# JunoCam at perijove-14 (2018 July 16): What the images show

**John Rogers** (British Astronomical Association) (2018 July 30)

Perijove-14 (PJ14) was performed with spacecraft orientation similar to PJ13, and on a track only 45 deg different in L3 longitude. Equator crossing was at L1 = 36, L2 = 192, L3 = 74.5.

Amateur ground-based coverage of the track is shown in Figures 1 and 2. Unfortunately, few observers in the southern hemisphere were able to get any images on the days immediately around the perijove, but Japanese observers (posting on ALPO-Japan) got good images, especially one by Hideo Einaga 28 hours after perijove (Figures 1 & 2).

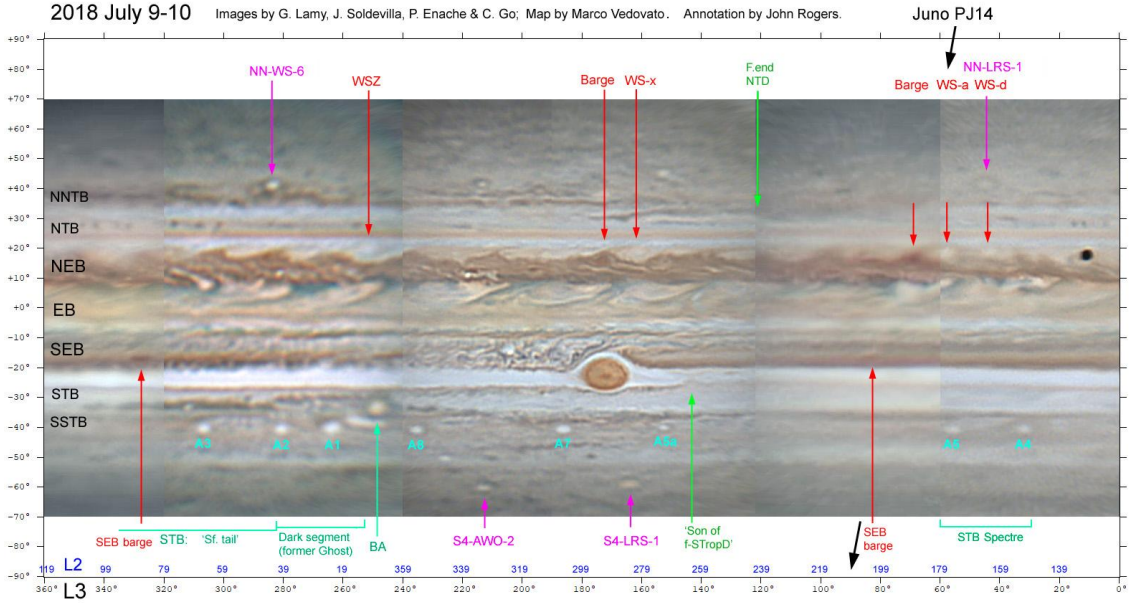


**Figure 1**: Three ground-based maps. (Note that the flyby track is at a junction between images in the first two of them.)

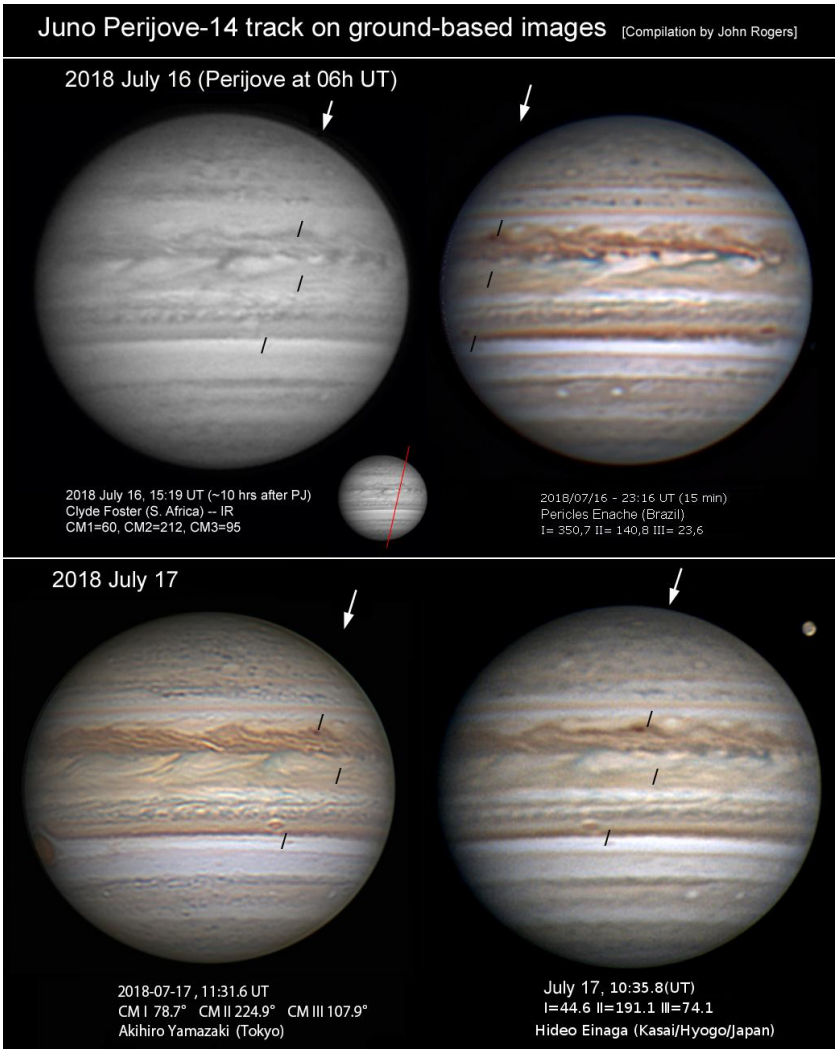


**Figure 2**: Four ground-based images, with portions of Juno's PJ14 track marked (accounting for the differential motion of the equatorial region). A larger set will be posted in our next report on amateur images.

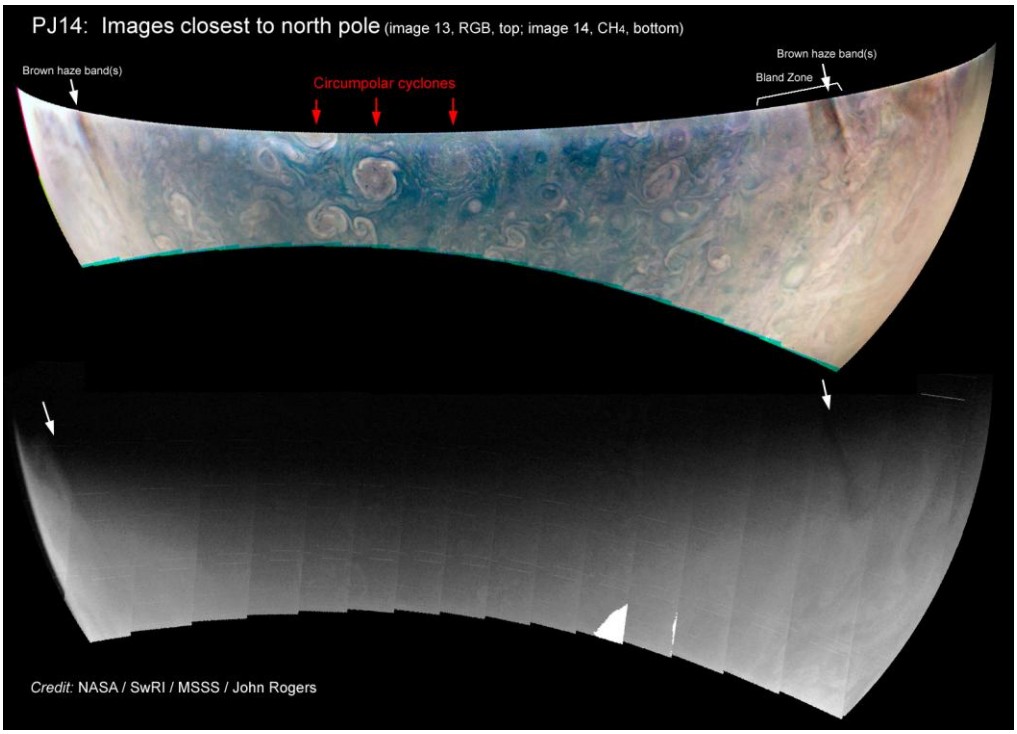


**Figure 3**

*North polar region:*
Figure 3 shows the two images taken at maximum latitude (now only 82.8ºN): colour and methane-band. These are the projected images initially released by the JunoCam team. Now that these images only capture a narrow strip while passing over the north polar region, it is hard to appreciate the overall pattern, so Figure 4 shows composite north polar projection maps in colour and methane-band, compiled from projections of multiple images made by Gerald Eichstädt. Familiar features are nicely seen:
--Circumpolar cyclones: Three are seen, including a beautiful spiral with a nice little circular 'eye'.
--Haze bands: As usual, there are linear bands in the Bland Zone, connecting with complex swirls to the south, associated with multiple edges to the North Polar Hood. Many of these features are evident both in colour and in methane maps. (We showed a much more complete pair of maps at PJ12.)
--The Bland Zone (approx.= N6 domain): It is interrupted by a chaotic sector between a huge FFR to the south and a large bright AWO to the north. (FFR = [cyclonic] folded filamentary region; AWO = anticyclonic white oval.) This AWO belongs to the N5 domain; see Figure 6A.

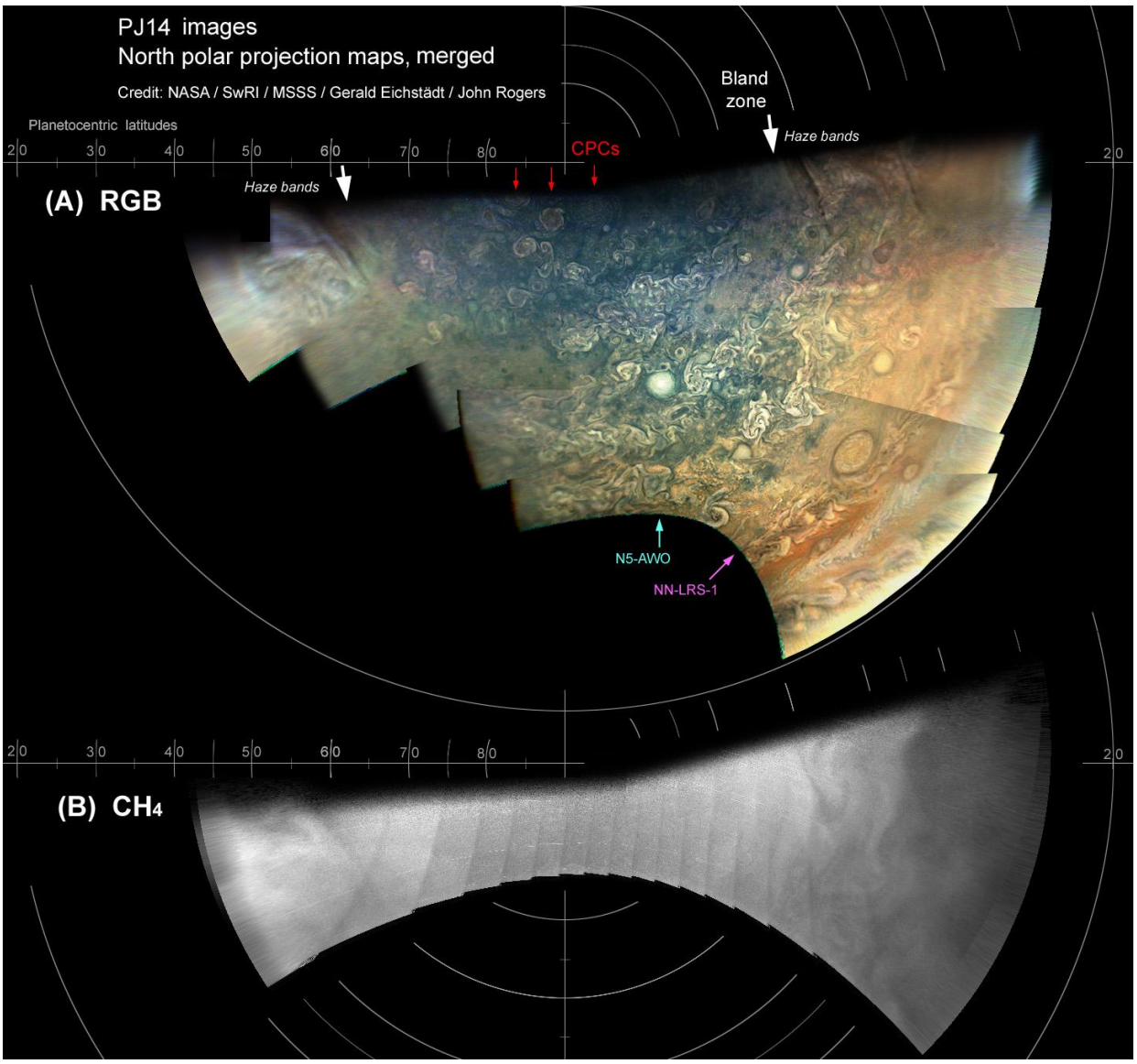


**Figure 4**

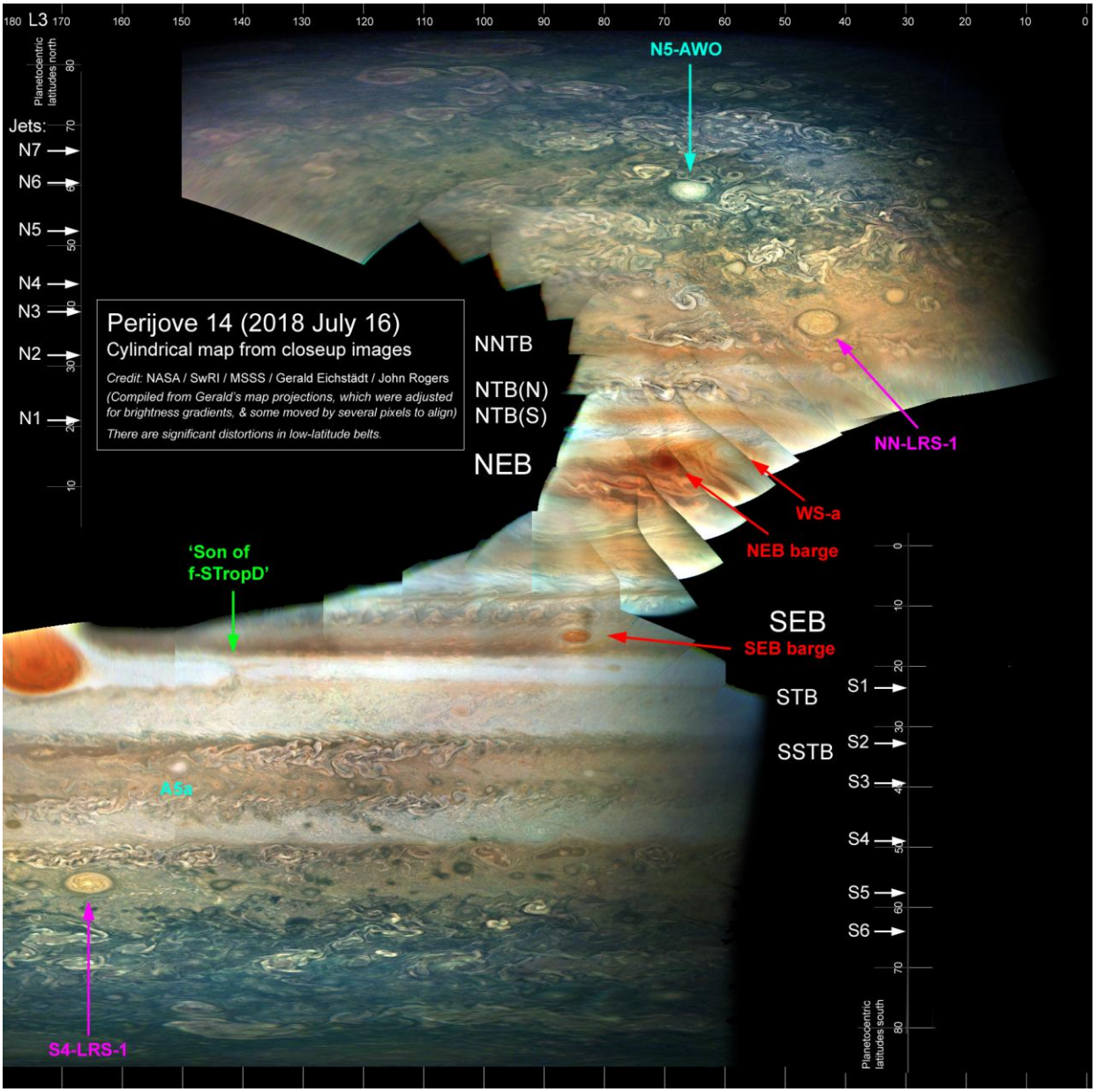


**Figure 5**

*Northern domains:*

Figure 5 is a composite cylindrical map of the perijove images, at reduced scale.

Figure 6A shows closeups of three disparate anticyclonic ovals, from Gerald's full-scale renditions. One is the large bright N5-AWO. One is an AWO in the northern, cyclonic part of the N4 domain, distorted into triangular shape by the cyclonic turbulence around it. (We have documented such displaced N4-AWOs in ground-based and Hubble images, and noted one in JunoCam's PJ12 images.) Both these AWOs show rows of bright 'popup clouds' in their central regions. The third oval is NN-LRS-1, the long-lived Little Red Spot of the N2 domain, which JunoCam also viewed close up at PJ3 and PJ7.

Figure 6B gives an overview of the northern hemisphere close-ups from the N5 domain to the equator. As at PJ13, impressive FFRs (rifted regions) are seen in both the NNTB and the NTB(N).

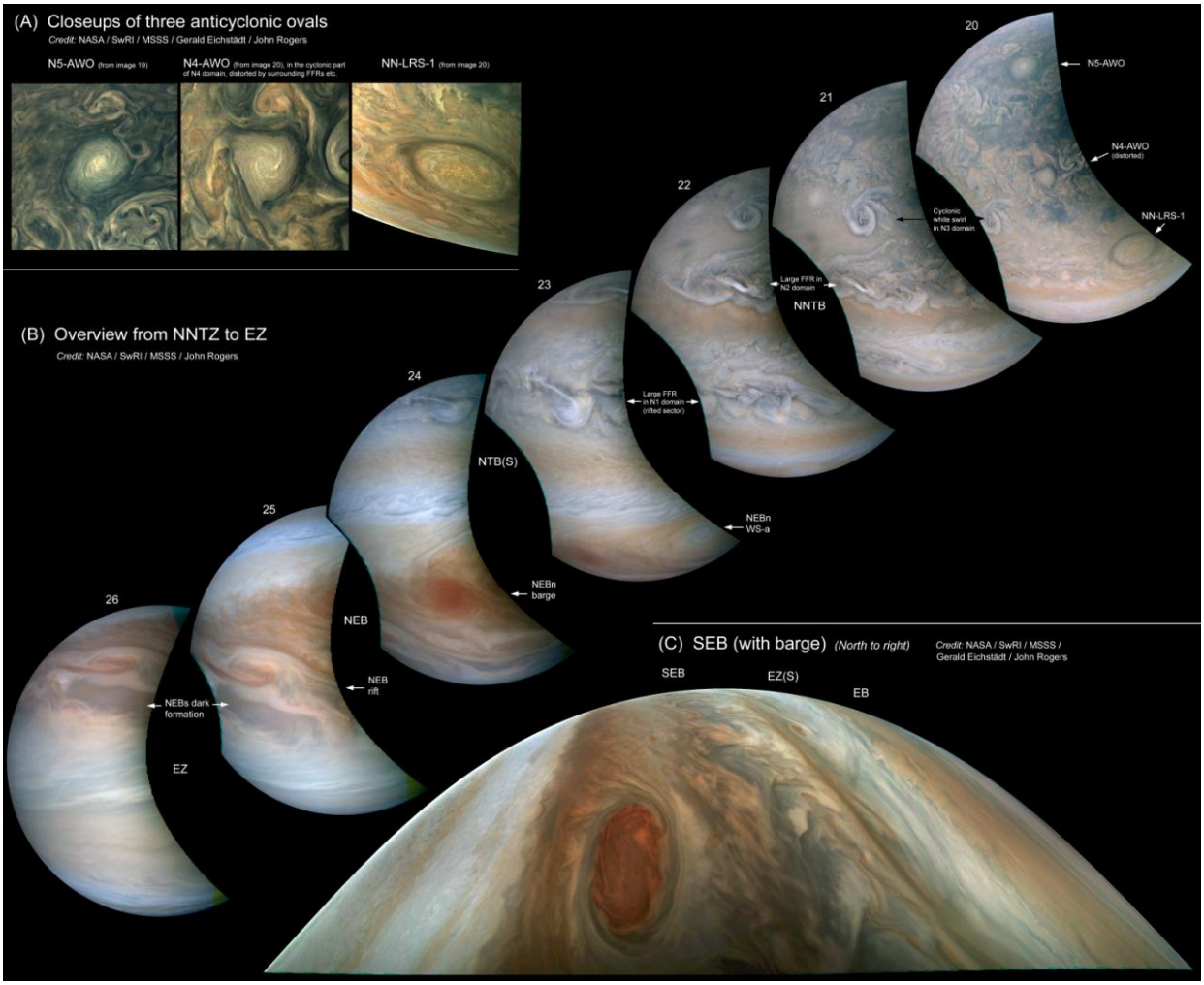


**Figure 6**

*North Equatorial Belt:*
Passing over the NEB (Figure 5), JunoCam fortuitously captured views of two of the most prominent circulations that have developed since the start of 2017: the AWO called WS-a (though imaged near the horizon with little detail), and a prominent barge (almost directly below the spacecraft). As with previous circulations in the NEB seen by JunoCam, the barge is diffuse at high resolution. [We previously viewed WS-b at PJ7, WSZ at PJ9, WS-d at PJ13, and miniature barges at PJ8, PJ12 and PJ13.] On the NEB south edge there is a dark grey segment (compare Figure 2): it's not a well-formed formation ('hot spot'), but a lesser feature though perhaps similar in nature.

*Equatorial Zone:*
Two images cover the EZ at high quality. Image 26 shows no mesoscale waves except in some small streaks near the horizon. In image 28, there are prominent mesoscale wave sets in narrow white cloud bands in the bright EZ(S). The broad orange-and-grey Equatorial Band, which is now a major coloration event covering almost half the width of the EZ, does not contain obvious mesoscale waves, but subtle, short-wavelength ones can be seen in the portion directly below the spacecraft.

*South Equatorial Belt:*
JunoCam obtained excellent closeup views of the longest-lived SEB barge (Figure 6C). It has a well-defined oval shape and cyclonic circulation pattern. The images support what we'd deduced from ground-based imaging: that the 'white spot' on its N edge, which is often the

most conspicuous part of such features, is a diffuse, irregular band of white cloud lining the N edge of the circulation, not a coherent structure in itself.

*Outcome of the South Tropical Disturbance (STropD):*
The STropD seems to have been determined to defy my predictions [see 'Jupiter in 2018: Report no.5' (2018 June 17)]. When the p. end (p-STropD) passed the GRS, it produced intense turbulence p. the GRS across the southern STropZ and in the S. Temperate latitudes, but it failed to re-form a p-STropD as expected. When the f. end (f-STropD) arrived at the GRS, on May 30, it did not immediately reappear p. the GRS. But just as I was writing in Report no.5 that it did not re-form, images from June 12 onwards showed a rather inconspicuous feature developing which did resemble a f-STropD [image compilation to be shown in our next ground-based report]. By June 28 it apparently spanned the STropZ; it was pointed out by Johnny Hsieh and Andy Casely. In Figures 1 & 5 herein, I have nick-named it 'Son of f-STropD', though this is not suggested as a permanent name. JunoCam did not see it close up, but did record it near the limb in high-latitude images so it is visible in Figure 5. It has a continuous curve that clearly suggests a f-STropD. But we will have to wait and see whether it recreates a complete STropD, or whether it soon dissipates.

'Son of f-STropD' marks the f. end of the sector of southern STropZ that was disturbed after the p-STropD passed the GRS. Its development can be seen by comparing the present JunoCam map (Figure 5) with the equivalent map in our PJ13 report. At PJ13, there was a very dark grey band in this sector; now this is pale orange. It does not show any turbulence, despite the massive turbulence that was seen pouring into these latitudes at PJ12.

Alongside this sector, the S. Temperate domain (south of the S1 jet in Figure 5) was also massively disturbed at PJ12, and this was evident at PJ13 as many tiny dark spots (probably vortices). At PJ14, only one or two of these remain visible; but these latitudes do still look very turbulent at high resolution. This seems to have been an example of turbulence evolving from large to small scales.

Much more obvious is the usual turbulence seen further south, in the images of the long-lived large FFR in the SSTB, which is spectacular as always.

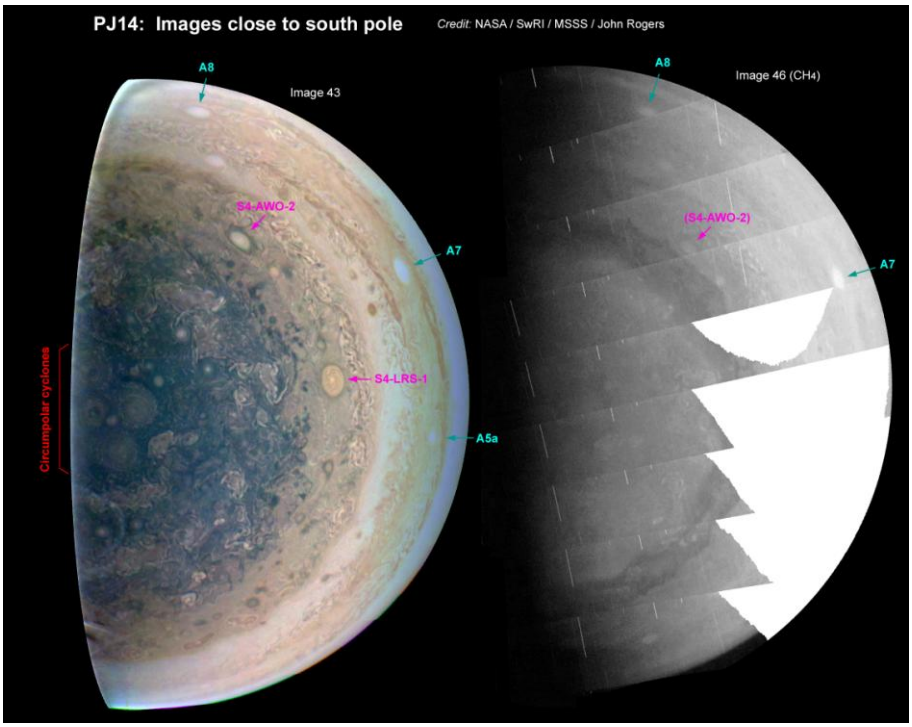


**Figure 7:** Images close to the south pole. [Image 43 is shown because it has better quality than image 45 which was closest to the pole.]

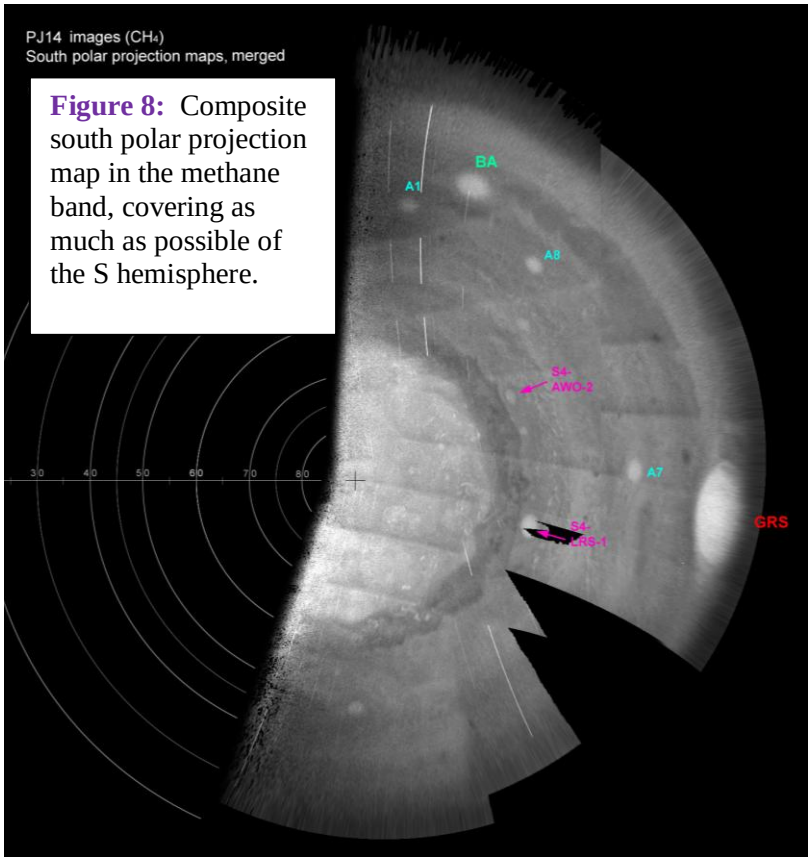


**Figure 8:** Composite south polar projection map in the methane band, covering as much as possible of the S hemisphere.

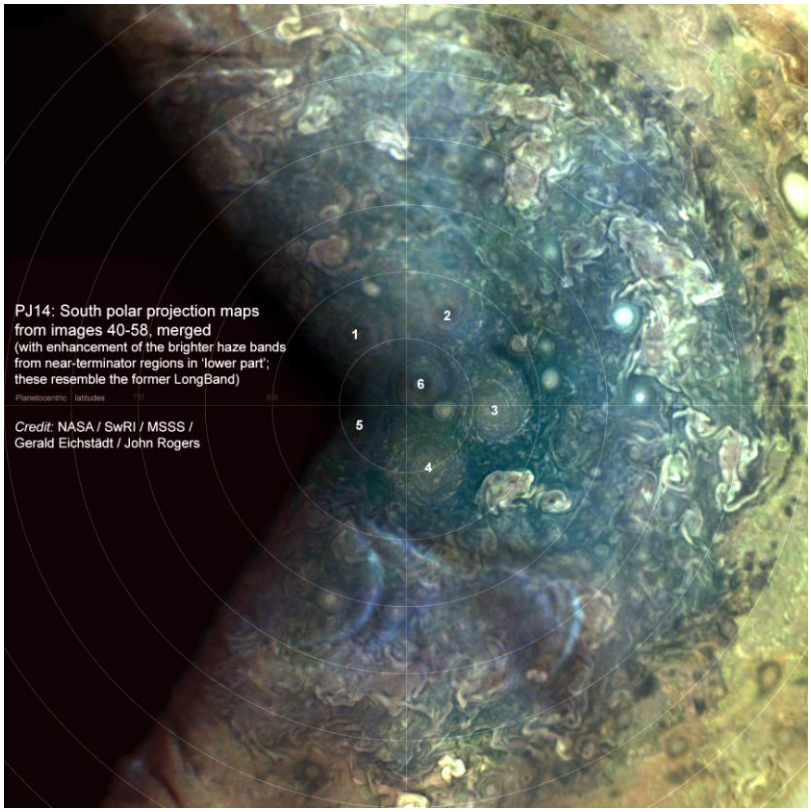


**Figure 9:** Composite south polar projection map of the region down to 60°S, with the circumpolar cyclones labelled.

*South Polar region:*
The south polar region is shown in Figures 7-9. It shows the usual features in both colour and methane images.

*The circumpolar cyclones (CPCs)* form the most perfect pentagon yet; the gap between CPCs-2 & 3 has almost disappeared.

However, there is a prominent little AWO very near the centre. (It may be the AWO that was lodged between CPCs-4 & 5 at PJ13, swept inwards by the circulation of CPC-4, and now temporarily trapped in the triangle between CPCs-3, 4, & 6.)

The position of the central cyclone (CPC-6) is fully consistent with its previous cyclic motion relative to the pole; it has begun a third cycle.

There are again prominent haze bands close to the former position of the long-lived Long Band (which was absent at PJ13), though they may not actually contact CPCs-4 & 5 as the Long Band did. In Figure 9, they are bright near the dusk terminator. A map from subsequent lo-res images (not shown) shows them as overlapping *dark* bands near the *dawn* terminator instead. This diurnal contrast reversal has been seen at previous perijoves (e.g. our PJ12 report).