

Future Planetary Defense from the Moon, both Nearside and Farside

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ABSTRACT. The current rush of space-faring countries to the Moon opens new prospects for Planetary Defense also. Precision asteroid and comet astrometry is important to determine impact risks and to study future space missions to deflect them. In fact, the more precise and accurate are the estimates of the six orbital parameters of each asteroid and comet, the more precise and accurate will be the lead-time needed to deflect them will be. The Seeing on both the Nearside and Farside of the Moon is excellent, and so the time to install optical telescopes on the Moon is now getting closer. In our paper, we compare how the atmosphere around the Earth affects the estimate and precision of asteroid/comet orbital elements and check that against the Moon Seeing, showing that the Moon (both Nearside and Farside) will be better than the Earth to achieve a better Planetary Defense. Finally we refer to international Projects about the Moon exploitation in order to suggest a few good Moon location for future Planetary Defense Observatories on the Moon.

Keywords: Moon, asteroid, comet, lead-time, accuracy, Earth atmosphere.

In December 2021 the International Academy of Astronautics (IAA) created a new Permanent Committee devoted to the Moon Farside Protection. This new Committee is chaired by this author, Prof. Claudio Maccone, and the Committee's Co-chair is Prof. Jack Burns of the University of Colorado at Boulder (US).

We advocate the support to the Moon Farside Protection by all scientists working at least in four different areas of science:

- 1) SETI
- 2) Astrobiology
- 3) Cosmology
- 4) Planetary Defense.

In fact:

1) SETI needs radio quietness to possibly detect Alien Civilizations "signatures" that reach us very feeble because of the huge distances among stars in the Milky Way, if not from other galaxies. The discovery of one or more ExtraTerrestrial Civilizations in this or other galaxies would change the history of Humankind.

2) ASTROBIOLOGY studies pre-biological interstellar molecules by virtue of their roto-vibrational spectra: a delicate search for feeble spectral lines that only advanced radio telescopes and the Moon Farside radio silence may achieve.

3) COSMOLOGY needs the radio quietness on and above the Moon Farside to pick up the extremely feeble radiation of the hydrogen line at 1420 MHz as down-shifted to much smaller frequencies, MHz or kHz, by the 14 billion years of universe expansion.

4) PLANETARY DEFENSE. The seeing from the Moon is wonderful (though the micro-meteorite risk is high). Thus, optical telescopes pointing at the (blocked) Sun would enable high-accuracy measurements of the orbital parameters of NEOs, greatly improving all data for Planetary Defense.

By February 2023 (when this Abstract is being prepared) this new IAA Committee has already obtained the support of dozens of new Members worldwide (including the USA, China, Europe and more), and so we are now seeking for the support of the United Nations COPUOS, the International Astronomical Union, the International Telecommunication Union, CORF, CRAF and other organizations to draft a Farside Treaty to protect the radio-noise free Moon Farside before private polluters destroy it.

REFERENCE

- [1] Maccone C. (2019), "Moon Farside Protection, Moon Village and PAC (Protected Antipode Circle)", Acta Astronautica, 154 (2019), 233-237.