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Russian plans for lunar investigations. Stage 1

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Abstract

Lunar Race of 60-ies and 70-ies between US and Soviet Union produced outstanding results for lunar science. For many technical reasons mostly near equatorial and mid-latitude Lunar regions were investigated at this glorious time. New epoch of Lunar investigations began at the late 90-ies. It gradually shaped the image of a new wet moon at least at the vicinity of its polar regions.

Strong interest to the mechanisms of the formation of a near polar volatiles deposits, their migration and their composition (including the bisotope one) became the central theme of the Russian program of lunar investigations for next 10 years. Certainly the number of other outstanding scientific topics like the properties of Lunar dust, peculiarities of regolith interaction with the supersonic solar wind flow, characteristics of the Lunar magnetic and gravitational anomalies, etc., are planned to be studied both from the orbit and from the surface.

First stage of the Russian Lunar Program consists of a four missions: Lunas 25, 26, 27, 28. (The numeration follows Lunar missions of a Soviet Epoch - last successful regolith sample delivery have been accomplished by Luna 24 in 1976). Luna 25 will land to the southern polar site, which would be the most suitable for engineering reasons and also interesting for the science.

Second lander Luna 27 will have more sophisticated payload with the additional instruments in comparison with Luna 25. Luna 27 should be landed to the selected landing site at the vicinity of the South Pole, which could be the most promising for installation of the future Lunar Base. It is very important that Luna 27 will be equipped by the subsurface drill to get samples from the permafrost shallow subsurface (one attractive option now is that this drill will be provided by our ESA colleagues having the experience of designing and manufacturing of a similar drill for the Exomars project). The principal difference of the drilling at Luna 27 in comparison with the early missions of 70-ies is that this drilling should keep all the volatiles in the regolith intact and accordingly should avoid any substantial heating, which might result in their evaporation.

Orbiter Luna 26 carries a selfcontained payload for studies of Lunar exosphere and Radar for investigation of the subsurface Lunar structures. Astrophysical experiment LORD will register the emissions after the rare interactions of super high energy cosmic rays with the Lunar body. This is a special (very important for cosmology) energy range where cosmic rays are scattered at the background microwave radiation.

Last at this stage mission Luna 28 should provide cryogenic return of polar regolith samples with volatiles inclusions to the Earth laboratories for the detailed analysis of their isotope composition

Russia considers this stage of Lunar investigations as a first stage to the program of Lunar Exploration, which should culminate by the construction of an international Lunar base. Although the lunar mission discussed above represent the part of the national federal space program for 2015-2025 they are fully opened for the international participation and as mentioned above some of their important elements are discussed in terms of collaboration with ESA.