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DISCOVERY OF NEAR-EARTH OBJECTS AT VENUS

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ABSTRACT

The population of asteroids orbiting at the interior of the Earth is currently very poorly known. Only 14 “Atiras” have been discovered, 3 of which in the ~1 km class. However, past studies showed that this population, potentially harboring hazardous objects, could be as much as half the number of Atens (~900 known) [1].
Mission concepts such as Sentinel [2] or EUNEOS [3] have proposed in the past to observe from Venus’ orbit, or even closer to the Sun, for a more efficient NEO detection. However, we believe that a Venus-orbiting mission could be an outstanding platform capable of coupling NEO discovery with Venus exploration.
The first phase of Venus spacecraft exploration by the Venera, Pioneer Venus, and Vega missions (1962-1992). It established a basic description of the physical and chemical conditions prevailing in the atmosphere and at the surface of the planet. ESA’s Venus Express has provided global long-term remote sensing observations [4]. Today, several future plans to explore the planet focus on the geology and interior of the planet observed from a quasi-circular polar orbit [5,6]. This orbit can be considered as a unique vantage point to investigate near-earth objects and potentially hazardous objects (PHOs) at Venus.

From a Venus orbiter quasi-circular polar orbit, based on the EuNEOS study [3] a typical astrometry instrument would use a very large FOV (3.0° x 3.0°) and small pixel angular size. EuNEOS and Sentinel have explored different options for NEO detection from the inner Solar System. Polarimetry measurements, providing clues on the albedo of the observed object, could also be an option. In order to avoid moving parts and also conflicting observational requirements, we propose a continuously scanning telescope optimized for moving object detection. The simple

rotation of the probe(e.g. around the optical axis of the Venus-pointing camera) could produce the scanning motion needed to observe NEOs. There's a wide choice of geometric configurations (angle of the NEO telescope in respect to the rotation axis, orbit constraints...), to be taken into account and optimized by numerical simulation.

References

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