Juno at PJ38: What the pictures show

John Rogers (BAA) (2021 Dec.25)

Juno's Perijove-38 was on 2021 Nov.29. Perijove was at latitude 31.5°N ('centric), then Juno crossed the equator at L1=129, L2=241, L3=91.7. This was just 22° preceding the PJ36 track. However, for the first time in many orbits, the spacecraft was tilted so that the pointing instruments looked directly downwards at low latitudes. This was mainly done to optimise coverage for the JIRAM instrument, but also enabled JunoCam to get its closest views yet of the N. Temperate domain and adjacent regions.

This was the fourth of six closely spaced orbits planned to survey the odd equatorial 'magnetic pole' that Juno discovered, nicknamed the 'Great Blue Spot'. This happens to be the side of Jupiter with few notable large features in visible light. However, at PJ38, Juno was lucky to pass directly over several important features.

This report is based on the initial releases of the images by the JunoCam team, plus hi-res versions of some by citizen scientists Brian Swift and Kevin Gill. A full set of fully processed images and maps will follow later.

North Polar Region (Figure 1): The circumpolar cyclones (CPCs; numbered in Figure 1) look very much as they did at PJ36, and there is still a small anticyclonic vortex N of CPC-1, whereas the structures outside the polygon of CPCs have changed considerably.

High northern domains: The increasing resolution on this domains continues to show more details. Figure 2 shows an AWO adjacent to a brown cyclonic oblong, in the N4 domain. Popup clouds are well resolved in the AWO, even in the methane-band image. In the same images we see the anticyclonic oval NN-LRS-1, whose central part has recently become strongly red again;it is very bright in methane.
Figure 3 is a ground-based map of the planet around the time of PJ38, for reference. As it is now late in the apparition, the resolution is not as good as it was in earlier months.

North Temperate & Tropical domains (Figure 4): Figure 4(B) shows a neat cyclonic 'barge' in the NTB, though it was too small to show up in Figure 3. Figure 4(A&C) show portions of the NTZ and the whitened northern NEB, in full-resolution versions posted by Kevin Gill with contrast enhanced. In recent perijove reports we have noted the emerging textural patterns in these thickly cloud-covered regions, and these nadir views show more detail yet. In the NTZ we see well-resolved popup clouds, and in the NEB(N) we see extensive bands of semi-periodic mesoscale waves (between the brackets).

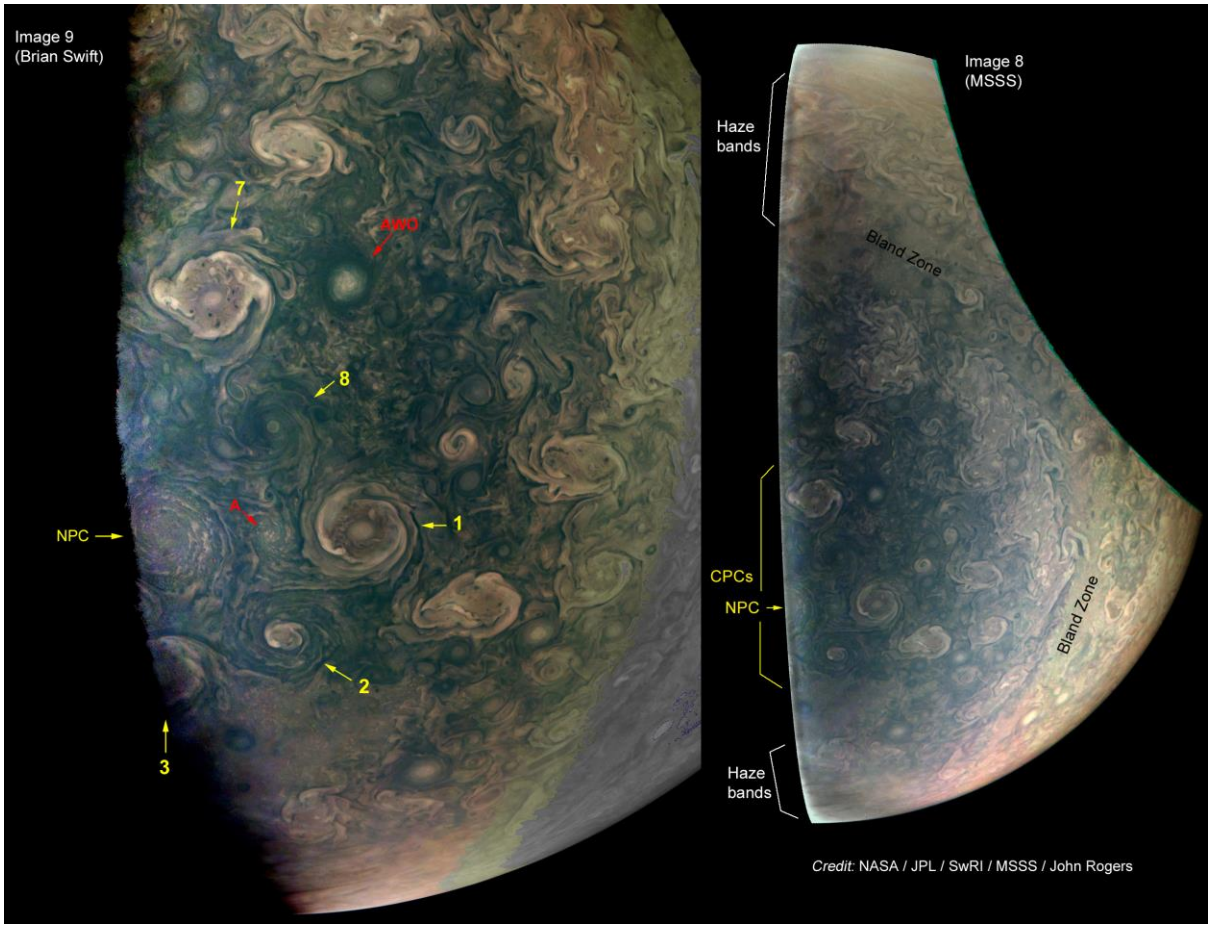
NEB(S) & Equatorial Zone: A highlight of PJ38 was Juno's passage directly over an active convective outbreak in the NEB(S) (Figure 5). This was one of several small outbreaks that have appeared in this residual component of the NEB this year, as the NEBs jet has accelerated to exceptionally fast speed. We have just posted a report on this outbreak as 2021 Report no.6 (direct link: https://britastro.org/node/26451).
Figure 5(C) is an enlargement of the orange Equatorial Band, with semi-periodic and irregular cloud patches, and mesoscale waves with various wavelengths. This has been the usual aspect at recent perijoves but this is the first nadir view of it.

South Temperate domain: Another highlight of PJ38 was a flight over the recent (Aug.7) STB outbreak, provisionally labelled Spot 8, also seen at PJ36. It had become inconspicuous in ground-based images since Sep., but the PJ38 images show that it is still a turbulent little feature, roughly the same size as at PJ36 (Fig.6). This outbreak is fully described in our recently-posted 2021 Report no.5 (direct link: https://britastro.org/node/26450).

South Polar region: South of Spot 8, each domain exhibits FFRs of various sizes (Figures 6 & 7). The S4 domain includes a long chain of them ("Cyclone Alley" as in Tollefson et al., 2017). At the f. end of this chain, the S4 domain also exhibits a particularly thick (apparently elevated, broad and opaque) band of haze on the terminator in Fig.7.
The images taken high over the SPR (e.g. Fig.7) also show other bands of haze further south. Although we have not yet produced maps, even these preliminary images show a long dark haze band in similar position to the Long Band at other recent perijoves, partly encircling the polar pentagon. Two of the circumpolar cyclones are tentatively identified in Fig.7.

Figures:

Figure 1:



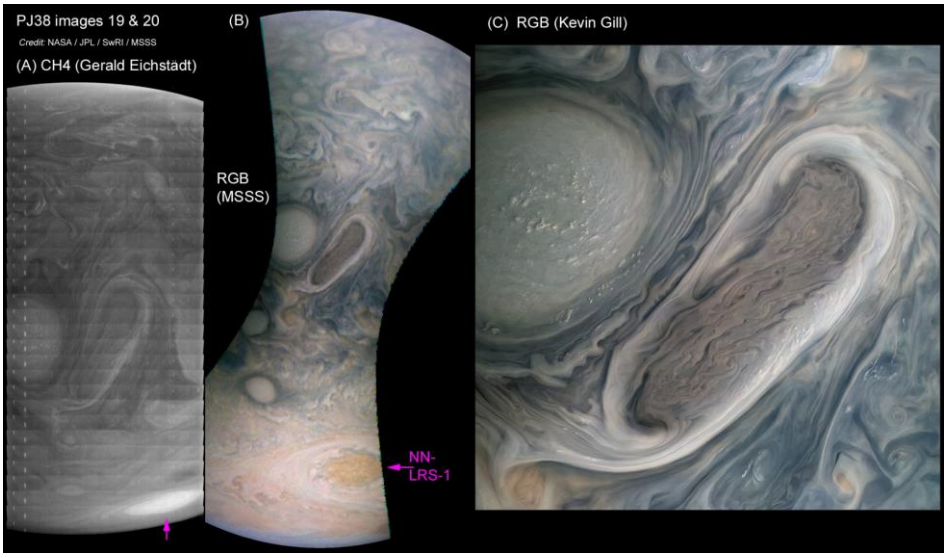


Figure 2:

Figure 3:

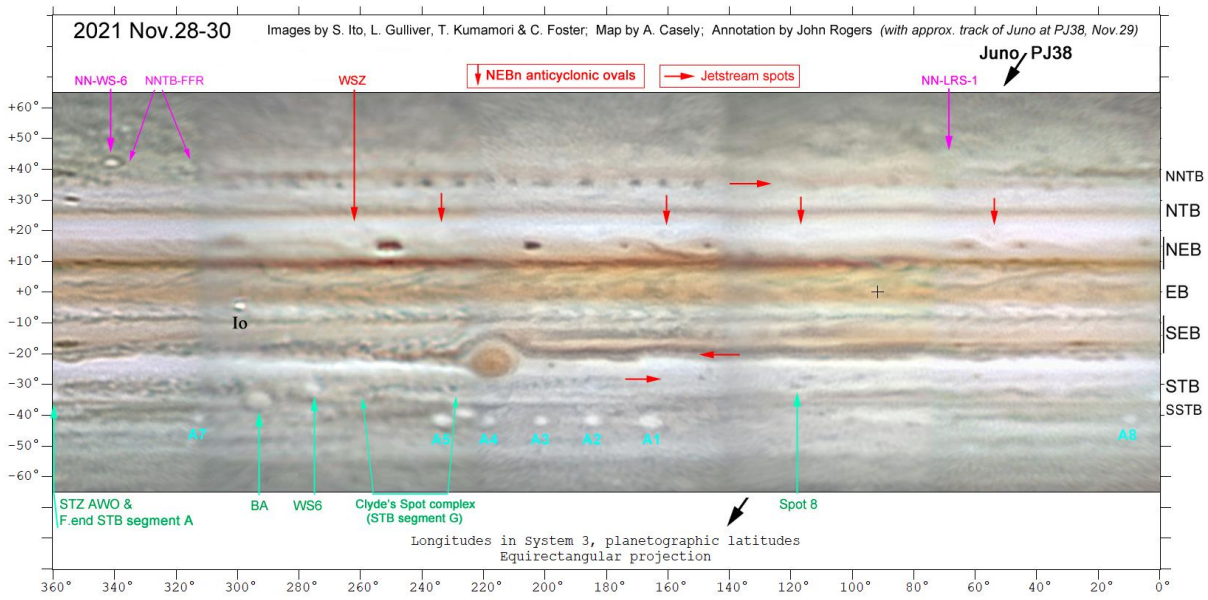


Figure 4:

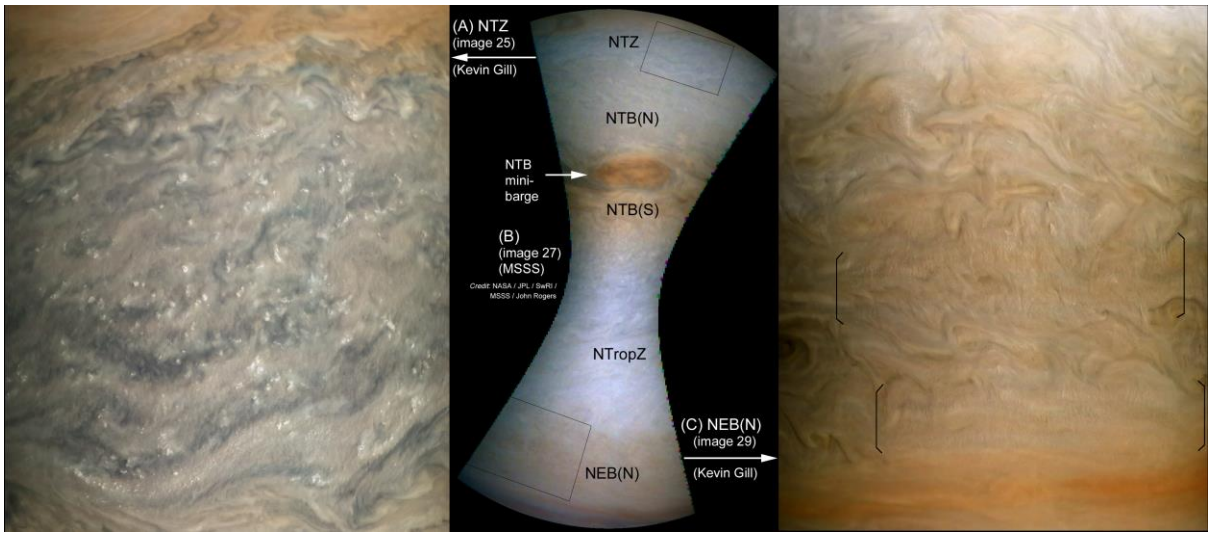


Figure 5:

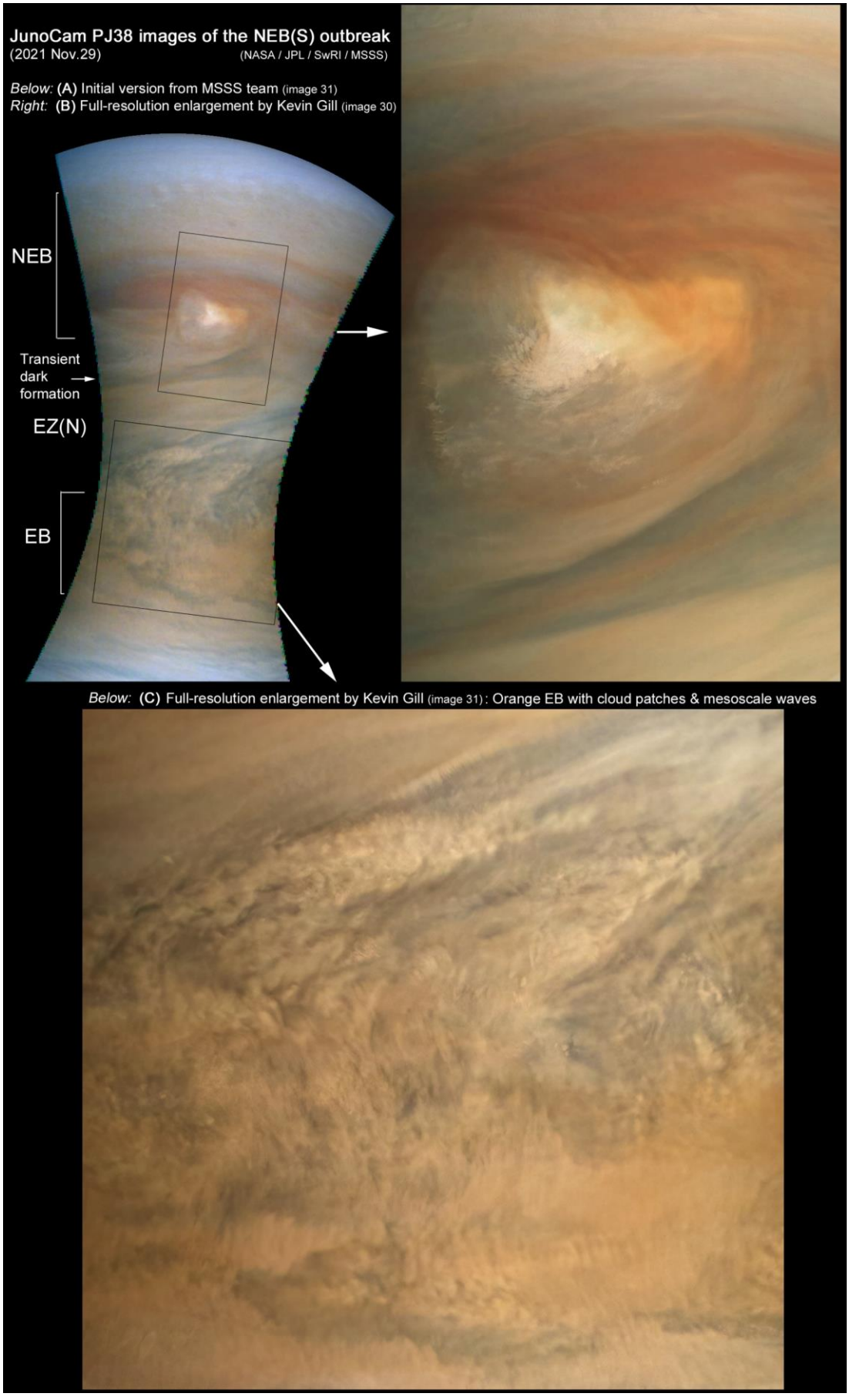

JunoCam PJ38 images of the NEB(S) outbreak
(2021 Nov.29)
(NASA / JPL / SwRI / MSSS)
Below: (A) Initial version from MSSS team (image 31)
Right: (B) Full-resolution enlargement by Kevin Gill (image 30)
NEB
Transient dark formation
EZ(N)
EB
Below: (C) Full-resolution enlargement by Kevin Gill (image 31): Orange EB with cloud patches & mesoscale waves

Figure 6:

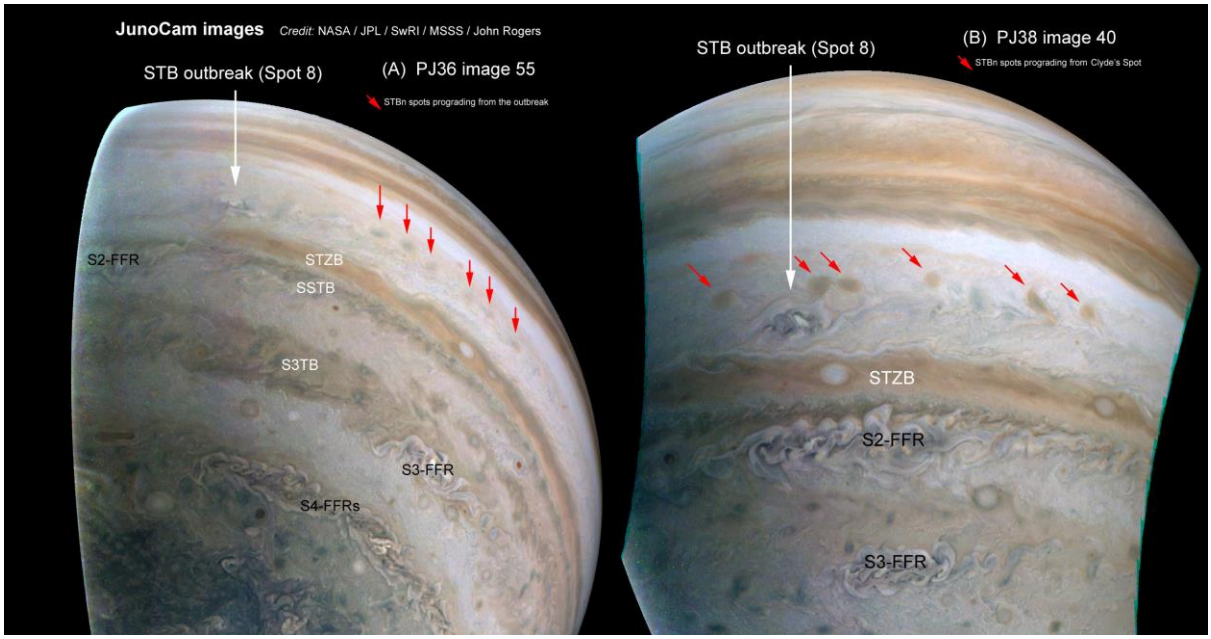


Figure 7: