A*** *[Adapted from Ref.R1:]*

Spacecraft have always recorded a retrograde jet in the STBs latitudes, around 32ºS, with variable mean speeds ranging from DL2 = +20 to +42 deg/30d. We have shown that the higher retrograde speeds are in structured sectors [Refs. R1-R4], e.g. average DL2 on the S edge of Segment A from HST images was DL2 = +45 and +47 (u_3 = -22, -23 m/s) in 1997 and 2007, and +83.5 (u_3 = -38 m/s) in 2012 (**Table1**). Even higher speeds were observed during the chaotic transformations of the STB Remnant and Ghost (see **Table1**). The Cassini ZWP used for reference in our ZDPs, with a peak of DL2 = +30.7 (u_3= -11.6 m/s), is presumably an average between a short Segment A and unstructured sectors with lower retrograding speed.

Our observations, tracking dark spots, are not expected to detect the maximum wind speeds on jets; in the S. Temperate domain, as in some other domains, the ZDP usually appears 'blunted', with less-retrograding speeds than the spacecraft ZWP: spots in the Sf. tails typically have DL2 ~ -4 to +12 deg/mth. However, much-more-rapidly retrograding speeds were recorded from **2005 to 2007,** DL2 from +26 to +44 deg/mth, all in the long tail of the merged STB segments, at 31.7 to 32.5ºS, the latitude of the jet peak. There were intermediate speeds in 2008 as it returned to normal. (There were also many spots in the STZ with more typical speeds in those years, with a well-defined ZDP that was just south of the retrograding jet ZWP.) It seemed likely that this outbreak of spots from 2005 to 2007 was a long-lasting consequence of the collision of STB segments A and B in 2003/04.

High retrograding speeds were again observed a few years after the arrival of Segment D in 2013. The enlarged, turbulent Segment A was shrinking in 2014 and 2015 and by early 2016 it was very small, though with some activity. **In 2015/16,** the dark spots in the Sf. tail were strongly retrograding, with DL2 = +11 to +36, at 31.3 to 32.5ºS. These speeds were more positive than usual, matching the jet peak observed by spacecraft. The 2015/16 ZDP is reproduced here (Figure 26, from [Ref.R8]) for comparison with our recent ZDPs.

From 2017 Feb. to May, Segment A was again emitting many retrograding dark spots (DL2 ~ +21; but this activity ceased in mid-May, so the retrograding spots disappeared in June-July and BA then had no grey rim. There was no further activity until the STB Ghost arrived in 2018 Feb.

***Section 5.1:* South Temperate Current (STC): Mean values of DL2 (deg/30d)**

1880-1940 [Ref.S1]: STC mean DL2 = -15; means of individual apparitions range -11 to -19.
General decline from: (~1880-1902): ~-17
to: (~1925-1934): ~-12 –then more variable.

1940-1990 [Ref.S1]: STC dominated by the 3 great AWOs, whose mean speed declined (with 12-year oscillation), from (early 1940s: the 3 proto-ovals): ~-26
to (late 1980s: the 3 great AWOs): ~-12.
Other features generally had the same drift rates, probably because the 3 AWOs were locked to the STB segments.

1993-2000 [Ref.R4]: STB revival, driven by new turbulent STB segments, pushing against the slower-moving AWOs: The leading pair of AWOs had DL2 = -12.8 (1991-95), -11.7 (1995-97).
F.end of dark turbulent STB had steady drift: (1994-1996): -15.5, then
(1996-2000): -14.5. This progression apparently pushed the 3 AWOs into mergers in 1998 & 2000 culminating in the formation of oval BA.

2001-2018: [Ref.R3]:
Even though Segment A continued active, contracting f. oval BA after it formed, BA retained DL2 ~ -11 to -13, and did not accelerate until 2005, after the collision with Segment B.
Typical drift rates in 2001-2015 *[from Refs.R1 && R2]*, in DL2 (deg/30d), were as follows:
Oval BA when dark spot f. it is quiet: -10.4 to -11.8.
Oval BA with dark turbulent STB f. it: -14.2 to -16.5.
Structured sectors such as STB Ghost and Spectre had DL2 = -16.7 (±1.0, SD) (range -15.4 to -17.8).
From 2016-2018, the mean speeds for BA were all in or near the 'quiet, slow' range (-11.0 to -12.0).

***Section 7:* The STBn jet** *[from Refs.R1 &R2, & Ref.R13 Appendix 2]*

This jet is double and variable. In ZWPs it has two sub-peaks, at ~26.5°S and 29°S. The northern peak is present all around the planet, with mean DL2 ~ -94 to -114 deg/30d in recent decades. The southern (29°S) peak is mainly present alongside STB structured sectors, where it has DL2 ~-111 or sometimes faster.

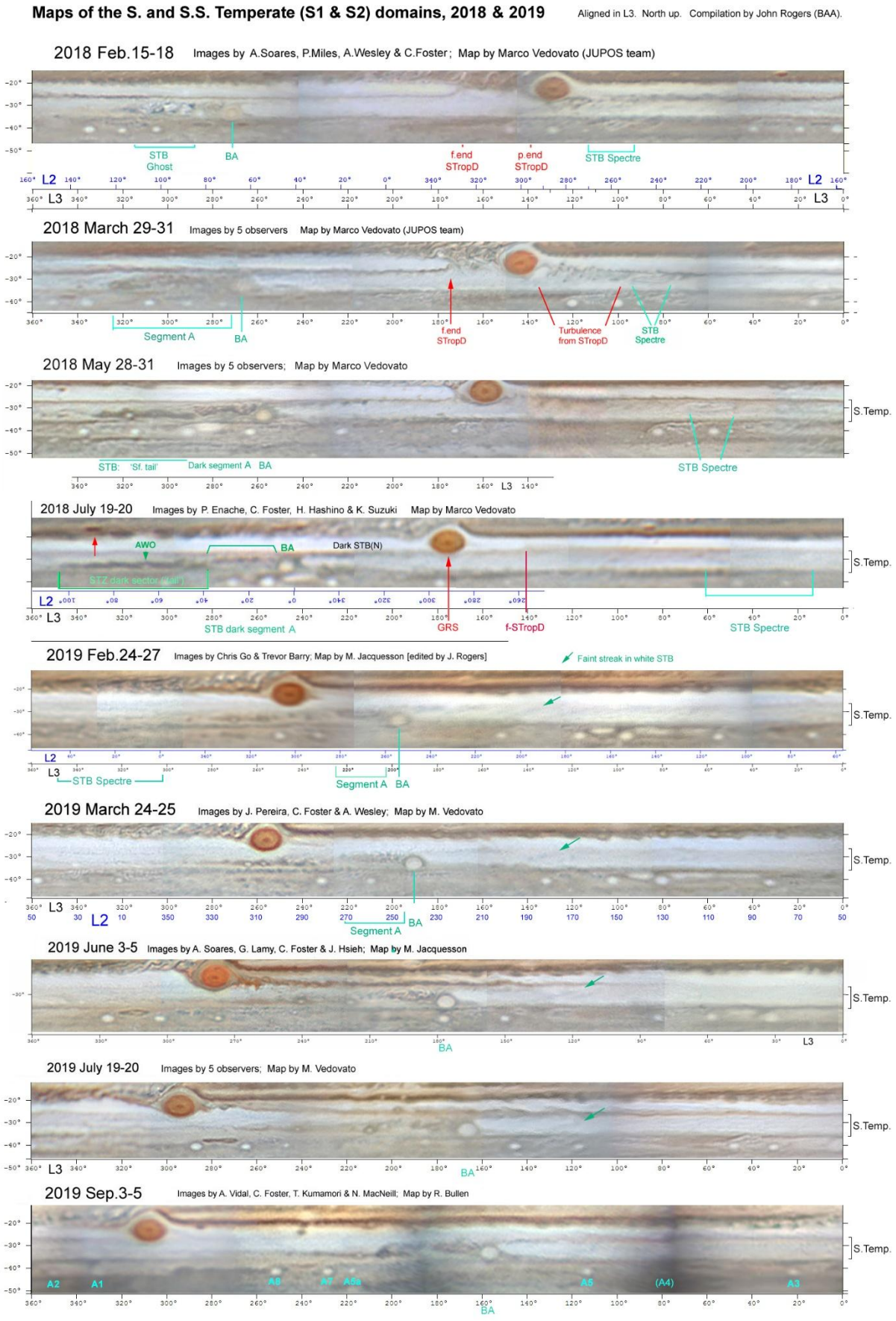
Dark spots on the STBn are mainly produced in either of two circumstances: (i) Np. a dark turbulent segment of STB, esp. the segment f. oval BA when it has been reinvigorated by events f. it; (ii) during an incipient STB Fade (as in 2010). Images from Hubble and Juno confirm that these spots have little if any vorticity. They tend to drift northwards during their lives, between the latitudes of the two sub-peaks, usually without change of speed as the southern sub-peak disappears as the spots prograde from their origin.

An outbreak is initiated by a collision of STB segments f. oval BA. Initially the jet spots drift comparatively slowly (mean DL2 ~ -75 to -83), but later they drift faster (~-90 to -100). The spots p. a different STB segment in 2010 also had comparatively slow drift (mean DL2 ~ -76 at 28.0°S).

In Ref.R2, we presented a full analysis of the outbreaks in 2004-05, 2010-11, and 2013-15. These all occurred p. BA after a STB structured segment collided with Segment A. In 2013-2015, the mean speed in intervals of several months progressively increased from DL2 = -83 to -100, while the mean latitude decreased from 28.3°S to 27.7°S. This outbreak also enabled us to understand the variations in the ZWP: G. Hahn produced ZWPs covering the outbreak in 2014 April [Ref.S5], showing that it matched the ZDPs for these spots as they prograded p. BA, with the south component of the jet weakening with longitude as the spots drifted north.

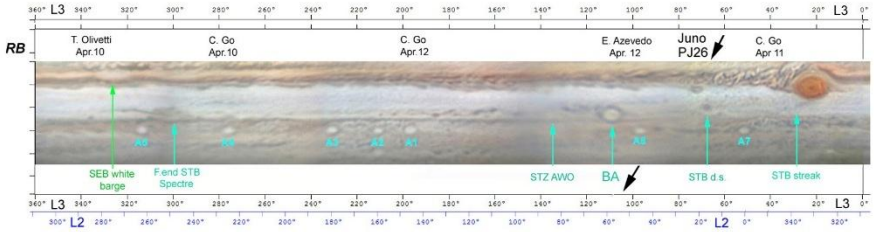
There was little activity on the STBn in 2015/16 and 2016/17, until in 2018 March, STBn jet spots again appeared p. BA. [Ref.R3] also summarises measurements of the wind speeds on the STBn jet components in structured sectors in different states, including the STB Ghost before and after its turbulent transformation in 2018.

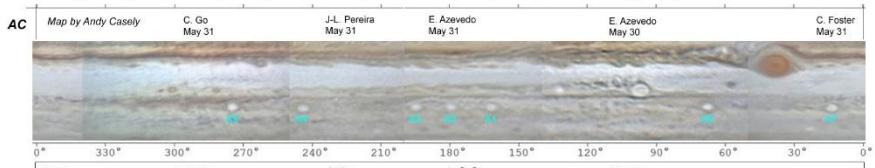
Appendix B: Maps of the S. Temperate domain from amateur images (JUPOS team)

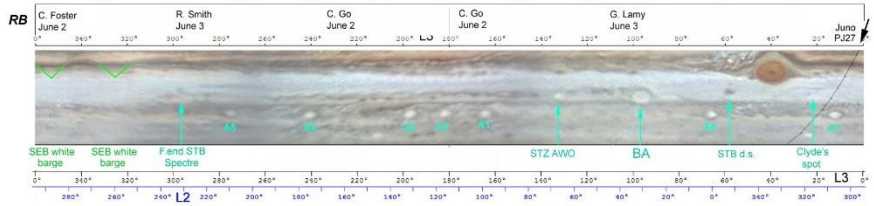


Maps of S1 & S2 domains, 2020 & 2021

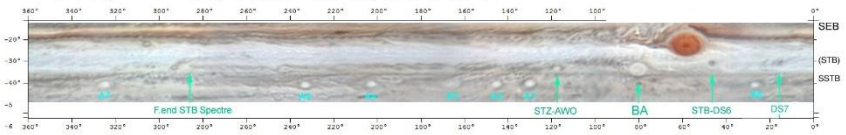
Maps by Rob Bullen (*RB*, enlarged x1.054) and Joaquin Camarena (*JC*) and Andy Casely (*AC*). Compilation by John Rogers



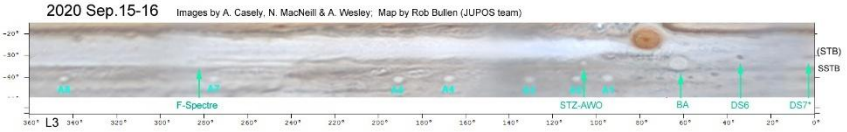




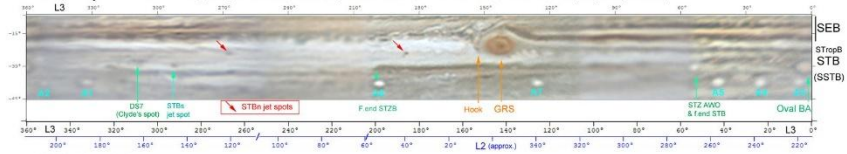
2020 July 24-26 Images by T. Barry, C. Go & A. Casely; Map by Rob Bullen (JUPOS team)



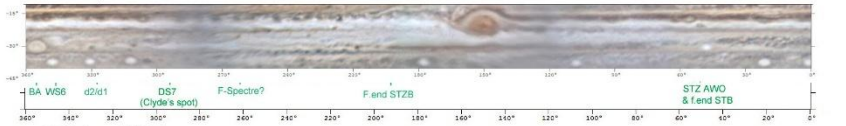
2020 Sep.15-16 Images by A. Casely, N. MacNeill & A. Wesley; Map by Rob Bullen (JUPOS team)



2021 April 2-5 Images by T. Olivetti, A. Casely & C. Foster (& March 30, T. Barry, L3 205-253); Map by Andy Casely

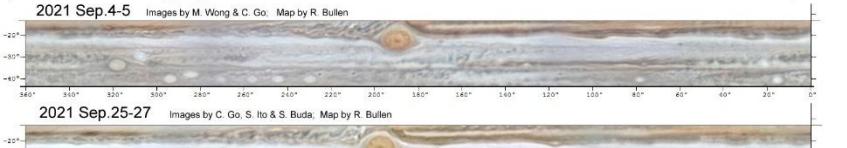


2021 May 1-3 Images by 4 observers; Map by R. Bullen

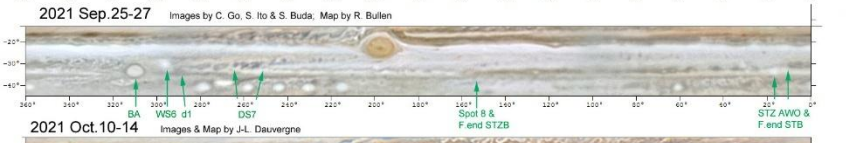


2021 June 25-27 Images by T. Olivetti, C. Foster, C. Go & J.L. Pereira; Map by Rob Bullen (JUPOS team)

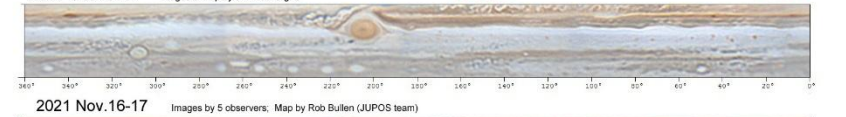
2021 Sep.4-5 Images by M. Wong & C. Go; Map by R. Bullen



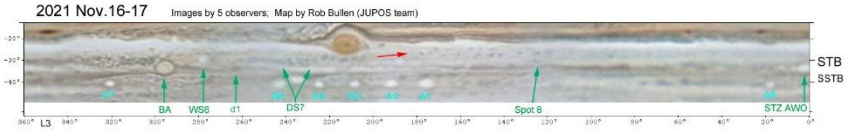
2021 Sep.25-27 Images by C. Go, S. Ito & S. Buda; Map by R. Bullen



2021 Oct.10-14 Images & Map by J-L. Dauvergne



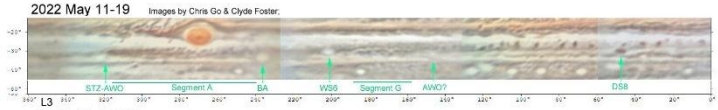
2021 Nov.16-17 Images by 5 observers; Map by Rob Bullen (JUPOS team)



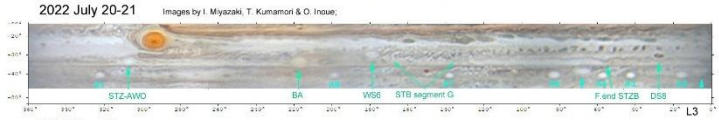
Maps of the S1 & S2 domains, 2022/23 & 2023/24, from amateur images

Aligned in L3; planetographic latitudes. All maps by Rob Bullen (JUPOS team) unless otherwise stated; annotations by John Rogers.

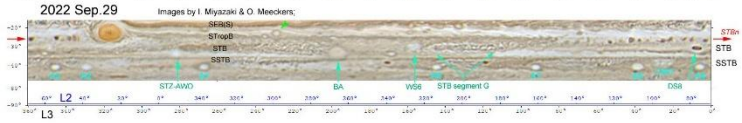
2022 May 11-19 Images by Chris Go & Clyde Foster;



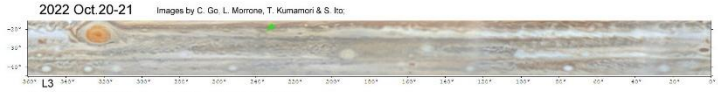
2022 July 20-21 Images by I. Miyazaki, T. Kumamori & O. Inoue;



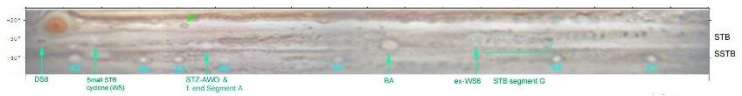
2022 Sep.29 Images by I. Miyazaki & O. Meeckers;



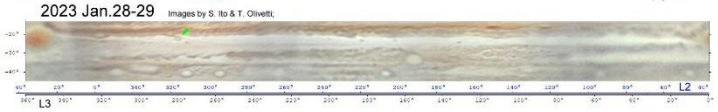
2022 Oct.20-21 Images by C. Go, L. Morrone, T. Kumamori & S. Ito;



2022 Dec.27-29 Images by I. Miyazaki, C. Go & N. MacNeill;

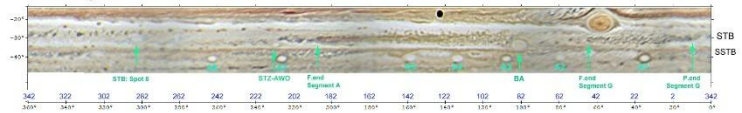


2023 Jan.28-29 Images by S. Ito & T. Olivetti;

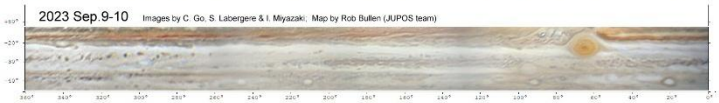


2023 July 30-31 Images by C. Go, S. Labergere, G. Walker & O. Inoue; Map by R. Bullen

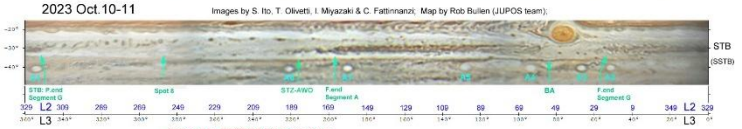
2023 August 21-22 Images by I. Miyazaki & S. Ito; Map by Rob Bullen (JUPOS team);



2023 Sep.9-10 Images by C. Go, S. Labergere & I. Miyazaki; Map by Rob Bullen (JUPOS team)



2023 Oct.10-11 Images by S. Ito, T. Olivetti, I. Miyazaki & C. Fattinnanzi; Map by Rob Bullen (JUPOS team);



2023 Oct.14-16 *Add set to 2023/24 Compilations on SSD, then delete this one*

Images by 4 observers; Map by Andy Casely

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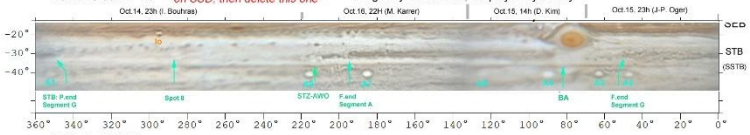
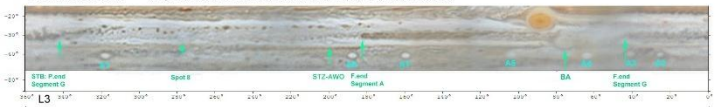
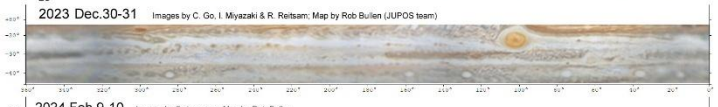


2023 Oct.30-31 Images by 7 observers on ALPO-Japan; Map by Rob Bullen (JUPOS team)

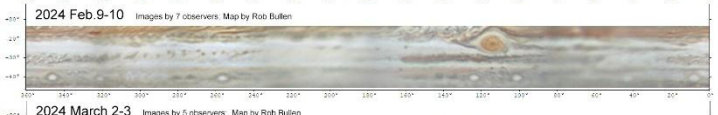
2023 Nov.20-21 Images by J. Rozakis, D. Kim, T. Olivetti & S. Ito; Map by R. Bullen (JUPOS team)



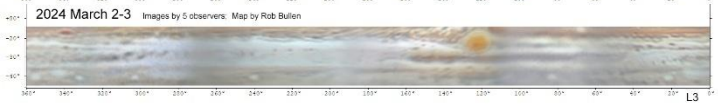
2023 Dec.30-31 Images by C. Go, I. Miyazaki & R. Reitsam; Map by Rob Bullen (JUPOS team)



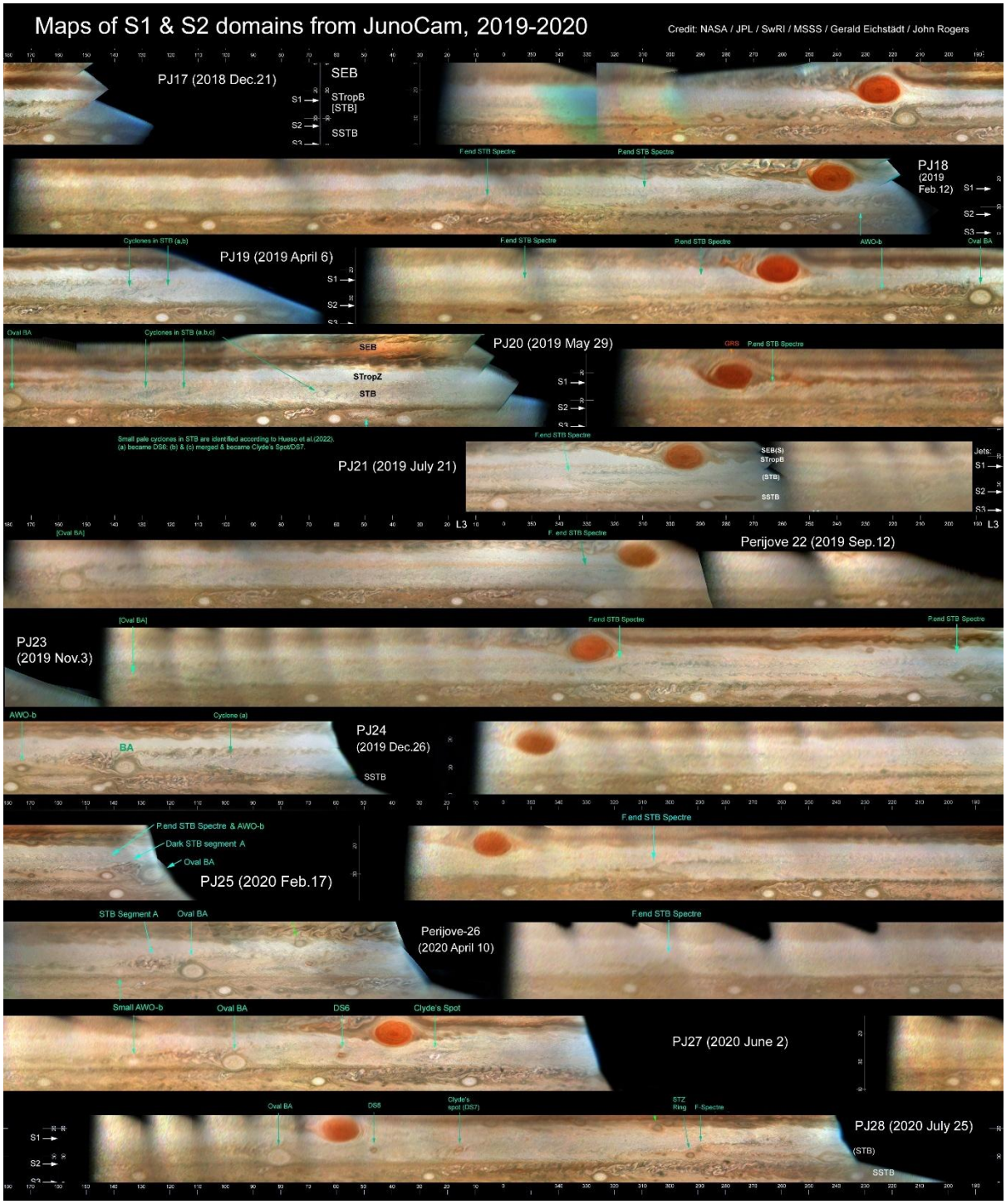
2024 Feb.9-10 Images by 7 observers; Map by Rob Bullen

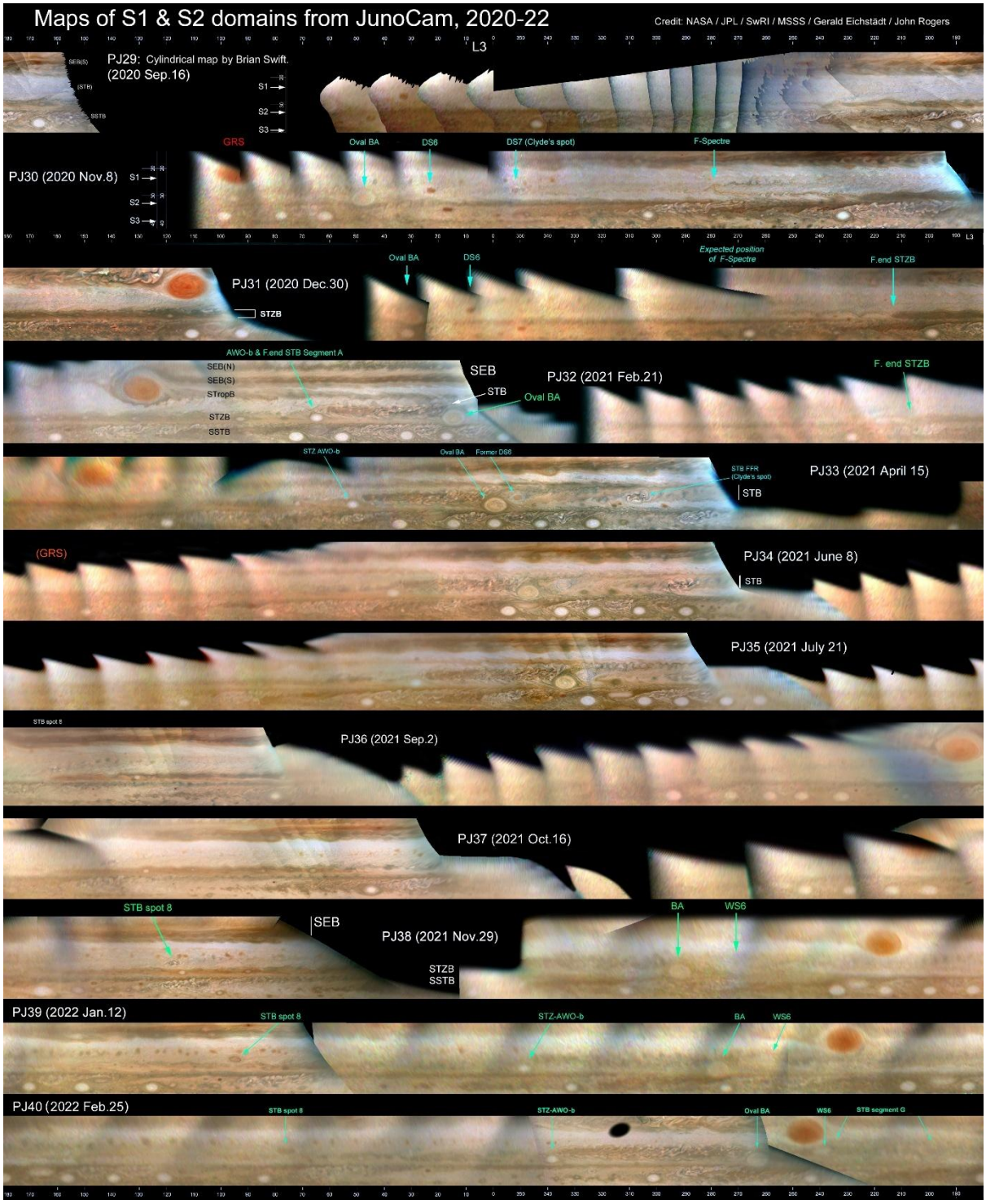


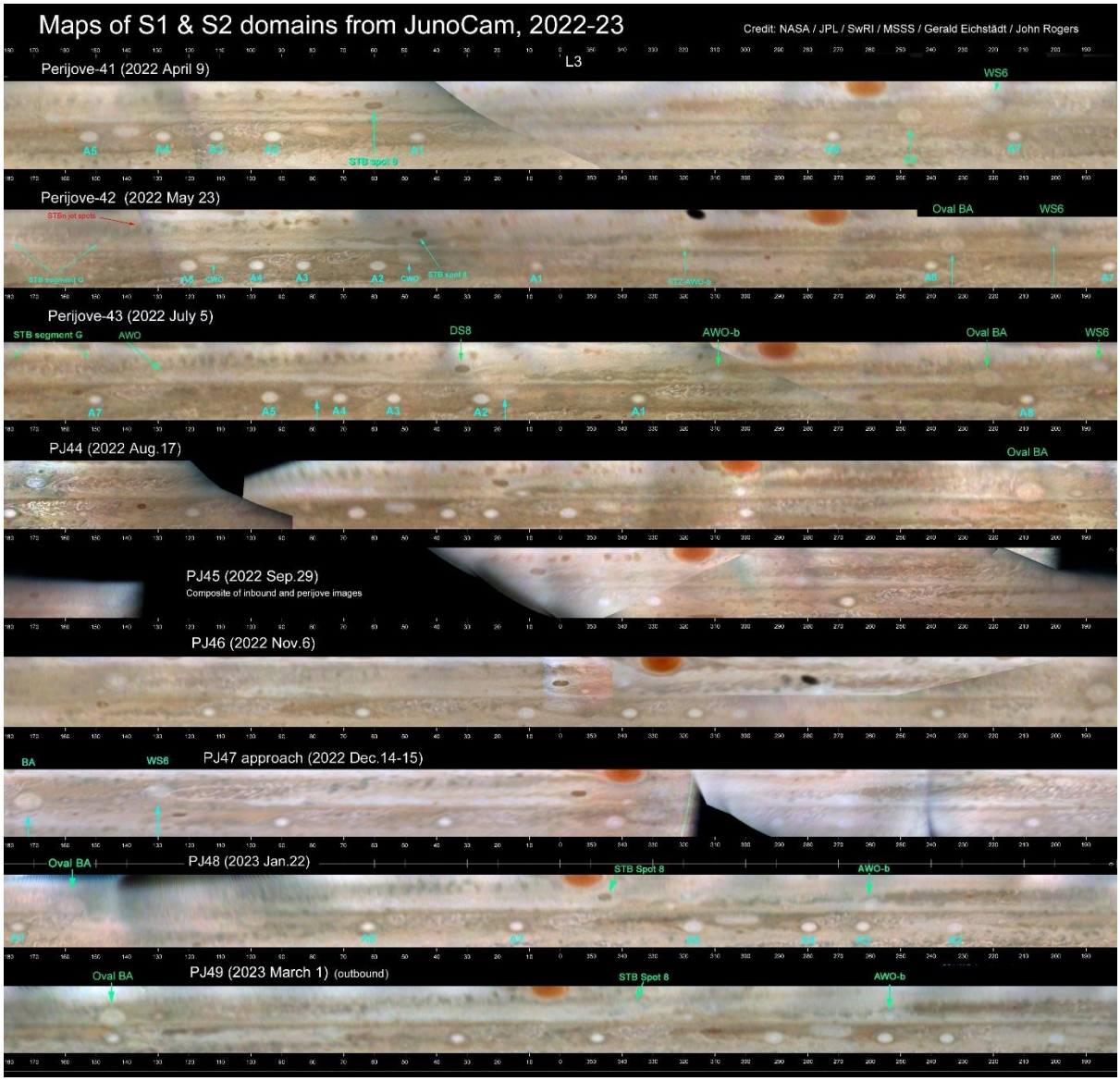
2024 March 2-3 Images by 5 observers; Map by Rob Bullen



Appendix C: Maps of the S. Temperate domain from JunoCam




Maps of S1 & S2 domains from JunoCam, 2020-22
Credit: NASA / JPL / SwRI / MSSS / Gerald Eichstädt / John Rogers
PJ29: Cylindrical map by Brian Swift. (2020 Sep.16)
L3
S1
S2
S3
PJ30 (2020 Nov.8)
GRS
Oval BA
DS6
DS7 (Clyde's spot)
F-Spectre
Expected position of F-Spectre
F.end STZB
PJ31 (2020 Dec.30)
STZB
AWO-b & F.end STB Segment A
SEB(N)
SEB(S)
STropB
STZB
SSTB
SEB
STB
PJ32 (2021 Feb.21)
F. end STZB
STZ AWO-b
Former DS6
STB FFR (Clyde's spot)
PJ33 (2021 April 15)
(GRS)
PJ34 (2021 June 8)
PJ35 (2021 July 21)
STB spot 8
PJ36 (2021 Sep.2)
PJ37 (2021 Oct.16)
BA
WS6
PJ38 (2021 Nov.29)
PJ39 (2022 Jan.12)
STZ-AWO-b
PJ40 (2022 Feb.25)
STB segment G


Maps of S1 & S2 domains from JunoCam, 2022-23
Credit: NASA / JPL / SwRI / MSSS / Gerald Eichstädt / John Rogers
Perijove-41 (2022 April 9)
L3
WS6
A5
A4
A3
A2
STB spot 8
A1
A7
Perijove-42 (2022 May 23)
Oval BA
WS6
STBn jet spots
STB segment G
A4
CWO
A4
A3
A2
CWO
STB spot 8
A1
STZ AWO-b
A8
A7
Perijove-43 (2022 July 5)
STB segment G
AWO
DS8
AWO-b
Oval BA
WS6
A7
A5
A4
A3
A2
A1
A8
PJ44 (2022 Aug.17)
Oval BA
PJ45 (2022 Sep.29)
Composite of inbound and perijove images
PJ46 (2022 Nov.6)
BA
WS6
PJ47 approach (2022 Dec.14-15)
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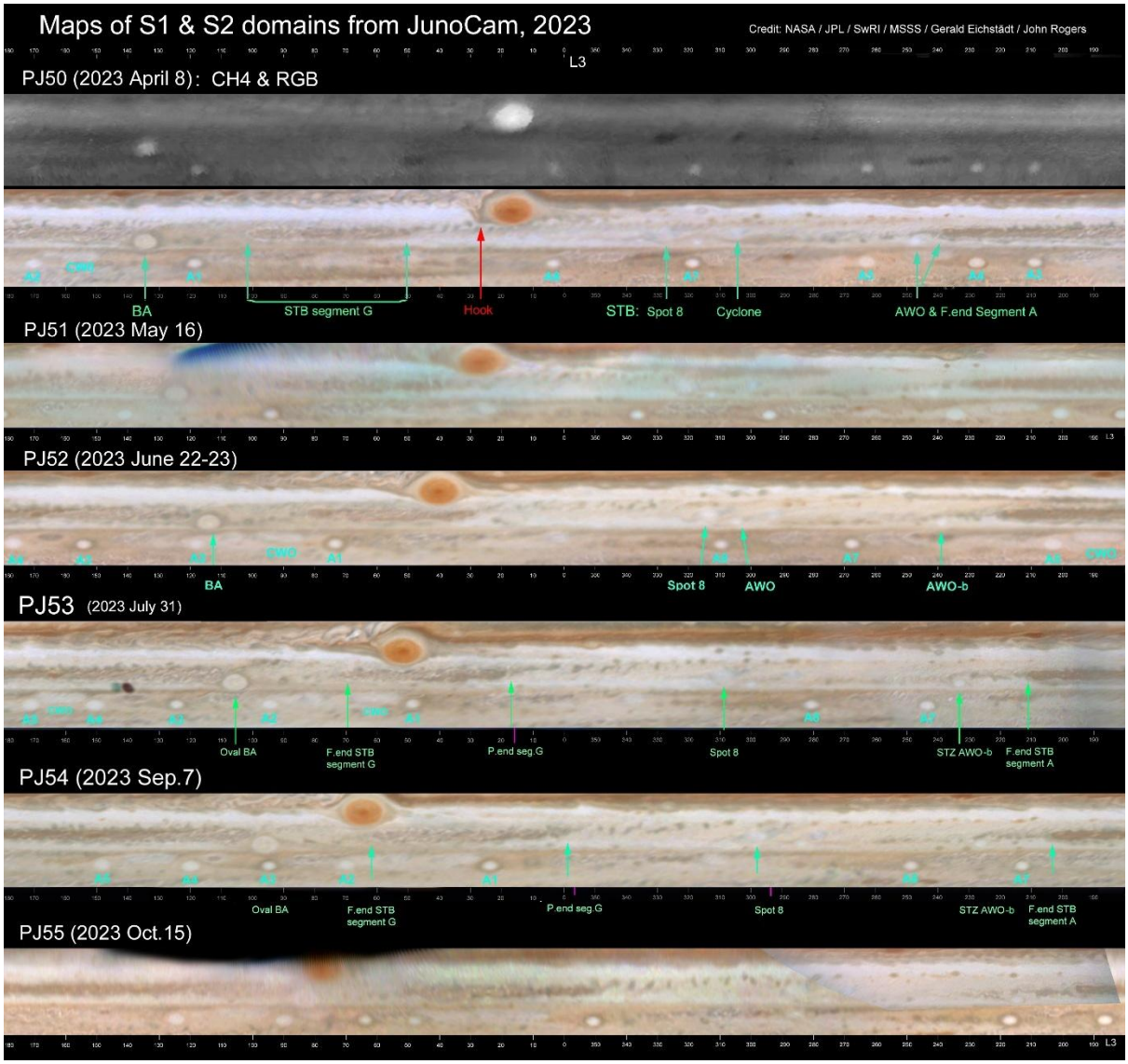
Oval BA
PJ49 (2023 March 1) (outbound)
STB Spot 8
AWO-b



Appendix D: JUPOS charts of the S. Temperate domain & STBn jet, 2018-2024

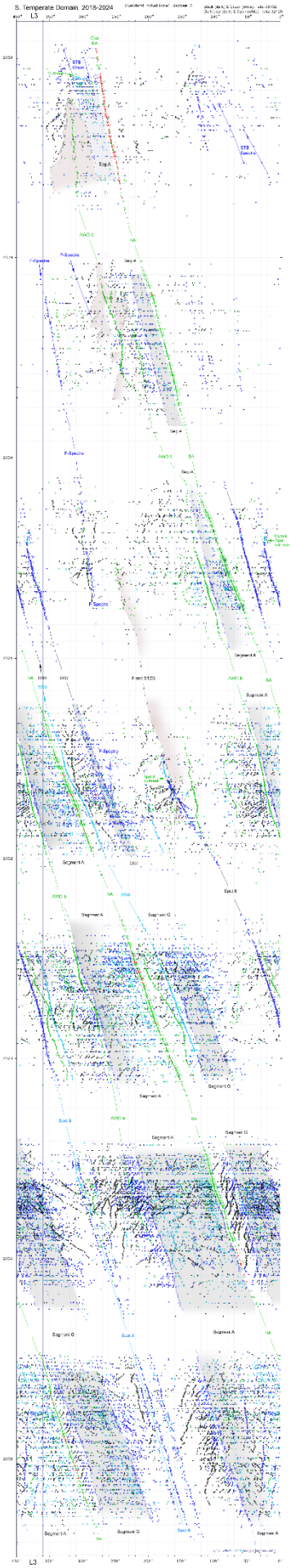
[on following pages]

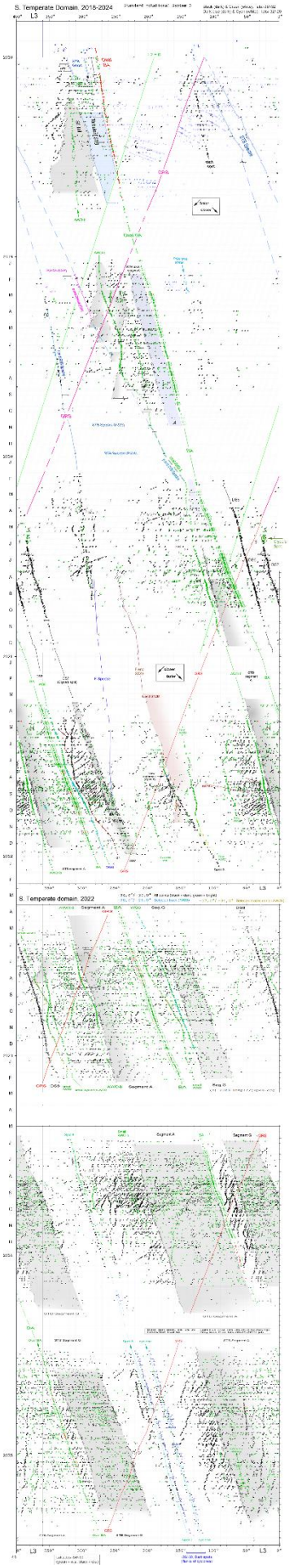
(1) S. Temperate domain, in L3: the JUPOS database, with major features annotated. Tracks of dark STB segments are shaded grey, and STZB or 'Sf. tail' shaded brown. The boundaries of the STB Spectre were seldom measured so track segments have been overlaid schematically.

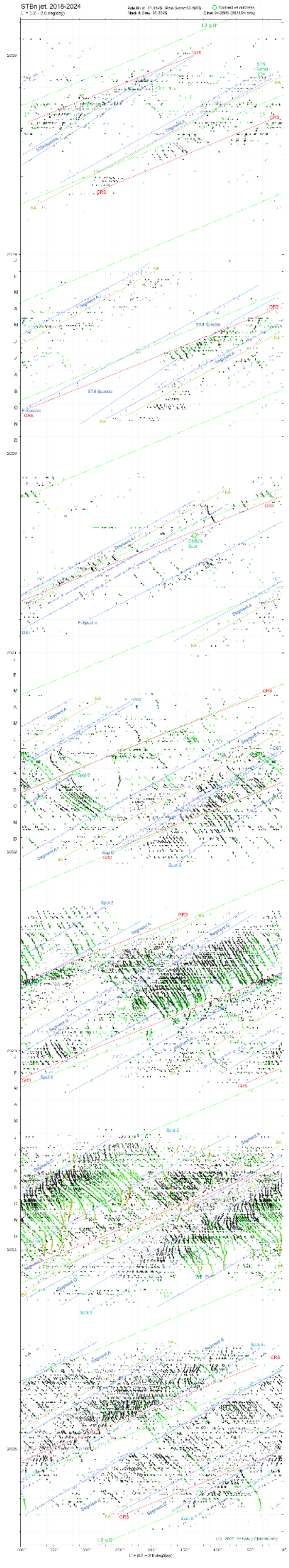
(2) S. Temperate domain, in L3: our interim charts, mostly from posted reports, re-scaled to fit chart (1). (The first two years were plotted in L2, in reverse direction, and have here been geometrically adjusted appropriately.) These charts contain additional measurements of specific features, including some from methane images (to track the STB Spectre, in magenta) or from JunoCam (during solar conjunction), and additional annotation.

(3) STBn jet: the JUPOS database, plotted in a system moving at -2.0 deg/day in L2 (-2.267 deg/day in L3). This shows most clearly the drifts of the STBn jet spots themselves. Tracks of major features in the S. Temperate domain are overlaid schematically.

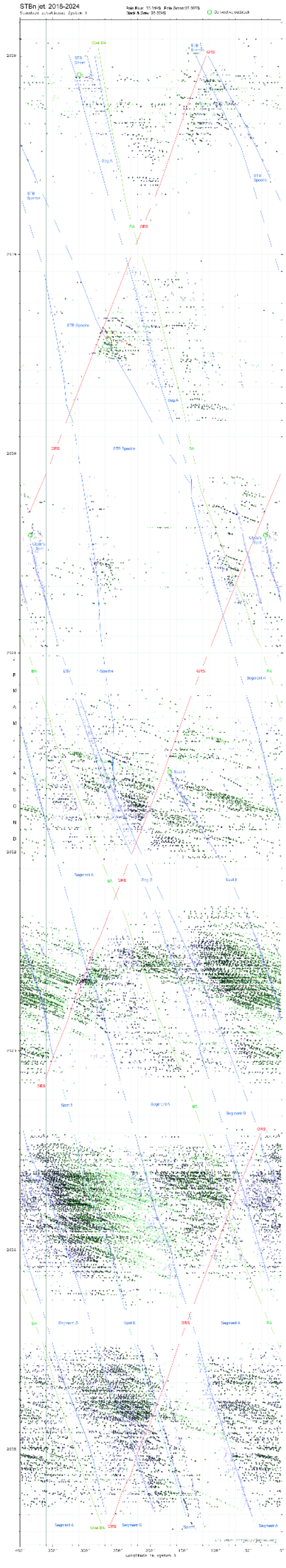
(4) STBn jet: the JUPOS database, plotted in L3. This shows how the STBn jet spots relate to the major features in the S. Temperate domain, whose tracks are overlaid schematically.


S. Temperate Domain. 2018-2024


S. Temperate Domain. 2018-2024
S. Temperate domain. 2022



STBn jet. 2018-2024
Convective outbreak
STB Ghost
BA
GRS



STBn jet. 2018-2024
Convective outbreak
Oval BA
STB Ghost
STB Spectre
GRS

Table 1 [continued from Ref.R1]:

Speeds of retrograding spots in STBs flow & jet							
2001-2012 dark spots Sf. STB segments [from our 2001-2012 report, Ref.R1]:							
Mean speeds of spots at lats. 31.5 to 32.8S (STBs jet)							
Apparition	*DL2(°/30d)*	*+/-SD*	*U3 (m/s)*	*Lat.*	*+/-SD*	*N*	
Spots f. segment A							
2001-02	**-0.3**	1.5	-3.2	**-32.5**	0.30	3	
2003-04	**12.7**	1.5	-8.5	**-32.6**	0.12	3	
2005	**27.6**	2.3	-14.7	**-32.3**	0.21	3	
2006	**5.9**	0.1	-5.7	**-32.7**	0.10	3	
	33.4	2.2	-17.1	**-32.2**	0.30	5	
J6	43.2		-21.3	-31.9		1	
2007	**14.5**	3.2	-9.3	**-32.4**	0.60	4	
	26.9	1.2	-14.6	**-31.5**	0.21	4	
J5	44.1		-21.7	-31.7		1	
2008	**18.1**	2.7	-10.9	**-31.8**	0.27	8	
2010 & 2011	**6.7**	1.9	-6.1	**-32.2**	0.21	5	
Spots f. segment D							
2010 & 2011	**15.2**	8.5	-9.6	**-32.5**	0.05	4	
(Single outlying values are omitted, except single spots labelled J6 and J5, in blue.)							
Subsequent years, f. Segment A [from our 2012-15-18 reports, Refs.R2 & R3]:							*Plus fast-retro speeds Sf. Ghost or DS5/Spectre:*
2012/13	*tbd*						
2013/14	*tbd*						
2014/15	**16.7**	7.3	-10.3	**-31.7**	0.40	9	plus d.s. recirc. Sf.Ghost, DL2=**+22**, & f.DS5, **+35**.
2015/16	**24.6**	6.4	-13.6	(-32)		15	inc. 2 d.ss.Sf. DS5/Spectre, DL2 = **+24 to +26.6**, 34.3S.
(all 3 sectors)	11 to 36		-8 to -18	-31.3 to-32.5			& recirc. ss. Sf. Spectre, DL2=**+35 & +29**.
2017	**21**		-12.1				
2018 (& see below)	**19**						after Spectre collision
Wind speeds in dark turbulent sectors, from our 2000-2012 report (Table 6) and 2015-2018 report (Table 3):							
	DL2(°/30d)	*+/-SD*	*U3 (m/s)*	*Lat.*	*+/-SD*	*N*	
Segment A (ZWP)							
2007	47.4		-23	32.0			ZWP from New Horizons, Segment A
2012	83.5		-38.1	31.8			ZWPs from HST (2012 Sep.), Segment A
1997	45		-22	32			ZWP from HST [MI&SL, 2002, Icarus 160, 316;
(range):	(11 to 86)		(-8 to -39)				similar from GM&SL, 2001]. Segment A
Pale sectors becoming turbulent							
2010	100	10	-44.4	33			Our tracking: STB Remnant tnsfmn
2018	51	12	-24.2	33			Our tracking (2 spot groups): STB Ghost tnsfmn
	120	3	-52.6				*[Add values from Hueso et al.,2022]*
Wind speeds around white STB Ghost							
2017	77.5	5.3	-35.4	32.3			HST maps
Speeds of fast-retro spots, from JUPOS tracking, in this new 2019-2023 report:							
The most rapidly-retrograding spots or groups are listed; single spots entered in blue.							
	DL2(°/30d)	*+/-SD*	*U3 (m/s)*	*Lat.*	*+/-SD*	*N*	
2019	[None >+10]						
2020:							
Alongside Spectre	68		-31.2	32.9		1	Decel. to +24 deg/30d on passing F-Spectre
F. Seg.A	69		-31.8	32.5		1	Then moved S and decel. to +7 deg/30d.
2021:							
F. Seg.A	59.1	3.7	-27.8	32.2	0.1	3	Peak group; others less rapid.
F. Seg.G	27.3	5.0	-14.7	31.9	0.4	9	
F. Spot 8 (d25)	18		-10.6	33.7		1	fastest of 2 just after outbreak
P. Seg.G (d5)	26		-13.8	33.7		1	fastest of 2 before Spot 8 outbreak
2022:							
F. Seg.A (d17)	16.5		-10.1	32.5		1	Also one in Seg.A
& (extra)	45		-22.0	31.9		1	
F. Seg.G & Spot 8	20	2.0	-11.5	33.1		4	
2023:							
In Seg.A (S side)	34.4		-17.5	32.6		1	Fastest-retro of group, southerly ZDP
F. Seg.A, proximal	11.7	1.3	-8.2	31.8	0.3	3	
F. Seg.A, distal	29.6	1.6	-15.6	32.1	0.4	3	One briefly reached +45 deg/30d, moving S
P. Seg.G	43.2	0.3	-21.2	31.8	0.3	2	
F. Seg.G	[None >+10]						

Table 2: Drift rates of long-lived features

Measured from JUPOS charts Grey italic type: Imprecise.
Yellow side-bar: Mean drift over solar conjunction.

	Start	End	DL2 (deg/30d)	Notes
Oval BA	2018 April	2018 July	-13.8	
Oval BA	2018 Sep.	2019 Jan.	-15.2	
Oval BA	2019 Jan.	2019 Mar.	-17.1	
Oval BA	2019 Mar.	2019 Aug.	-14.2	
Oval BA	2019 Aug.	2020 Mar.	-13.6	
Oval BA	2020 Mar.	2020 Dec.	-17.3	Oscillating
Oval BA	2020 Sep.	2021 April	-16.8	
Oval BA	2021 June	2021 Dec.	-17.6	
Oval BA	2021 Dec.	2022 April	-18.6	
Oval BA	2022 April	2022 Nov.	-16.2	
Oval BA	2022 Nov.	2023 Feb.	-19.0	
Oval BA	2023 Feb.	2023 June	-16.4	
Oval BA	2023 June	2024 Mar.	-16.2	Oscillating
Oval BA	2024 Jan.	2024 July	-18.3	
		Mean	-16.45	
		Mean	-17.4	(2020-2024)
AWO-b	2018 April	2018 July	-9.6	Oscillating
AWO-b	2018 Sep.	2019 Mar.	-14.5	
AWO-b	2019 Mar.	2019 Sep.	-18.5 -> -9 -> -32	
P-Spectre & AWO-b	2019 Aug.	2020 Feb.	*-22.3*	
AWO-b	2020 Mar.	2020 June	-12	Varying
AWO-b	2020 June	2020 Dec.	-16	Varying
AWO-b	2020 Sep.	2021 May	-15.5	
AWO-b	2021 April	2022 Jan.	-14.2	Oscillating be
AWO-b	2022 Jan.	2022 May	-14.7	
AWO-b	2023 Jan.	2023 July	-12.0	
AWO-b	2023 July	2023 Sep.	-14	
		Mean	-14.4	
		(since 2020 June)		
P-Spectre	2018 Mar.	2018 July	-21.6	
P-Spectre & AWO-b	2019 Aug.	2020 Feb.	*-22.3*	
		Mean	-21.95	
F-Spectre	2018 Mar.	2018 May	-20.4	
F-Spectre	2019 Feb	2019 Aug.	-12.9	
F-Spectre	2019 July	2020 Mar.	-12.3	
F-Spectre	2020 Feb.	2020 June	*-10.6*	
F-Spectre	2020 July	2020 Nov.	*-11.1*	
F-Spectre (approx)	2020 Sep.	2021 May	*-10.6*	
		Mean	-13.0	
		(since 2019 Feb.)		

F.end Seg. A	2020 June	2020 Dec.	-14.5
F.end Seg.A	2021 April	2021 Dec.	-14.7
F.end Seg.A	2021 Dec.	2022 May	-14.7
F.end Seg.A	2022 May	2022 July	-13.8
F.end Seg.A	2022 Aug.	2022 Oct.	-17.5
F.end Seg.A	2022 Oct.	2023 Feb.	-14.4
F.end Seg.A	2023 Jan.	2023 Aug.	-14.8
F.end Seg. A	2023 June	2023 Oct.	-14.5
F.end Seg. A	2023 Oct.	2023 Dec.	-17.5
F.end Seg. A	2024 Jan.	2024 Mar.	-14
F.end Seg.A	2024 Feb.	2024 July	-15.5
		Mean	-15.1
	(omitting 2 extreme values)		SD:
Pre-DS6 cyclone	2019 June	2019 Sep.	-11.9
Pre-DS7 cyclone	2019 July	2019 Sep.	-10.5
Clyde's spot	2020 May	2020 June	*-9*
--> DS7	2020 June	2020 Dec.	-15
DS7	2020 Sep.	2021 June	-16.2
DS6	2020 April	2020 Nov.	-14.8
DS6 -> WS6	2020 Nov.	2021 April	-13.6
WS6	(2021: Variable)		
WS6	2021 Dec.	2022 May	-21.2
WS6	2022 April	2022 June	-19.6
WS6	2022 July	2022 Dec.	-17.8
P.end DS7	2021 Mar.	2021 Oct.	-17.2
P.end Seg.G	2022 July	2022 Oct.	-18
P.end Seg.G	2022 Oct.	2023 Jan.	-17
P.end Seg.G	2022 Dec.	2023 Aug.	-17.2
P.end Segment G	2023 Aug.	2023 Oct.	-19
P.end Segment G	2023 Nov.	2024 April	-17
P.end Seg.G	2024 Jan.	2024 Aug.	*-15.8*
		Mean	-17.6
		(except last)	
Spot 8	2021 Aug.	2021 Dec.	-22.7
Spot 8	2022 Jan.	2022 May	-19.5
DS8	2022 June	2022 Oct.	-16.2
DS8	2022 Oct.	2023 Jan.	-12.5
Spot 8 (DS -> WS)	2023 Jan.	2023 June	-14.5
Spot 8	2023 June	2023 Aug.	-12.5
Spot 8	2023 Aug.	2023 Dec.	-16.5
Spot 8	2024 Feb.	2024 July	-15.7
		Mean	-14.65
		(since 2022 June)	
F.end STZB	2021 Mar.	2021 Aug.	-15.6

Table 3. Speeds of STBn jetstream spots

[Continued from tables in Refs.R1-R3]

	DL2 (deg/30d)				***u (m/s)***		*Lat.*		*N*	*Notes*
	Min	**Mean**	SD	Max	**Mean**	SD	(deg.S)	SD		
2018 May-July		**-87**	1		**33.9**	0.4	29 --> 28		3	
		-74			**28.3**		29 --> 28		2	
2019 May	-79	**-104.1**	10.7	-119	**41.9**	4.7	26.4		12	Wavetrains on STropB p. GRS
June	-65	**-79.2**	7.2	-89	**31.1**	3.1	26.3		13	Wavetrains on STropB p. GRS
Oct.		**-77**			**29.8**		27.8		2	Short train p. BA
2020 Mar.-Oct.	-78	**-82.1**	2.7	-86	**32.2**	1.1	27.2	0.4	6	P.BA (Mar.-May) & past
										Clyde's Spot (July-Oct.)
2021		**-85.8**	13.4		**34.2**	5.8	<26.0		8	Unusual at low lat.
Sep-Oct.		**-94.0**	3.9		**37.3**	1.7	>26.0		6	P. new Spot 8
Aug-Sep.		**-84.3**	3.9		**33.1**	1.7	>26.0		8	P. WS6/BA
Oct-Jan.		**-79.2**	4.1		**30.1**	1.8	>26.0		10	P. DS7 (major outbreak)
Total		***-84.9***	*8.8*		***33.7***	*3.8*			*32*	
2022 Apr.-Oct.		**-75.8**	4.1		**29.5**	1.8	26.7	0.6	76	In dense outbreaks p. BA & Seg.G.
2023 June -->		**-88.8**	4.8		**35.4**	2.1	26.1	0.2	60	P. Segment G (massive outbreak)
2024 Jan.		**-85.7**	2.9		**33.7**	1.3	27.4	0.5	25	On N edge of Seg.A
Sep-Nov.	-110	**-120.3**	10.5	-143	**47.8**	4.6	29.4	0.3	9	On N edge of Seg.G (Sep-Nov.)