

Influence of Jupiter's South Equatorial Disturbance on jet-stream speed

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A report of the Jupiter Section.

Figures

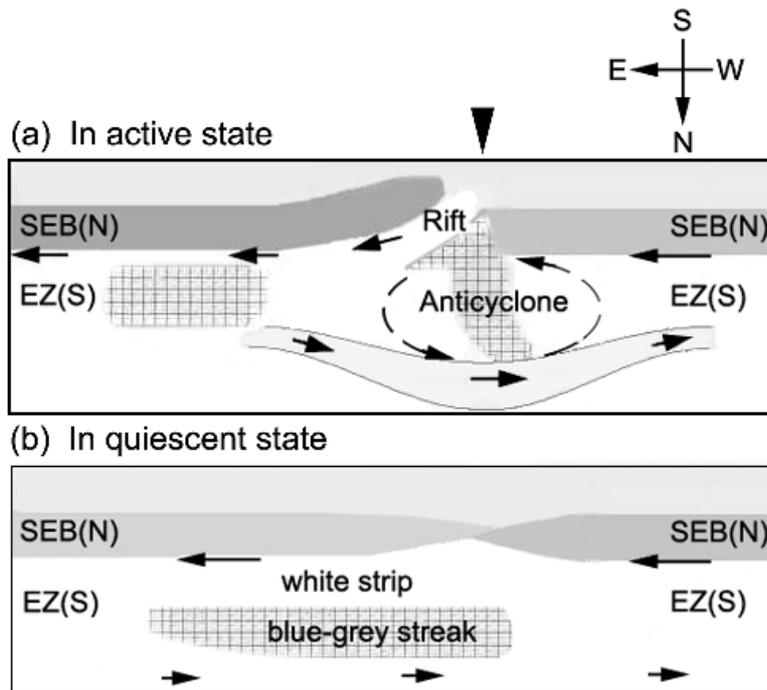


Fig.1. Diagrams of the typical visible appearance of the SED.

(a) At times when it is highly active (adapted from ref.2).

(b) At times when it is quiescent.

The large arrowhead at top indicates the adopted longitude of the SED (main complex).

Arrows indicate directions of flow relative to the SED.

Cross-hatching indicates variable blue-grey patches or streaks.

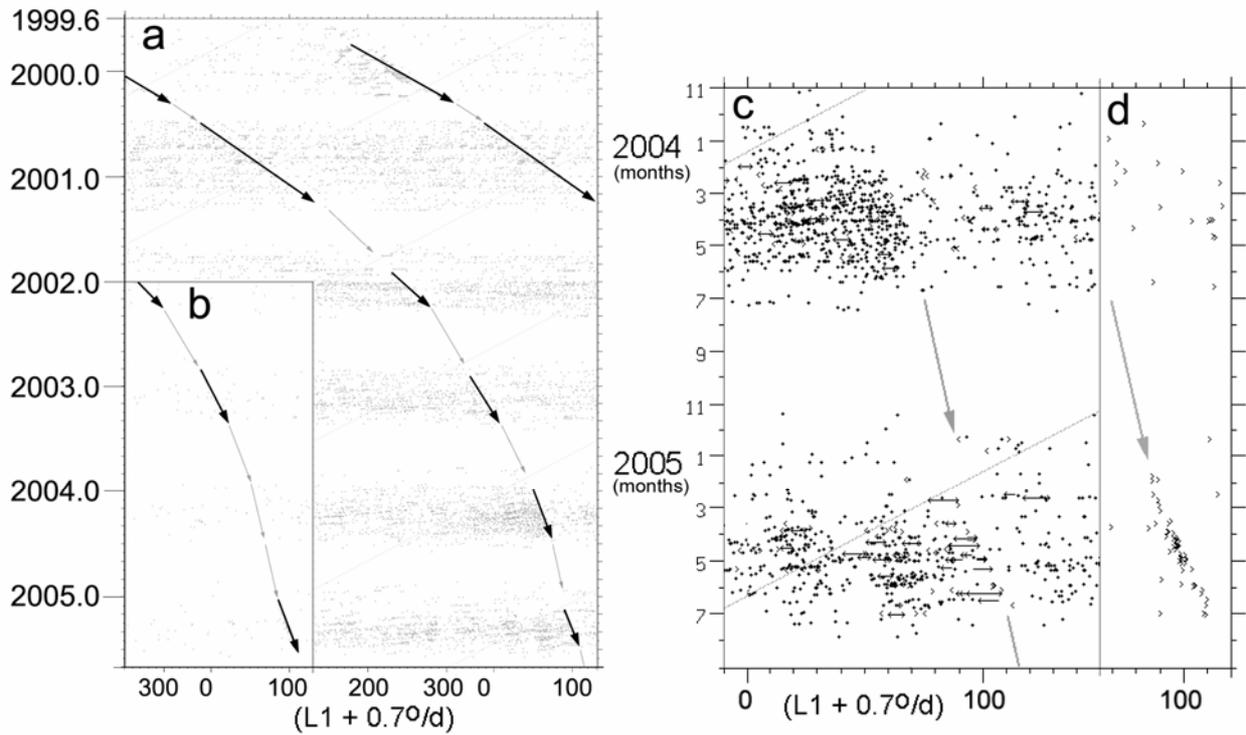


Fig.2. Longitude charts showing the persistence of the SED, 2000-2006.

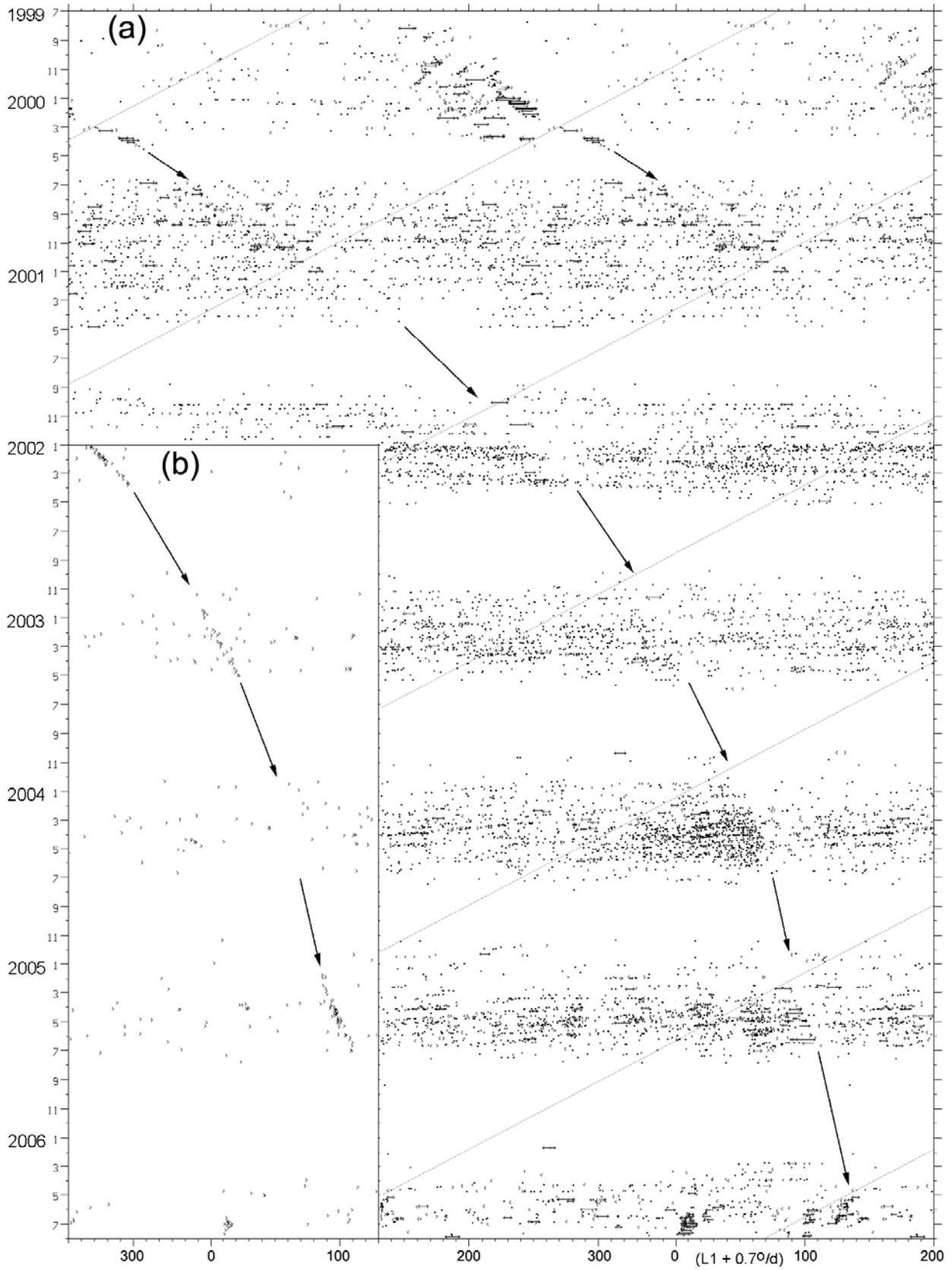
(a) The track of the SED (main complex) is marked by arrows: black where distinct, grey where indistinct or interpolated. The grey background is a reduced-scale longitude chart of all dark spots at latitudes 5.0 to 8.0°S. The SED (main complex) marks the interface between a dense area of points to the left (east) and a sparse area to the right (west).

(b) Longitude chart of the west ends of dark streaks in EZ(S), latitudes 3.0 to 6.0 °S, with same scales. When the SED is indistinct in (a), it is marked by a distinct track in (b).

(c,d) Full-resolution portions of charts (a) and (b) respectively. In 2004 the SED was distinct as an interface on the chart of SEBn dark spots (a,c); in 2005, instead, it was represented by a streak in EZ(S) (b,d).

In all panels, longitude scale moves at +0.7°/day in System I (-6.66°/day in System III). Diagonal lines indicate $L1=0$. (In all figures with drift charts, longitude increases to the right and time increases downwards, marked in months.)

For full-resolution version of the whole chart, see [Supplementary On-line Figure 2 \[NEXT SHEET\]](#).



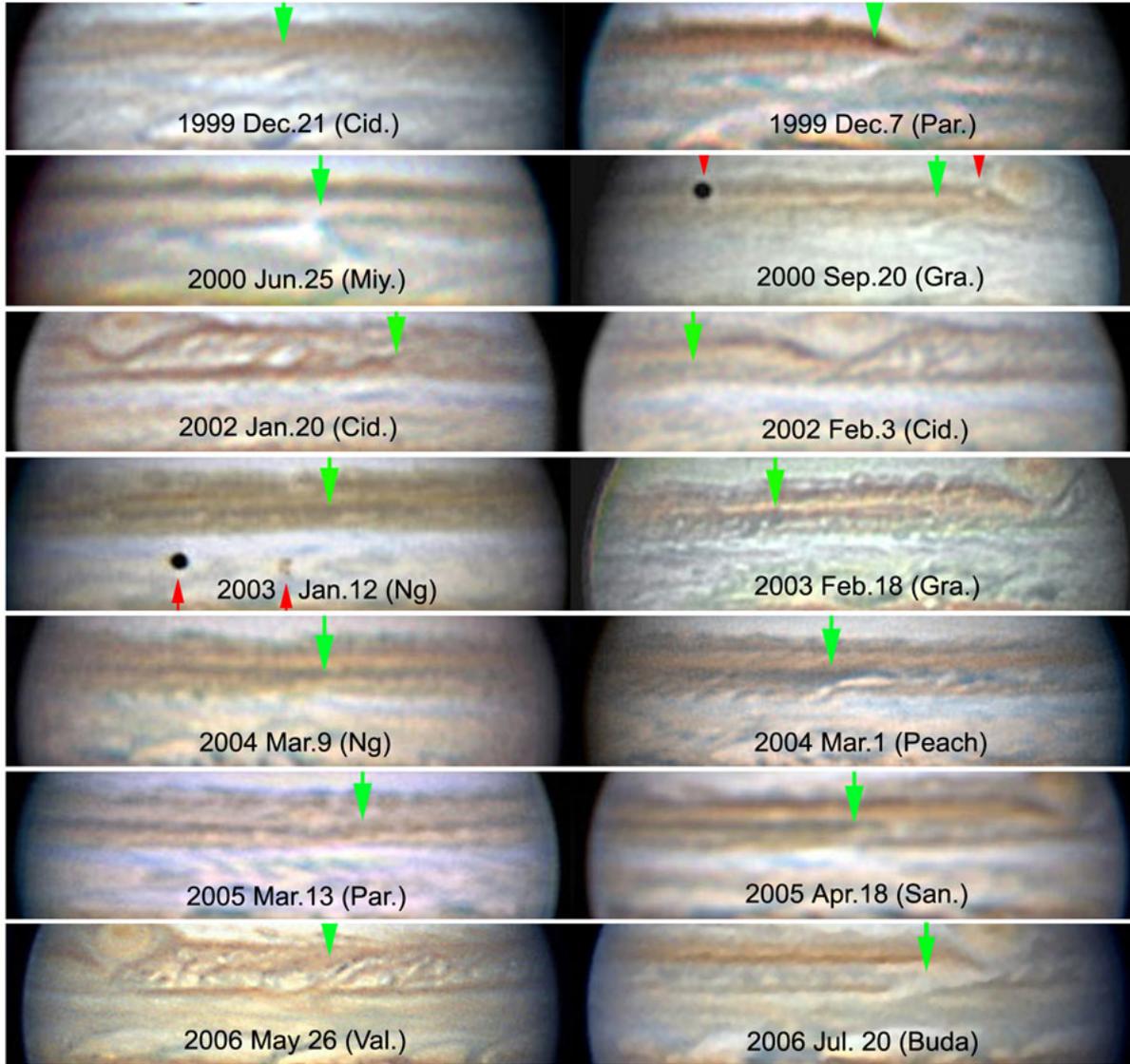


Fig.3 [colour]. Typical views of the SED, 1999-2006.

Each panel covers approximately 25°S to 8°N. South is up. For each apparition, the left image shows the SED when it was remote from or west of the GRS; the right image shows it east of the GRS, i.e. just after passing it, when the SED rift tends to be most well-defined. Green arrow indicates longitude of the SED (main complex). In 1999 and 2000 it was clearly defined by a bright rift in SEBn, surrounded by blue-grey shadings. This aspect returned in 2004. In contrast, in 2002, 2003, and 2005, the SED was marked mainly by a bright strip in EZ(S) with a dark blue streak along its north edge, although there was usually still a small discontinuity in SEBn at the west end of these strips. In 2006, the SED was marked by one of several diffuse brownish shadings accumulating in the EZ(S). Red arrowheads indicate Io and its shadow in transit. Observers' names are abbreviated: see text for full names.

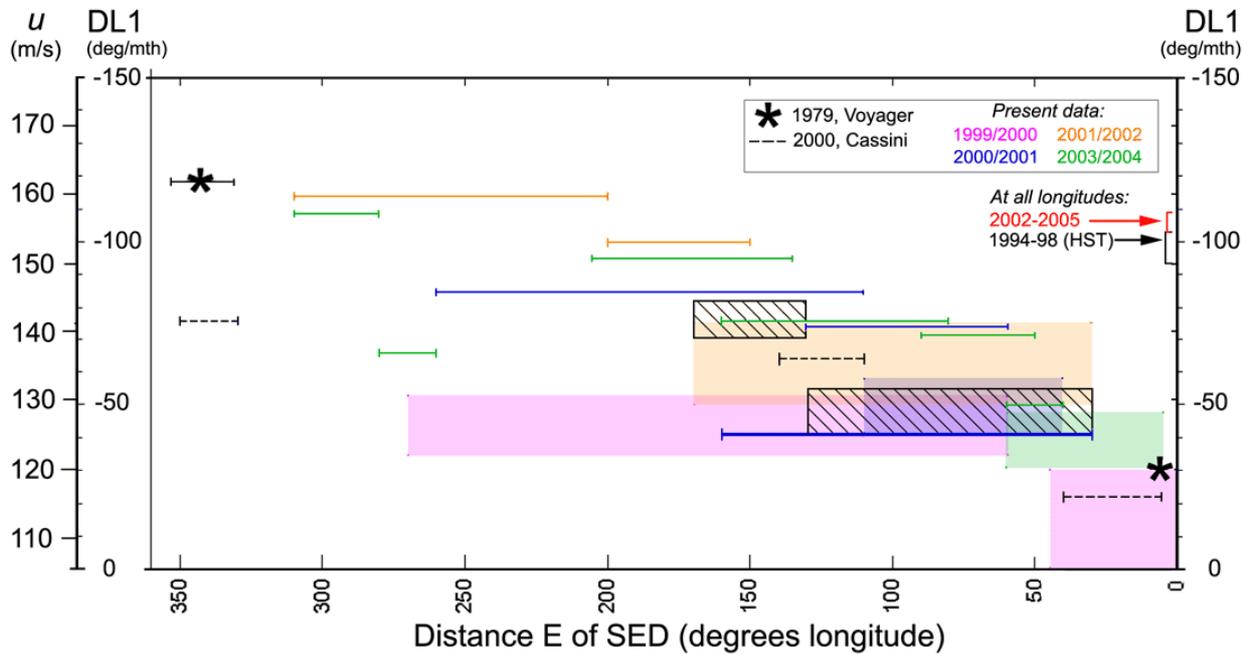


Fig.4 [colour]. Speeds of spots on SEBn in relation to the SED.

The observed speeds of small spots on SEBn, at $\sim 7^\circ\text{S}$, are plotted against the distance preceding (east of) the SED (main complex). Data are from Table 2. Shaded boxes represent the range of speeds and longitudes for numerous spots; single horizontal lines represent tracks of one or a few spots, which travel from right to left. Individual spots were rarely seen to accelerate, so all have been plotted for constant speed. Our measurements are colour-coded by apparition (see box on figure). The dotted lines and the cross-hatched box are measurements from Cassini strip-maps such as those in Fig.5. The asterisks are values from Voyager [ref.6].

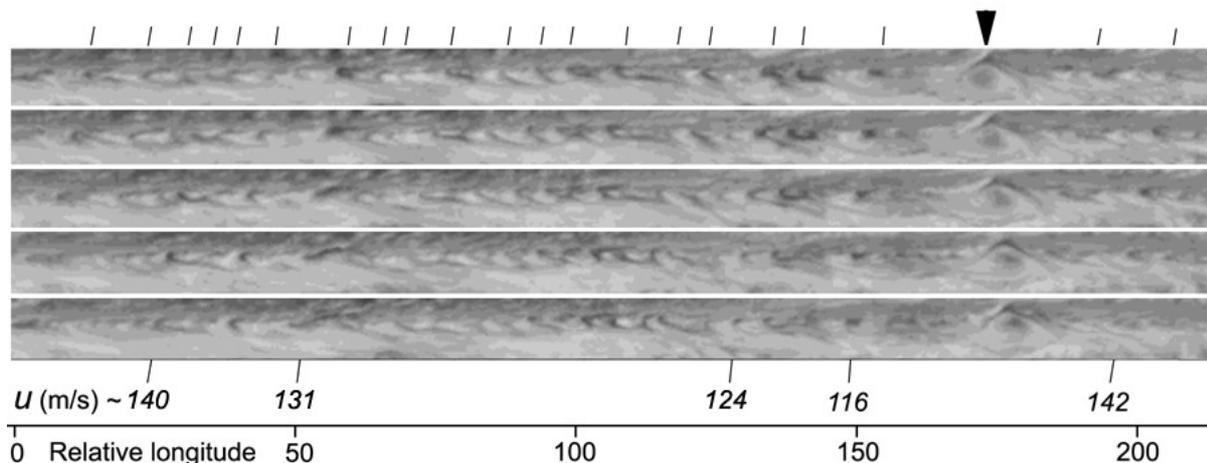


Fig.5. Strip-maps from Cassini imaging system in near-infrared (2000 Oct.-Nov.), realigned in a longitude system with rate close to System I. Five strip-maps are shown (from a much longer series), taken at 20-hour intervals. They cover the SEBn (above) and EZ(S) (below), and were aligned on the longitude of a long-lived NEBs projection so that the SED main complex (arrowhead) shows only a slow increase in longitude. The features tracked are the dark chevrons (< shapes), indicated by lines above. Drift rates estimated for some examples are shown below. South is up, longitude increases to the right (arbitrary scale), and time increases downwards. These are frames from the Cassini movie of cylindrical projection maps at 756 nm [ref.21] (originals from NASA/JPL/Southwest Research Institute).

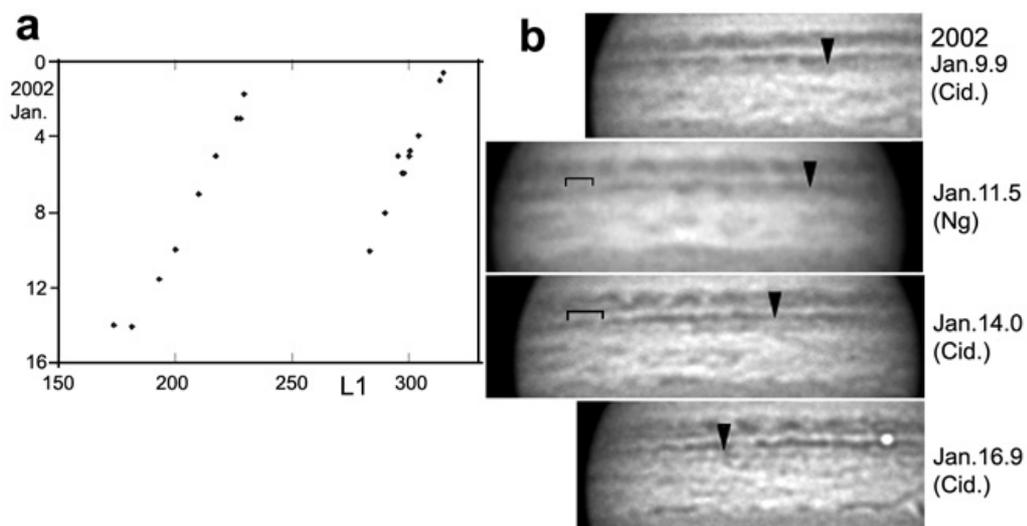


Fig. 6. Data in 2001/02.

(a) Longitude chart of the fastest dark spots in the SEBn jet at 7°S.

(b) Images showing the fastest spot on SEBn (arrowhead) approaching the SED main complex (bracket). The images are aligned on a dark plateau on NEBs to show the very rapid motion. 2002 Jan.9, 22:18 UT, CM1=190; Jan.11, 12:49 UT, CM1=159; Jan.13/14, 00:05 UT, CM1=167; Jan.16, 21:36 UT, CM1=190.5. All images by A. Cidadão (Portugal) except Jan.11 which is by E. Ng (Hong Kong). All images in red light except Jan.16 which is in near-infrared (≥ 830 nm).

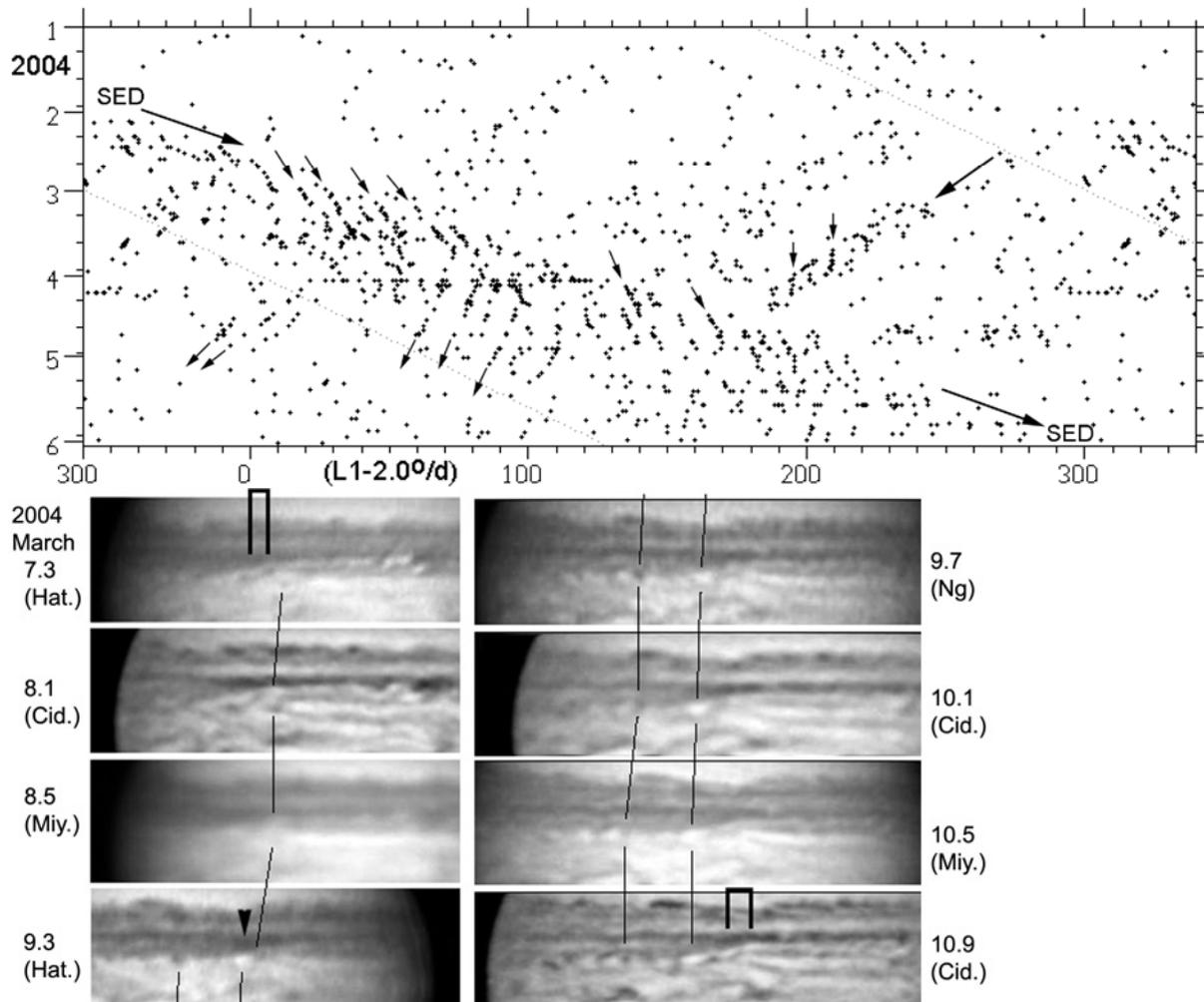


Fig.7. Data in 2004.

(a) Longitude chart of dark spots at latitudes 5.0 to 8.0°S. Time scale is marked in months. Longitude scale moves at $-2.0^\circ/\text{day}$ in System I. Diagonal dotted line indicates $L1=0$. Small arrows indicate many of the individual spots. Large arrows indicate the main complex ('SED', downwards to right) and the rapidly-moving band (downwards to left).

(b) Images showing the motions in and around the SED in detail, at intervals of 1-2 jovian rotations, in 2004 March. The images are aligned in System I. The SED main complex (brackets on first and last images) retrogrades at $\sim +0.8^\circ/\text{day}$. Lines track some of the small spots with more rapid motions, prograding at ~ -1.2 to $-1.3^\circ/\text{day}$: first, one of two small dark spots crossing the mouth of the rift; then, a bright spot which appears at the same location (arrowhead); and preceding it (to the left/east), a dark spot which is preceded by a chain of dark and bright spots, all drifting at similar speed. Each image is the sum of red and green channels from a colour image, except for March 8.1, 10.1, and 10.9, which are near-infrared images.

Images were taken as follows: 2004 March 7, 06:28 UT, CM1=131, Hatton; Mar.8, 02:18 UT, CM1=137, Cidadão; Mar.8, 12:07 UT, CM1=136, Miyazaki; Mar.9, 06:38 UT, CM1=93, Hatton; Mar.9, 16:55 UT, CM1=109, E. Ng; Mar.10, 03:01 UT, CM1=119, Cidadão; Mar.10, 12:29 UT, CM1=105, Miyazaki; Mar.10, 22:34 UT, CM1=114, Cidadão.

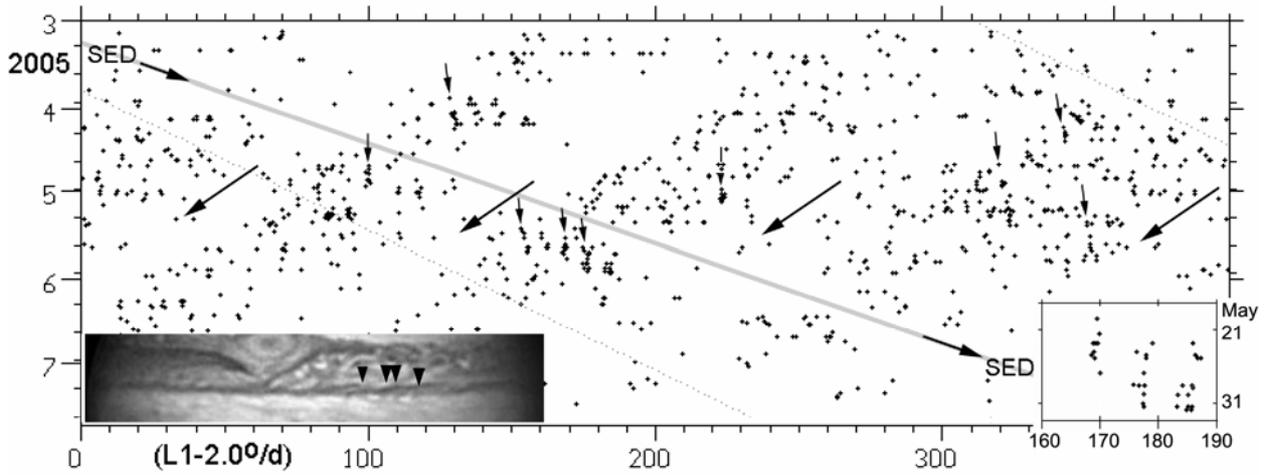


Fig.8. Data in 2005.

Main chart: Longitude chart of dark spots at latitudes 5.0 to 8.0°S. Time scale is marked in months. Longitude scale moves at $-2.0^\circ/\text{day}$ in System I. Diagonal lines indicate $L1=0$ (dotted line) and the track of the SED (grey line). Note several rapidly-moving bands (diagonal down to the left: $DL1 = -3.5^\circ/\text{day}$; 155 m/s; large arrows indicate gaps between them), but the individual spots in them move more slowly (near-vertical tracks, indicated by small arrows: 128-136 m/s). *Inset at right* shows three such tracks at expanded scale. *Inset at left* shows one such cluster of chevrons on 2005 April 30 (D. Peach: red + green channels). For a series of these strip-maps in colour showing the motion of the cluster at ~ -2.6 to $-2.0^\circ/\text{day}$, within a band of activity that was moving at $\sim -3.5^\circ/\text{day}$, see *Supplementary On-line Figure 8b (below)*:

