JunoCam images at PJ60

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1. Io

On all the even-numbered orbits for the rest of this year, Juno will fly past the southern hemisphere of Io about 4 hours before perijove, at ever-increasing distances. The PJ60 flyby, on 2024 April 9, was the first of these. Although the closest approach to Io was 16932 km (eleven times further than at PJ58), the resolution was good enough to reveal a wealth of detail. These views revealed more volcanic activity than JunoCam has hitherto seen, mainly in the southern hemisphere: four active plumes on the limb, changes since the Voyager and Galileo maps, and a spectacular new red ring around a far-southerly caldera.

The source volcanoes of the plumes have been identified by Jason Perry as Volund, Prometheus, Seth, and Mixcoatl [141ºW, 46ºS]. He notes that Seth [132ºW, 5ºS], source of the biggest and brightest plume, has been experiencing an intense eruption with a new flow field since late 2022. In contrast, Volund and Prometheus have been erupting since the Voyager 1 flyby in 1979. Jason Perry identifies the big red ring as a deposit from Nusku [4ºW, 65ºS], which must have undergone a very large eruption recently.

Figure 1 shows rough assemblies of raw images, brightened to show the plumes. Figure 2 (in opposite orientation) shows some of the best images with key features marked, including image 54 which was a long exposure to show the jove-lit dark side, revealing the red ring. Figure 3 aligns these with the NASA Voyager/Galileo south polar map. Although many apparent differences are presumably due to the differences in lighting and viewing angles, many others are real changes. Both may be apparent in Lerna Regio, which shows an apparent reversal in contrast, and was the site of a plume seen at PJ58.

2. Jupiter: Global maps

As usual in the present phase of the mission, JunoCam was able to image the planet for >10 hours on its inbound leg (crossing the orbital plane from south to north during its flyby of Io), enabling Gerald Eichstädt to project and assemble the images into global maps. More distant images on the outbound leg gave better coverage of the high southern latitudes, so in Figure 4 Gerald's best composites are combined into a single global map. (Unlabelled versions of maps are included in the ZIP file.)
The apparition of Jupiter for ground-based observers was ending around this time as the planet disappeared into the evening twilight, with only a few Japanese observers still recording the major features, so the JunoCam map is particularly valuable. Again, the images of the NEB are particularly interesting (e.g. Figure 5, showing an elaborate rift system), and there appears to be more darkening of NEB sectors towards the north than at PJ59.

Figure 6 is a map of the north polar region, down to 45ºS at the edges (& see below). Figure 7 is a map of the south polar region from outbound images. One CPC is clearly shown (yellow arrow), and the long-lived Long Band is clearly visible as a long dark streak tangential to that CPC. As previously (see our PJ59 report), a rotation of 26º in longitude enables some features in the NPR to be identified from the previous perijove, notably the two brightest AWOs at 72-73ºS, although there is less match with the FFRs.

3. Jupiter: North polar region

JunoCam is working well, but the spacecraft now travels through an intense radiation belt on its approach to Jupiter's north pole, and this has led to partial loss of the north polar images at PJ56, PJ59, and now PJ60. Some images were not usable, but image 85 suffered only data dropouts in some of the colour channels, so a satisfactory view of the circumpolar cyclones (CPCs) can be recovered. Figure 8 is a hi-res map by Gerald, in which I have converted the broad coloured strips to grey-scale to reveal the CPCs. We can see that CPCs 5 to 8 have the same individual morphologies as at PJ59; CPC-6 has a light, smooth-textured circular central region, while CPC-8 is very disrupted. There is no longer an anticyclonic vortex between CPCs 6, 7 and 8.

Figure 1:

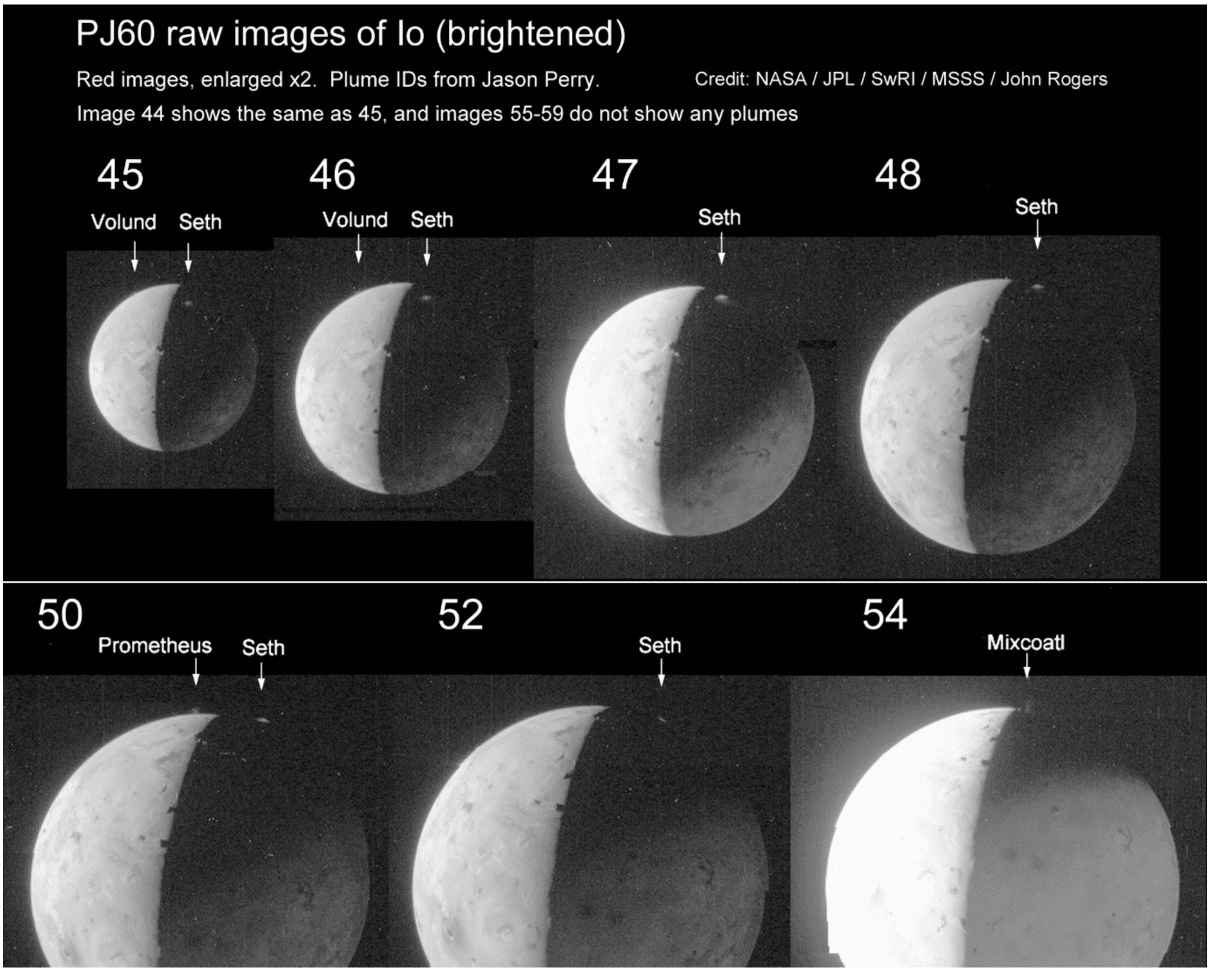

Figure 2:

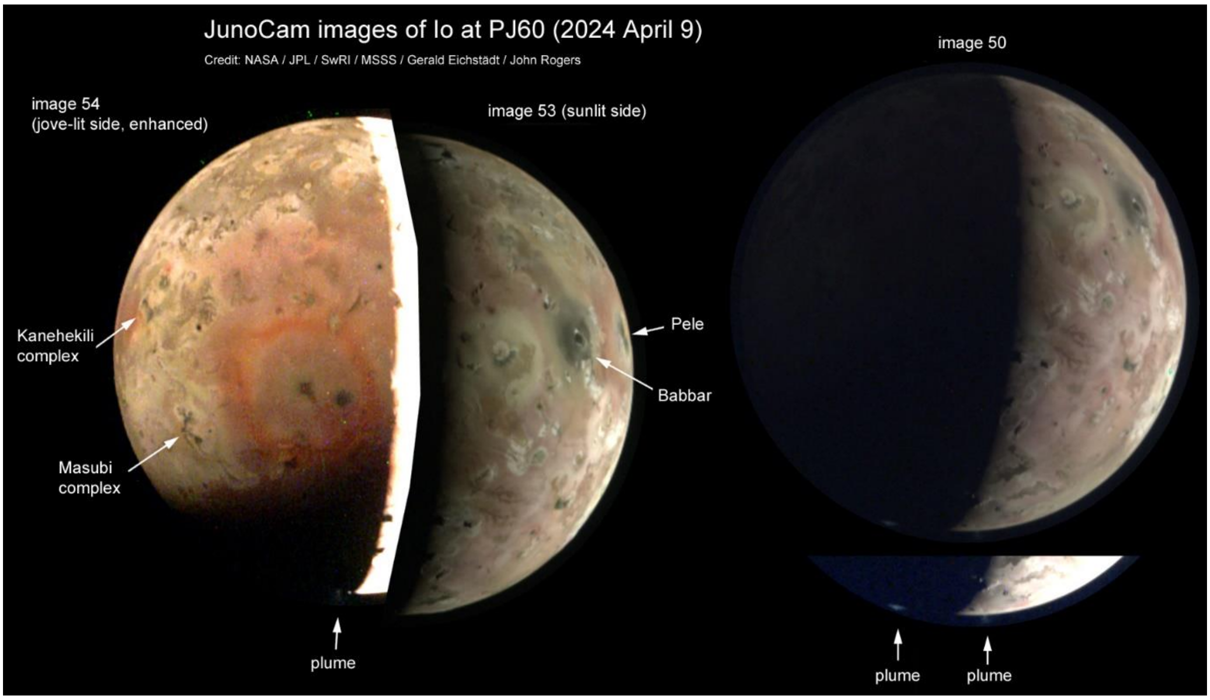

Figure 3:

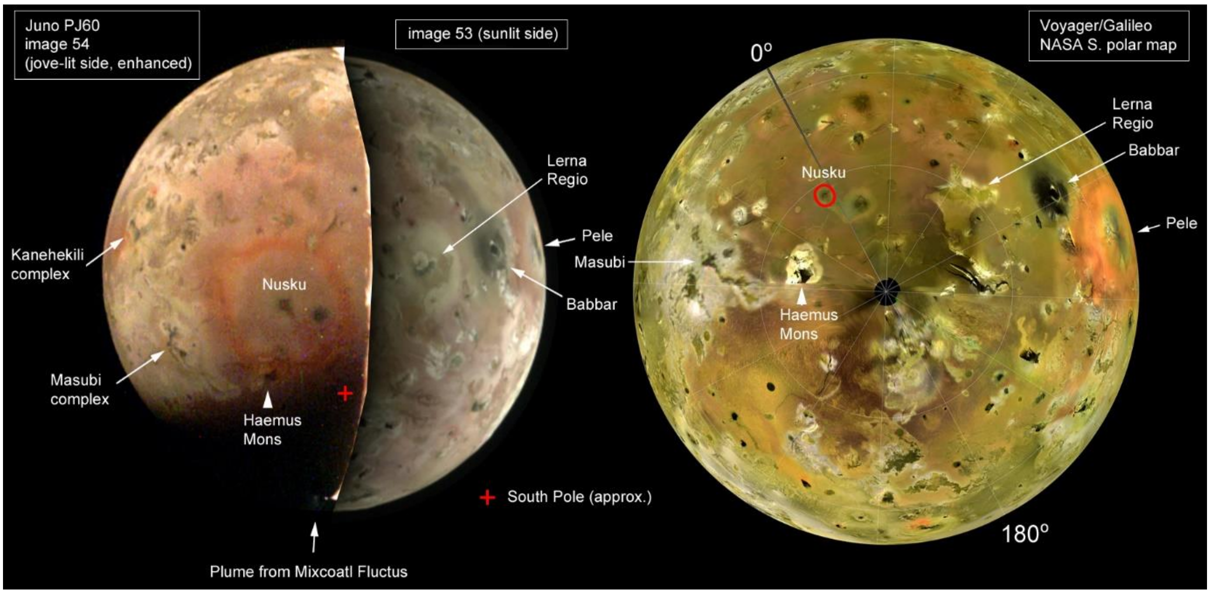

Figure 4:

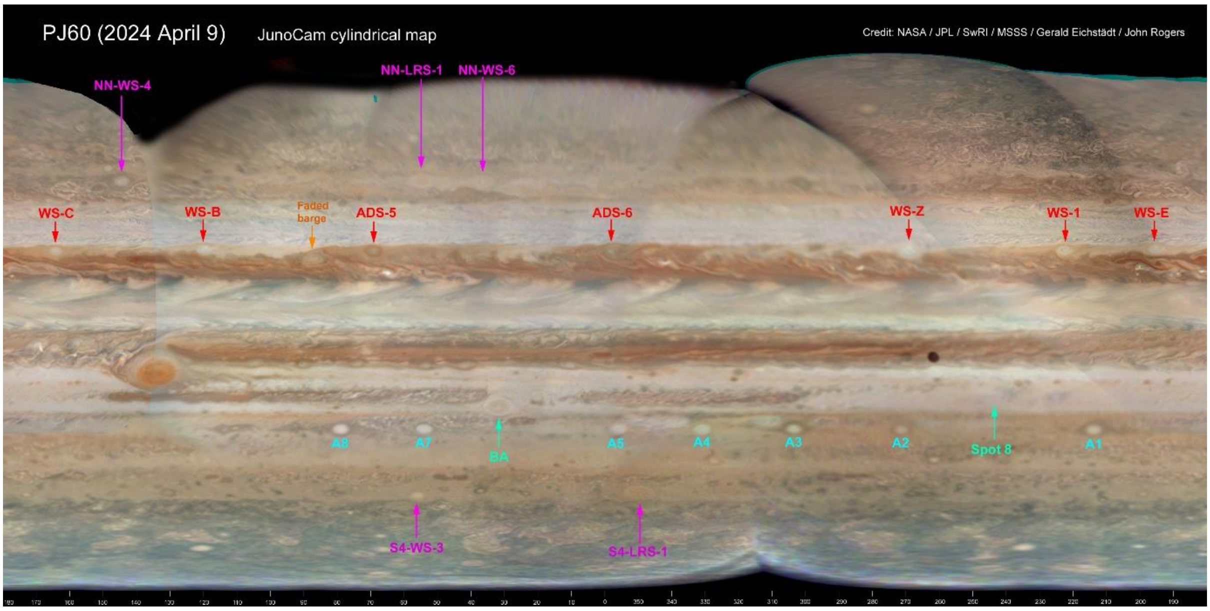

Figure 5:

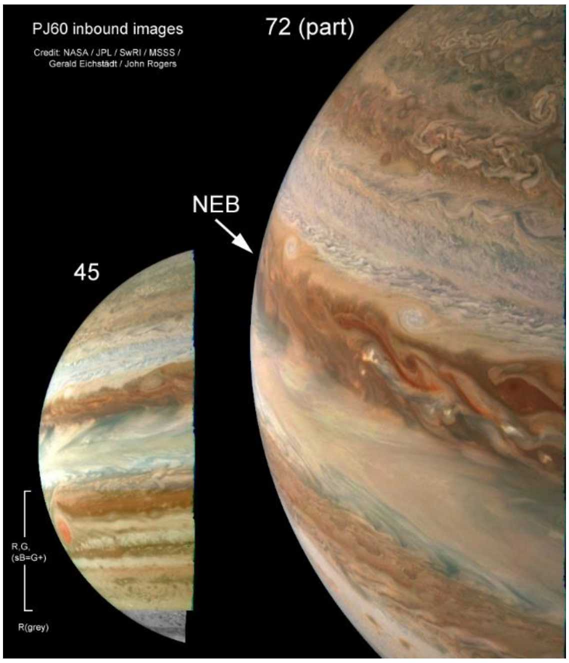

Figure 6:

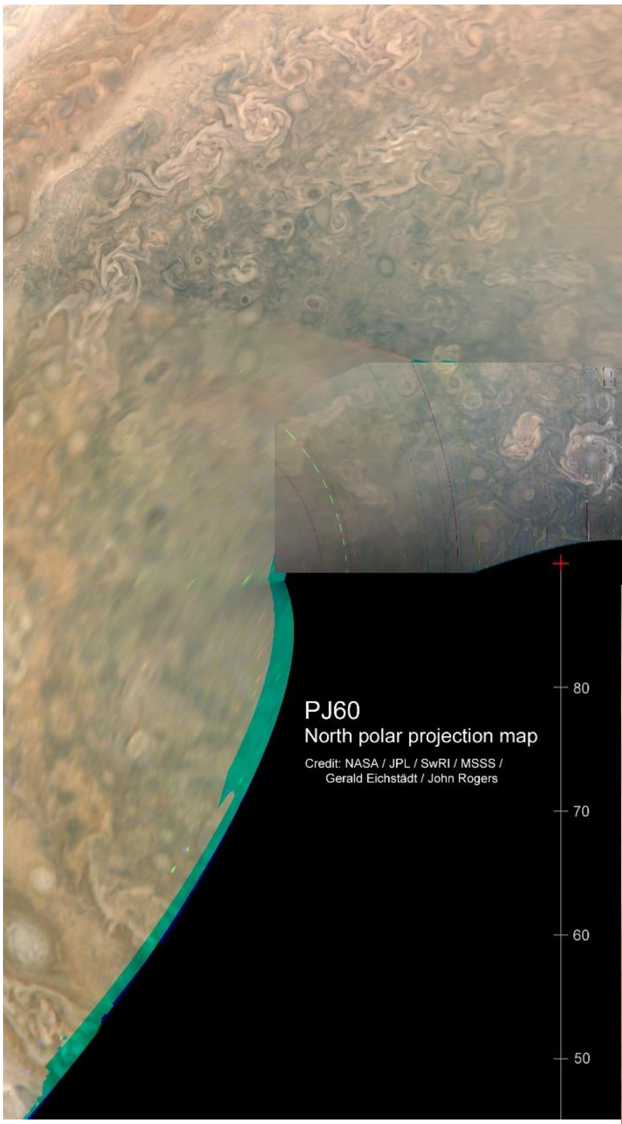

Figure 7:

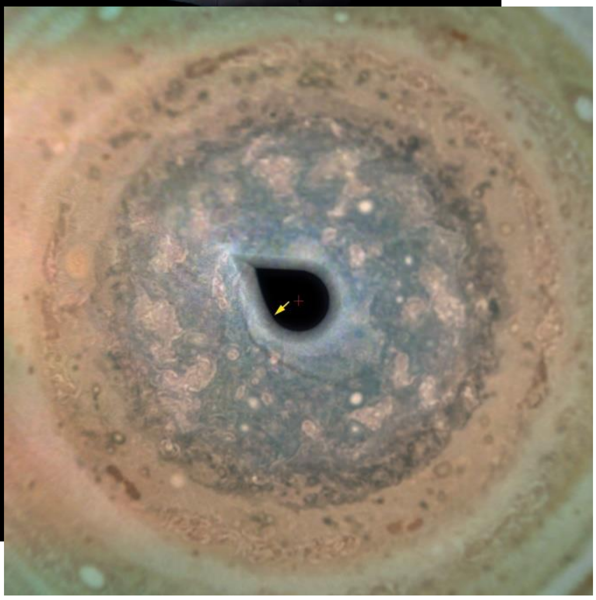

Figure 8: