PENEUS PATERA: ANALYSIS OF SURFACE MORPHOLOGY AT VARIOUS SCALES. D.A. Williams[1], R. Greeley[1], R. Ferguson[1]; R. Kuzmin[2], L. Xiao[1,3], D. Baratoux[4], P. Pinet[4], T. McCord[5], J.-P. Coombe[5]; [1]School of Earth & Space Exploration, Arizona State University, Tempe, Arizona 85287-1404 (David.Williams@asu.edu); [2]Vernadsky Institute, Moscow, Russia; [3]China University of Geosciences, Wuhan, China; [4]Observatoire Midi-Pyrenees, Toulouse, France; [5]Bear Fight Center, Winthrope, Washington.

Introduction: We are studying the highland paterae within Malea Planum, south of the Hellas basin on Mars (i.e., Amphitrites, Peneus, Malea, and Pityusa Paterae), which we previously suggested may be part of a larger volcanic province associated with the formation of Hellas, collectively called the *Tyrrhena-Malea Volcanic Province* [1]. One of our goals is to characterize these paterae using new, higher resolution spacecraft data (HiRISE, CTX, HRSC, THEMIS, CRISM, OMEGA) to understand better their formation & evolution, as was done previously for Tyrrhena and Hadriaca Paterae [2-4]. In this abstract, we discuss insights into activity at Peneus Patera from analysis of HRSC, THEMIS, HiRISE, and CTX images.

Data Used: We studied a THEMIS 100m Daytime-IR mosaic covering Peneus Paterae that was produced for this project, along with HRSC nadir (12-25 m/pixel) and color (50-100 m/pixel) images. In addition, we studied 2 HiRISE and 1 CTX images covering Peneus Patera.

Results: THEMIS: The THEMIS daytime-IR mosaic provides more detail on surface morphology at the 100m scale than has previously been available [5-7]. The shield-like topography of Amphitrites that is visible in MOLA data [8-9] does not exist for Peneus, nor are there the radial, sub-linear ridges and grooves (heavily subdued) that are found on Amphitrites. There is a paucity of large craters on the floor and north flank of Amphitrites, suggestive of resurfacing. In contrast, neighboring Peneus has the remnants of large (km-tens of km) craters on its rim and floor, has wrinkle ridges on its floor, and is bounded by curvilinear ridges and fractures, as noted in *Viking* data [7]. At the 100 m/pixel scale, in THEMIS images, there is no evidence of primary volcanic features in Peneus Patera.

HRSC: Both the 50 m/pixel and the 100 m/pixel HRSC color data from orbits 4408 and 2133, respectively, show a dark zone on the north-central floor of Peneus Patera, and smaller but darker patches of material on the floors of craters south of Peneus, and just inside the north rim of Malea Patera. The 4-color HRSC spectra is consistent with basaltic materials [10], this interpretation being supported by OMEGA reflectance spectroscopy observations with the identification of mafic absorptions. The dark region on the floor of Peneus is a zone of intense seasonal dust devil activity (the TES dust cover map by [11] indicates minimal to moderate dust cover, 0.94-0.98), and we suggest the darker material is a region of ancient, buried lava flows (~3.7 Ga, based on crater count on THEMIS mosaic: [12]), similar to lunar 'cryptomaria' [13], or a concentrated zone of basaltic ash. At the 12-25 m/pixel scale there is no other evidence for volcanic features.

HiRISE and CTX: As of this writing (Oct 16 2007) only one CTX and one HiRISE image cover the interior of Peneus Patera, along the SE interior rim (**Fig. 1**). At full HiRISE resolution it is clear that the floors of these paterae are currently being modified by periglacial & aeolian processes. The floor of Peneus is covered with pingo-like mounds a few meters in size and polygonal fractures typical of terrestrial periglacial terrains. Layering, if it is present, is difficult to identify. The images from HiRISE suggest it will be very difficult to identify primary volcanic features in this area due to this extensive modification.

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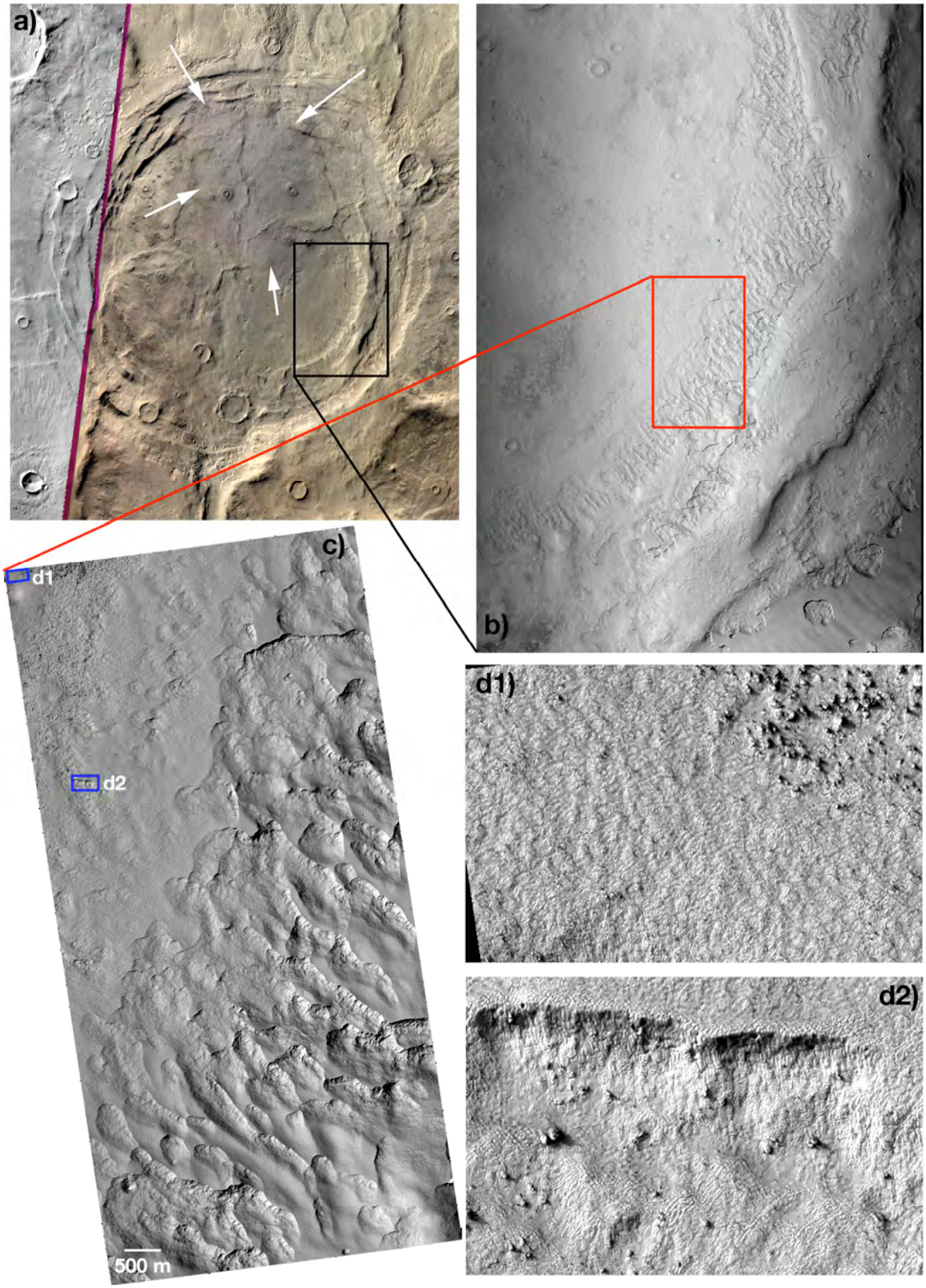
Figure 1 (next page). a) THEMIS daytime-IR mosaic of Peneus Patera, merged with HRSC color (stretched), at 100 m/pixel resolution. The white arrows delineate the central dark zone on the floor of Peneus which we interpret as buried basaltic flows or ash. b) CTX image P03_002296_1217_XI_58S306W of the SE inner rim and floor of Peneus, at 6 m/pixel resolution. c) HiRISE image PSP_002296_1215 of a portion of the rim and floor of Peneus, with a resolution of 50 cm/pixel. d1) Full-resolution blowout of HiRISE image showing texture of Peneus floor (corresponds to blue box at upper left corner of c). d2) Full-resolution blowout of HiRISE image showing texture of the wall of a scalloped depression on Peneus' floor (corresponds to blue box at center left corner of c).


a)
b)
c)
d1
d2
500 m
d1)
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