

## **Juno at perijove-13 (2018 May 24): What the images show**

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Perijove-13 (PJ13) had the spacecraft pointed towards Earth and Sun for optimal gravity mapping (a 'GRAV' orbit), so JunoCam only got oblique views of the low latitudes, and no views of the planet inbound until it passed over the north pole. However, the views of high latitudes were excellent and numerous. JunoCam now obtains more images than before, partly because it has been allocated more data volume, and partly because data can be transmitted directly to Earth during GRAV perijoves. However, some of the images have randomly scattered red, green or blue pixels (esp. near the terminator), which probably represent radiation strikes.

As usual, this PJ13 report is illustrated in part by the projected, reduced-resolution images initially released by the JunoCam team, and in part by the full-resolution images processed by Gerald Eichstädt, and composites of the maps that he made from them.

For ground-based views of the perijove track, please see our 2018 Report no.5

(<https://www.britastro.org/node/14405>) Figure 1 (map) and Figure 3 (set of images).

*North polar region:*

Figure 1 is a selection of images of the region (earlier images showed only a narrow sliver), and Figure 2 is a composite north polar projection map. The usual features are nicely seen.

*Northern hazes:*

As usual there are linear haze bands in the 'bland zone', often continuous with disparate swirls of haze bands to the south. One of the former (indicated in Figs.1 & 2) is a very bright rainbow band, overlying what may be a pair of small merging AWOs (anticyclonic white ovals) belonging to the N5 domain. A brown extension from it (marked by a dashed white line in Fig.2) runs roughly south, sinuously, becoming a brown-and-white haze band that overlies a N4 AWO largely enclosed by an FFR (images 23 & 24). This is probably one of those great swirls or loops of the edge of the N. Polar Hood that were visualised at PJ12. Two methane images were taken over the bland zone (e.g. image 20 in Fig.1) and successfully recorded some of these complex haze bands. Further mapping will clarify the relationship between the visible and methane-band aspects of these haze bands.

Figure 3 is a composite cylindrical map of the perijove images, at reduced scale.

The images of the high northern domains from N6 to N2 are especially spectacular with intricate swirls and many 'popup clouds' (i.e. tiny bright clouds casting shadows).

*NNTB and NTB:*

Impressive rifted regions (folded filamentary regions: FFRs) were viewed close up in both belts; Figure 4 gives an overview of them. Figure 5 shows closeups of the NNTB-FFR (images 27 & 28), indicating some of the rows of popup clouds, including (at right) a narrow "wall" of cloud with probably the longest shadows that I've yet seen. It also includes a grand view of a NNTBs jet spot, an anticyclonic vortex with rows of popup clouds.

The rifted region in the NTB(N) should be cyclonic, but it extends largely across the NTZ, which should be anticyclonic. I think this could be seen as the p. (E) end of the N. Temperate Disturbance.

**Figure 6** (image 29) is a view over the orange NTB(S). In contrast to early perijoves, but as at PJ12, it now contains many tiny bright clouds (presumably popup clouds although the Sun is too high here to cast shadows).

#### *North Equatorial Belt:*

The NEB locations are shown in **Figures 3 & 7**. By comparison with ground-based images (Report no.5) we can identify an AWO (WS-d) and a small but well-formed barge in a white halo (also seen near the horizon in **Figure 6**).

#### *Equatorial Zone:*

Image 35 covers the southern EZ at high quality, and shows mesoscale waves within some white cloud bands. They are not widely shown elsewhere, although there are hints of them in the southern part of the orange Equatorial Band.

#### *STB Spectre:*

An excellent series of images of the southern hemisphere revealed the STB Spectre (**Figures 3 & 8**), the pale cyclonic circulation that had recently been impacted and temporarily obscured (in ground-based images) by the great turbulence emanating from the S. Tropical Disturbance. So it is good to see Juno's confirmation that it is still intact; and these images should suffice for animation and measurement of the winds.

These images also give excellent views of the high southern latitudes including AWOs in the S2 domain and S4-LRS-1.

#### *South Polar region:*

The south polar region, south of the wavy S6 jet, shows the usual chaos of FFRs, with some small AWOs between them, and the usual patterns in methane images (**Figure 9**).

One of the JunoCam team's projects is to determine the motion of the FFRs and AWOs, and amateur ground-based images may now be able to help in this. Andy Casely (Australia) is taking hi-res visible and IR images and making polar projection maps of them which enable some of these high-latitude features to be identified and tracked (see his examples in **Figure 10**, and links in our 2018 Report no.5).

**Figure 11** is a composite south polar projection map of the region, with the circumpolar cyclones labelled.

#### *Circumpolar cyclones (CPCs):*

Of the 6 CPCs, all except CPC-1 [my usual numbering] can be clearly recognised, but there have been notable changes (compare Fig.S1 of my PJ12 report). In the long-lived gap between CPC-2 & -3, there is a well-defined dark disk: is this a new cyclone derived from the irregular circulation seen at PJ12? An even darker disk is present on the other side of the pentagon (near CPC-1?); but these features are not viewed at high enough resolution to identify them.

Conversely, an AWO is wedged between CPC-4 & -5 (but not CPC-1 & -2 as at PJ12).

CPC-6 (the central cyclone) is still centred far from the pole, at the same position as at PJ1 and PJ8. This confirms its cyclic motion; it has completed 2 cycles since PJ1, so has a mean period of 318 ( $\pm 53$ ) days.

A map of the haze bands in the south polar region is still being compiled. Many minor haze bands are visible, but notably, the 'Long Band' is almost entirely absent, for the first time since PJ4. There are some intensely bright and dark arcs of haze, spanning the belt of FFRs at ~67-71°S, but they are well north of the usual position of the Long Band.

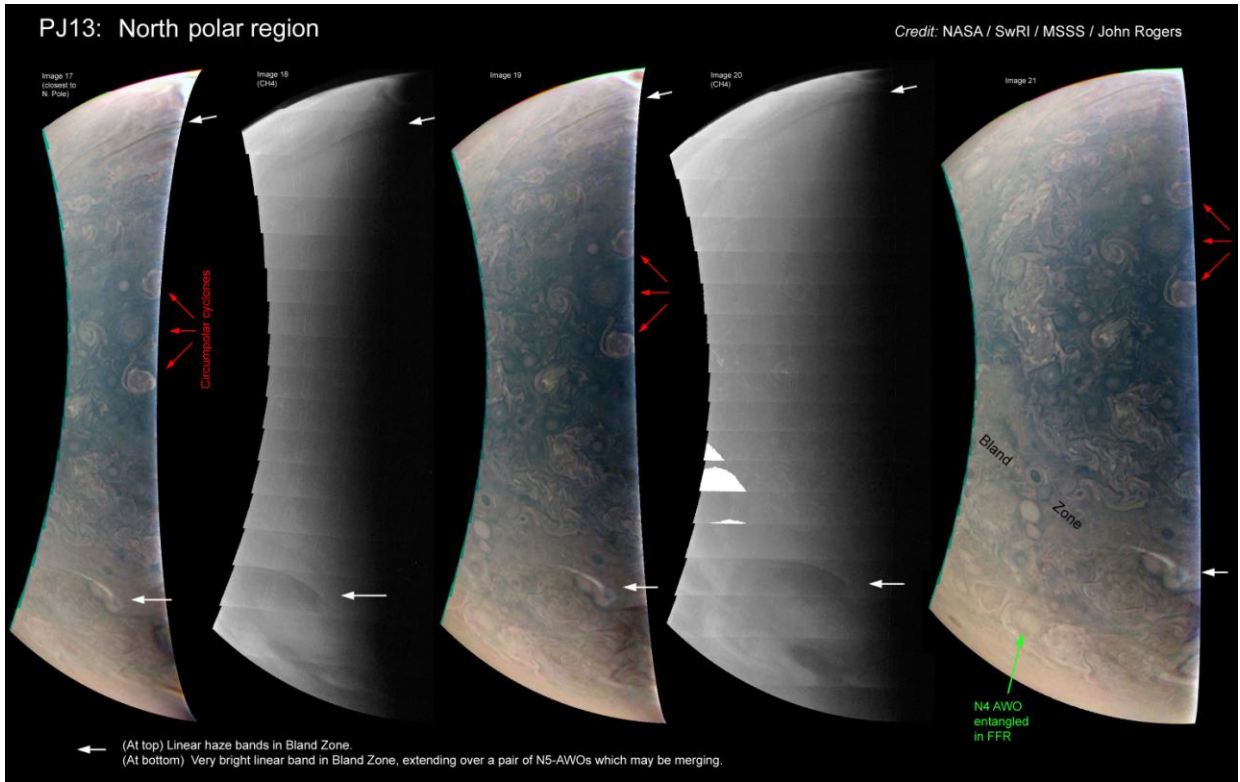


Figure 1

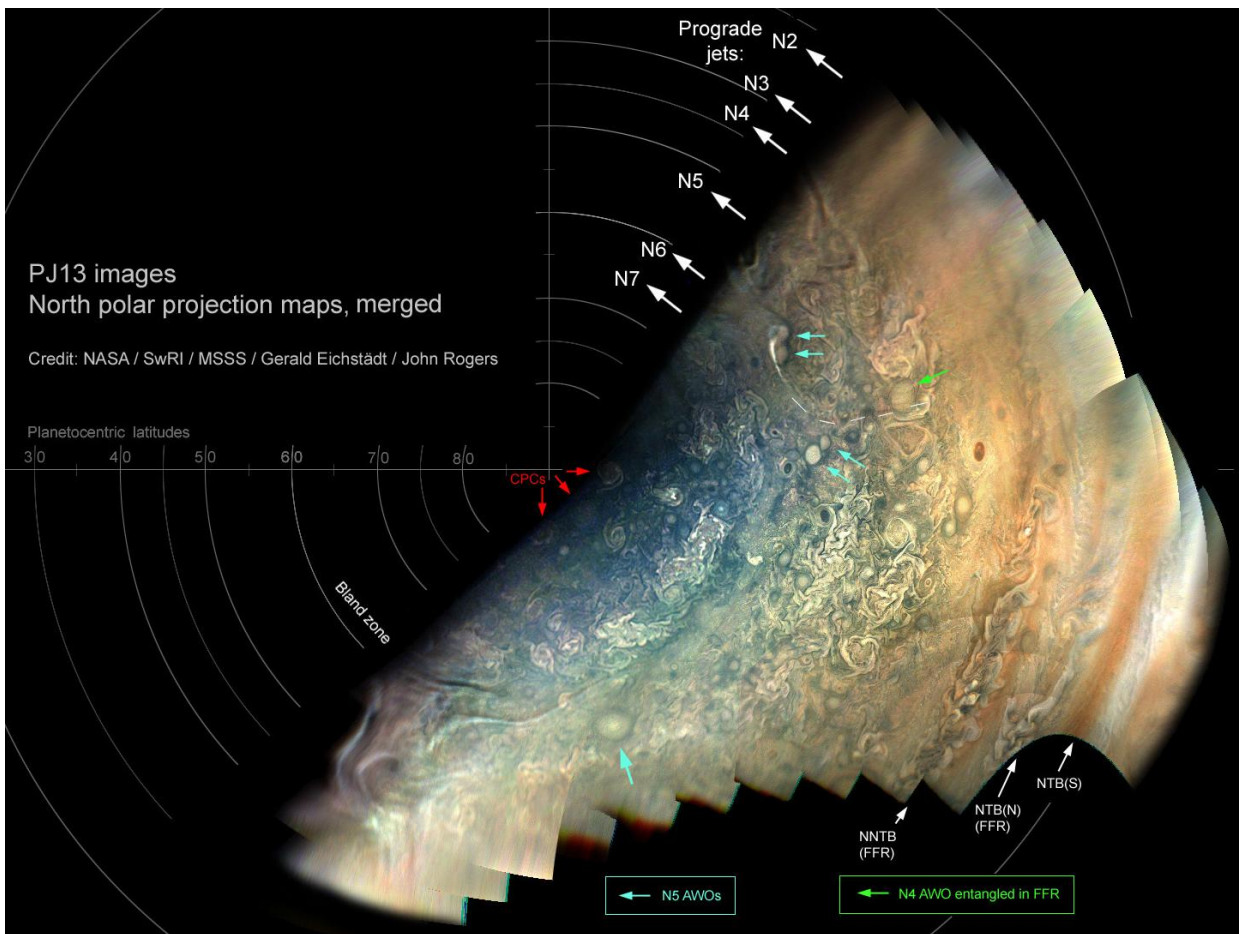


Figure 2

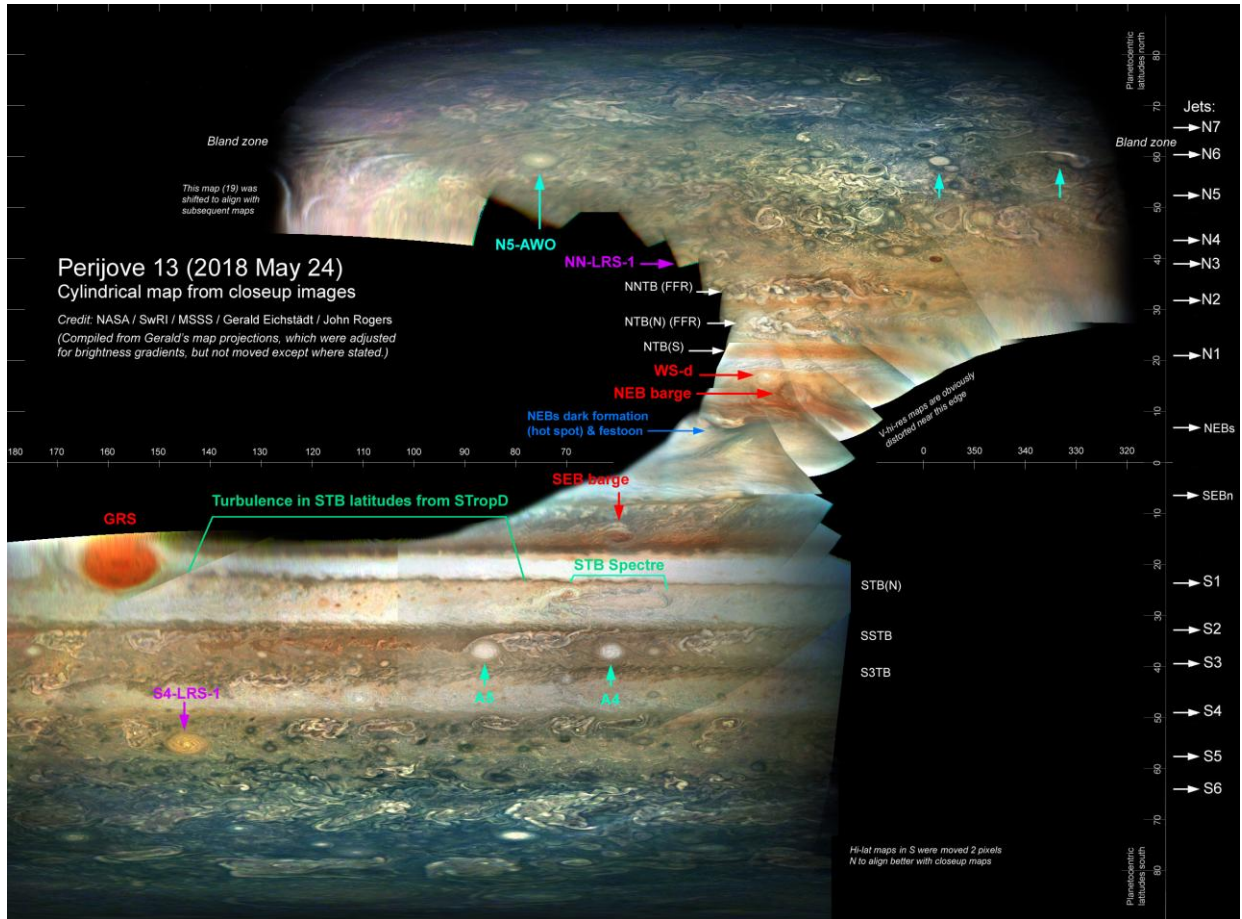


Figure 3

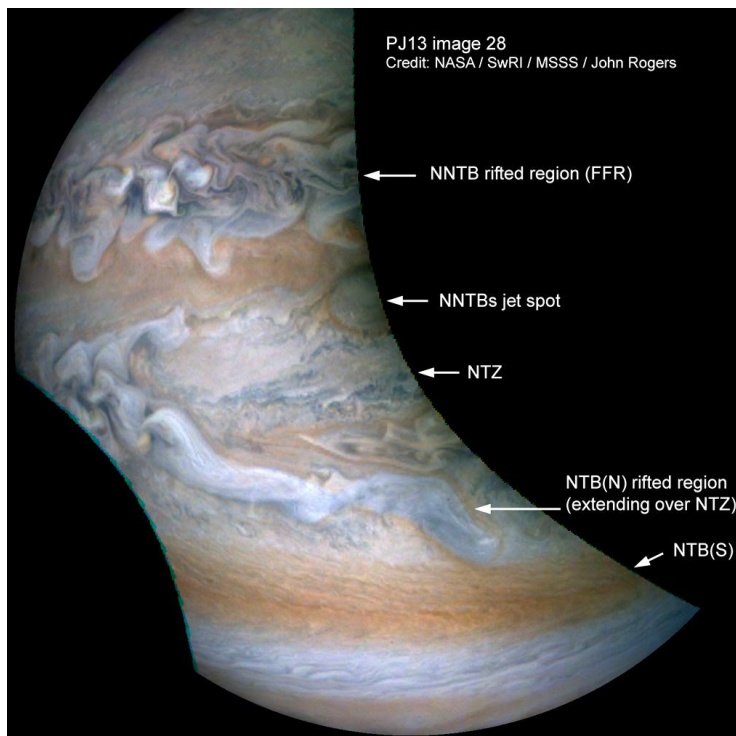
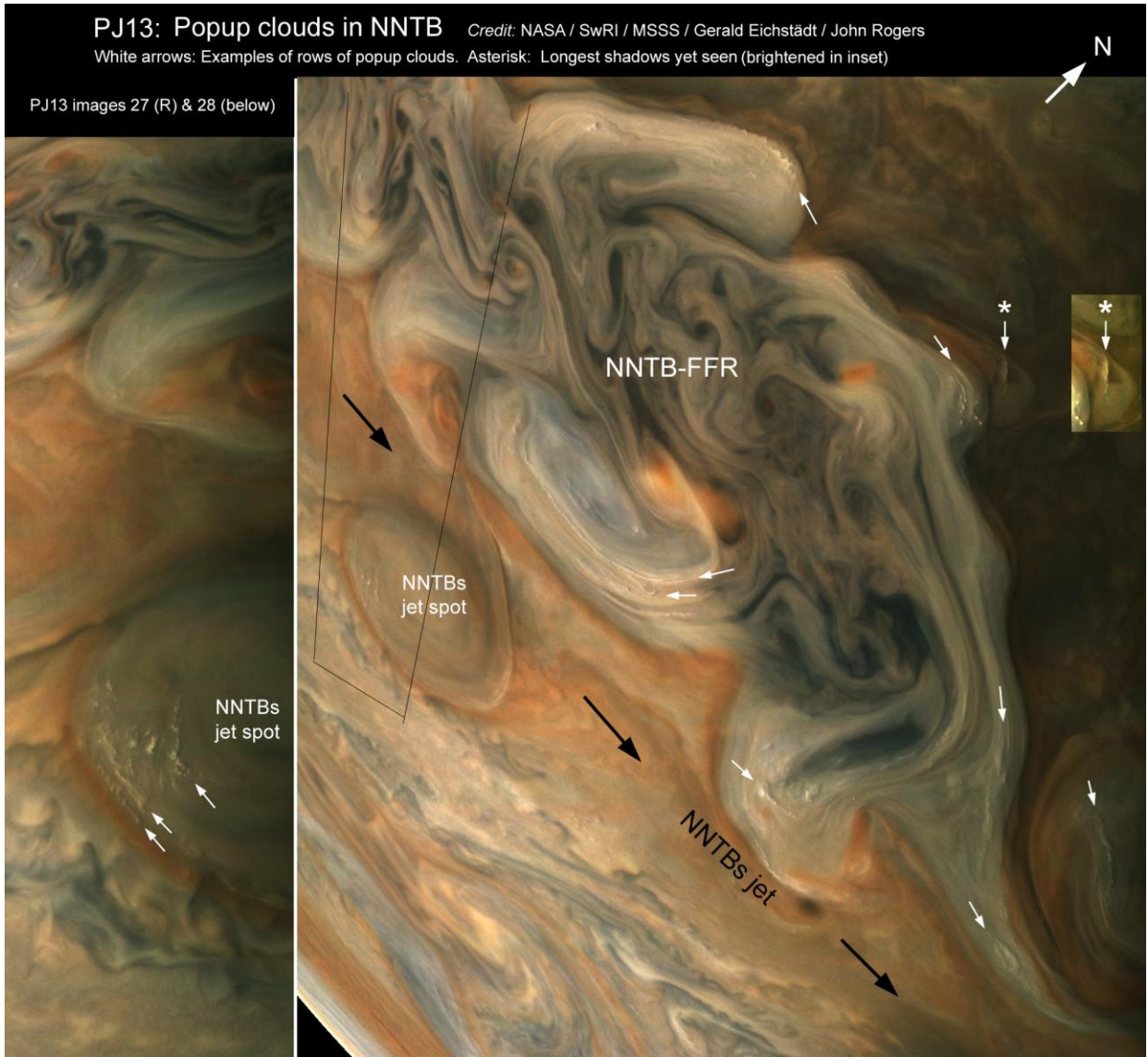
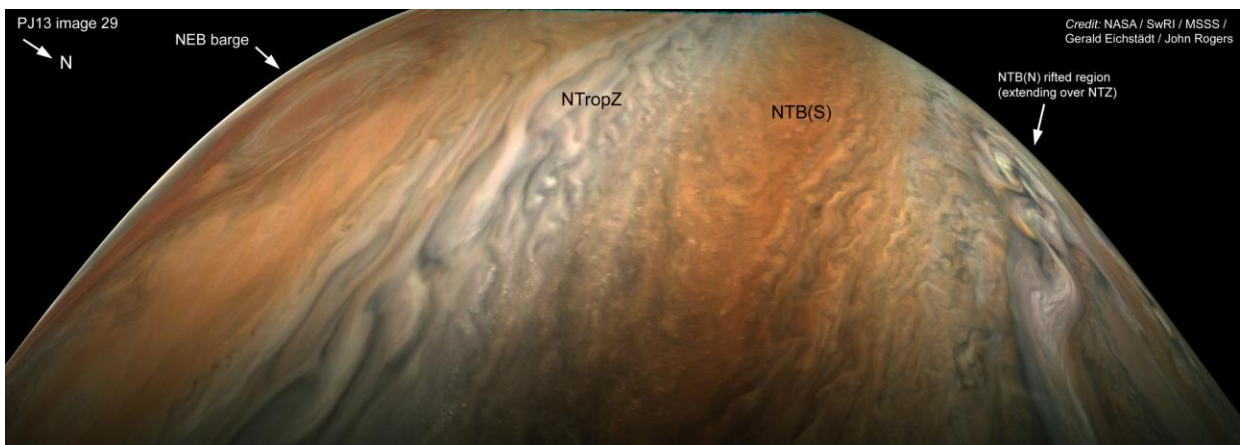


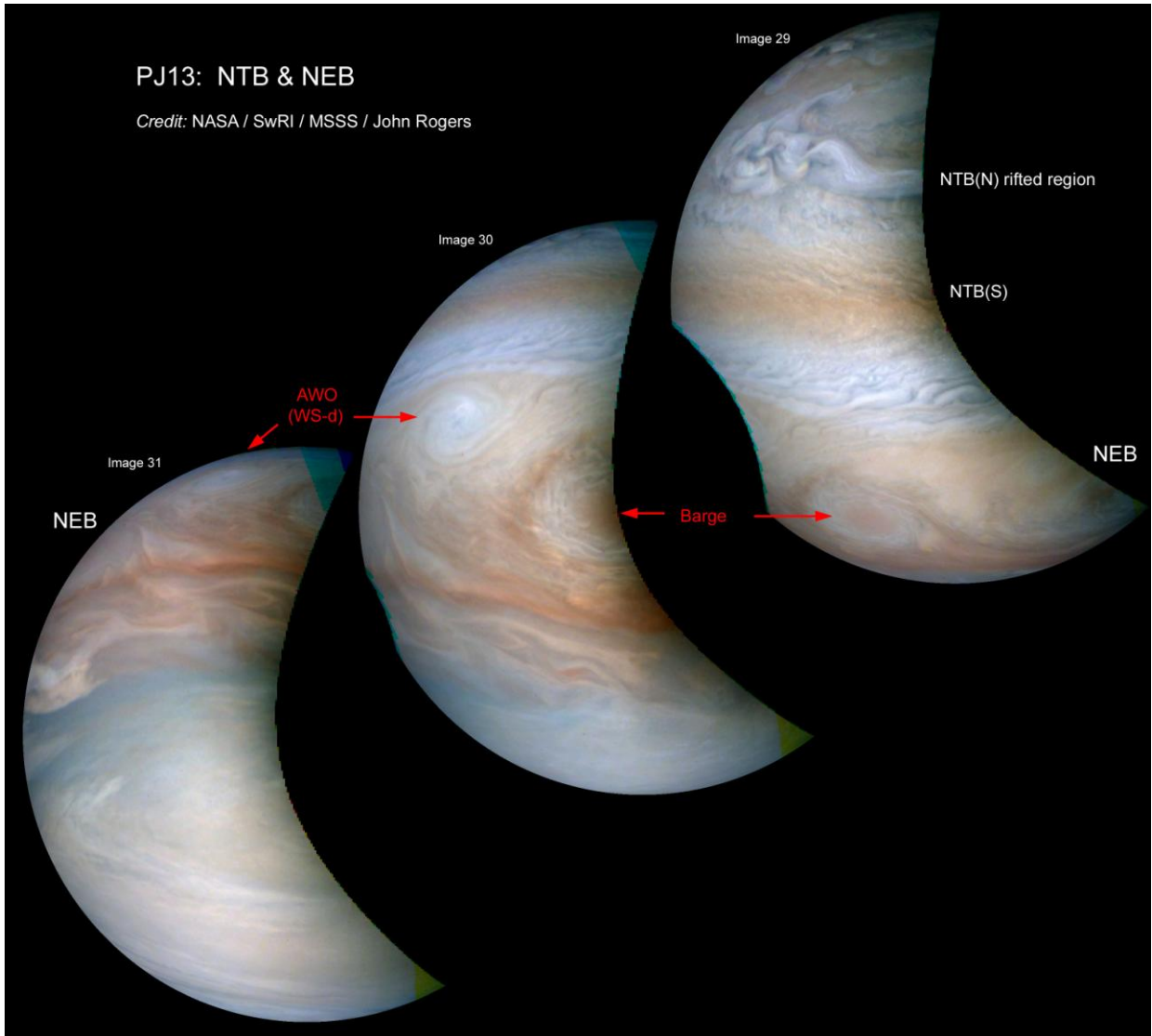
Figure 4



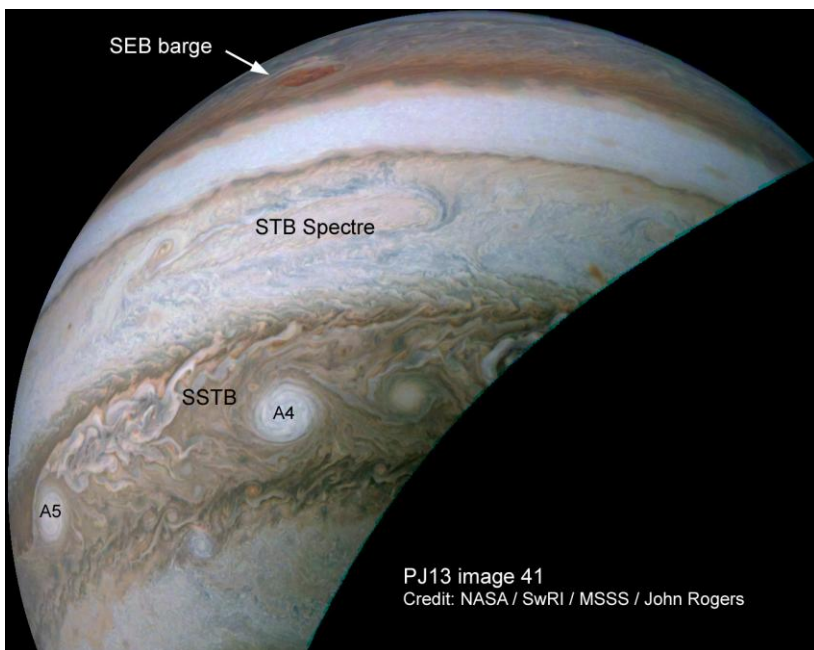
**Figure 5**



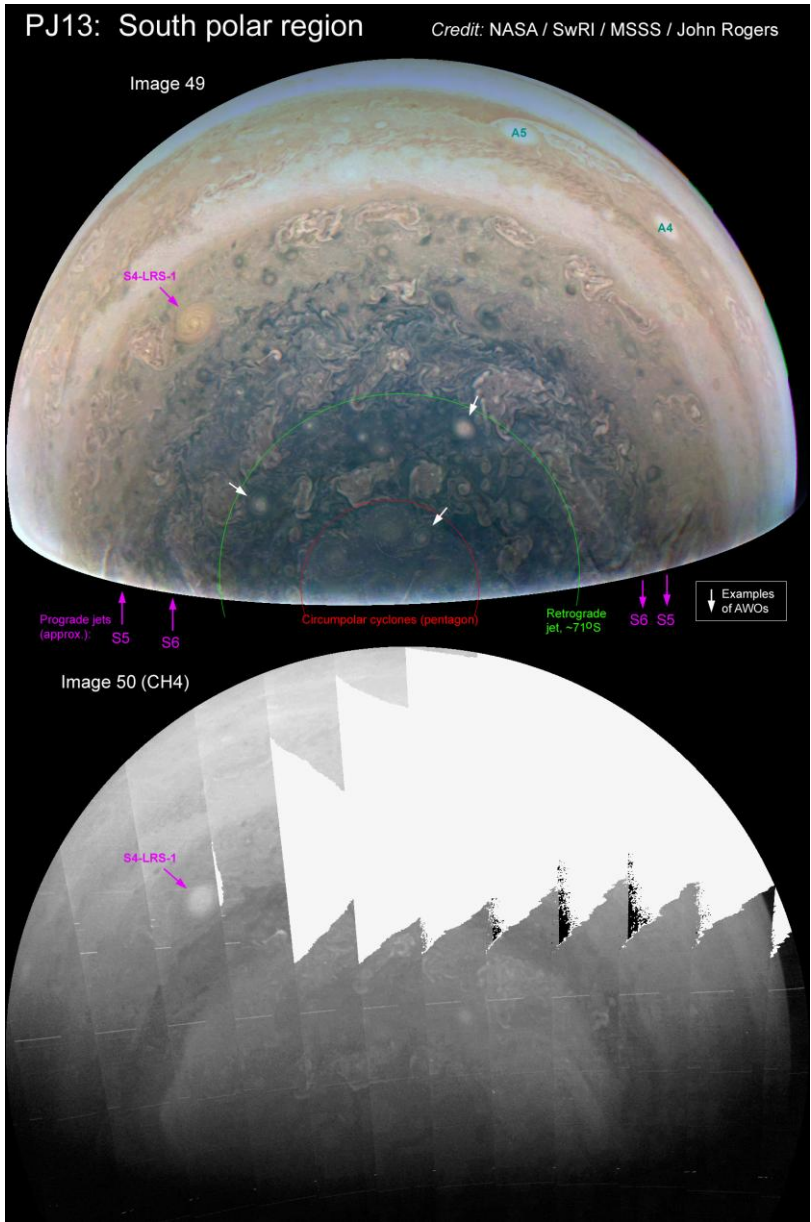
**Figure 6**



**Figure 7**

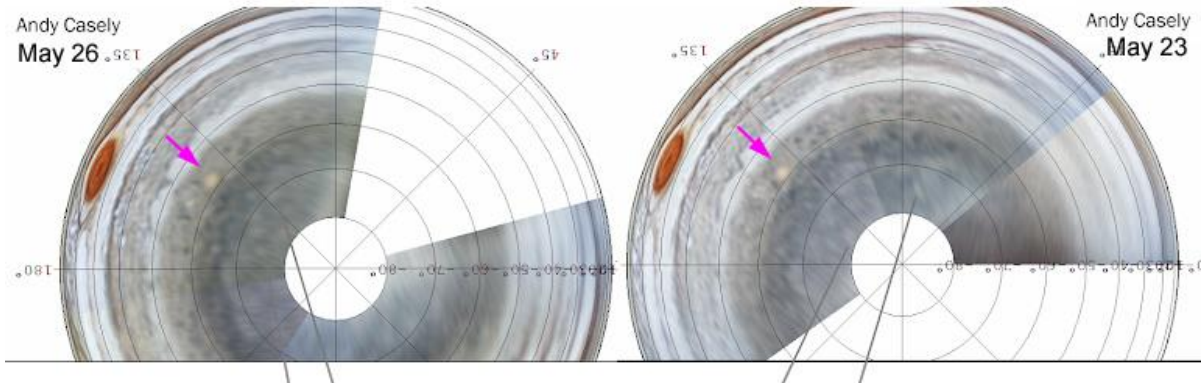


**Figure 8**

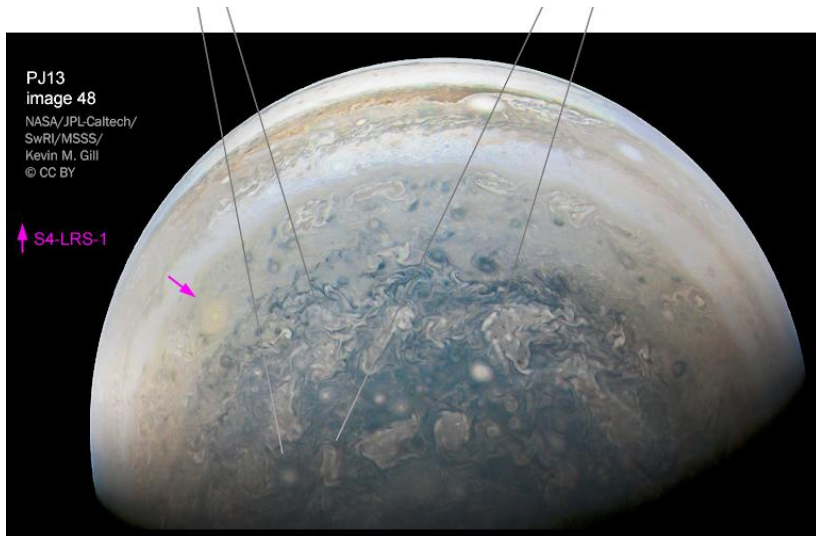


**Figure 9**

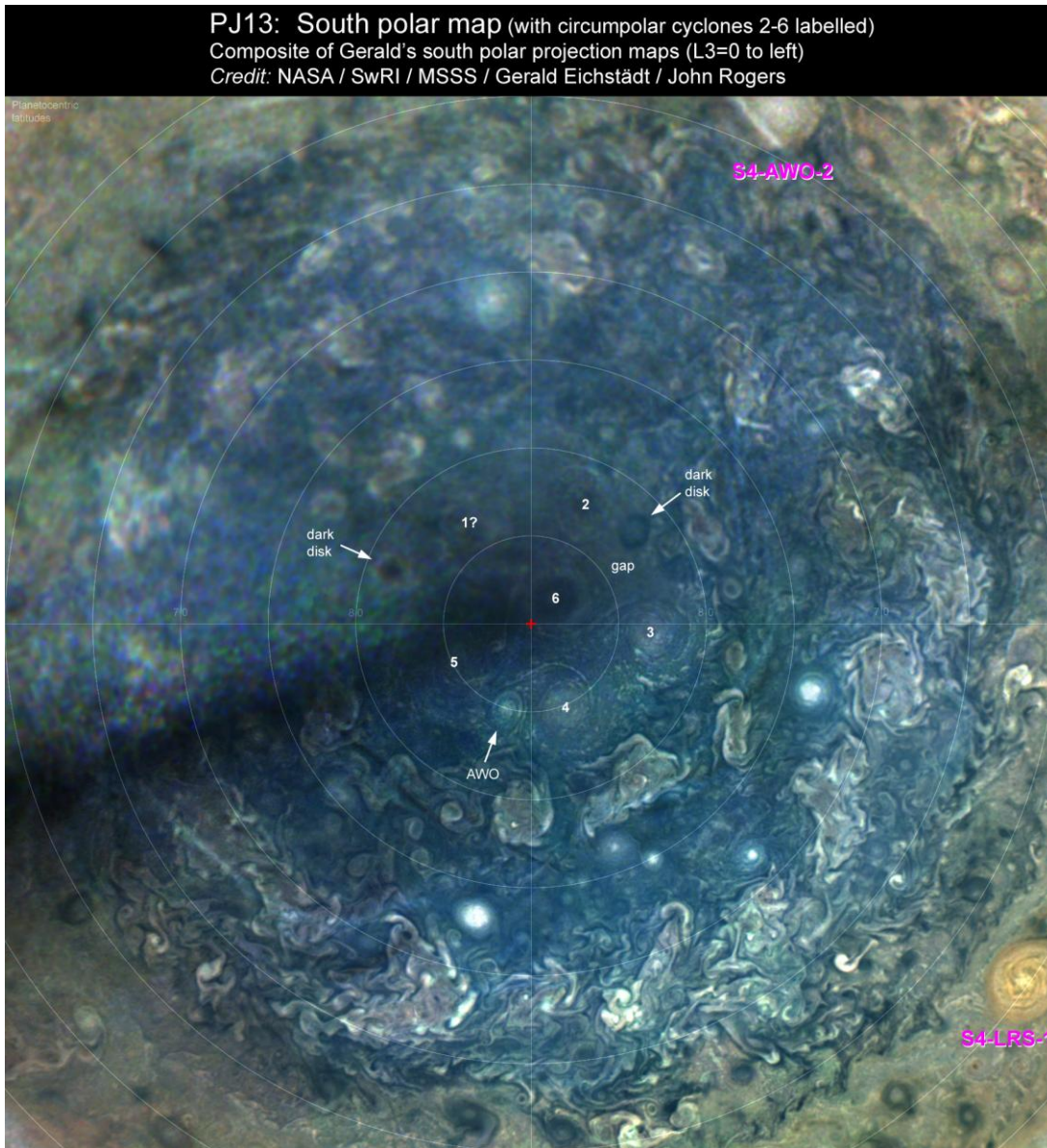
TOP: Images, polar projection maps, & comparison, all by Andy Casely;  
 BOTTOM: JunoCam image of S. Polar region at PJ13 (24 May).



**Figure 10 (top part)**



**Figure 10 (bottom part)**



**Figure 11** [in opposite orientation to Figures 9 & 10]