A POSSIBLE TERRESTRIAL ANALOGY OF THE "CANTALOUPE TERRAIN" ON TRITON'S SURFACE

E. Illés-Almár
Konkoly Observatory, H-1525 Budapest Box 67, Hungary

An extensive unit termed the "cantaloupe" terrain dominates the western part of the equatorial region of Triton. It consists of a dense concentration of pits or dimples criss-crossed by ridges of viscous material. Most of the dimples fall into two roughly uniform size classes of about 5 km and 25 km diameter ([1], Fig. 1,2).

The term "patterned ground" on the Earth's surface (as for example in Fig. 3) refers to natural regularities defined by stones, ground cover or topography that assume forms such as circles, stripes and polygons in water-laden soil that undergoes repeated – seasonal or daily – freeze-thaw cycles. Such patterns are found throughout the world, at sea level in polar and subpolar regions and at higher elevations in more temperate climate zones. Some of the patterns stretch over square kilometers while others cover less than a square meter. Some patterned ground on Earth results from free convection of water and some from cracking or from a combined effect of the two phenomena. Seasonal freeze-thaw cycles give rise to patterns larger than those produced by daily cycles. Depending on pattern geometry, the width ranges between three and five times the depth of the layer in which the free convection of water occurs [2].

The aim of this paper is to draw attention to a phenomenon that can be brought into connection with the surface characteristics of Triton and enrich the variety of possible explanations. Specifically, the pattern called "cantaloupe" terrain on the surface of Triton shows up some similarities with some kinds of patterned ground (terrain polygons) on the surface of the Earth. The pits or dimples are not destroying each other – as, e.g., the impact craters or multiple volcanoes do – but tile entire pieces of the surface and belong to uniform size classes. This fact suggests a steady state process of a longer characteristic time scale rather than an instantaneous or random process. The analogy may be of interest in spite of the fact that water obviously can not be the cause of the small scale structure of Triton's surface because of its low surface temperature (37-38 K).

There are, however, many open questions in connection with such an explanation. What is the circulating fluid? Probably nitrogen. What kind of soil is there? A mixture of ammonia/methane/water-ice/clathrate? The onset of circulation may be helped by a solid state greenhouse effect of nitrogen ice. The existence of geysers on Triton's surface and the fact that in some valleys and ruptures there are traces of flowing material permit us to suppose that there is some heating beneath the surface that can also advance the onset of fluid convection.

The author is indebted to Gy. Gábris and to Gy. Kovács for useful discussions.

References

1. B.A. Smith et al., Science 246, 1422, 1989.
2. W.B. Krantz et al., Sci. Am. p. 68. Dec. 1988.
3. E. Illés-Almár, poster-paper II-29, 12th ERAM, Davos, 1990.
4. E. Illés-Almár, BAAS 24, No.3, 968, 1992.

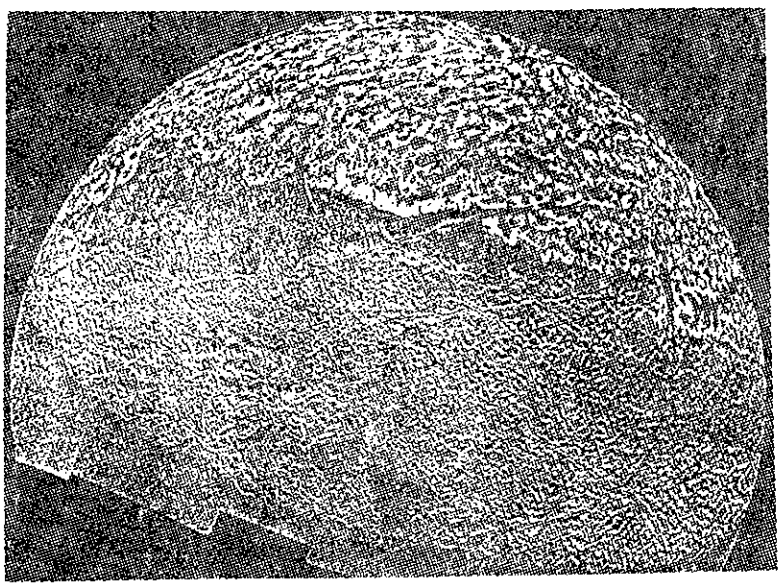

Fig. 1
The "cantaloupe" terrain on the equatorial region of Triton. Voyager-2 photomosaic. Resolution 1.5 – 3 km

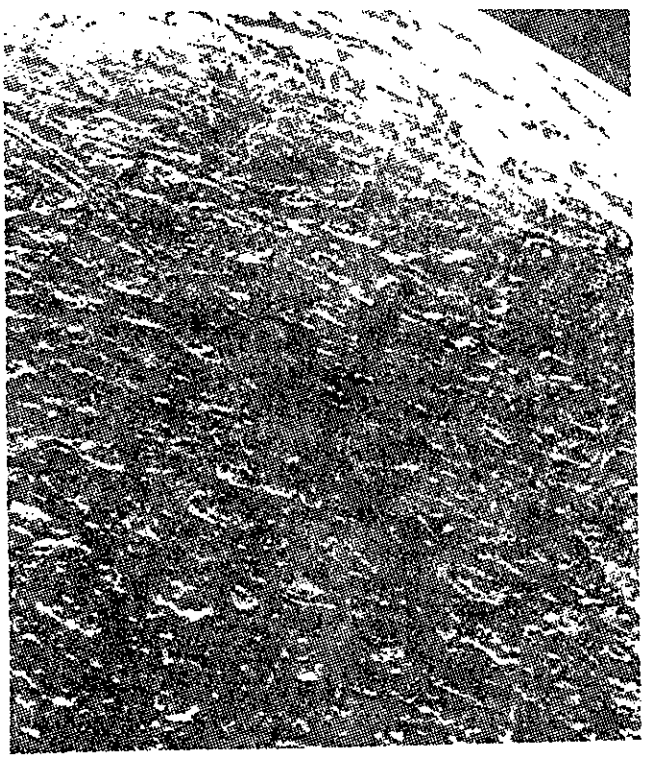

Fig. 2
A close up view of the cantaloupe terrain with 0.8 km resolution.

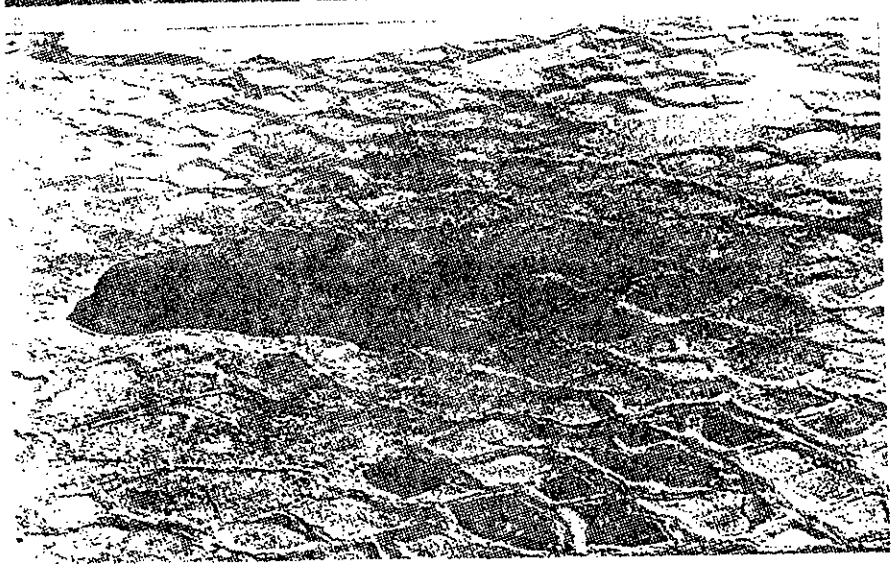

Fig. 3
Terrain polygons in Finland.