Ice sublimation landforms in Peneus and Amphitrites Patera. A. Lefort[1], P. Russell[1] and N. Thomas[1], [1]Physikalisches Institute, University of Bern, CH-3012 Bern, Switzerland, Alexandra.lefort@phim.unibe.ch.

Introduction: The Amphitrites-Peneus patera complex is located in Malea Planum, on the southern rim of the Hellas basin. It consists in two circular calderas, situated on a volcanic shield and was probably created by episodes of pyroclastic volcanism during the late Noachian period [1]. In addition to these volcanic landforms, the region also displays interesting features indicative of interstitial ice such as patterned ground (polygonal features), and sublimation landforms. The most interesting landform consists of smooth discontinuous layers of apparently thin material. This layer is eroded in scallops and mesa, very similar to the Swiss-cheese features of the South Polar Regions.

We use a combination of MOLA altimetry, MOC, Themis and TES data in order to map this region and study the formation and evolution of these sublimation landforms.

Calderas. Peneus Paterae (58.124°S, 307.455°W) is a caldera situated on local topographic highs. It is 125 x 136 km, has a relatively flat floor that lies at an elevation of 325 m, 150-800 m below the rim. Elevations are highest on the southwest rim (1.1 km) and lowest on the northern rim (500 m). It is surrounded by plains over distances of 50 km and by faults that step down into the caldera [2]. Amphitrites Patera (59.016°S, 298.901°W) is 121 km across and has a bowl-shaped floor with a minimum elevation of 1.2 km. The lowest point is situated to the west of the center, while elevations around its margin are ~1.7 km [2].

Mantle. The region is covered by a discontinuous mantle that covers the local high plains and almost buries craters between 300 and 1000 m diameter. This suggests that its thickness is about 100 m. It is most prevalent below 65° latitude. Although this mantle is rare in the plains and highlands north of 55° S in the Paterae region, the same type of material has been observed within Hellas basin. There, the low altitude may allow the presence of ice within the surface material, in spite of the relatively high latitude.

The appearance of the mantle is strongly dependant upon latitude. Two main general zones have been identified.

Layered terrains. South of latitude 65°S, in certain zones of the mantle, escarpments show thin layers of dark and bright material. The morphology of the layers and depressions within the layers suggest that they are composed of sand and small particles such as dust and loess, probably including interstitial ice as a weak cementing agent. Hypothesis concerning its origins include dust, glacial loess, volcanic airfall, lahars, and lacustrine deposits [3][4]. This mantle is likely to be presently undergoing erosion.

In some regions, the deposits exhibit features such as curvilinear scarps, similar to the morphology of the Martian polar layered deposits . It suggests that they may have formed by a mechanism of dust and ice deposition, similar to the mechanism that occurred in the polar regions, possibly because of atmospheric cooling at the end of the Noachian Period [5][6][7][8].

Scallops and mesa. Between 55°S and 65°S, the mantle is highly discontinuous and exhibits morphology similar to south polar Swiss cheese, probably caused by the sublimation of interstitial ice. The most interesting features in this area are mesas and troughs, as well as a special type of depression, scallops (fig.1) [2]. The northern slope of these depressions consists of a steep and apparently recent scarp, while the southern slope is gentler. Elevations of the base of the depression are increasing toward the south. The depressions, elongated in a north–south direction, can coalesce together. The MOC images we are studying show several stages of evolution of the scalloping process, from what appear to be initial depressions a hundred meters wide to kilometer-wide regions of fretted terrains, apparently resulting from the coalescing of several scallops. Thin and apparently sharp ridges can be seen between two coalescing scallops.

Considering the similarity of these depressions with those created by sublimation within the polar layered deposits, it is possible that they have been formed by the same type of process. Sublimation of interstitial ice would cause col-

lapse of the material, initially as a small pit growing southward, because of the solar heating on the southern side [2]. According to [1], the mantle sublimation and the scalloping process must still be active.

North of the 55° S, this mantle is thinner and even more discontinuous, and often replace by fretted terrains.

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References:

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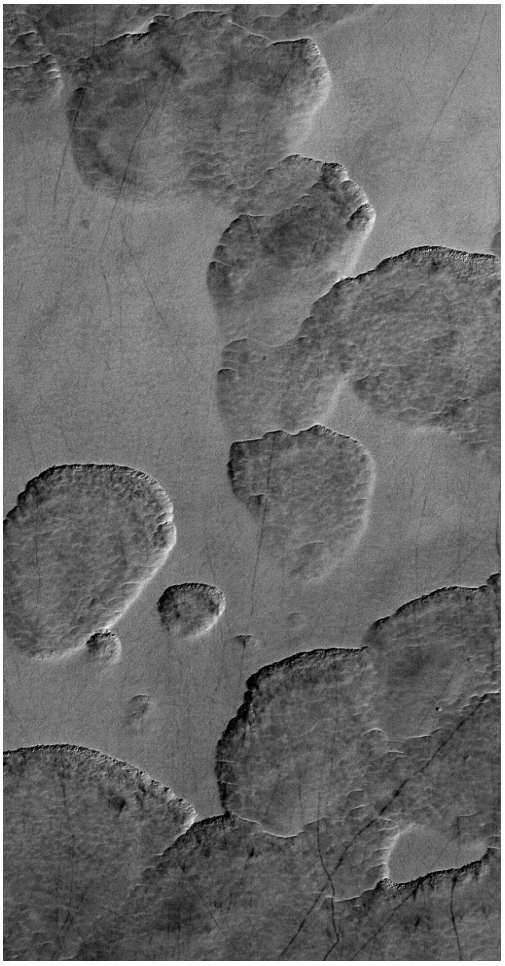
Further modelling. In parallel to the mapping of the surficial deposits of that region, we are building a 2-dimension thermal model [9] to evaluate the rate of sublimation occurring at different positions of the scallops and to deduce information on their formation process and evolution.



Coalescing scallops NW of Amphitrites Patera (MOC image E1100369, 58.68°S, 294.23°W)