**GEOLOGIC RELATIONS AND POSSIBLE ORIGINS OF URANIUS DORSUM.** M. G. Chapman[1], A. Dumke[2], E. Hauber[3], G. Michael[2], G. Neukum[2], S. van Gasselt[2], S. C. Werner[4], W. Zuschneid[2]; [1]U.S. Geological Survey, Flagstaff, AZ, 86001 (mchapman@usgs.gov), USA; [2]Institute of Geosciences, Freie Universitaet Berlin, 12249 Germany; [3]Institute of Planetary Research, German Aerospace Center (DLR), 12489 Berlin, Germany; [4]Geological Survey of Norway (NGU), 7491 Trondheim, Norway.

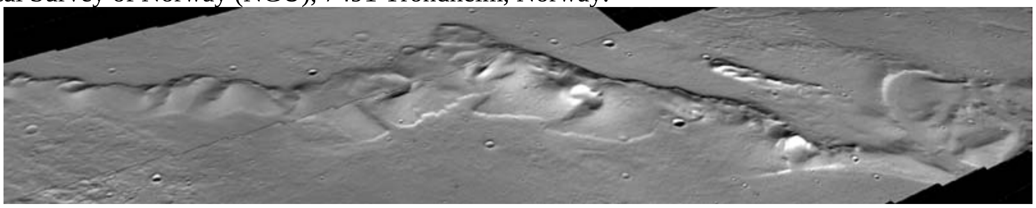

**Figure 1.** East Uranius Dorsum oblique view; THEMIS VIS images over MOLA topography; view from north.

**Introduction:** The Kasei Valles channel extends nearly 3000 km north from Echus Chasma (lat 1°S, long 80°W) and turns sharply east (lat 20°N, long 75° W.) to debouch into Chryse Planitia. Uranius Dorsum is a prominent ridge on the NW edge of Kasei that trends NE parallel to scour marks within north Kasei Valles. It is distinctly different in appearance from local wrinkle ridges that trend NW. We are mapping Kasei Valles to determine the geologic history and the origin of the channel and unusual features like Uranius Dorsum (Fig. 1; [1]). The channel cuts into Hesperian material (unit *Hr*) of the Lunae Planum and Tempe Terra plateaus [2-7]. As Uranius Dorsum lies on the floor of Kasei Valles, it postdates emplacement of unit Hr. Earlier mapping indicated that Tharsis lava unit *At5* covered large parts of the channel floor [2-6]. We have subdivided unit *At5* and broken out another extremely thin, widespread lava flood flow (unit *Ae*; [1]) that appears to extend over 1,000 km from Echus Chasma to abut grooved Kasei floor material near lat. 22.5°N., long. 76.25°W. (south of Uranius Dorsum). Unit *At5* flows locally overlie unit *Ae*. In addition, the surface appearance of *At5* and *Ae* are very different; *Ae* flows are thinner and smoother than those of *At5*, and high resolution images show platey-ridge surfaces.

**Summary and Discussion:** Using the production function coefficients of Ivanov [8] and the cratering model of Hartmann and Neukum [9] to derive absolute ages, our crater counts of the unit *Hr* indicate an average age between 3.6 to 3.8 Ga. At least 1 km above the Kasei floor, ancient east-trending grooves and streamlined islands cut Labeatis and Sacra Mensae (remnants of high plateau material near 25°N.) and Tempe Terra (near 34°N; [1]). Island trends indicate the ancient floods came west from Tharsis and crater counts indicate that this erosion took place around 2.98 Ga. On the Kasei floor south of the Uranius Dorsum ridge, resistant materials (lava flows?) are cut by Kasei erosion sourced from Echus Chasma that dates from 1.3 -1.0 Ga (mapped here as unit *AHchp*; Fig. 2). The lava plains that embay Uranius Dorsum on the north were originally mapped as part of younger lava unit *At4*. However, our crater counts indicate older emplacement around 2.6 Ga, but northeast of about the mid-point of Uranius Dorsum ridge the unit shows crater ages of 1 Ga to 1.6 Ga [10]. In this area, unit *At4* lavas show indications of flood erosion and here also form moated areas around Labeatis and other mensae [13, 10]. Variable ages of the unit in this area may be due to (1) erosion and flood resurfacing as the 1-1.6 Ga age overlaps that of relatively young north-trending Kasei flood scour or (2) younger lava flows having been transported beneath the older insulating crust of unit *At4*. The second scenario reflects that the majority of terrestrial flood lavas act as inflated pahoehoe flows to transport lavas 100s of km from vents underneath older crusts [11, 12]. Because the unit's lava flows date from 2.6 to 1 Ga, we changed the unit name to *AHt4*. The unit *AHt4* moats around mensae were interpreted to have formed when lava flows embayed ice-rich talus that have since sublimated away, suggesting a very different paleoclimate at the time of emplacement [13, 10]. An anastomosing narrow valley is eroded into unit *AHt4* north of Uranius Dorsum (Fig. 2). The valley is fed by numerous, small dendritic channels that can be traced to a rough areas of *AHt4* and to *AHt4* moats around Labeatis Mensa and degraded parts of unit Hr on Tempe Terra (mapped as Hcht). The dendritic channels can also be traced to smooth surfaces of unit AHt4 directly north of Uranius Dorsum. Perhaps the narrow valley formed as a melt-water channel fed by local areas of near-surface and surface ice. North of Uranius Dorsum, unit *AHt4* locally overlies an older unit, mapped tentatively as Unit *Ht3* (Fig. 2). Unit *Ht3* also appears to embay the Uranius Dorsum ridge. The ridge itself is too small for accurate crater counts, but it likely was emplaced before 2.6 Ga, because it is embayed by lavas of units *Ht3* and *AHt4* on the north and eroded by Kasei floods from the south. Southwest of Uranius Dorsum, unit

*AHt4* is overlain by unit *At5* of the Tharsis Montes lava flows. Emplacement of At5's underlying unit, unit *Ae*, took hundreds of Ma; ages for unit *Ae* range from 1.6 Ga to 90 Ma.

Uranius Dorsum is topographically much higher than any lava lobes in the area or on the flanks of the Tharsis rise. The dorsum extends 2° farther west (120 km to longitude 80°W) into the Tharsis flank than previously mapped [1], and its trend parallels that of ancient Tharsis floods and Tempe Terra rifts. Uranius Dorsum bounds the northeast part of a large lava-covered MOLA topographic low, centered west of Kasei Valles (at lat 18°N., long 81° W.). This low extends to long. 84°W., about 420 km away from the previous mapped boundary [2, 7] of Kasei. The dorsum has 58 aligned mounds along its length, each with a central pit. Some mounds have nested pits and one shows material possibly extending away from its pit. The ridge has a prominent frontal scarp on its south boundary and a much lower, less prominent scarp on the north boundary. Locally, gullies are present on the north facing slope of the ridge that cut the north boundary scarp of the ridge. Many closely-spaced incisions cut the ridge (and both bounding scarps) roughly perpendicular to its length and parallel to the north trend of relatively young Kasei floods. Incisions are via paths through the central cones of aligned mounds (47 cones are breached).

Hypothetical ridge origins include formation as a flood levee, glacial moraine, littoral volcanic cones, mud volcanoes, and fissure-fed volcanic cones. MOLA and HRSC topographic profiles over discrete mounds were made for comparison with these different types of terrestrial analogs. Profiles along the centerline of the dorsum indicate that the ridge maintains its height along its entire length. In addition, HiRISE imagery of the ridge has been requested for targeting.

The dominant steep frontal scarp of Uranius Dorsum on the south may be due to erosion by Kasei floods, glacial erosion, or ridge material abutting ice. As narrow dendritic channels head into the area north of Uranius Dorsum, surface ice may have been present in this area, therefore the topographically lower northern Uranius scarp may be due to ice erosion or ice dams.

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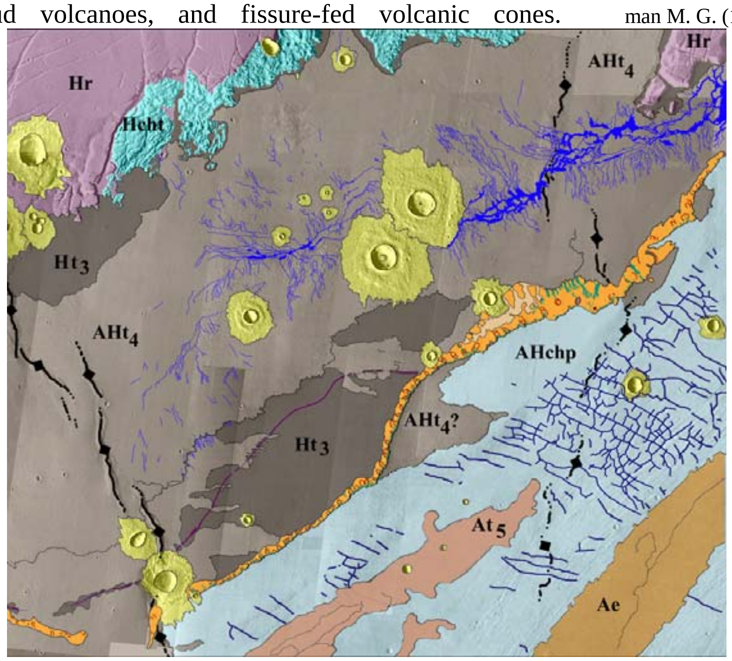


**Figure 2.** 210-km-wide geologic map centered at about lat. 23°N., long. 77° W; Uranius Dorsum colored bright orange with cones (red) & gullies (green); narrow channels shown in dark blue; lettering denotes unit names, north at top.