Juno at Perijove-6: The major belts from Perijove-1 to -6.

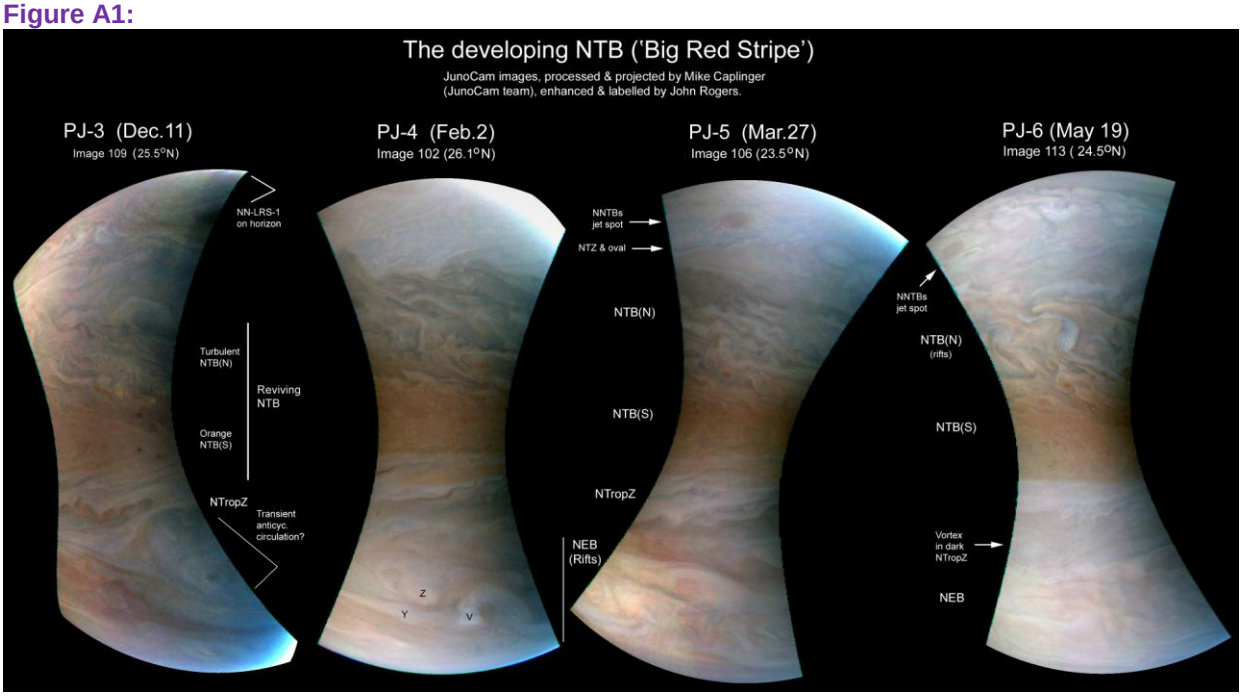
--John Rogers (British Astronomical Association), 2017 June 3

(Full-size figures are in a separate ZIP file.)

This report compares the JunoCam close-up images of Jupiter's major belts from each perijove when they were obtained. The figures show the JunoCam team's projected images – which do not have full resolution, but give the most useful overview, always projected as if looking down from a single point on the spacecraft track. However, they cannot be matched up exactly because the altitude and the latitude differed between perijoves. The quality of the images improved with testing over the first few perijoves, so for some latitudes, images from PJ1 were not adequate; even thereafter, the quality of some very close images is impaired, possibly by blur or compression. Details of the features described are given in our reports on the BAA Jupiter Section web site at https://www.britastro.org/section_front/15.

NTB (Figure A1):
The NTB has been reviving in classic manner since the great outbreak in autumn 2016, and JunoCam has repeatedly targeted the "Big Red Stripe" (the reviving orange NTB(S)) to follow this process. Ground-based images show that the appearance has been essentially the same at all longitudes, except for the turbulent sector viewed at PJ6 (though Hubble images may give a better overview). The orange NTB(S) had formed in the weeks preceding PJ3, and we can see its edges becoming better defined over the following months. To its south, the NTropZ was disrupted by prominent multicoloured streaks at PJ3 and PJ4 but has gradually become more organised. To its north, the NTB(N) latitudes have appeared chaotic throughout, but gradually became darker grey. The PJ6 image covers part of a long-lived FFR or rifted sector of NTB(N), which had persisted through the great NTB jet outbreak, so this sector is not typical of the whole NTB.

Figure A1:



NEB (Figure A2):

The NEB has undergone extensive outbreaks of convective white spots ('rifts'), and the context and further details of each picture are given in our reports on each perijove. The PJ3 image was just preceding a new bright rift. The PJ4 image showed several bright rifts (X,Y,Z). The PJ6 image was expected to capture an unusual pale sector which had evolved from extensive rifting, but this appears to have reverted to normal, so this is the least-disturbed NEB sector imaged. On the other hand, the image unexpectedly captures a striking anticyclonic vortex in the expanded northern NEB, apparently a new feature. This may be a snapshot of the formation of new AWOs in the aftermath of a NEB expansion event.

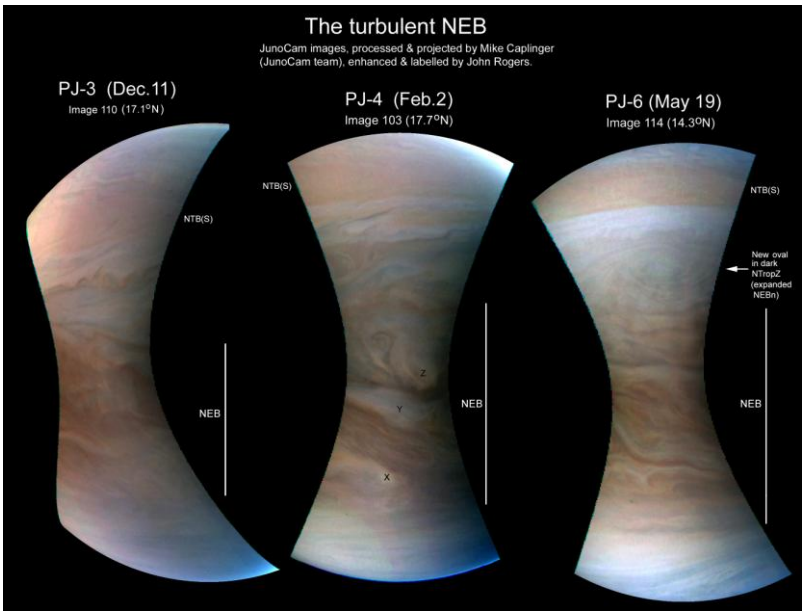


Fig. A2

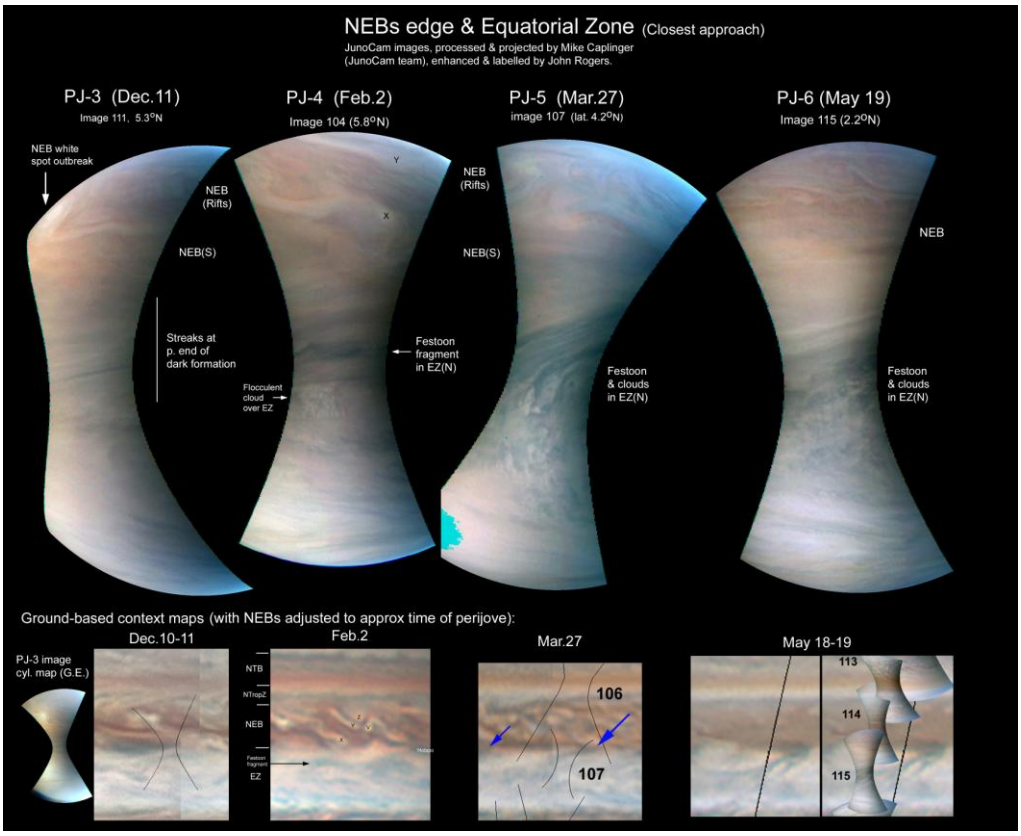
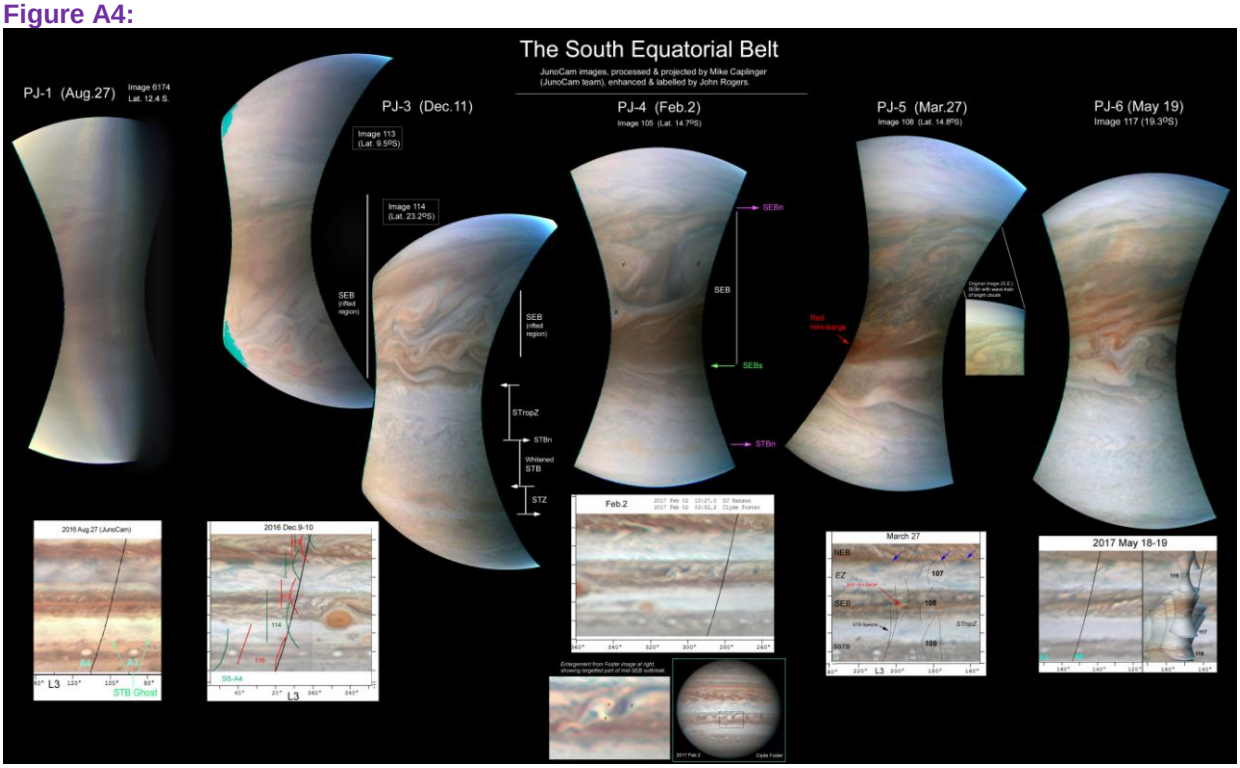


Fig. A3

NEBs/EZn (Figure A3):
These were the closest-range images, until perijoves shifted further north, and some of them are of suboptimal quality; however, they show fine details of the clouds. None of them have yet caught a NEBs dark formation ('hot spot'); instead, all have caught festoons or similar dark blue-grey streaks just preceding (PJ3), between (PJ4), or following (PJ5 & PJ6) hot spots. Previous spacecraft have shown the festoons themselves as bundles of streaks, often associated with rafts of white clouds on their Sp. sides, while sets of waves (of ~200 km wavelength, oriented north-south) are sometimes seen in the EZ. These features are again seen in the full-scale Juno images. At PJ3, there are two of the wave-trains in the EZ clouds. At PJ4 and PJ5, there are patches of flocculent white clouds over the EZ adjacent to a festoon; they appear to cast shadows. At PJ6, one can see quite extensive streaky white clouds and wave-trains associated with a festoon.

SEB (Figure A4):
These images have covered a good variety of different sectors, and show complex and multi-coloured cloud textures within the belt. At PJ1, most of the SEB was quiet including this sector. At PJ3, the images showed the perennial rifted sector following the GRS, with one of the bright white spots and large-scale streaks and eddies. Five weeks before PJ4, a new mid-SEB outbreak of white 'rifts' appeared preceding the GRS, and was beautifully imaged – specifically, a vigorous group of white spots near its leading edge, which looked looks similar to the rifted region following the GRS. At PJ5 and PJ6, the quieter part between the two rifted sectors was imaged. The PJ5 images included a red 'mini-barge', and the PJ6 image showed more disturbance on the SEBs retrograding from the rifted sector.

Figure A4:



STB (Figure A5):
There is no dark belt here at present; the nominal STB latitudes are as white as the adjacent zones, with just three short structured sectors of which only one has been imaged. But the JunoCam images show different textures in the clouds, which are similar in all the images. (The full-scale images must be inspected to appreciate them fully.) The STropZ has a smooth, slightly streaky texture, whether all white (PJ3) or largely grey (PJ4) or mixed (PJ5, PJ6). The STBn jet has an elaborate wavy texture. The white STB has a very fine-grained texture of complex white clouds. The STBs jet can be discerned by irregular small streaks; and the STZ has a cloud texture intermediate between that of the STropZ and STB.

Some of the cloud textures may be three-dimensional; and on top of them are innumerable tiny white clouds that cast shadows, scattered most densely across the STB and STZ, which have been seen with increasing clarity at all perijoves from PJ3 (weakly) to PJ6 (best) (**Figure A6 & PJ6 report**).

In contrast to the fine-textured white clouds, larger spots (detectable from Earth) are generally diffuse, whether pale orange patches on the STBn jet (PJ4), retrograding dark spots in the STZ following oval BA (PJ3), or grey streaks in the STropZ (PJ4, PJ5).

The only major feature imaged so far was the STB Spectre at PJ5, which showed an impressive cyclonic circulation pattern, and evidence for an anticyclonic recirculation loop on its south edge. The PJ1 image was immediately following the STB Ghost (a similar feature), and the STB showed complex texture, but this image (a low-quality compression test) did not show whether it was different from undisturbed sectors at later perijoves.

Figure A5:

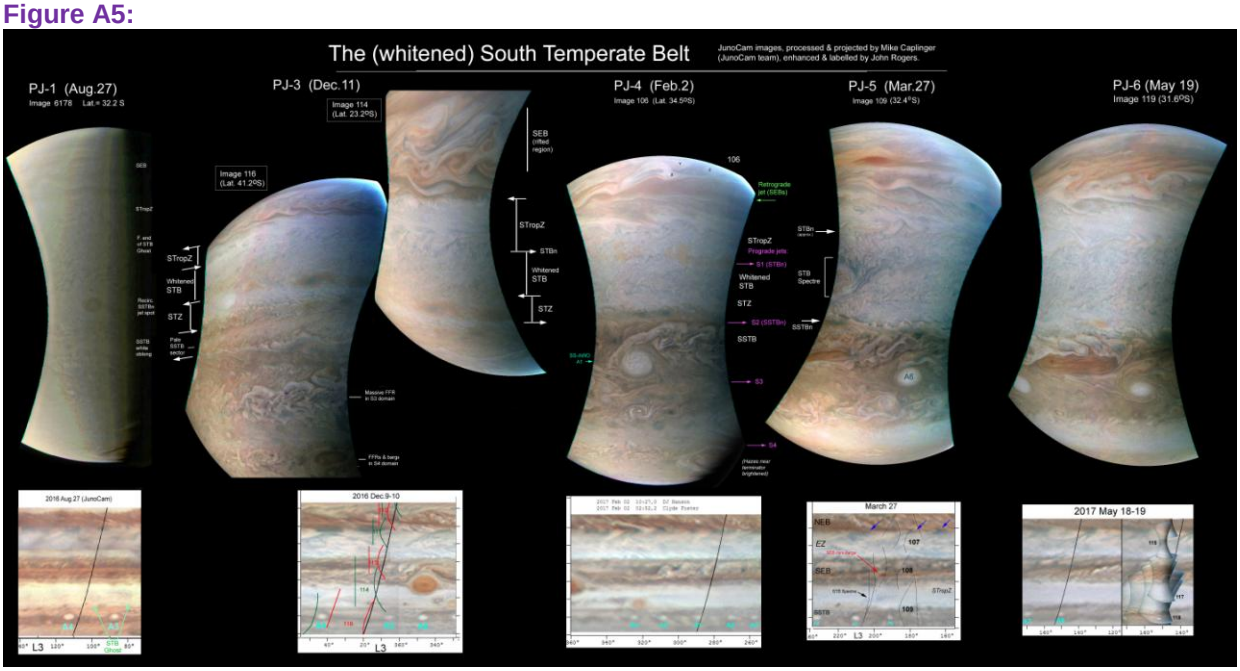


Figure A6: Images showing tiny bright clouds casting shadows, before PJ6: