THE FAR SIDE OF CHARON
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The Pluto-facing hemisphere of Charon displays two major terrain types: [1] the heavily tectonized Oz Terra (this place-name and others here are informal while some have been approved by the IAU) that stretch from the mid-latitudes to over the north pole and [2] the relatively smooth equatorial low plains of Vulcan Planum.

While this ‘encounter hemisphere’ of Charon was the best observed during the New Horizons flyby [3], we can use our knowledge of features and processes there to inform our interpretation of the remaining lower-resolution images of the ‘far side’ of Charon.

The Pluto-Charon system revolves in 6.38 days, and we have images that differ in resolution by a factor of 40 from the beginning of the last-rotation-before-encounter to closest approach (Figure 1). The ground scale of whole-disk images ranges from 40 km/pixel (the 351° image in the upper left of Figure 1, PC_MULTI_MAP_A_18_L1AH, LOR_0298590419 through LOR_0298590422) up to 0.88 km/pixel (the 342° image in the bottom right, C_LORRI, LOR_0299168679 through LOR_0299169016).

Smooth Plains of Vulcan Planitia Going backwards from the closest approach images, we lose our ability to reliably distinguish the smooth plains from the tectonized areas somewhere between the 54° and 45° images (Figure 1), from the 45° image onwards the smooth plains extend past the southern terminator (at approximately -36° latitude), meaning that we can’t reliably determine a southern boundary to Vulcan Planitia.

While only its peak is lit in the 342° image, Butler Mons can be identified as early as the 70° image as well as the linear sunlit features to its east. Beyer et al. [2] speculated that these features were north-facing scarps that might define a southern boundary to Vulcan Planitia, but further inspection of these structures in the earlier images, and the large crater to the south of Butler and its surroundings indicate that the smooth plains wrap around to the south of these features. This means that Butler Mons and these scarps most likely represent larger versions of the entirely-surrounded Kubrik and Clarke Montes, and provide no constraint on the southern extent of Vulcan Planitia.

Craters One of the interesting aspects of impact craters that are clearly observed on the encounter hemisphere are their varied albedo presentation. Some have no albedo distinction from their surroundings, while the most spectacular show concentric bright and dark albedo patterns in the ejecta, which may hint at subsurface layering and structure.

Most of the albedo patches on the encounter hemisphere are associated with impact craters, and so we have some confidence that circular albedo blobs on the non-encounter hemisphere are also signatures of craters. There are two such features which are bright-rimmed and dark-centered which are likely to be craters. The largest, Arroway, is a bright-rimmed feature with bright rays southeast of Argo Chasma, and the second is an unnamed crater centered around 153°.

Scarps and Chasma Given the illumination direction from the north, large scarps or chasmata on the far side can be successfully identified. For example, Mandjet Chasma (450 km long, 30 km wide, 5 to 7 km deep) can be identified as early as the 314° image, giving us confidence that we can identify ‘Mandjet’-sized features. Of course, it is difficult to know whether any light-dark lineament pair is a chasma (like Mandjet) or just an asymmetric scarp (like the Oz / Vulcan boundary scarp east of Serenity). Regardless, mapping and identifying features of this size provides additional context for our understanding of the tectonic processes that were at work on Charon. Additional ‘Mandjet’-class lineaments can be identified (some were pointed out in [1]).

Although the lighting geometry prevents us from identifying these features at high latitudes, initial analysis indicates that they are present even at latitudes that would be south of the offset great circle which Mandjet, Serenity, and the Oz / Vulcan boundary on the encounter hemisphere would describe. This would provide more evidence that Vulcan Planum may not wrap around the entire planet (and thus there is not a planetary dichotomy on Charon), but that tectonized areas and smooth plains may occur in different patches across Charon’s surface.

Figure 1: LORRI coverage for one rotation before New Horizon’s closest approach. Numbers below each image show the approximate center east longitude on Charon for each image. The upper left image without a label is the image at 350° reprojected to match the image at 351° in order to help match features. These images are interlaced deconvolved versions of the images from the following LORRI sequences: PC\_MULTI\_MAP\_A\_18\_L1AH (351°), PC\_MULTI\_MAP\_B\_1 (336°), PC\_MULTI\_MAP\_B\_2 (314°), PC\_MULTI\_MAP\_B\_3 (295°), PC\_MULTI\_MAP\_B\_4 (280°), NAV\_C4\_L1\_CRIT\_33\_02 (266°), PC\_MULTI\_MAP\_B\_6 (239°), NAV\_C4\_L1\_CRIT\_34\_02 (223°), PC\_MULTI\_MAP\_B\_8 (202°), PC\_MULTI\_MAP\_B\_9 (183°), PC\_MULTI\_MAP\_B\_10 (167°), NAV\_C4\_L1\_CRIT\_35\_03 (153°), PC\_MULTI\_MAP\_B\_12\_L1AH\_02 (126°), NAV\_C4\_L1\_CRIT\_36\_02 (110°), NAV\_C4\_L1\_CRIT\_37\_02 (86°), PC\_MULTI\_MAP\_B\_15\_02 (70°), PC\_MULTI\_MAP\_B\_16\_02 (54°), PC\_MULTI\_MAP\_B\_17\_02 (45°), PC\_MULTI\_MAP\_B\_18\_02 (35°), PCNH\_MULTI\_LONG\_1D1\_02 (17°), PC\_MULTI\_LONG\_1d2a\_02 (2°), and C\_LORRI\_FULLFRAME\_1 (350°). The two bottom right images are both from the time near closest approach. The image on the left is a deconvolved mosaic of LORRI images from the C\_LORRI sequence and the image on the right is MVIC image MC0\_0299176432.