Gianluigi Adamoli, Grischa Hahn, Michel Jacquesson, Hans-Jorg Mettig, Marco Vedovato, & John Rogers

APPENDIX 4:

EXCERPTS FROM PREVIOUS REPORTS ON OUR WEB SITE COVERING THE S.TEMP. DOMAIN. *(Illustrations not included.)*

Reports in 2003-04 :

[no longer on web site; figures expanded in this report]

Three bulletins [2004 April 10]:

III. Report on the S. Temperate region f. oval BA:

White oval BA, and the S. Temperate region just f. it, attracted attention around the New Year. Here is a short report and a compilation of the best images, describing and interpreting what occurred. Oval BA has been a well-defined white oval with a dark rim throughout the apparition. Following it, there has been a rapid interconversion of different states of cyclonic structure in the STB. This year's images are revealing small-scale phenomena that have not been clearly recorded since the Voyager imagery.

2003 Oct-Nov: As shown by the JUPOS chart by Hans-Joerg and colleagues, oval BA was moving more slowly than other features in the S.Temp.R. In particular a bright section (where both STZ and STB were white) was approaching it, and the short section of dark STZ/STB between them was rapidly shrinking. This may be why oval BA suddenly accelerated around Dec.1.

Dec.2-17: Following oval BA was a white sector of STB, 27 deg. long (labelled W on the images). Although the resolution was insufficient to be sure, this may have been a closed cyclonic circulation, i.e. a small 'STB Fade' sector.

Following this was a dark brown spot (labelled LBS), in the STZ, gradually fading. This may have been an anticyclonic ring like DS3 a few years ago.

Dec.29—Jan.4: Following oval BA, v-hi-res images revealed that the white sector had turned into a turbulent patch (as pointed out by Isao Miyazaki and Jesus Sanchez). The conversion is probably occurring on Dec.24 in Miyazaki's image. This patch was a cyclonic 'folded filamentary region' in Voyager terminology (labelled FFR) – analogous to the post-GRS disturbance in the SEB, but not normally resolvable in the STB. This was a short-lived state, marking the conversion of this cyclonic sector from a white oblong, through the turbulent FFR, to normal dark belt – again similar to phenomena witnessed in spacecraft movies.

Following this FFR, the LBS was still present in STZ, but faint.

Jan.17 onwards: Following oval BA, the STB had now become dark, although still often irregular on a small scale.

The LBS in STZ had disappeared [around Jan.4], but a different brown spot was visible from Feb.4-10 within the STB (labelled LBS2). This was presumably a residual cyclonic circulation in the belt (a miniature barge); it was not detectable thereafter. Conversely, just Sf. it on STBs, v-hi-res images from Feb.23 onwards (and especially March 6 onwards) revealed a tiny anticyclonic ring (labelled AWO).

Reports in 2005-06 :

[11] Interim reports on the SSTB (cyclonic white ovals break up) and STB (A remnant or a forerunner?) (Reports, 2006 July 30)
http://www.britastro.org/jupiter/2006report11.htm

STB: A remnant or a forerunner?

The STB Remnant (seen in the same images) is an obscure faint bluish streak in otherwise whitened STB latitudes, but I think it is important. From its latitude and appearance, it is probably a cyclonic disturbance, perhaps like a FFR. It thus constitutes an active complex in the STB, approximately half way round the planet from the other such complex; but it has no large AWO.

This second complex is essentially an 'orphan' cyclonic circulation such as those observed by the Pioneer and Voyager spacecraft (see book p.228). In those days, in addition to the 3 widely spaced AWOs, the orphan cyclonic region divided the STB into four. At other times the STB was just divided into three by the three great AWOs. In the late 1980s, the STB became divided into two, with one complex containing AWOs BC + DE, and the other containing oval FA. When they all combined into one complex, new spots arose to create a second complex which existed from 1998 to 2003. (This is the situation shown in the Cassini movie.) When it too merged with the first complex (now characterised by the single AWO BA), new spots again appeared on the other side of the planet, and these have persisted as the present STB Remnant.

In summary, there must always be 2-4 active complexes spaced around the S. Temperate domain. If there is a large gap, a new feature arises to maintain the spacing, often an orphan cyclonic circulation.

But we are also waiting for another phenomenon to occur. As there is only one great oval left, will the S. Temperate domain again become subdivided into several large anticyclonic cells which contract to form a new generation of great AWOs, as happened from 1940 onwards (see book pp.223-228)? The first sign of that happening was the appearance of three short dark features (dusky STZ or STB(S)), subdividing the STZ. This could describe the appearance of the two active complexes in the present STB! They do not have the circulation patterns expected for the origin of great anticyclonic circulations (see the Cassini movie): but could they be the fore-runners of the same process? Time will tell.

[& previously:, no.[9]:]

STB: Oval BA's red ring is unscathed as it drifts past the GRS:

Oval BA marks the p. end of the only large dark sector of STB: this is the major complex of activity in this domain.

Note that p. oval BA, the STB is largely faint (white) except for a narrow STB(N), which is probably composed of small dark spots prograding from the active complex in the STBn jet stream. (See the Cassini movie for a dramatic view of the dynamics in this region, showing how the active complex emits dark spots on al adjacent jetstreams.) This STB(N) has become longer and darker since oval BA started passing the GRS.

As it started to pass the GRS, the whitened STB immediately p. oval BA dramatically turned very dark (see images of June 21—July 7). But since then, the dark patch has become smaller again (July 8-27).

Albedo changes like this are quite common as these great S. Temperate ovals pass the GRS, as the compression of jetstreams here clearly destabilises the cloud layers.

However no change was expected to the internal circulation of oval BA, and there has been no change in its colour: the orange ring is still a striking feature in hi-res images (as of July 27).

Reports in 2007:

[20] Jupiter in 2007: Final Numerical Report.
http://www.britastro.org/jupiter/2007report20.htm

S. Temp. Region:
The only major anticyclonic spot was **Oval BA**, which retained its orange colour from the previous year, although the colour faded somewhat during 2007. [It has been well shown in many previously posted images of STrD-1; also **Figs.11 & 12** in next part.] Its track, remarkably, showed 3 cycles of an oscillation with period ~ 90 days, in phase with that of the GRS! **(Fig.9)** We have searched previous years' charts for any similar oscillation without a clear positive result. (In even-numbered years, its motion is perturbed by passing the GRS. In odd-numbered years, it has shown smaller changes in speed which are not convincingly correlated with those of the GRS.)

F. oval BA, there was the now-familiar large-scale structure: the single dark segment of STB, punctuated by a small AWO (STC no.2), and followed by a string of slow-moving dark spots in the STZ. The latter (nos.5-17) came in groups with different speeds, one group having DL2 = +33: equal to the full retrograding speed of the STBs jet-stream!

There is a second long-lived large structure in this domain, a cyclonic cell called the **STB Remnant (Fig.10)**. As usual it had low contrast, being very pale blue-grey, within a sector of very faint STB. It was passing the GRS from April to June. It showed little change all year, but as it passed the GRS the STB(N) alongside it darkened for ~2 months. Also, as the p. end emerged p. the GRS in May, an additional oblique faint streak appeared just p. it; this feature persisted.

Reports in 2008 :

[6] Jupiter in 2008: Full Interim Report. [2008 August].
http://www.britastro.org/jupiter/2008report06.htm

S.Temp.Region:

The STB is still thin or absent around most of the circumference.

The STB Remnant is a long-lived, low-contrast, large cyclonic cell, ~20 deg. long, still very pale blue [Fig.3]. It is dark in methane-band images. P. it is a much smaller oblique streak, also pale blue and methane-dark. The surrounding STB has been absent (white and methane-bright), but in late July diffuse pale brown STB material prograded to this region, so in some images the STB Remnant now appears light with a slightly darker surround.

Its important status has been confirmed by the anticyclonic recirculation of two SSTBn jetstream spots, each of which performed a U-turn at its f. end, in June and in July [Fig.4] (and possibly one in early May which disappeared). After the turn they retrograded in STZ, with DL2 = +8 to +12, for at least 2 weeks, though they then drifted south and ceased retrograding.

Thus, the STB Remnant obstructs jetstream flow in the STZ. In fact, Mettig recently posted a chart which suggests that similar recirculations have happened in other years starting in 2004:
http://jupos.privat.t-online.de/img/spec_STCS_1999-2008.GIF

This is interesting as we are looking for new large-scale anticyclonic circulations to develop in the STZ to replace the old AWOs which merged a few years ago.

Retrograding small dark spots are also seen elsewhere in the STZ, including one with DL2 = +36: probably the fastest yet observed here, close to the full speed of the STBs jetstream.

The most conspicuous S. Temperate features are still oval BA and structures f. it, with little change since last year. Oval BA (DL2 = -14.5) still has a pale orange annulus. There was little change in the oval or its surroundings as it passed the GRS: conjunction was on July 1 [see illustrations in previous report on the LRS]. F. it is the only really dark segment of STB, which breaks up to Sf. with retrograding spots (DL2 = +17), which terminate at a conspicuous, very dark oval in STZ ('STZ Dark Spot': DL2 = -16). This must be anticyclonic so its very dark grey appearance is unusual; it resembles 'DS3' of a few years ago.

P. oval BA there is a long dark but narrow segment of STB(N) (see below); and diffuse light brown material is extending even further p. (see above).

STBn jet:
The STB(N) carries very small jetstream spots (DL2 = -99) that arise just p. the GRS, but are not distinct until they have passed another STB dark spot (L2=36 on July 9, DL2 = -16). Some of them survive as far as the STB Remnant and a pair passed it with only temporary hesitation then re-acceleration.

Reports in 2009:

[6] Jupiter in 2009: An interim report (2009 Sep.)
http://www.britastro.org/jupiter/2009report06.htm

STZ/STB:
The next AWO to the north, oval BA, was reddish from 2006 to 2008 but has almost no colour in 2009. The formerly orange ring within it is now the same pale fawn colour as its surroundings.

The STB is tenuous at most longitudes, as usual, but has developed a new dark sector, which is f. the GRS and due to pass the GRS later this year (marked 'STB-1' on Fig. 5). This has developed in a long gap, opened up by the convergence of the other two long-lived STB sectors: the short, very dark block f. oval BA ('STB-2' on Fig. 5), and the long, very pale blue 'STB Remnant'. The STB Remnant itself formed in identical circumstances in 2004-05 [http://www.britastro.org/jupiter/2006report07.htm and ...report11.htm].
Images this year give more evidence that it is a cyclonic cell: its darkness in methane-band images, and its sinuous blue outline in an exceptionally fine image by A. Wesley on Aug.4 (Fig.6).

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[7] Jupiter in 2009: Interim Report, with new insights into the NTZ disturbance, NEB expansion, and SEB fading.
http://www.britastro.org/jupiter/2009report07.htm

STBn jet:
Many jetstream spots were recorded, DL2 = -82 deg/mth, all arising at the p. edge of the dark segment STB-1 (see below). Initially they only travelled <40 deg and disappeared on reaching the GRS. From Oct. onwards, as STB-1 passed the GRS, the STBn jetstream spots were travelling further.

STB (Figs.15 & 16):
There were 3 segments of STB, provisionally named as follows:
(1) STB-1: A new dark segment, which arose from a single very dark spot that was present in 2008. It has become a major dark segment of STB, with slower dark spots drifting away at its Sf. end, and rapidly prograding SSTBn and STBn jetstream spots arising at its p. edge. All these are typical aspects of such STB segments (see the Cassini movie).
(2) STB-2: The dark segment f. oval BA: during 2009 it shrank to become a single very dark spot on the f. edge of oval BA (Figs.2,16,17).
Oval BA had suddenly decelerated in 2008 Sep. and in early 2009. In 2009 it maintained fairly steady drift but unusually slow (DL2 = -10.0 deg/mth). Oval BA was almost colourless for most of 2009, but regained some orange colour in Dec., and was distinctly orange even in lo-res images in 2010 Jan. (Figs.2,17,14). The dark spot, and a small AWO, persisted f. oval BA.
(3) STB Remnant: As in the previous year, "The STB Remnant is a long-lived, low-contrast, large cyclonic cell, still very pale blue. It is dark in methane-band images. P. it is a much smaller oblique streak, also pale blue and methane-dark." [Refs.2 & 4]. It was catching up with STB-2, and in 2009 Oct., the oblique blue streak came into contact with the small AWO, which thereupon lost its dark rim (Figs.16 & 17).

Reports in 2010/11:

[8] Jupiter in 2010: Interim report: Southern hemisphere. [2010 Sep.28]
http://www.britastro.org/jupiter/2010report08.htm

STB-2: Merging dark ovals become methane-bright
STB-2 (the former STB Remnant) has remained turbulent in July and August although on a small scale. We tracked two small very dark spots within its N edge on July 10-17, finding DL2 = -110 deg/mth. This is much more rapid than the concurrent STBn jetstream spots, 2 deg. further N, and along with the speed of DL2 = +100 which we reported for spots on its S edge in June, this confirms strong cyclonic circulation in STB-2.

At the Sf. end of STB-2, in the usual pattern for these STB segments, small dark spots gather into slowly-retrograding dark rings which merge into the last in the row. These very dark rings had DL2 ~ +7 deg/mth in July, and mergers were imaged in detail on Aug.13 and Aug.31. **Remarkably, they became methane-bright as they merged (Fig. 3).** As this report is finalised, the merged dark ring is still consistently methane-bright up to Sep.26 (Marc Delcroix, Tomio Akutsu). Is it evolving into a new small AWO, to replace the one that was lost?

A similar dark ring in STZ, 60 deg. f. STB-1, is also methane-bright (Akutsu, Sep.20).

Oval BA: Passing the GRS
Oval BA, still strongly orange, had a steady DL2 = -11.8 deg/mth throughout 2009-2010, until July, when it accelerated to -13 deg/mth just after its collision with the STB Remnant
Following the reports cited above, we have made further extensive compilations of hi-res images covering oval BA and the GRS:
--Aug.7-15 [http://www.britastro.org/jupiter/2010report06.htm]
--Aug.16-19 (inc. v-hi-res blink pair, Aug.18) **[Fig.4]**
--Aug.20-21 (M. Tachikawa's fireball on Aug.20 was on the NEBn north of the GRS)
[http://www.britastro.org/jupiter/2010report07.htm**]**
--Aug.28-Sep. 4 (excerpts in **Fig.3**).
Oval BA was passing the GRS from Aug.11 to Sep.14, with conjunction on Aug.28 **(Fig. 3)**.

STBn jetstream: Exceptionally intense activity
There are numerous small dark spots on the STBn jetstream, at 28-29 deg.S. This may be the densest activity ever recorded on it. Throughout the apparition they have been emanating in a crowded stream from STB-1, with DL2 = -76 (May-July) then -73 (July-Aug). Most of the STBn jetstream spots from STB-1 run up to the f. end of STB-2 without changes, but as they pass it they are weakened, and most disappear before reaching its p.end at oval BA. One of them, very small, was deflected N down a grey column f. the GRS on Aug.18, to recirculate onto the SEBs. **(Fig.4)**

Since late July, a similar dense stream has been emanating from Oval BA/STB-2, prograding on the narrow STB(N) past the S edge of the GRS at -84 deg/mth.