**PDC2021**

**Vienna, Austria**

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**ESA’S ACTIVITIES IN PLANETARY DEFENCE**

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##### ABSTRACT

The European Space Agency (ESA) has been active in the field of planetary defence since January 2009. As part of its Space Situational Awareness programme, ESA has set up an ‘NEO segment’. In 2018, the ‘Planetary Defence Office (PDO)’ was established. Since January 2020, it is part of ESA’s Space Safety Programme.

The mission statement of the Space Safety programme is the

*“…* ***protection of our planet, humanity and assets in space and on Earth from dangers originating in Space”*** (PB-SSA 2018(24)).

For the PDO:

(a) Be aware of the situation of natural objects in space;

(b) predict possible impacts and their consequences, inform relevant parties;

(c) prepare for risk mitigation, by technological developments and on political level.

The PDO team is structured in three ‘pillars’:

(1) Observations;

(2) Information provision;

(3) Mitigation.

Most activities are performed by personnel physically located at our NEO Coordination Centre, at ESRIN, ESA’s location in Frascati, Italy. All software/hardware is supported by the Space Safety ground segment team, see Di Girolamo *et al.* (this conference).

‘O*bservations’:* The PDO has set up a network of follow-up observers and telescopes, mainly with telescopes of aperture 40 to 200 cm. In a collaboration with the European Southern Observatory, we have regular access to the 8.2 m Very Large Telescope. For more information, see Conversi *et al.*, Micheli *et al.* (this conference).

ESA is developing a survey telescope, called ‘Flyeye’ telescope with OHB Italia as prime contractor. Integration of the cameras (16 in total) is in process. In parallel, the optical train is being tested. The production of the site infrastructure for the final telescope location (Mt. Mufara, Sicily, Italy) has started.

The PDO is also studying the possibility for Europe to contribute to radar observations.

‘I*nformation provision’:* In 2020, the PDO has established an independent capability to determine orbits and predict near-Earth object impacts. The software is an evolution of the NEODyS system, initially developed by the Univ. Pisa and operated by the company SpaceDyS, both Italian. Objects with a computed impact probability greater than 0 for the next 100 years will be posted on the so-called ‘risk page’. Following the agreement with the International Astronomical Union, for predicted impact probabilities larger than a Palermo Scale value of −2, the computations are double-checked with JPL/NASA. For more information and additional services, see Cano *et al.,* Frühauf *et al.* (this conference).

‘*Mitigation’* covers a number of activities: ESA’s PDO is setting up interfaces to emergency response agencies in member countries, is actively involved in the International Asteroid Warning Network and the Space Mission Planning Advisory Group. To demonstrate the capabilities of asteroid deflection, ESA is building the Hera mission which will complement NASA’s DART mission impacting asteroid Dimorphos, part of a binary system. ESA is preparing two CubeSat missions: M-ARGO, studying a small asteroid; LUMIO, observing impact flashes on the lunar far side. The two CubeSat missions are currently in Phase A, with funding currently being secured for actual implementation.

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