ICE-BEARING PERMAFROST ON MARS UPPER BOUNDARY DEPTH: CONNECTION WITH TOPOGRAPHY. G.A.Burba, R.O.Kuzmin, V.P.Shashkina. Vernadsky Institute, Moscow, II7334, USSR

The planetary cover of rocks with temperatures below $0^{o}C$ - cryolithosphere-on Mars have two main layers: lower, ice-bearing and upper, "dried up" (I). The ice-bearing permafrost layer upper boundary (roof) depth determinations with fluidized ejecta craters show decreasing of the depth from equatorial to polar regions (I). Such determinations permit us to compile the map of this boundary depths for southern part of Martian western hemisphere (Fig.I). 52 craters were used. The comparison of this map and topographic map (2) shows that ice-bearing permafrost roof depth decrease also when surface topography decrease.

This latitudinal and altitudinal roof depth variations are shown on Fig.2 in smoothed form.

To clear patterns of altitudinal roof depth variations the mean depths for each latitude were extracted from roof depths map (Fig.I) to recieve map of roof depth anomalies (Fig.3). Depths, shown on Fig.3 are declinations of observational depths (Fig.I) from mean roof depths for each latitude as determined earlier (I). Data points taken from Fig.3 and plotted vs.topographic altitudes (Fig.4) shows connection of negative anomalies (roof depths more than mean on this latitude) with topographically high areas and vice versa. Ice-bearing permafrost roof depth anomaly (A,m) is connected with surface topography (H,km) by the following empirical equation: A=(IOO - I7H).

The equation permit us to calculate roof depth if we have data on topography and mean roof depths for each latitude. Existing of such data (I,2) permits to compile roof depth maps for those areas of Mars which have no satisfactory photographic data to determine depths by fluidized ejecta craters observations. Comparison of observational and calculated data along latitude $20^{o}S$ (Fig.5) shows their good similarity. Prognostical map was compiled for the whole western hemisphere of Mars.

Differences in "dry permafrost" layer thickness (i.e. from topographic surface till ice-bearing layer roof) found during our maps analysis for different topographic altitudes (even on the same latitude) may be connected with differences of rocks thermophysical characteristics, degree of ice-bearing, diffusion coefficients and possibly with differences of under permafrost waters roof depths. The quantitative estimation of this factors' role in drying up of Martian permafrost upper layer is now in progress with means of mathematical models calculations.

REFERENCES: (I) Kuzmin R.O.(I980) Lunar Planet.Sci.XI, 585-586. (2) USGS (I976) Topographic map of Mars, I:25 000 000.

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MARTIAN PERMAFROST DEPTH

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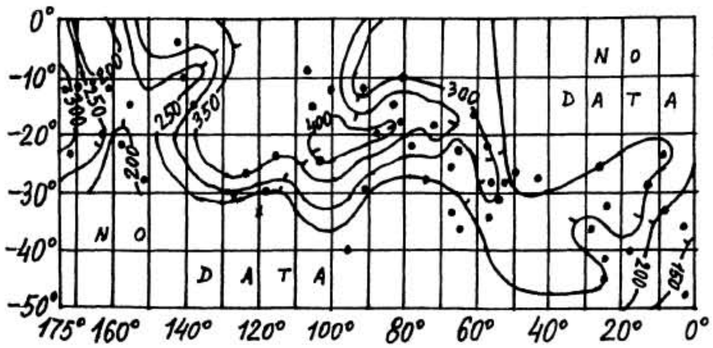

Fig.I. Map of ice-bearing permafrost layer roof depth for south-western quadrangle of Mars. (meters)

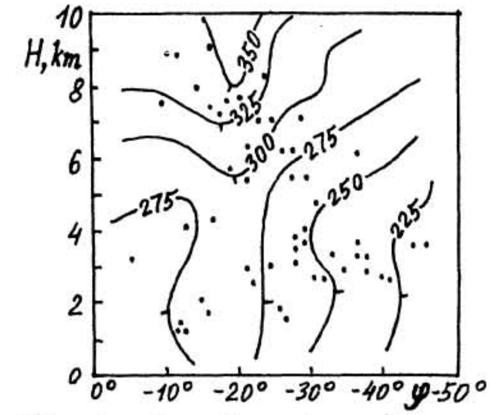

Fig.2. Ice-bearing permafrost roof depths plotted on latitude- surface topography graph (smoothed).

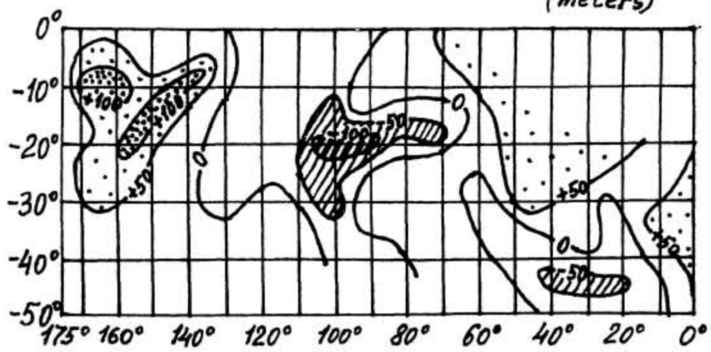

Fig.3. Roof depths declinations (anomalies) from mean depths for each latitude. (meters)

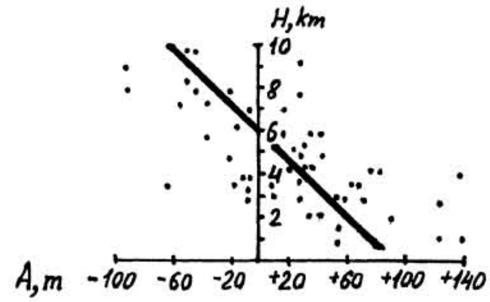

Fig.4. Roof depths anomalies vs.surface topography.

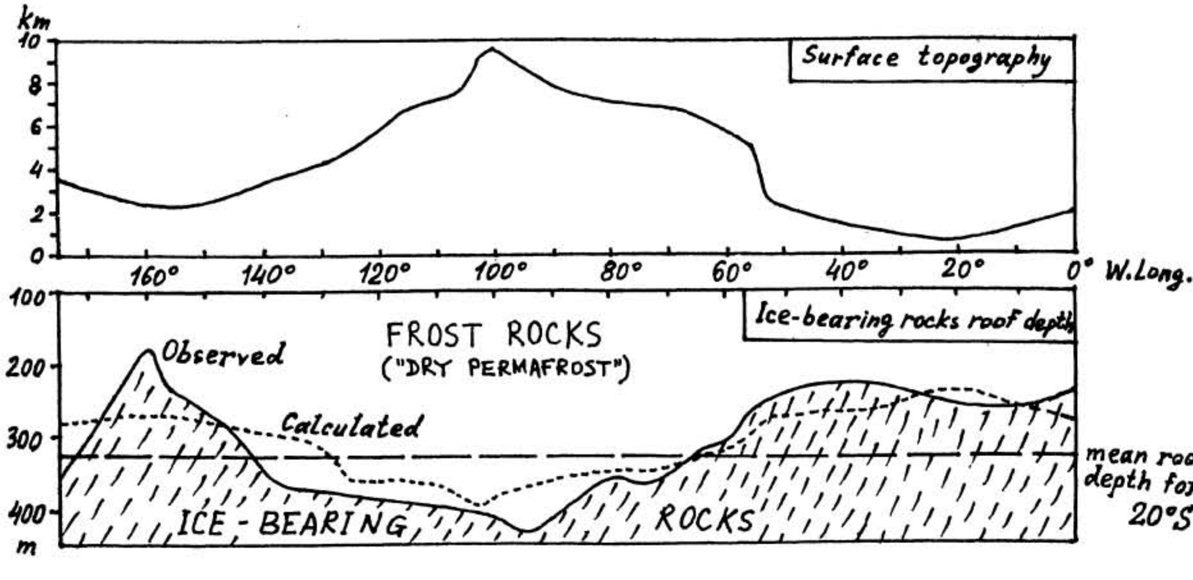

Fig.5. Observational (fluidized ejecta craters) and calculated depths comparison along 20°S.

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