JUPITER IN 2007: FINAL NUMERICAL REPORT

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Part 6: N.N. Temperate Region to N. Polar Region

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These latitudes were not affected by the global upheaval.
The drift rates of spots **(Table 6 & Fig.33)** generally agree with the spacecraft zonal wind profile **(Fig.1),** except that the spots in N^3TC show a more shallow profile (as in the NTropC). In the N^4TC, as in the high southern latitudes, the spots adhere closely to the spacecraft profile, even when they are stable AWOs or belt segments. In both domains, **Fig.1** indicates that all the spots with DL2 faster than -20 deg/mth are in an anticyclonic zone (N^3TZ or N^4TZ), whereas the latitudes of the slower ones do not clearly indicate their sense of rotation.

N.N. Temperate Region

There was one distinct segment of NNTB, 15-22 deg. long., with the long-lived NNTZ Little Red Spot adjacent to its f. end (see maps from April-May in **Fig.2**).

The LRS was a dull reddish oval. This colour was never very strong in 2006 or 2007, and seemed to become weaker from April to August, being virtually identical to the brown of the surrounding NPR. The LRS is always bright in methane images (e.g. Don Parker, Aug.3). There were also two AWOs in the same latitude, also tracked from 2006.
As is often the case, the drift rates for all these features alternated unpredictably between ‘true NNTC’ (DL2 ~ 0) and faster rates typical of N^3TC (DL2 = -11 to -22). This year the ovals spent most of their time in the latter state.

N^3-N^4 Temperate Regions

The JUPOS chart shows a widespread, consistent N^3TC with DL2 = -16 **(Fig.33A)**.

A significant disturbance affected latitudes 45-55ºN, longitudes L2 = 220-350, in June, with sudden acceleration of several spots in the N^3TC, and appearance of new spots in the N^3TZ **(Fig.33A)**, and sudden appearance of many dark and bright spots in the adjacent N^4 Temp. region as well **(Fig.33B)**. No such coordinated disturbance, limited in longitude but affecting two adjacent domains, has been observed in such high latitudes before. What was the nature and cause of this disturbance?

In the N^3 Temp. region, the affected white spots and new dark spots were at 45-47ºN (canonical N^3TZ), the accelerated white spots being at the higher latitudes. Inspection of v-hi-res images does not show any obvious cause. The earliest features of the disturbance were at L2 = 270-320, on May 23: acceleration of N^3TC white spot no.6, and appearance of fast-moving dark spot no.10, with another just f. it. These were on Peach’s first images taken at Barbados, but the phenomenon was not an artefact of v-hi-res imaging; the white spots were well tracked both before and after their acceleration, and the small dark spots were also recorded by other observers. Could no.10 be a N^4TBs jet-stream spot, initiating a jet-stream outbreak analogous to those at lower latitudes, which generated the disturbance? However, it was not moving with full jet-stream speed. (Peach's images even show an even faster tiny dark spot, catching up with no.10, with estimated DL2 ~ -70 at lat.~47ºN: probably on the true N^4TBs jet.)

From the start of June, other N^3TZ white spots accelerated, and more new (stationary) spots appeared in the N^4 Temp. region at 51-54ºN. Note that accelerations were linked to latitude shifts (Table 6) and there was no change in the zonal wind profile (Fig.1).

While the cause of this disturbance remains obscure, this may be an example where modern observations reveal a phenomenon of these hitherto-obscure high latitudes which does not belong to the categories that we recognise in lower latitudes.

In the N^4 Temp. region, one notable white spot was no.2, which has been tracked since 2006, and was very stable with normal N^4TC drift until it suddenly shifted 2 deg. north and accelerated to DL2 = -30 for just 2 weeks, before reverting. This speed represents partial influence of the next prograde jet ('N^5TBs') at 56ºN, as was also seen for an AWO in 2000/01.

In addition to all these compact spots, the North Polar Region has larger, more irregular features, shown in north polar projection maps by Peach and by Cassini **(Fig.34)**. The NPR (everything N of the NNTZ) has no well-defined belts. It looks like an irregular network of dark lanes, with lighter, vaguely circular patches between them. The Cassini map shows that these light patches are cyclonic folded filamentary regions (FFRs). At lower latitudes FFRs are more localised, but in the NPR they are the largest and most extensive structures, and they are seen even very close to the north pole.

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TABLE 6 AND FIGURES ARE ON FOLLOWING PAGES.

TABLE 6.

2007: Positions and drift rates: NNTB to NPR

Current/ Spot no.	Description	L2(O)	DL2 (inc. sequences)	Lat.	SD	Dates	Notes
NNTC							
NNTB:							
1	DS (1 of 2)	174	+17	38.2	0.47	May-June	
2	Dark segment NNTB:					Mar-June	
	p. end	(185)	-19	37.6	0.42	June-July	
	f. part	--	-8	37.9	0.56	June-Sep.	
	f. end	198	(0);-12;-7	37.9	0.54	Mar-Sep.	(alongside LRS)
3	DS	(201)	+1	38.4	0.39	June-Aug.	Detached from 2f.
NNTZ:				38.00	0.31		
Oval-1	LRS-1	199	0;-14;(-2)	40.8	0.5	Mar-Aug.	Large, dull reddish oval
Oval-2	AWO	311	-18;-14;-4;(-8)	41.2	[assumed]	Jan-Oct.	[These latitudes are not independent
Oval-3	AWO	54	-12;-22;-11; 0;-12	41.4	[assumed]	Feb-Aug.	as JUPOS measurers often assumed latitude +41.2 in fitting the disk.]
Means:			-13.1				(N=12) Faster tracks
			-0.8				(N=6) Slower tracks
N3TC							
2	DS	(65)	-18	45.6	0.52	Feb-Apr.	[There is no no.1]
3	WS	150	-15	45.4	0.6	Apr.-Aug.	
4	DS	156	-16.5	45.6	0.93	Feb-July	
5	WS	(256)	-15	45.5	0.54	Apr-May	Var. drift before and after (Feb-Aug.)
6	WS	(275)	-12	44.9	0.42	Apr-May	faster before and after (Feb-Aug.)
7	WS	320	-17	45.3	0.57	Feb-June	faster after (see below)
8	WS	(178)	-16	44.4	0.58	July-Aug.	
Mean (spots 2-8):			-15.6	45.2	0.4		(N=7)
Disturbed sector, June-August:							
5b	WS		-30 (var.)	46.6	0.66	June-Aug.	Suddenly accelerated
6b	WS		-25	45.3	0.49	May 23-June 12	Suddenly accelerated
			-28 to -15 (v)	45.5	0.60	June-Aug.	
9	WS		-16	44.4	0.76	June-Aug.	New
10	DS		-33	46.0	0.31	May 23-June 9	New
			-15	45.7	0.63	June-Aug.	
7b	WS		-28 (var.)	46.0	0.72	June-Aug.	
11	P. end dk. streak		-20	46.0	0.41	June-Aug.	
12	WS		-13	45.1	0.55	July-Aug.	
N4TC							
1	DS	68	-1	49.8	0.5	May-July	
2	WS	155	+6.6	52.3	0.7	Feb-July	Tracked since 2006; v. stable until
			-30	54.3	0.67	July 17-31	sudden switch in lat. & drift
			(+3.5)	53.8	0.3	Aug.3-Sep.3	
3	WS	(248)	-19	54.5	0.8	Apr.24-May 14	Alongside N3TC no.3
Disturbed sector, June-August:							
4	3 WSs	220-265	+6	51.6	0.8	June-Sep.	
	& one of these:	228	-1	50.3	0.6	July-Aug.	
5	5 DSs	240-360	mean +6 range +3 to +9	52.9	0.7	June-Aug.	
6	3 DSs	230-270	mean +6	50.6	0.9	July-Aug.	
7	1 DS	--	-19	54.2	0.9	July25-Aug.18	
Mean (exc. fast spots):			-4.9	51.8	1.4		(N=15)

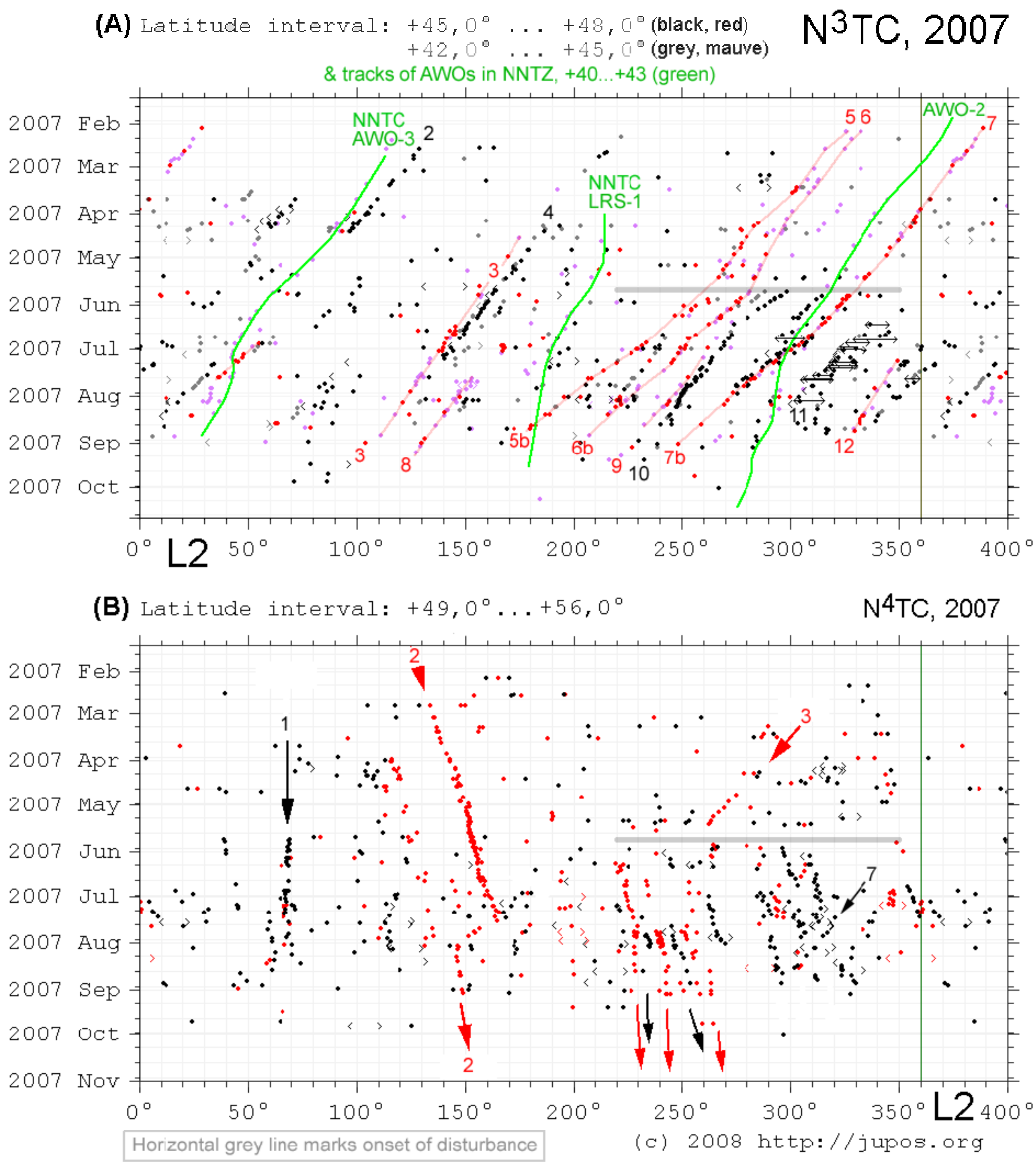

Fig.33. JUPOS charts of N^{3}TC (A) and N^{4}TC (B). In (A), tracks of the 3 NNTZ ovals are added in green. In both charts, the horizontal grey line marks the onset of the disturbance: note acceleration of spots in N^{3}TC below this line, and appearance of many new spots in N^{4}TC. (The acceleration of N^{3}TC w.s. no.7 led to it overtaking NNTC w.s. no.2 which was decelerating, after they had travelled in parallel for months.)

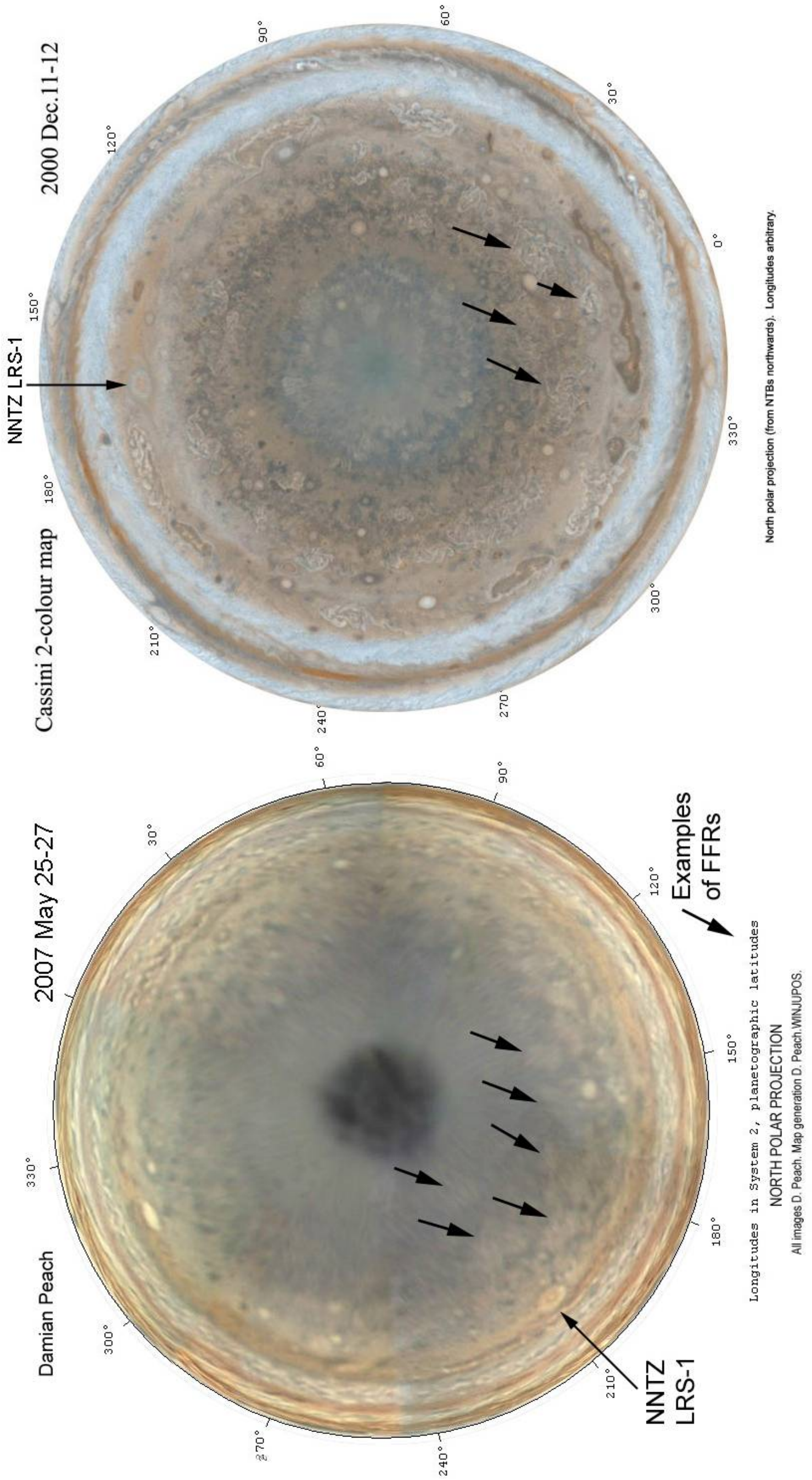

Fig.34. North polar projection maps by Damian Peach and by Cassini. The NPR looks like an irregular network of dark lanes, with lighter patches between them (arrows). The Cassini map shows that these light patches are folded filamentary regions (FFRs), which are the largest and most extensive structures in the region, and they are seen even very close to the north pole.