OBSERVATOIRE DE LA CÔTE D'AZUR
UNIVERSITÉ CÔTE D'AZUR

Direction

Dr Lindley N. Jonhson
NEO Programs Executive
Planetary Science Division
Science Mission Directorate
NASA Headquarters
Washington, DC 20546
USA

Nice, 26 october 2020

Réf : DM/IG/2020-080
Objet : IAWN

Dear Dr Jonhson,

On behalf of the French Riviera Observatory (OCA), I am pleased to inform you of our wish to join the International Asteroid Warning Network (IAWN). To this effect, I send you the attached Statement of Intent.

Please be informed that until further notice, Dr Patrick MICHEL, Research Director at the OCA Lagrange Laboratory, will represent OCA at the IAWN.

Yours sincerely,

Denis MOURARD
Provisional administrator

PJ : Statement of Intent

OCA's participation in IAWN

The Côte d'Azur Observatory (OCA) is highly involved in the activities related to Near-Earth Object discovery, characterization, deflection and outreach. OCA offers efforts in various areas relevant to IAWN: discovery and characterization from the ground and from space, estimate of the whole NEO population, numerical modeling of their properties (interior, surface, structural stability, impact), communication and outreach.

The Principal Investigator of the Hera mission (Michel et al. 2018, ASR 62) of the European Space Agency is a member of OCA. Hera is under development in the ESA Space Safety Program for launch in 2024, and will contribute to the first asteroid deflection test by the NASA DART mission with associated measurements that will fully characterize the target (including for the first time the internal structure) and the impact outcome.

Members of OCA have contributed to the debiased model of the Near-Earth Object population published in Bottke et al. (2002, Icarus 156) and Morbidelli (from OCA) et al. (2002, Icarus 158) and updated in Granvik et al. (2018, Icarus 312) and Morbidelli et al. (2020, Icarus 340), which serves as a reference for estimating NEO survey efficiencies and the percentage of discovered objects with a magnitude or size limit. They also contribute to ground-based observations of NEOs, allowing the determination of their thermal inertia (Delbo et al. 2007, Icarus 190), their thermal evolution (Michel & Delbo 2010, Icarus 209), their spectral properties (Carry et al. 216, Icarus 268) and their density (Carry 2012, PSS 73).

OCA members contribute also to the characterization of NEOs from space and through the analysis of returned samples of primitive NEOs (Libourel et al. 2016, Icarus 282), as co-Investigators of the sample return missions Hayabusa2 (JAXA) and OSIRIS-REx (NASA), and of the DART mission. They also coordinate or contribute to two European Union funded projects (2020-2023), NEO-MAPP and NEOROCKS, which are devoted to studies of NEOs.

OCA members also develop numerical models of NEOs, which allow understanding how they form, their physical stability, their dynamics and their response to external actions (such as a kinetic impact). For instance, they contributed to the first formation scenario of NEO binaries (Walsh, Richardson, Michel 2008, Nature 454) with implications on their structure, to the first simulations of small asteroid formations by asteroid disruption and reaccumulation, suggesting that most have a rubble pile structure (Michel et al. 2001, Science 294), to studies of the structural stability of NEO rubble pile, with or without cohesion (Tanga et al. 2009, ApJ 706; Zhang et al. 2018, ApJ 857). Recently, they revisited the effects of tidal encounters on NEOs (Zhang & Michel 2020, A&A 640), and studied the properties of irregular fragments in rubble pile simulations (Ferrari & Tanga 2020, Icarus 350).

OCA members are also involved in and lead the processing of Solar System observations by Gaia (ESA), in the frame of the Data Processing and Analysis Consortium of the mission. This has led to the detection of previously undiscovered asteroids, confirmed by the ground-based follow up network Gaia-FUN-SSO (coordinated by a member of OCA) and to the publication of the first sub-milli-arcsecond astrometry of asteroids in the second data release of Gaia (The Gaia Collaboration, Spoto, Tanga et al. 2018, A&A 616). Responsibilities of OCA members in DPAC also include the processing of reflectance spectra of asteroids. Beyond data reduction we also actively work to the scientific exploitation of Gaia, for instance by targeting stellar occultations (Tanga & Delbo, A&A 2007; Ferreira and Tanga, A&A in publication, 2020) to characterize Main Belt objects and NEOs. This activity supports the science of space missions such as DESTINY+ (JAXA, targeting Phaethon), and Hera to the binary object Didymos.

Observatoire de la Côte
L'administrateur par :

Denis MOURARD

9-Mar-2014

Statement of Intent
for Participation in
the International Asteroid Warning Network

The intent of the International Asteroid Warning Network (IAWN) is to establish a worldwide effort to detect, track, and physically characterize near-Earth objects (NEOs) to determine those that are potential impact threats to Earth. This network is comprised of a partnership of scientific institutions, observatories, and other interested parties performing observations, orbit computation, modeling, and other scientific research related to the impact potential and effects of asteroids. IAWN endeavors to foster a shared understanding of the NEO hazard and optimize the scientific return on these small celestial bodies. Herein, this statement provides guidance and operational principles for the partners in this network. This partnership is organized consistent with the concept developed within the United Nations (UN) Committee on the Peaceful Uses of Outer Space (COPUOS).

Participation

Participation in the IAWN is entirely voluntary and each participant's activities are funded through their own resources. The IAWN can be supported by survey telescope operations; critical follow-up observations; orbit computation and hazard analysis; observations to characterize specific NEOs; data distribution, processing, and/or archiving; or other analysis and infrastructure contributions. New facilities and capabilities may contribute to the IAWN as they come online and are integrated into the network.

As a condition of participating in the IAWN, the partners accept the existing set of coordination roles amongst the various existing NEO network facilities and agree to a policy of free and open exchange of all data submitted to the network. Distribution of data submitted to the network may be limited for a short period during processing while these data are ingested, correlated and verified.

As conceived, the IAWN may be expanded and enhanced with the identification of new partners and the availability of new capabilities for NEO detection, follow-up, and characterization observations, together with the methods to analyze these data products. As current survey and follow-up capabilities are limited, global coordination and distribution of effort is highly desired.

Operational Principles

The overall needs, goals, and objectives of the IAWN are to:

- Maintain, support, and enhance existing ground-based observation facilities that currently perform discovery and physical characterization of NEOs;
- Develop international rapid all-sky search capacity, geared towards discovering small, imminent impactors;
- Build ground-based facilities to globally survey larger areas of sky to fainter magnitudes;

- Develop a well-positioned space-based infrared survey to discover objects much faster than the current rate; and

- Establish an international communication policy and procedures regarding close approaches and impact risks.

To execute the objectives above, the functions of the IAWN are to:

1. Discover, monitor, and characterize potentially hazardous NEOs using optical and radar facilities and other assets based in the northern and southern hemispheres and in space;
2. Provide and maintain an international clearing house for the receipt, acknowledgement, and processing of all NEO astrometric observations and orbits to provide a global NEO database;
3. Serve as the international focal point for accurate information on the NEO population and any hazards they pose to the Earth;
4. Compute precision orbit determination of specific NEOs that pose a threat with the Earth and provide appropriate warning and evaluation of that threat;
5. Provide a portal for characterization data on potentially dangerous NEOs that are of great interest;
6. Coordinate campaigns for observing potentially hazardous NEOs;
7. Support the development and use of numerical and other theoretical modeling to obtain broader understanding of object characteristics and thus to augment what can be achieved via direct observation;
8. Recommend policies regarding criteria and thresholds for notification of an emerging NEO impact threat;
9. Develop a database of potential impact consequences, depending on geography, geology, population distribution, and other related factors;
10. Assess hazard analysis results and communicate them to entities identified by partners as being responsible for the receipt of notification of an impact threat in accordance with established policies; and
11. Assist Governments in the analysis of impact consequences and in the planning of mitigation responses.

Communication Strategy and Planning

The signatories to this Statement of Intent recognize the importance of being adequately prepared for communications with a variety of audiences about NEOs, close approaches, and NEO impact risks. Participants in the IAWN recognize the need to consult with experts in science communication, risk communication, public policy analysis, and emergency management in developing messages and other content for communication with various audiences. The IAWN intends to be coordinated and prepared for communicating effectively the nature of the NEO hazard and detection of any specific impact threats with national and international political leaders, policy makers, emergency managers, and the general public. Signatories agree to coordinate with validated authoritative sources for:

- astrometric and orbital data (via the International Astronomical Union (IAU)-mandated

Minor Planet Center (MPC));
- the computation of impact probabilities (NEODyS and NASA's NEO Program Office);
- the ensuing actions aimed at improving the knowledge of the relevant NEOs (NASA's NEO Program Office and the ESA NEO Coordination Centre);

before the release of any statements to the media or public warning of the potential for impact of any specific asteroid or comet threat.

The IAWN Steering Committee

Representatives of core capabilities for the IAWN intend to form a Steering Committee to better coordinate the operation and interchange of the network, and guide its growth, enhancement and evolution. The Steering Committee intends to meet on approximately an annual basis to perform a review and provide guidance and recommendations. All partners in the IAWN are welcome to send representation to the Steering Committee meetings.

Signature:

The objectives of the IAWN can only be realized through a global multilateral partnership dedicated to a better understanding of the NEO impact hazard. Signature on this Statement of Intent serves as an expression of interest in supporting the IAWN and its objectives, but does not constitute a binding commitment.

[Signature by Official of Institute/Organization]