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ASTRONOMY FROM THE MOON: PERSPECTIVES AND PREPARATION

Abstract

From the Moon one can conduct observation of the Earth and its environment , as well as planets and solar system objects, in a large range of wavelengths. Due to its location and its lack of absorbing atmosphere the Moon is a special platform for astrophysics and cosmology (Foing et al 1994) .

Solar observations can be conducted in optical, UV, X-rays, radio, plasma sensors to monitor activity, flares and coronal mass ejections. We shall show some solar measurements from SMART1 and recent missions, and will discuss what could be done from networks on surface and orbit, and peaks of eternal light.

The Moon can host as well small telescopes (including simple transit telescopes scanning the sky over a lunar rotation) to monitor multiwavelength variability of stars and cosmic objects. Larger telescopes can be used for diverse galactic and extragalactic research, and liquid mirror telescopes (Angels et al 2006) can be deployed with a sensitivity beyond JWST. Interferometric telescopes can also be installed and operated thanks to the high stability and low seismicity of the Moon.

Networks of radio telescopes can be deployed on lunar farside for galactic and extragalactic studies, and cosmology of the dark ages. The Moon surface can be used also for ultra high energy physics and astrophysics, with the possibility to detect cosmic rays, but also Cerenkov radiation of from subsurface soil of particles up to 10^{20} eV

Precursor experiments: We performed some precursor tests of lunar telescopes or radio antenna with analogue astronauts during LUNEX EuroMoonMars field campaigns in various Moon analogue sites. We shall report of robotic deployment of network Low Frequency radio antenna during Etna ARCHES campaign in June 2022.

We can perform astronomy from Moon surface and orbit, when it is effective and complementary to other space observatories. Special issues concern the effect of dust, human installation, operation and maintenance , and the protection of lunar environment in epoch of increasing activities and resource exploitation. This was recommended as a community resolution to COSPAR at World space Congress in 1992, and in subsequent 15 ICEUM conferences organized by ILEWG since 1994.

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References: [1], Foing B. et al 1994AdSpR..14, [2], Astronomy and Space Science from the Moon, in 1994AdSpR..14 (Foing B. Editor), [3] Angels R et al , 2008ApJ...680.1582; [4] Wedler A. et al , RSPTA.37990574W, [5] Heinicke C, Foing B.2021 RSPTA.37990568H