

Juno at Perijove-9: II. What the close-up images show

John Rogers (BAA), 2017 Nov.

Summary: At perijove-9 (PJ9) on 2017 Oct.24, JunoCam took the usual superb sets of images covering both polar regions, and an almost continuous swathe of close-ups. These included close-ups of two outstanding anticyclonic white ovals (AWOs): White Spot Z in the N. Tropical Zone, and A5 in the SSTB. Views of high latitudes gave further insights into the multicoloured haze bands there, which are only summarised in this report.

As usual, this account is based on the reprojected, reduced-resolution images as initially posted by the JunoCam team, and on the full-size images as processed by Gerald Eichstädt. Illustrations are from the former unless otherwise stated. In [Figure 4](#), map projections of the close-up images (by Gerald) are combined to give a pole-to-pole map of the track.

This report uses names and abbreviations as explained in our reports on previous perijoves.

As usual, the close-up images show tiny bright white clouds in many regions, some of which cast shadows despite the fairly high sun angle at this perijove. Often they assemble in lines. They are seen, for example:

- in and around some vortices in the high northern latitudes;
- in some of the light lanes in the rifted NTB(N);
- on the orange NTB(S), where they also appear light orange, being below the overlying haze;
- in rifts in the mid-SEB outbreak (especially large rafts of them);
- widespread on the whitened STB and STZ;
- in bright lanes of the large FFR in the S3 domain.

Could these tiny elevated clouds on bright lanes in FFRs explain why these lanes are methane-bright? We cannot make a direct connection because in the JunoCam images, the tiny clouds are only resolved at low latitudes whereas good methane images are only obtained at high latitudes. But there are none on the NEB nor SEB, except in white rifts, and none on WSZ.

North polar region (images 75-79) ([Figure 5](#)):

Now that the tilt of the north pole away from the Sun is almost maximal (-3.5°), only one circumpolar cyclone is clearly visible, though two low-contrast flanking ones can be partly discerned on the terminator.

The bland zone with haze bands (images 75-80): In the 'upper' part in the images ([Figure 5](#)), the typical bundle of narrow linear haze bands includes an especially striking white-and-brown pair. In the 'middle' part, several large and small FFRs intrude upon the bland zone. In the 'lower' part, the 'bland zone' is completely disrupted by turbulent features, and a large N5-AWO (which is actually yellowish) intrudes into it as well. As we have seen before, this N5-AWO is not methane-bright (image 77), and some of the linear haze bands extending over it are not methane-bright either, and some of these show rainbow colours. The closest images of this N5-AWO ([Figure 6](#)) clearly show brown haze bands crossing it; just south of it is a N4-AWO which is likewise crossed by a haze band, but this band is white.

High northern latitudes (closeups: images 80 & 81): This region is gloriously bewildering as always. Examples of the tiny bright clouds are in [Figure 7](#).

NTB (image 82): This image makes a good addition to the temporal sequence showing the maturation of the NTB from PJ3 onwards ([Figure 8](#)). It covers the long-lived rifted sector of NTB(N) (which probably survived the 2016 NTB outbreak), showing it to be indeed more rifted than previously imaged sectors.

The views of the NTB and NEB (images 82-85) are aligned in [Figure 9](#), and merged in Gerald's map projections in [Figure 10](#).

NEBn (images 82-84): These images all show half of **White Spot Z (WSZ)**, which looks enormous! [I expected it to be further east, but the JUPOS chart confirms it has slowed down in Aug-Sep., --> predicted L2 = 52 (± 3), L3 = 224, on Oct.24. In contrast to PJ8, the PJ9 images are oriented directly along the track and all 3 show the following (west) half of WSZ, despite the sub-spacecraft L3 changing from 225 to 228.5. These 3 images cover only 4.6 minutes so are unlikely to reveal winds in WSZ.]

WSZ has a light brown tint throughout, consistent with ground-based images in recent months. Internally, it has low contrast, but shows dense concentric cloud texture, very different from the recently born ovals WS-b and WS-d imaged at PJ7 and PJ8. Bright 'rifts' are draped around it. Within the NEB proper, everything appears diffuse.

NEBs (images 84 & 85): These images show a small dark grey spot on NEBs, but it is too small to be a typical 'hot spot'. [The JUPOS chart does not show any well-defined hot-spot track leading to this position, although of course there were no recent observations.]

SEB (image 88): This is a dramatic scene with conspicuous large rifts, including large rafts of shadow-casting white clouds in the north half. These are part of the mid-SEB outbreak which is evidently still ongoing.

STropZ—STZ—SSTB (images 89-91, and 92&93 obliquely over wider area):

The S. Tropical Band is now a prominent dark grey belt across this sector (slightly north of the STBn jet). The STB-STZ latitudes are white, and show no circulation patterns. [Any incipient circulations in this sector p. oval BA, which I thought might be shown, must be intermittent.]

S2-AWO-A5 is beautifully shown in the close-up images, as expected. On its f. side, there is a dark, turbulent sector of SSTB, but no longer a FFR.

High southern latitudes (images 90-93):

In the S3 domain we see large FFRs, and south of them, many small *anticyclonic* vortices (white, grey, and yellow).

In the S4 domain, there is a good close-up of S4-AWO-2 (whose outer part is quite reddish).

South polar region (images 92-98: [Figure 11](#)):

The now-familiar features are well shown, as follows. Methane image 96 shows the sharp wavy edges of the S.P.Belt and the S.P.Hood. The waves are especially well defined this time. Blinking of Gerald's south polar projection maps (esp. from images 92 & 98) confirms that the S6 jet follows the wavy edge of the SPH at 62-64°S; but it also suggests that the putative retrograde jet at ~71°S is not continuous, but is formed only by the south edges of the FFRs which form a nearly continuous ring at ~65-71°S. (In these large FFRs at ~65-71°S, their internal bright streaks are methane-bright.) Just south of this ring of FFRs is the loose ring of AWOs at ~71-74°S; these are now small and numerous so it may not be possible to match them up with those seen at earlier perijoves. Around the pole itself, five circumpolar cyclones are clearly visible ([Figure 12](#)).

Many dark and bright haze bands are visible near the terminator, including a long arc of haze that spans much of the south polar region, running along the edges of two of the circumpolar cyclones (best seen in image 105, [Fig.11](#)). This arc is a bundle of both brown bands and white bands (sometimes rainbow-coloured: [Fig.12](#)), resembling those in the bland zone in the north. A similar (possibly the same) band across the south polar region was in the same place at PJ8, and perhaps at some previous perijoves.

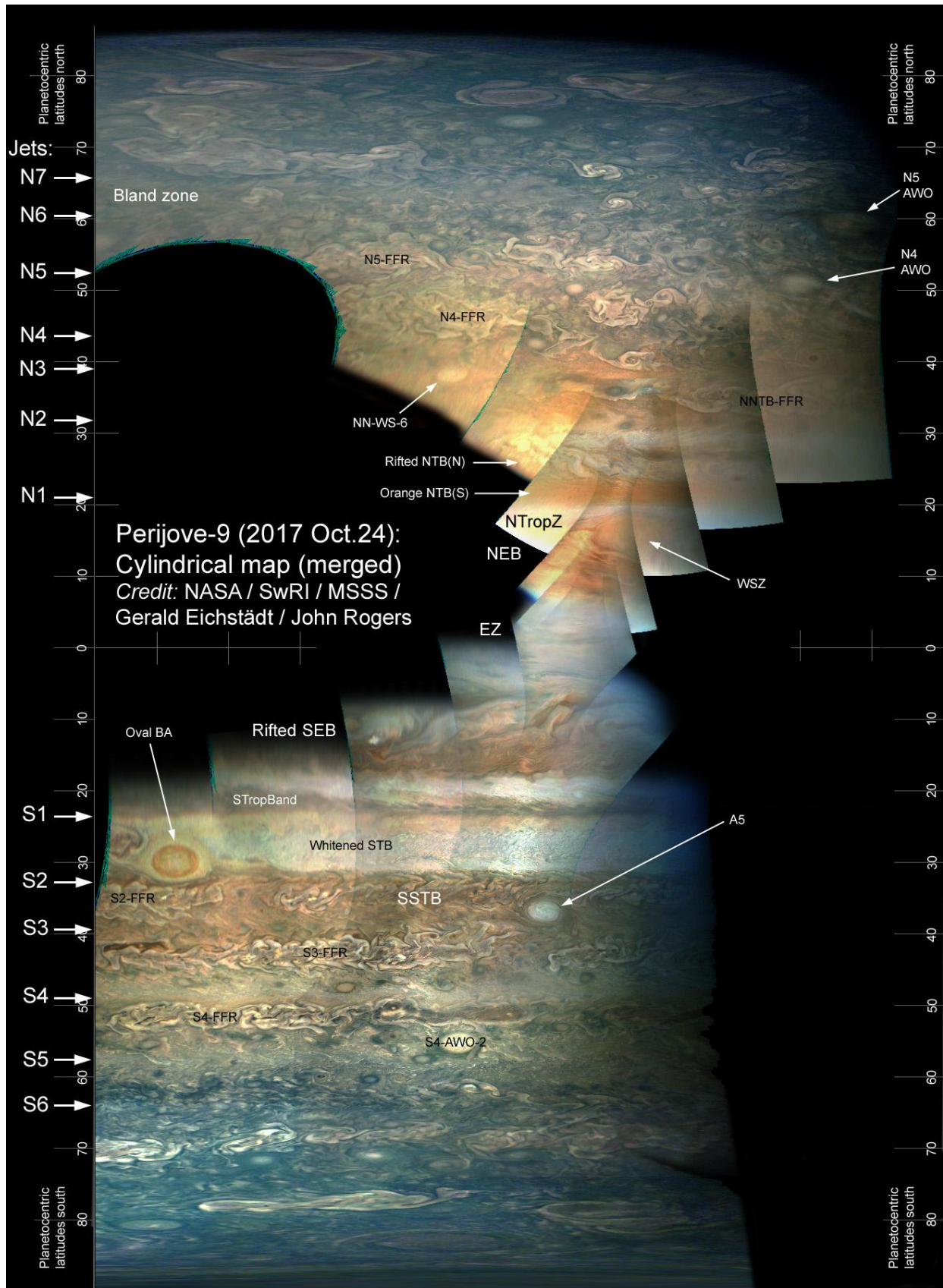


Figure 4

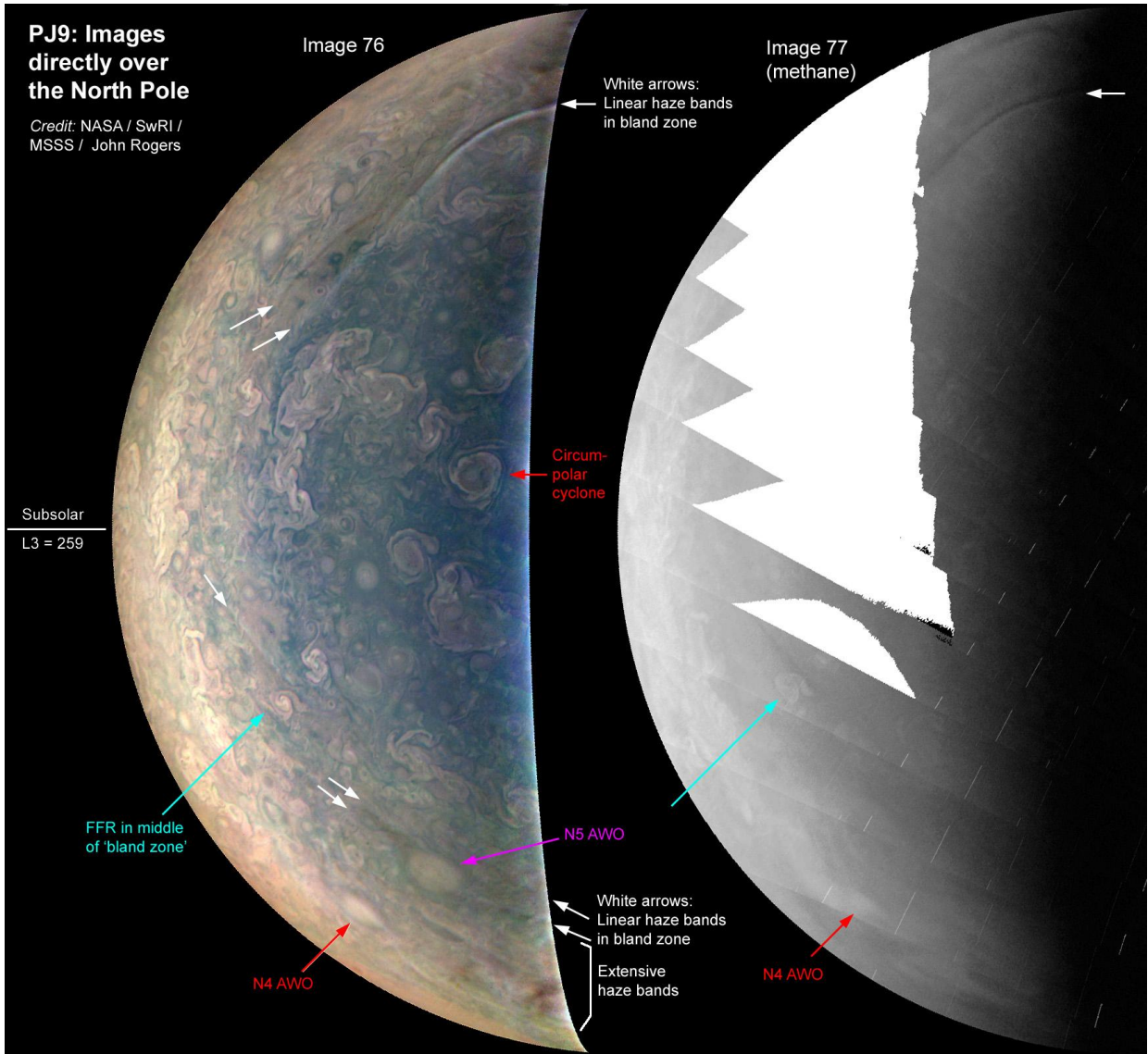


Figure 5

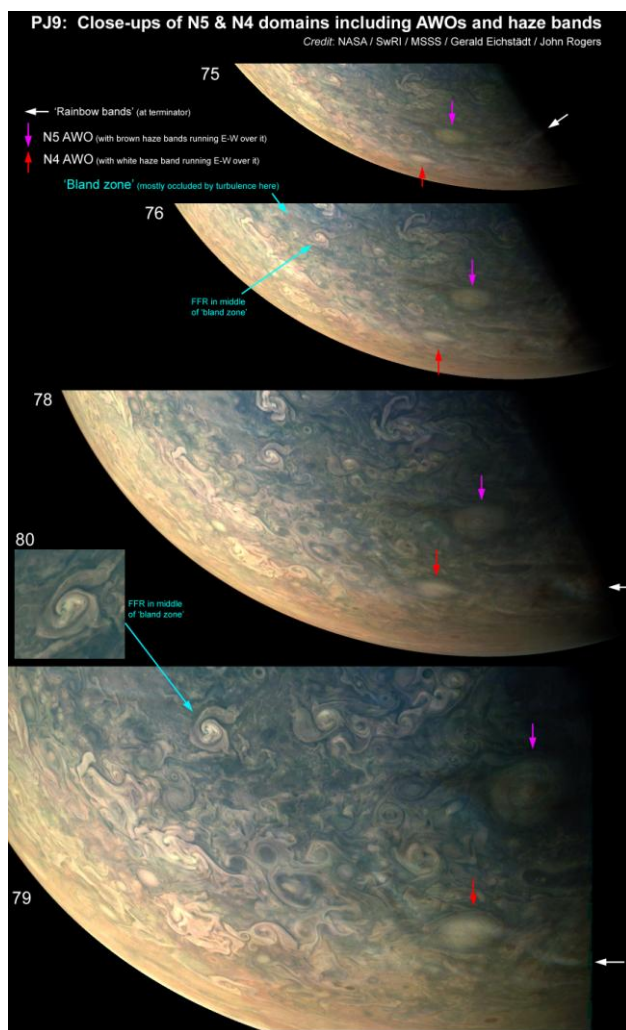


Figure 6

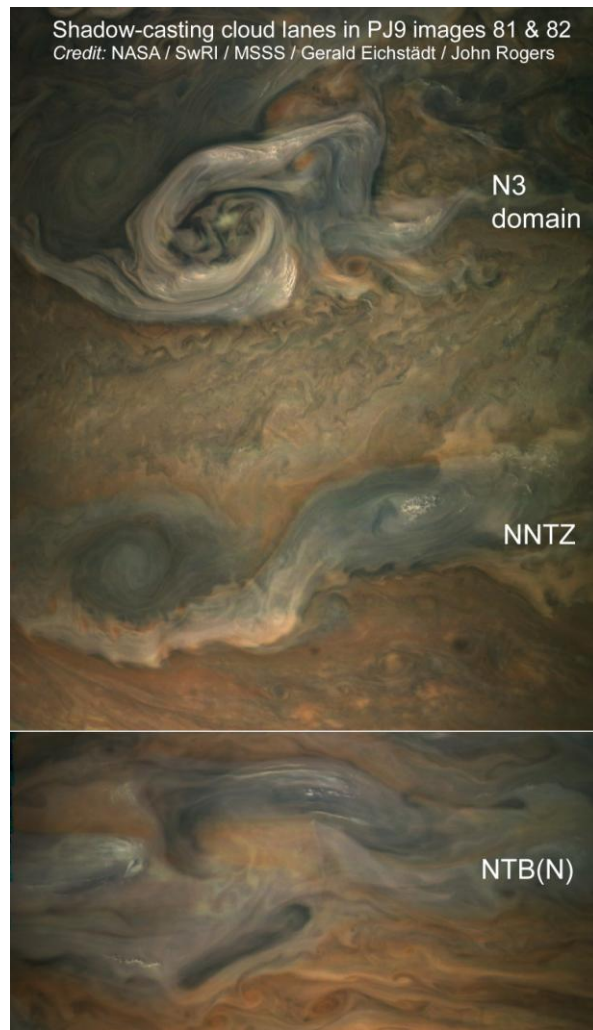


Figure 7

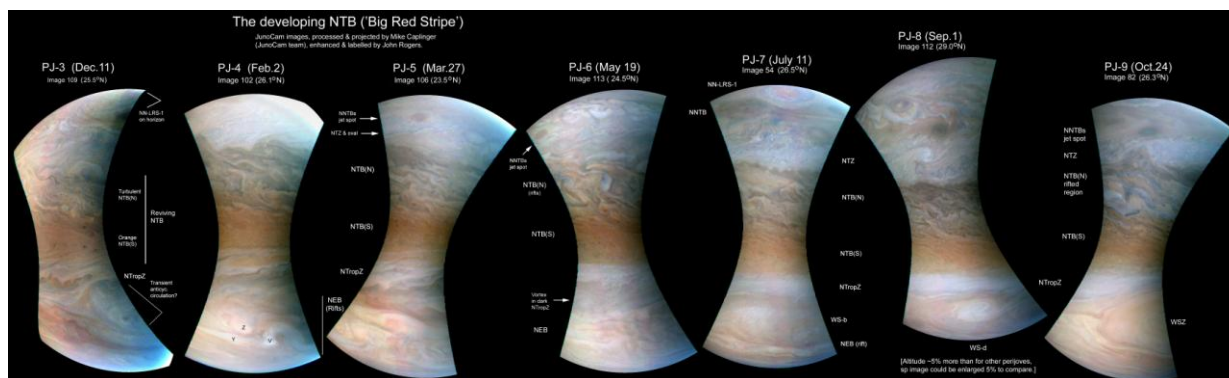


Figure 8

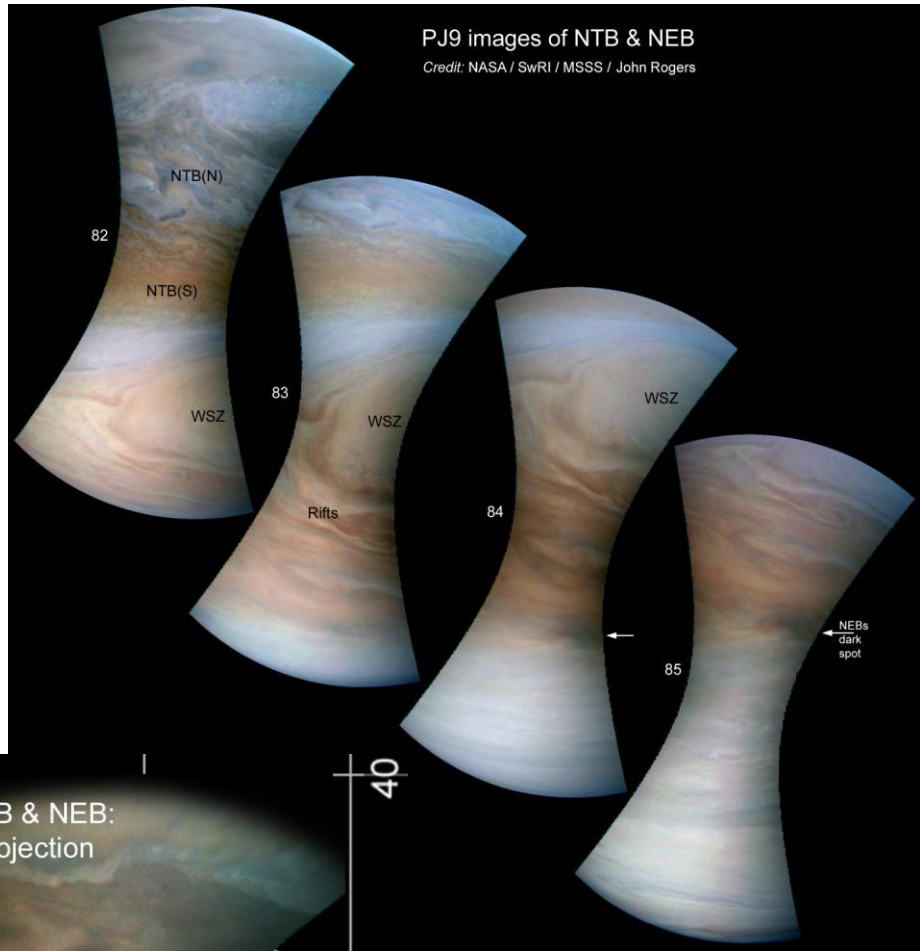


Figure 9

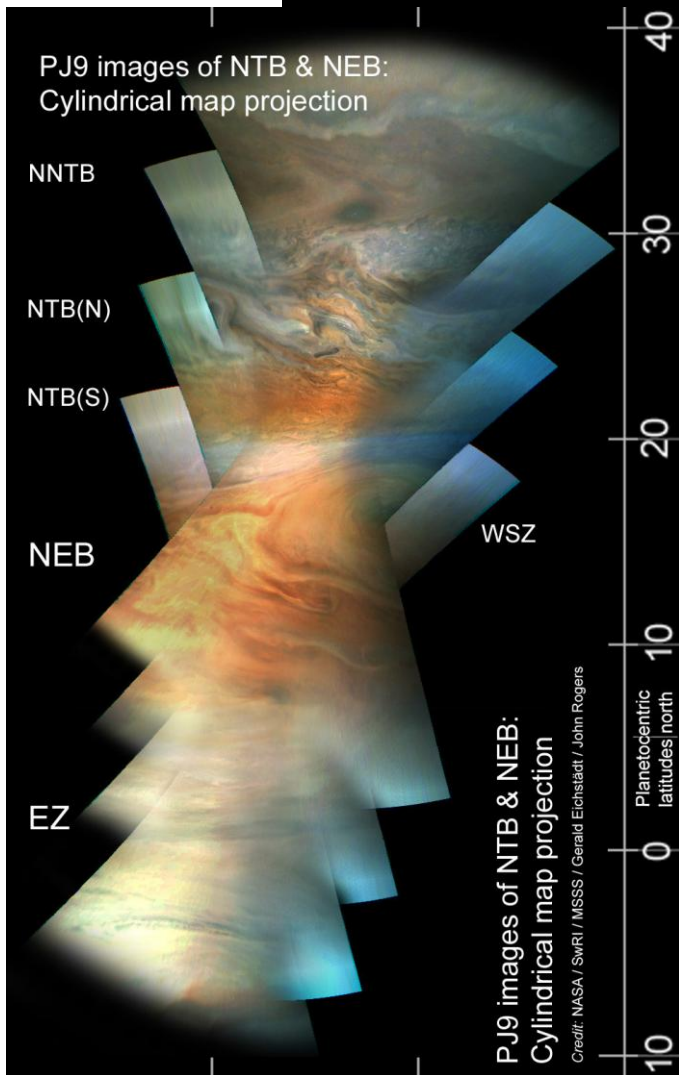


Figure 10

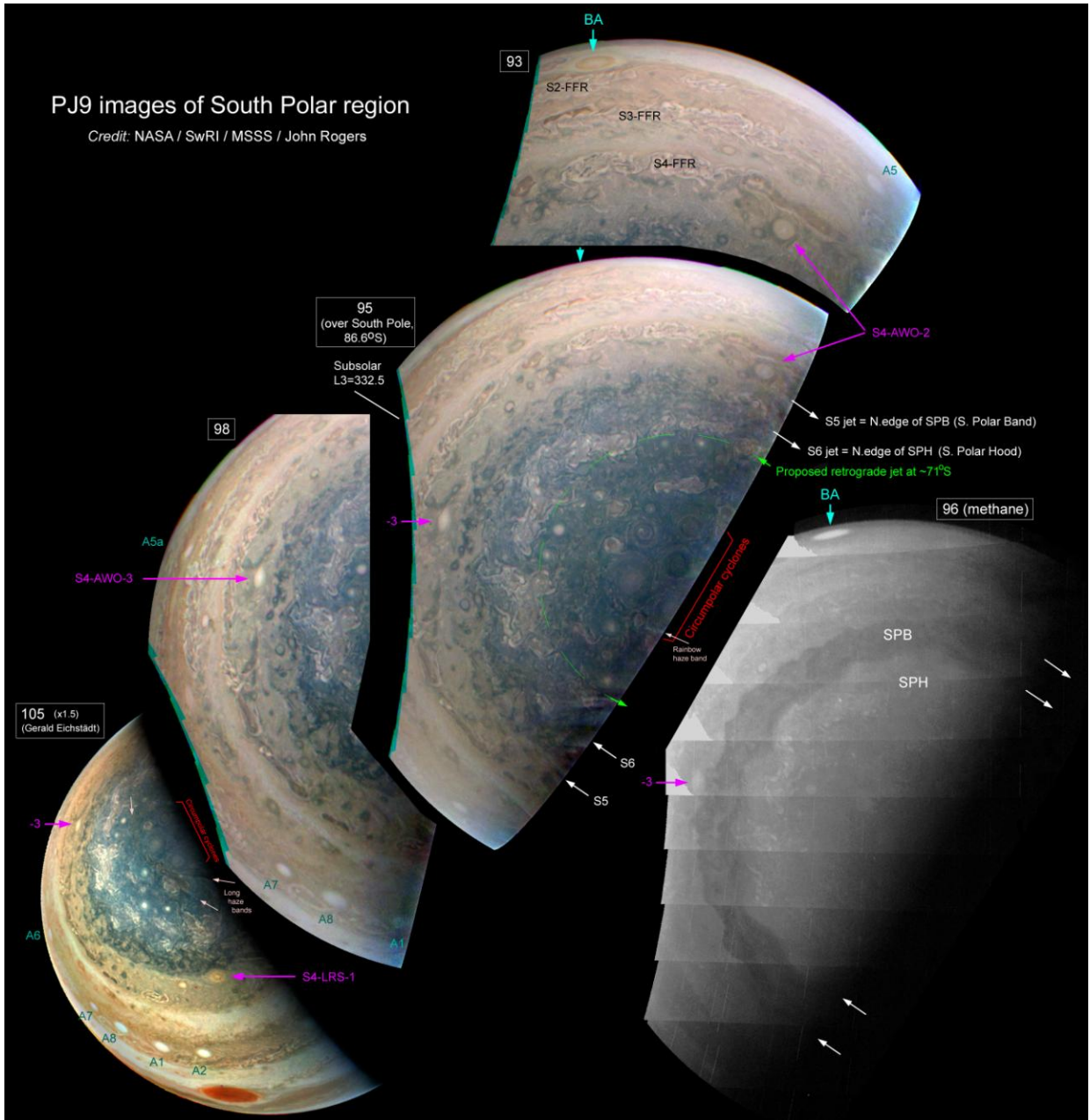


Figure 11

PJ9 images of South Pole: Circumpolar cyclones & haze bands

Credit: NASA / SwRI / MSSS / Gerald Eichstädt / John Rogers

Image 92

Image 93

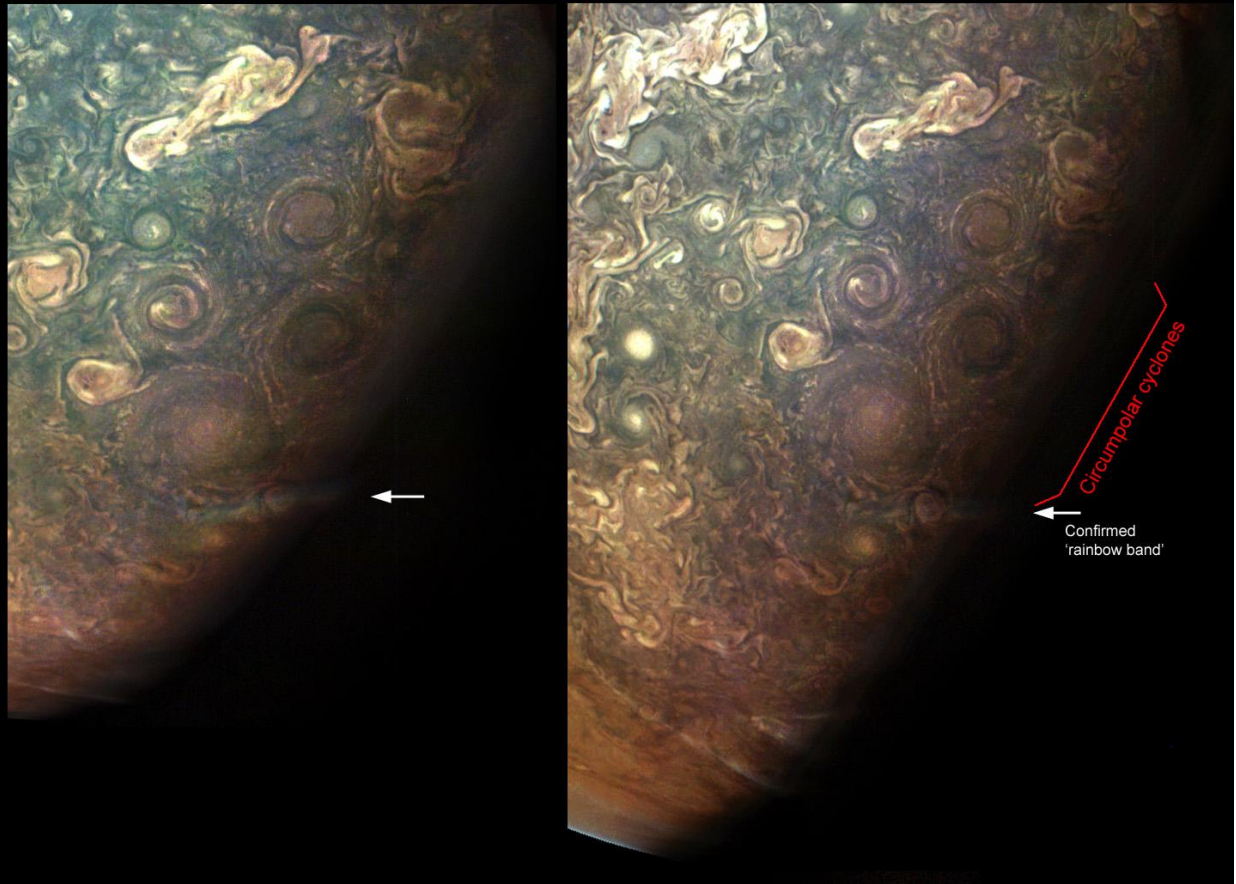


Figure 12