Application of the Fleet of Micro Sized Space-Motherships (MSSM) with Nano, Pico Space Devices and Robots (NPSDR) for Life Signal Search on DDS Sites Using Global Digital Dune Database of Mars

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Introduction:

Mars Global Digital Dune Database [1] helps to find appropriate landing site selection for the space probes. Our earlier proposal of the application of nano-micro-pico devices in field-wide research becomes available. We should like use them to search signals of life activities, which have been proposed in connection with the Dark Dune Spots (DDS) [2]. We focused our search for the Southern Polar Region of Mars.

The application of nano and micro devices for space and planetary technologies today means a smaller, cheaper and more efficient technology. With multiplied amount, variety of shapes and fleet operation tasks the small units should be equipped by sensors for signal about the primitive life forms like as the CBC type ones. Our proposal is the following: put the nano cube like devices into selected DDS sites in the Southern Polar Regions of Mars (Fig. 1.).

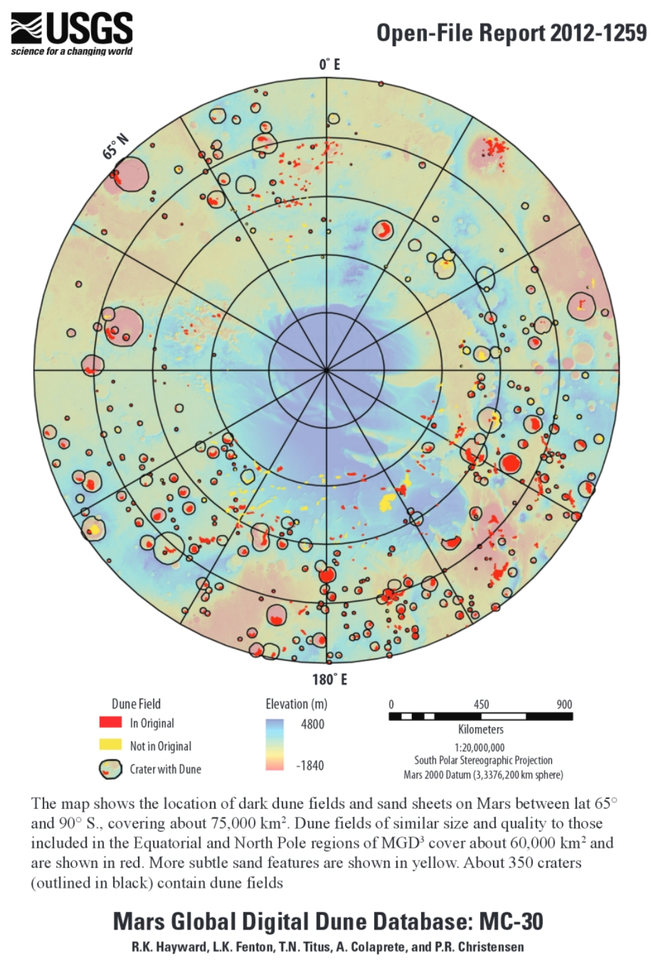

Fig. 1. DDS sites in the Southern Polar Regions of Mars.

NPSDR: Our earlier articles [3,4] defined the concept of Nano and Pico Space Devices and Robots (NPSDR) and described the basic structures, functions, fields of the application possibilities, e.g. parts, deploying, self moving, mechanical design, functional content, information transmitters, power systems and detections, purposes and possible targets. Micro and nano sized space probes mean in space technology to represent sizes form cubic decimeter to millimeter. Micro and nano technology means the SI originated sizes. This article uses both terminologies in their places. (Fig. 2.)

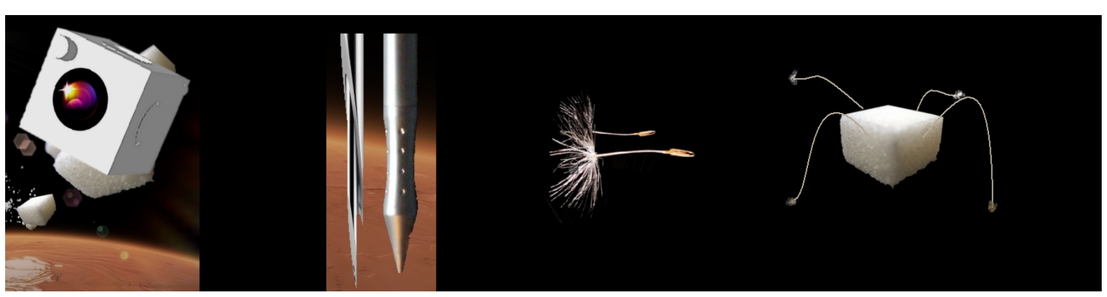

Fig. 2. Suggested types of NPSDR units in cubic inch size.

MSSM and fleet of NPSDR:

Now we describe new concepts of devices in wide scale of shapes and sizes applicable to use for interplanetary missions, e.g. reduced Micro Sized Space-Mothership (analogue to jet-carrier in sea) sized nearly one cubic decimeter. MSSMs are to carry and distribute fleet of nano probes of NPSDRs. From a fleet of MSSMs are deployable fleets of nano probes (NPSDRs) as sensor ships. NPSDRs are different shaped according to target – inner, outer – and with wide spectrum of possible independent or more multiplied sensors - fleet of analytical sensor ships – and with reduced smart telecommunication systems. In case of application of MSSMs for NPSDR sensor probes, it is enough to communicate with motherships, which gather, pack and transmit the collected data towards to Earth.

Features of MSSMs with NPSDRs:

To reduce launching costs it is reputable to use standard payloads e.g. cubic sized or multiplied cubic sized probes. It is targeted for multiple launches from different platforms. MSSMs can build a Group Positioning System described below. Net of MSSMs serves to scrutinize big amount of volume of target on planetary surface or above in the atmosphere or in orbit. On the surface there are deployable a net of penetrator bullets. They can make a 3D map like seismic sonar; in case of using multiplied NPSDRs. Chirp resonating can reveal detailed inner structure.

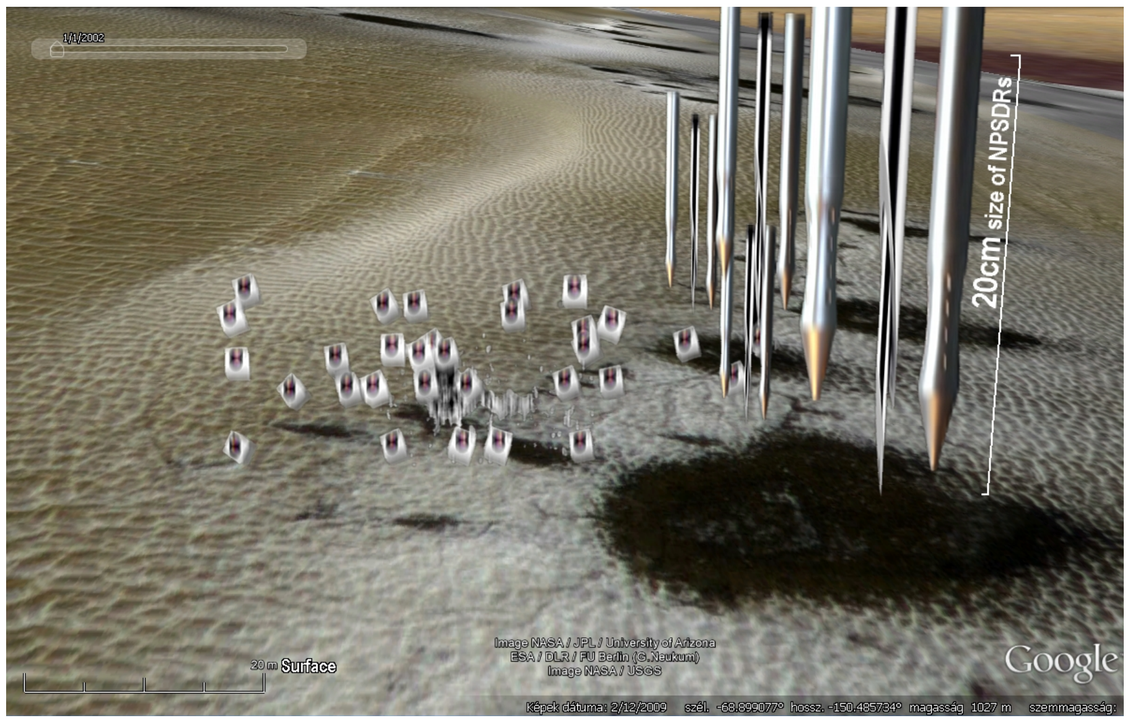

Fig. 3. The preparation for landing of the NPSDR units in the Southern Polar Region of Mars [5]

Environment friendly: It is very important to emphasize always, new probes must be environment friendly. To reach this goal, small probes should contain that composition of chemical elements as like the meteorites do according to cosmic abundance of elements. In this respect we can call them 'meteorite-like probes'.

Analytical methods can be noninvasive and invasive.

Authors are going to describe noninvasive and invasive deployable analytical methods in another USRA article. Now we are discussing hardware concept an invasive method, penetrator type NPSDRs. They can be installed when it is necessary to go inside into a surface or atmosphere to earn important data.

Invasive, beneath the surface – Bullet NPSDRs

Invasive, beneath the surface – Bullet NPSDRs are to reach deeper inner regions of surfaces when we can deploy long-shaped bullet like NPSDRs. It is applicable ammunition or rocket like drive in case of reaching the surface to shot itself deeply, according to kinetic conditions. This is a forced invasive measuring, which must be wellfounded and reasonable because of environmental friendly reasons which are important.

Life signal blocks of the NPSDRs:

The NPSDR units should contain a small biodetecting sensor system. It also needs a long-wearing energy source, a radio-communication subsystem and a radiation shielding. Moreover, it should be equiped by a subsystem which makes it possible to the safe landing.

Conclusions:

Technologies of last few years show it is profitable to investigate and to use available micro and nano technologies in planetary missions to reduce costs of researching. Moreover Micro Sized Space-Motherships (MSSMs) with NPSDRs are shown how to increase the possibilities of earned data in shorter time and in bigger field of surfaces and volumes of area to be measured and discovered. Fleets of NPSDRs are deployable to realize and to accomplish in situ modern analytical methods in wide range of Earth and planetary sciences. Proposal is to put devices into any Mars Program boxes and during orbiting phase drop them onto destination localities and/or put into the various Earth-type planetary bodies, or comet and asteroid missions in the future.

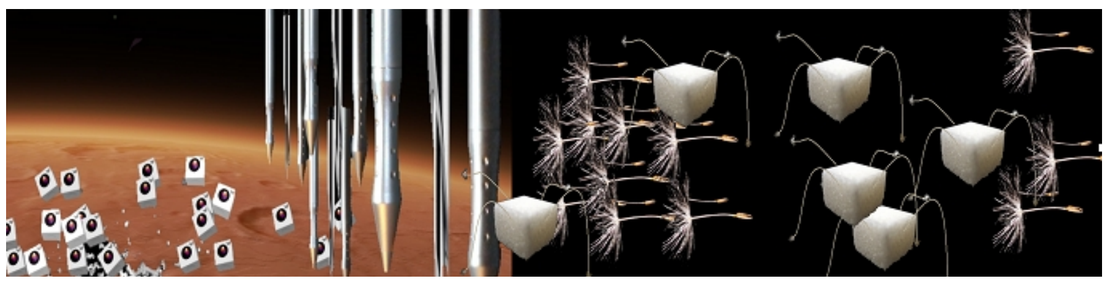

Fig. 4. The proposed landing or deploying of the NPSDR units visible at the various Earth-type planetary bodies.

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[5] Background picture credit: Google Earth Mars; Image NASA/JPL/University of Arizona; ESA/DLR/FU Berlin (G. Neukum); Image NASA/USGS