

Jupiter's high-latitude storms: A Little Red Spot tracked through a jovian year

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FIGURES

[Note: The versions provided (GIFs and JPEGs) may need to be re-made as TIFs from the original files for best printing quality.]

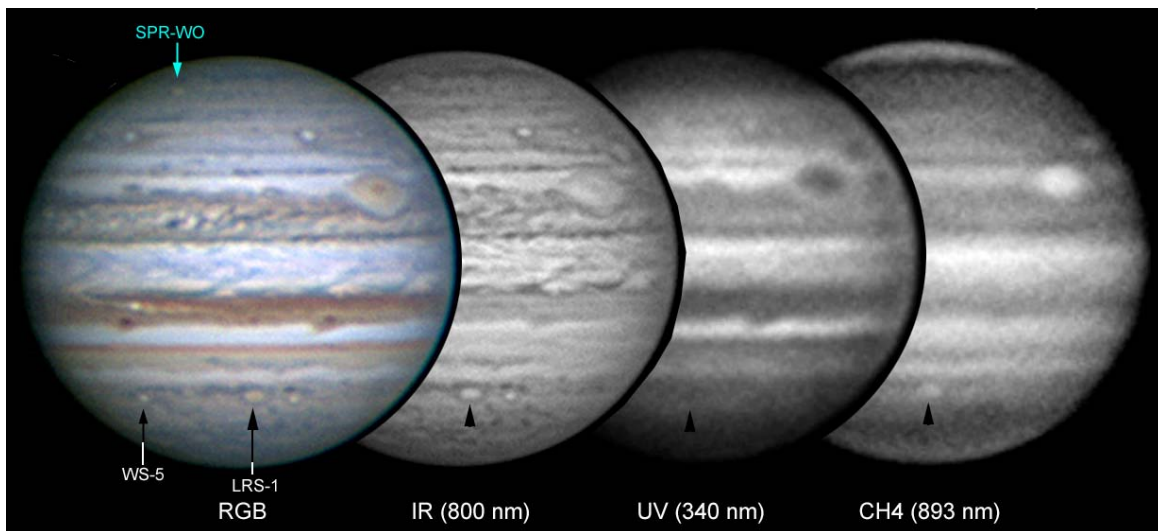


Fig.1. Multispectral images on 2008 May 24 by T. Akutsu, showing some of the NNTZ ovals discussed here (WS-5, LRS-1, and a minor AWO f. LRS-1). LRS-1 was reddish with a dark rim. Also note other reddish ovals: the SPR-WO, and the GRS and oval BA near f. limb (bright in methane image). (See [Fig.S1](#), on-line, for more images in 2008.)

Tracks of ovals in NNTZ, 1993-2008

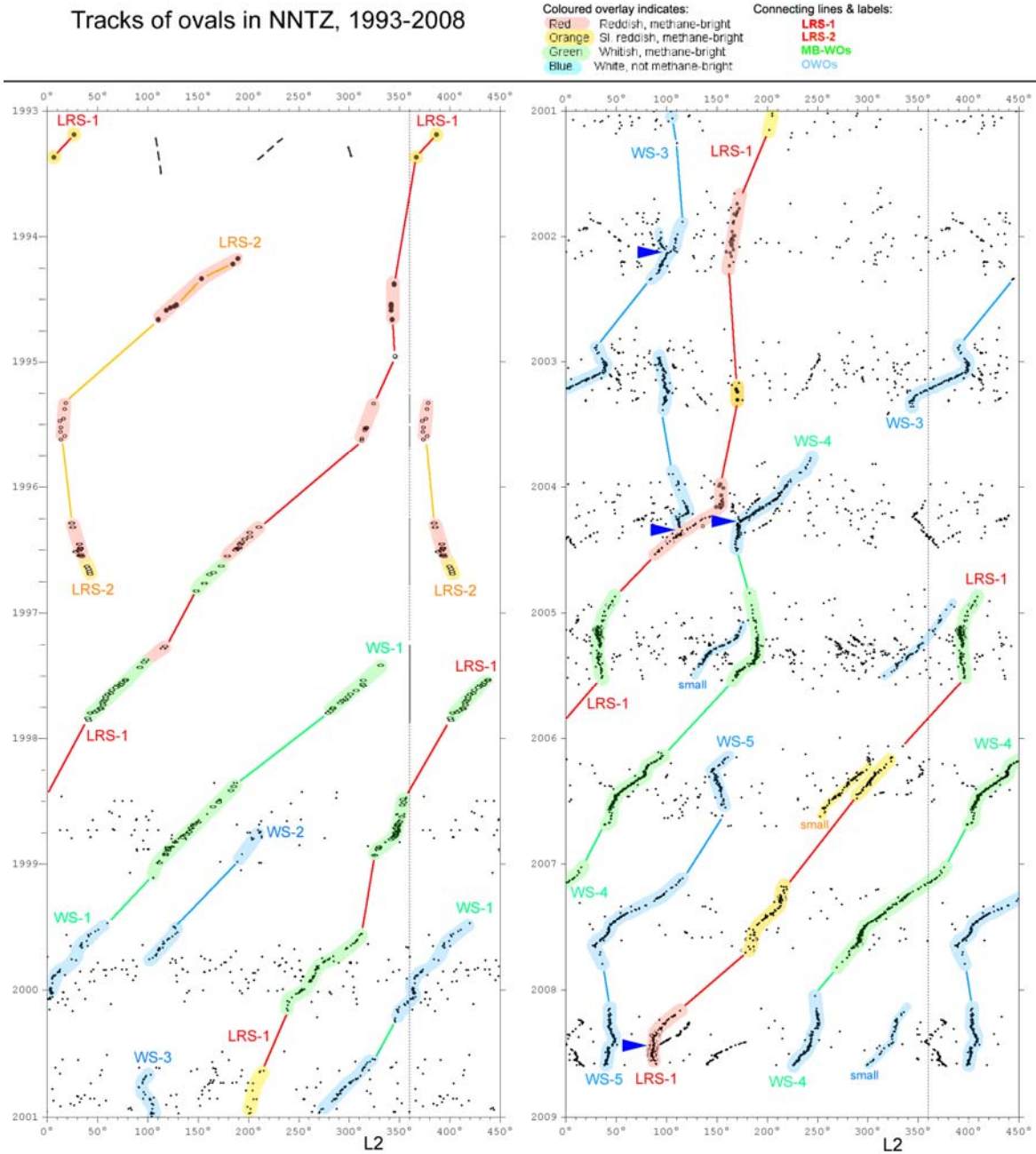


Fig. 2. Chart of longitude (L2) vs. time, for all bright ovals between latitudes 39.5 and 42.5 deg.N. Small points, JUPOS measurements; open ellipses, manual measurements on pre-1999 images; filled circles, manual measurements of red and/or methane-bright spots. Coloured overlay indicates whether the ovals were coloured and methane-bright (MB) at the time, thus: (pink), reddish and MB; (yellow), slightly reddish and MB; (green), white and MB; (blue) white and not MB (except in v-hi-res images). Colours of connecting lines and labels indicate the class of spot as in Table 2. Dark arrowheads indicate where ovals merged. (See Fig.S2, on-line, for chart in L3.)

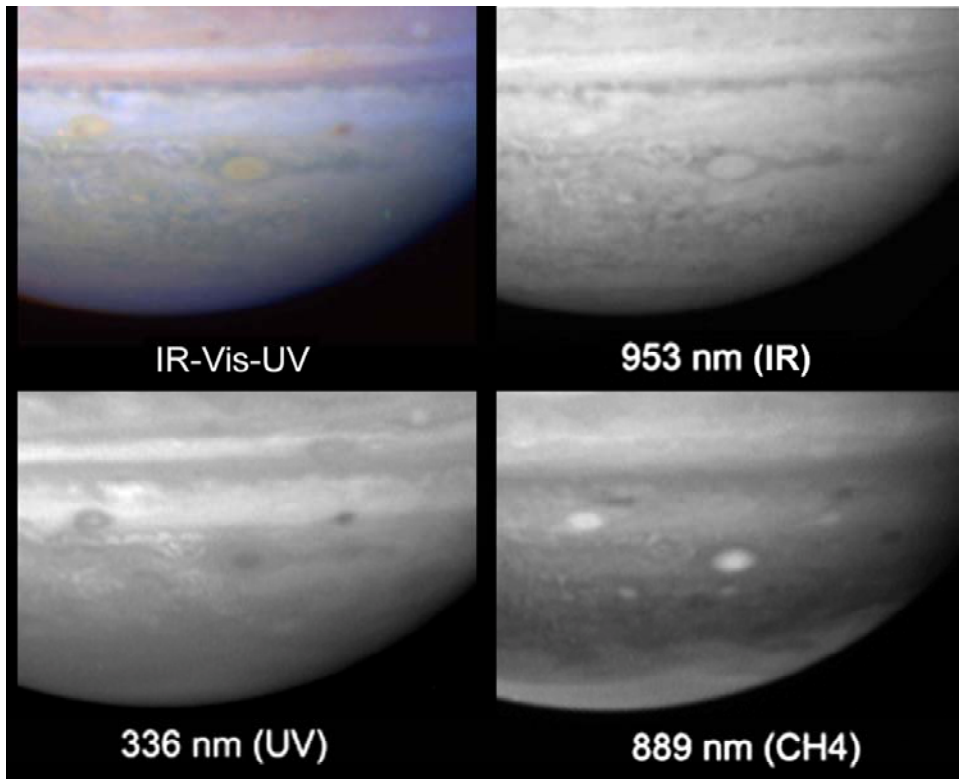


Fig. 3. LRS-1 on 1994 July 30, from HST (WFPC-2), in multiple wavebands. It is bright in infrared continuum (IR) and methane (CH₄) but dark in ultraviolet (UV). The images are also combined to make an enhanced-colour image. At top left of each frame is another LRS, rapidly prograding in the NTZ, recorded only in summer 1994. (See [Fig.S3](#), on-line, for more HST images of LRS-1 and LRS-2 in 1994.) *Credits: Ref.34.*

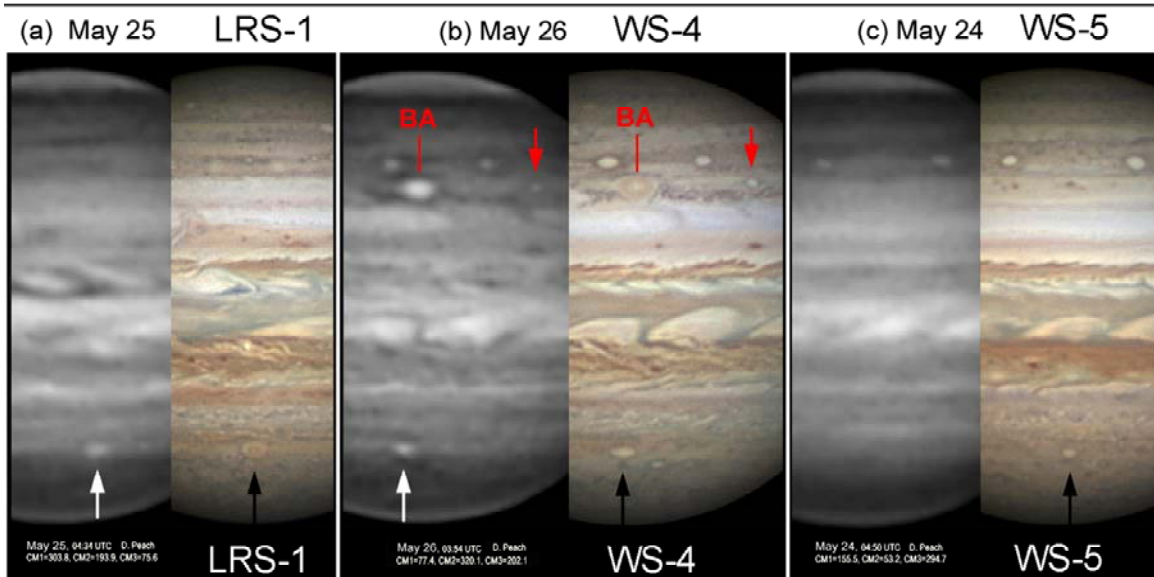


Fig. 4. LRS-1, WS-4, and WS-5, in 2007: Methane-band and colour images by Damian Peach on Barbados. LRS-1 has a weakly reddish core. Note that WS-5 is not methane-bright although a slightly smaller S. Temperate oval is clearly detected (red arrow). Oval BA, and S.S. Temperate AWOs, are also methane-bright. (See Fig.S4, on-line, for images in 2006.)

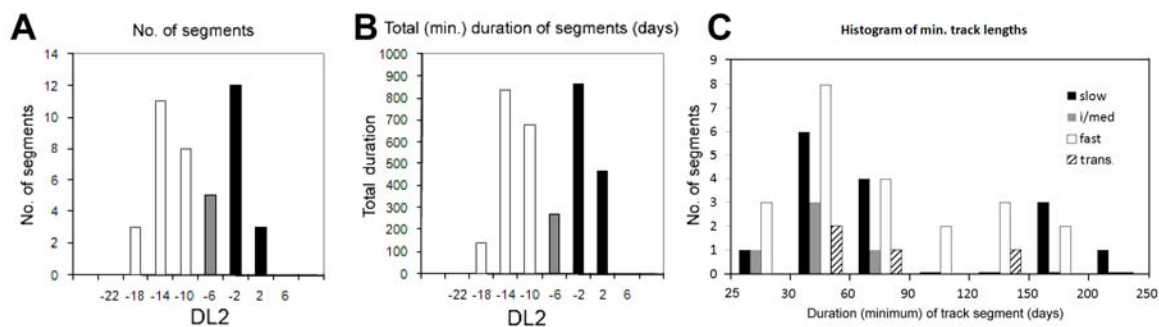


Fig.5. Histograms of drift rates (DL2, deg/month), for LRS-1 and MB-WOs together (1996-2008). The charts include all track segments that could be identified with stable drift (DL2, deg/month) over >25 days. In many cases the duration was a minimum value, limited by solar conjunction or by other periods with few observations. (A, B) Histograms of speeds of segments, by number of segments (A) or summed duration of segments (B). (C) Histogram of (minimum) duration of segments, by speed range: slow (>6 deg/mth), intermediate (-6 to -10 deg/mth), fast (<-10 deg/mth), or transitional (smoothly varying or oscillating so that no drift rate could be defined). Note that spots spend only a small amount of time in ‘intermediate’ and ‘transitional’ states. A small amount of time has been excluded altogether where observations were not sufficient to determine whether a spot maintained linear drift or not. Charts do not include tracks interpolated across solar conjunction (see Table 4). (See Fig.S5, on-line, for histograms for each class of ovals separately.)

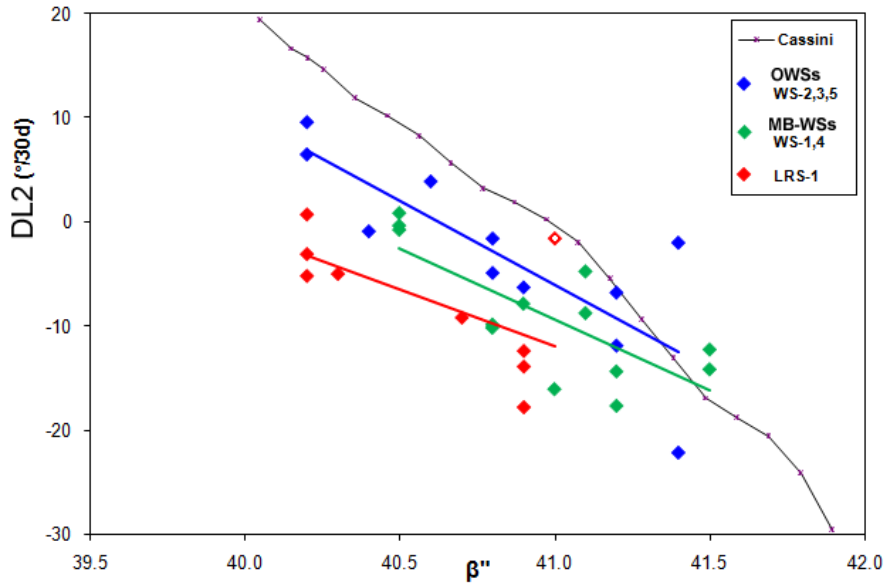


Fig.6. Chart of drift rate (DL2) vs. latitude (β''), for LRS-1, MB-WOs, and OWOs (1998-2006). The 3 classes of spots follow approximately parallel regression lines. The continuous line is the Cassini zonal wind profile (Ref.25). The outlying point for LRS-1 (red open symbol) is from 2001/02, when the spot was unusually dark red in a light zone. See Fig.S6 for a regression line with this point excluded, and with minor white spots added.

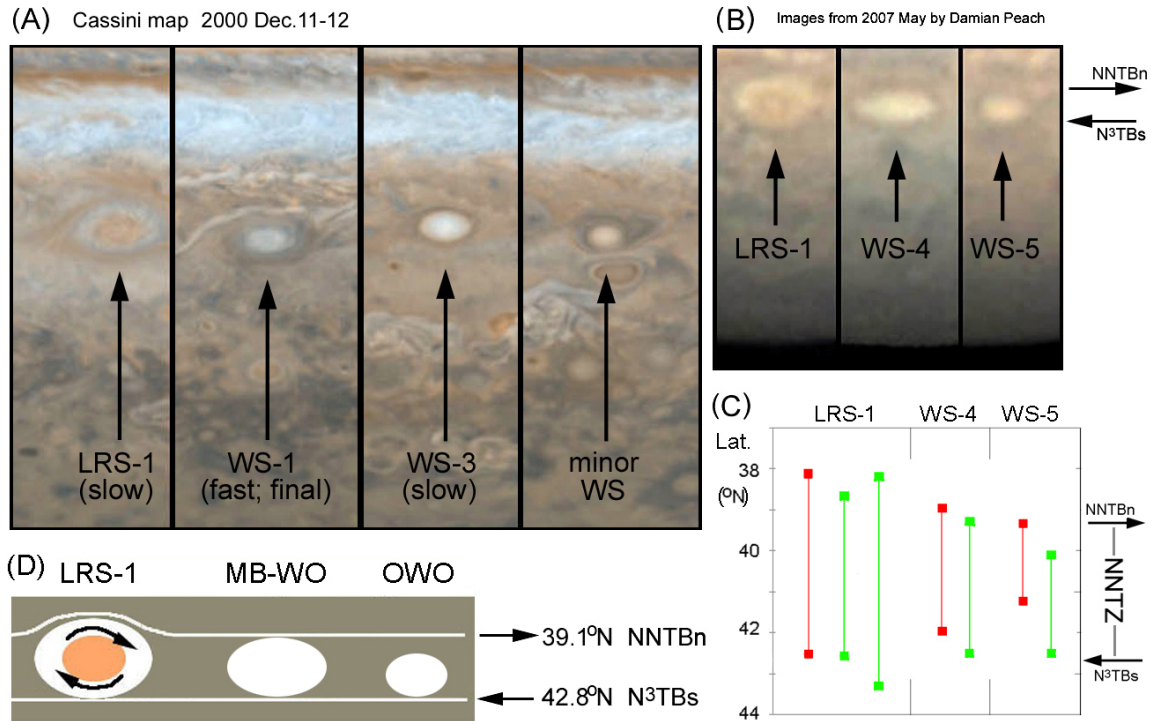


Fig.7. Alignment of the ovals in latitude.

(A) Cassini map (2000 Dec.).

(B) Images by D. Peach (2007 May, from Fig.4): all 3 ovals were moving fast at the time.

(C) Measured latitudes of S and N edges of LRS-1, WS-4 (MB-WO), and WS-5 (OWO), from images by HST (1994; first column for LRS-1 only: n=4) and D. Peach (2006: n=3 or 4, and 2007: n=1 or 2). Red symbols when the oval had slow drift, green symbols when it had fast drift. Note that LRS-1 is broader than the NNTZ and always indents the NNTBn jet, whereas the white ovals are as wide as or narrower than the NNTZ. When they are moving fast, all are positioned with the N edge at the N³TBs jet, but when they are moving slow, the white ovals shift bodily to the S.

(D) Diagram showing relation to jets. Typically, the north edge of each oval is close to the prograding N³TBs jet. In (A), WS-1 was unusually further north than the other ovals, because it was drifting faster and, perhaps, because it was at the end of its life. This was the last image of it, and the outer part of the oval has become dark grey. In (B), the relative latitudes of the ovals are shown when all 3 had fast drifts, approximately aligned with the adjacent jets. This is the typical arrangement as summarised in (D).

Credit for (A): NASA/JPL/University of Arizona image PIA07782, from the Cassini ISS, team leader Dr. C. Porco (CICLOPS / S.W.Res.Inst., Boulder).

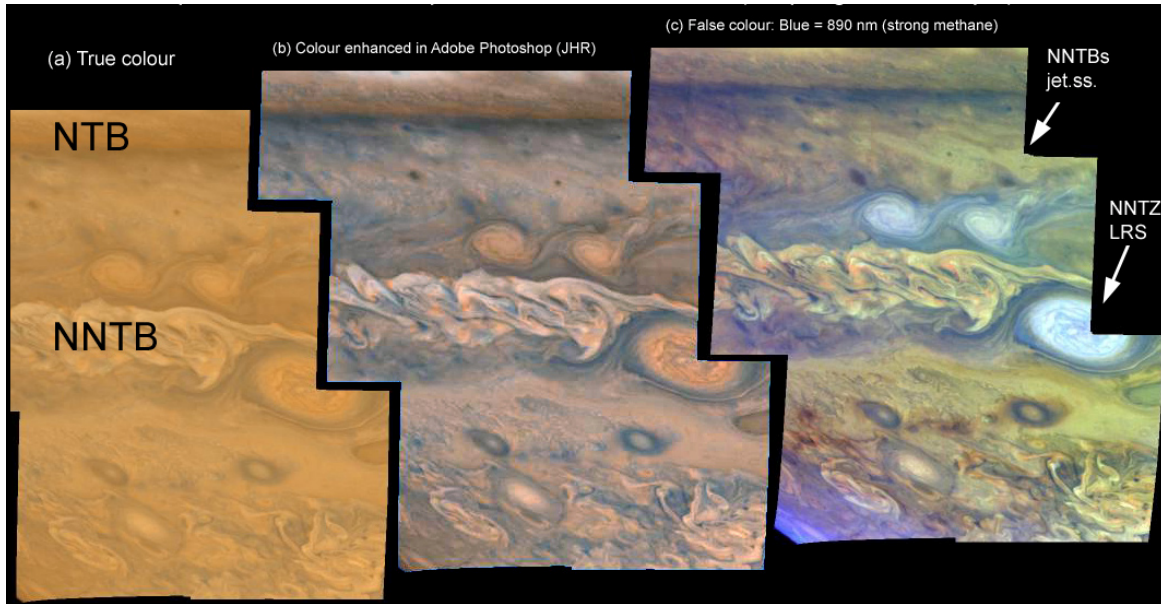


Fig.8. LRS-1 from Galileo Orbiter (G7 perigee, 1997 April). **(a)** True colour. **(b)** The same with colour enhanced to show relative differences: NN-LRS-1 is redder than other spots. **(c)** False colour: 889 nm (strong methane) in blue, 727 nm (weak methane) in green, 756 nm (red) in red. NN-LRS-1 is MB so appears white indicating that it is covered with thick high-altitude clouds. The image also happens to include a pair of NNTBs jetstream spots, which are shown to be anticyclonic vortices which are slightly reddish and MB.

Credits: NASA images PIA00893 & 894, taken by the Galileo SSI team, leader Dr. M.J.S. Belton. Available at: <http://photojournal.jpl.nasa.gov/targetFamily/Jupiter>.