

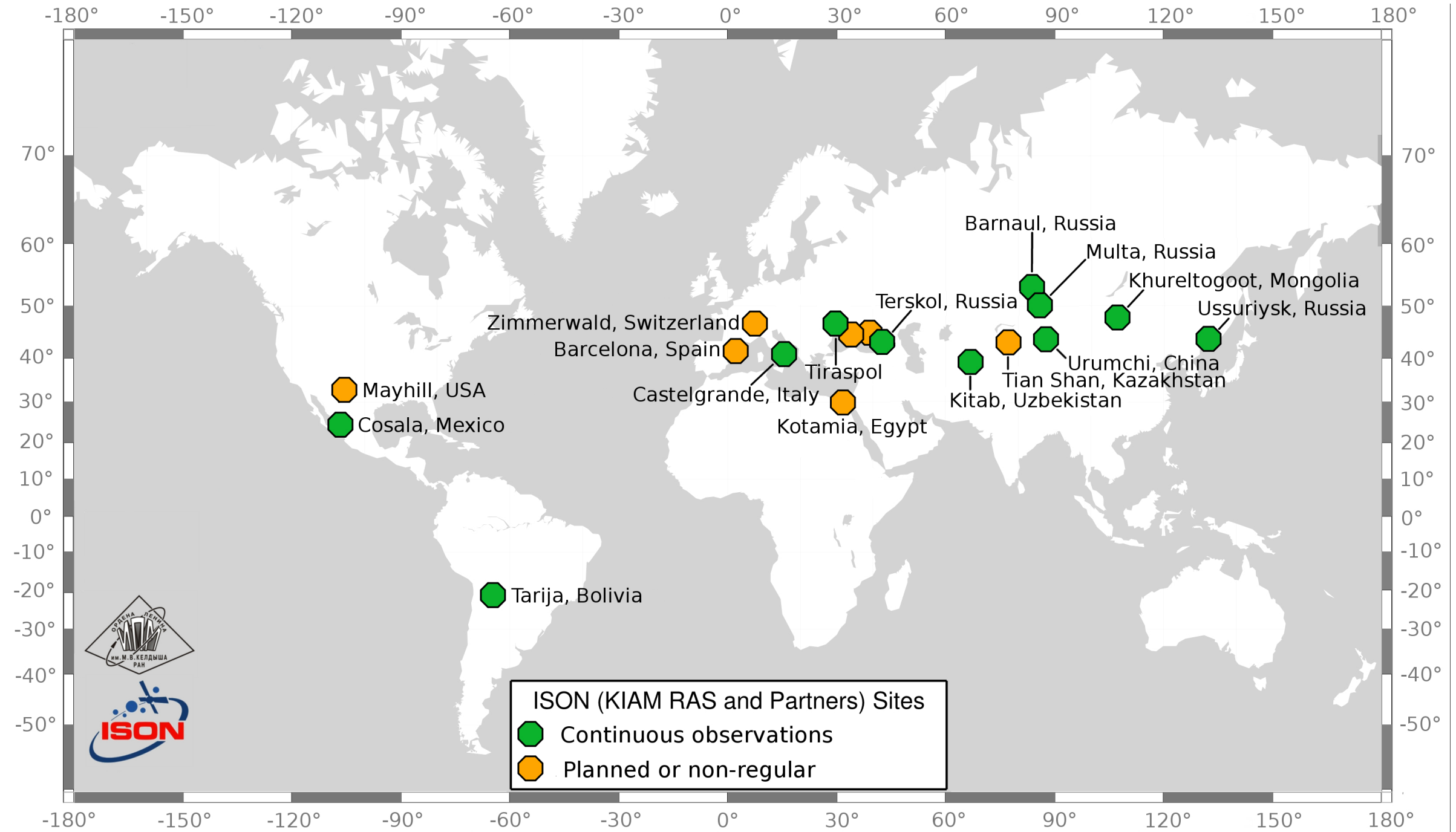


Recent Developments of the ISON Initiative

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ISON, or International Scientific Optical Network, is an initiative of the Keldysh Institute's research fellows to coordinate international campaigns of optical observations. ISON mainly focuses on anthropogenic space objects orbiting Earth and near-Earth objects.



Existing and Possible Challenges for ISON or Similar Projects

- It can not be a peer competitor to commercial enterprises in space situational awareness.
- Cooperating entities may not be interested in data on space objects resulting from cooperation due to security concerns or owing to the lack of incentives from their governments to leverage these data.
- Modus operandi of usual scientific and technical cooperation can hinder routine monitoring of the near-Earth space and prompt response to high-priority observation tasks: telescopes of cooperating organizations are usually voluntarily operated in-house with due regard for centralized recommendations.

Possible Contribution of ISON or Similar Projects to SDGs and LTS

- Opportunity to provide data, technology and training to educational and research organizations without the influence of commercial interests can help to fill possible gaps related to growing commercialization and securitization of space situational awareness, thereby contributing to equitable access to outer space.
- Promotion of the idea of free access to comprehensive data on anthropogenic space objects, including their precise orbital data.
- Opportunity to serve as a model or a building block for an upcoming international decentralized overarching framework for sharing data on anthropogenic space objects.



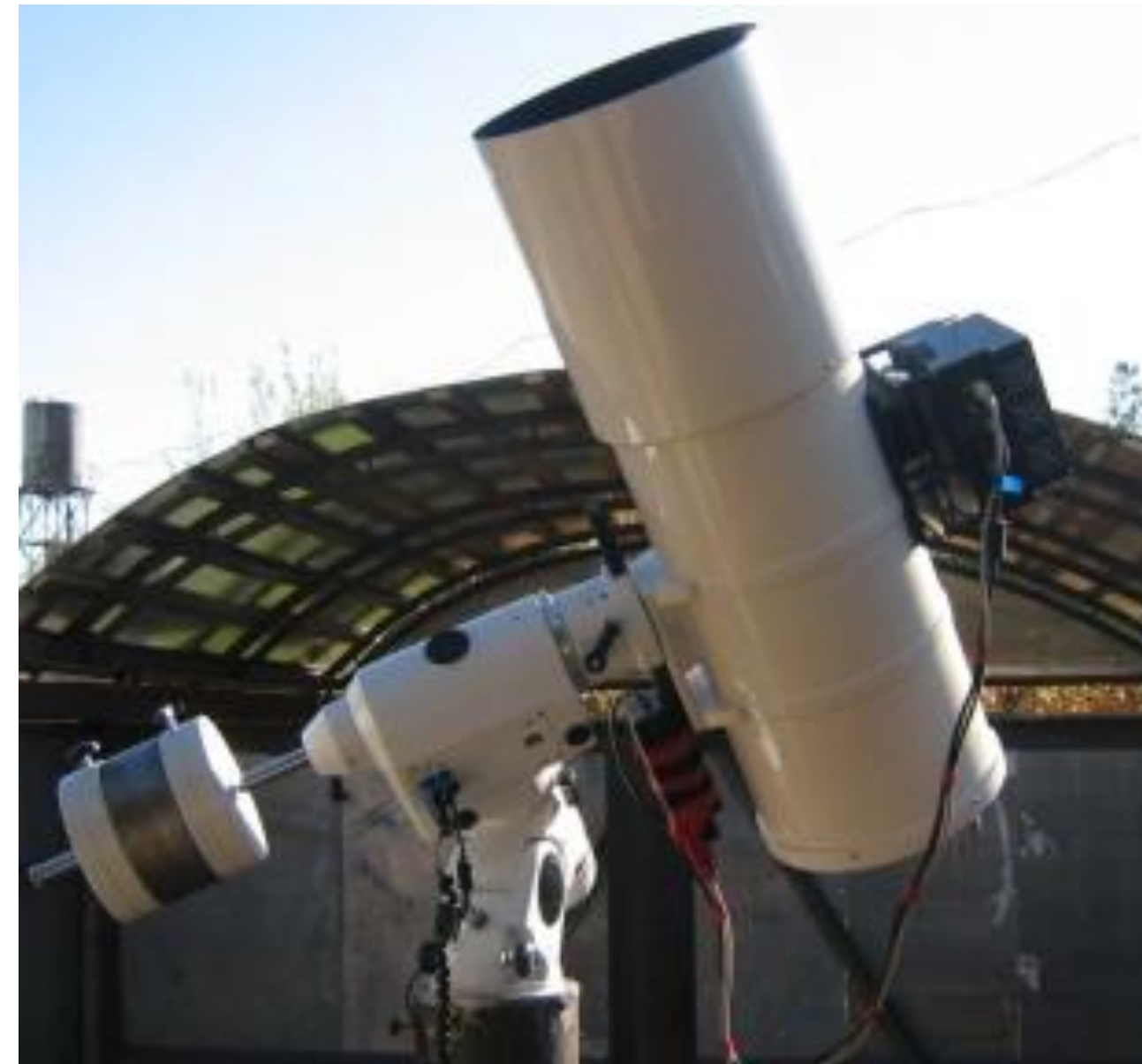
ISONscope is a joint program of the Keldysh Institute and UNOOSA within the memorandum of understanding signed between the Keldysh Institute and the UN in 2019.

ISONscope became a part of the Space Exploration Track of the Access to Space for All Initiative of UNOOSA. It is envisioned that ISONscope will facilitate optical observations of space objects in the geosynchronous region and beyond for scientific and applied research in developing countries of the winner entities.

Content of ISONscope

Two opportunities were available through the selection process under the first round of ISONscope in 2021. Each opportunity includes:

- provision of a small-aperture optical telescope and all related equipment and software;
- training of staff members of the selected organization on the telescope operation and data processing;
- technical support;
- participation in campaigns of the Keldysh Institute on optical observations of objects orbiting the Earth and minor planets;
- up to 50 per cent of the telescope observation time for research purposes of the selected entity.



Specifications of the Equipment to be Provided

- Telescope optical tube: reflector, aperture from 20 cm to 35 cm, a field of view from $2^{\circ} \times 2^{\circ}$ to $4^{\circ} \times 4^{\circ}$ with no significant aberrations in CCD/CMOS images.
- CCD/CMOS camera: monochrome, ASCOM compatible, 50 mm minimum sensor diagonal, 2048 x 2048 pixels minimum sensor size, cooling at least 30°C below ambient, PPS time synchronization, frame read time no more than 6 seconds.
- Telescope mount: equatorial, ASCOM compatible, not less than $1^{\circ}/\text{sec}$ slewing speed for each axis, not less than 100 arcsec/sec maximum supported tracking speed for each axis.
- Single-frequency GPS receiver.
- Motorized focuser: ASCOM compatible.

Observing Campaigns of the Keldysh Institute

ISON involves wide field-of-view telescopes 20 to 80 cm in diameter at more than 20 sites. Selected entities of ISONscope will become a part of ISON, participate in joint observing campaigns and be able to obtain data and observation time of other telescopes of the network. ISON observing campaigns are aimed at:

- optical astrometric observations, cataloguing of objects and monitoring of events in the geosynchronous zone and high Earth orbits;
- photometric studies of objects orbiting the Earth in all types of orbits;
- observations of asteroids and comets for studying their physical properties;
- follow-up observations of newly discovered minor planets;
- participation in the International Asteroid Warning Network campaigns.

ISONscope Eligibility



Applying organizations from developing countries, if selected, shall ensure:

- a site in accordance with data specified in the application form and minimum requirements on the number of clear night hours per year and sky brightness;
- a shelter for the telescope, reliable power supply and internet connection;
- its staff for the telescope operation and feasible technical support.

Winner of the 1st round of ISONscope: the project of Kenya Space Agency and the National Museums of Kenya

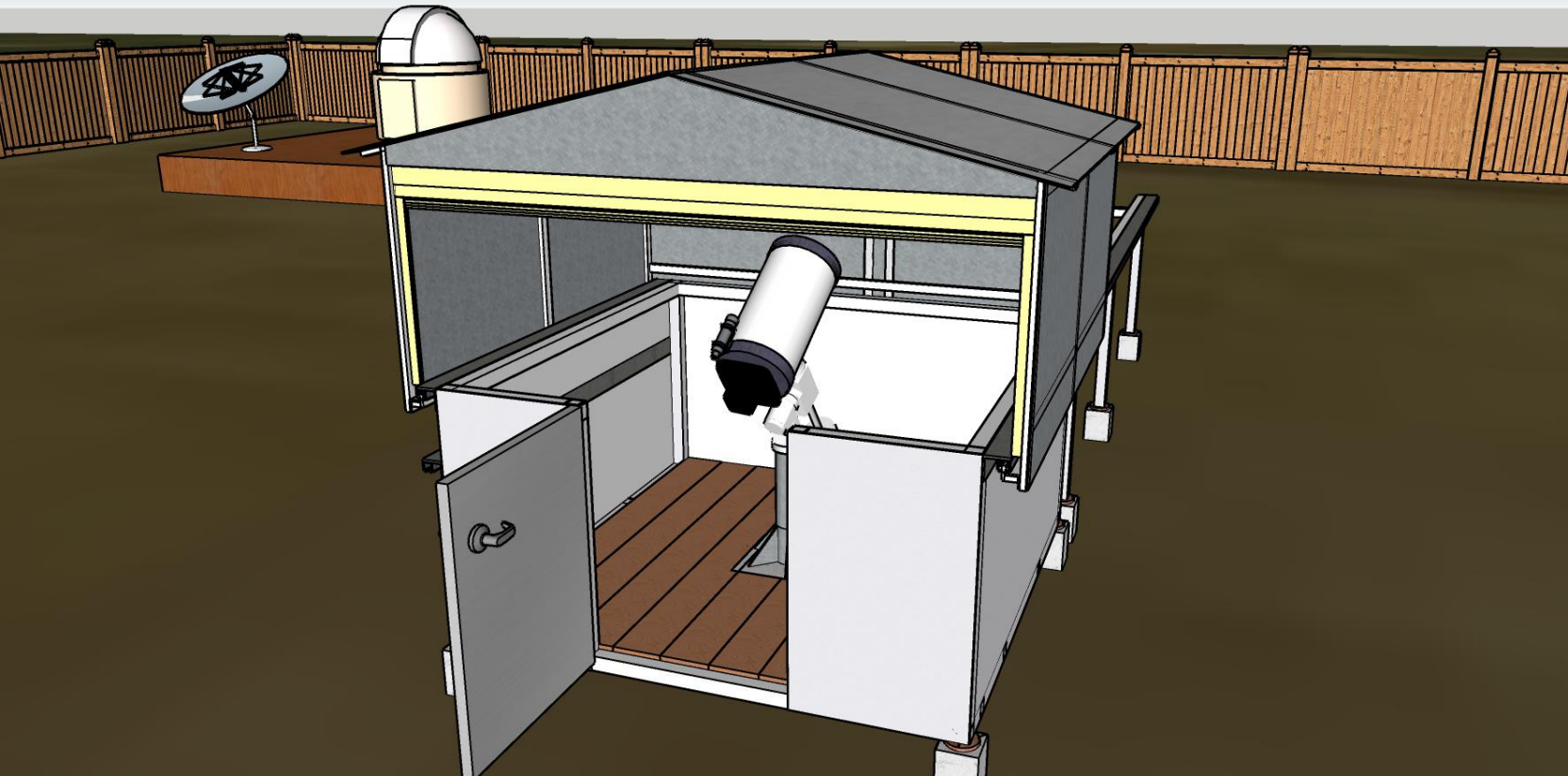


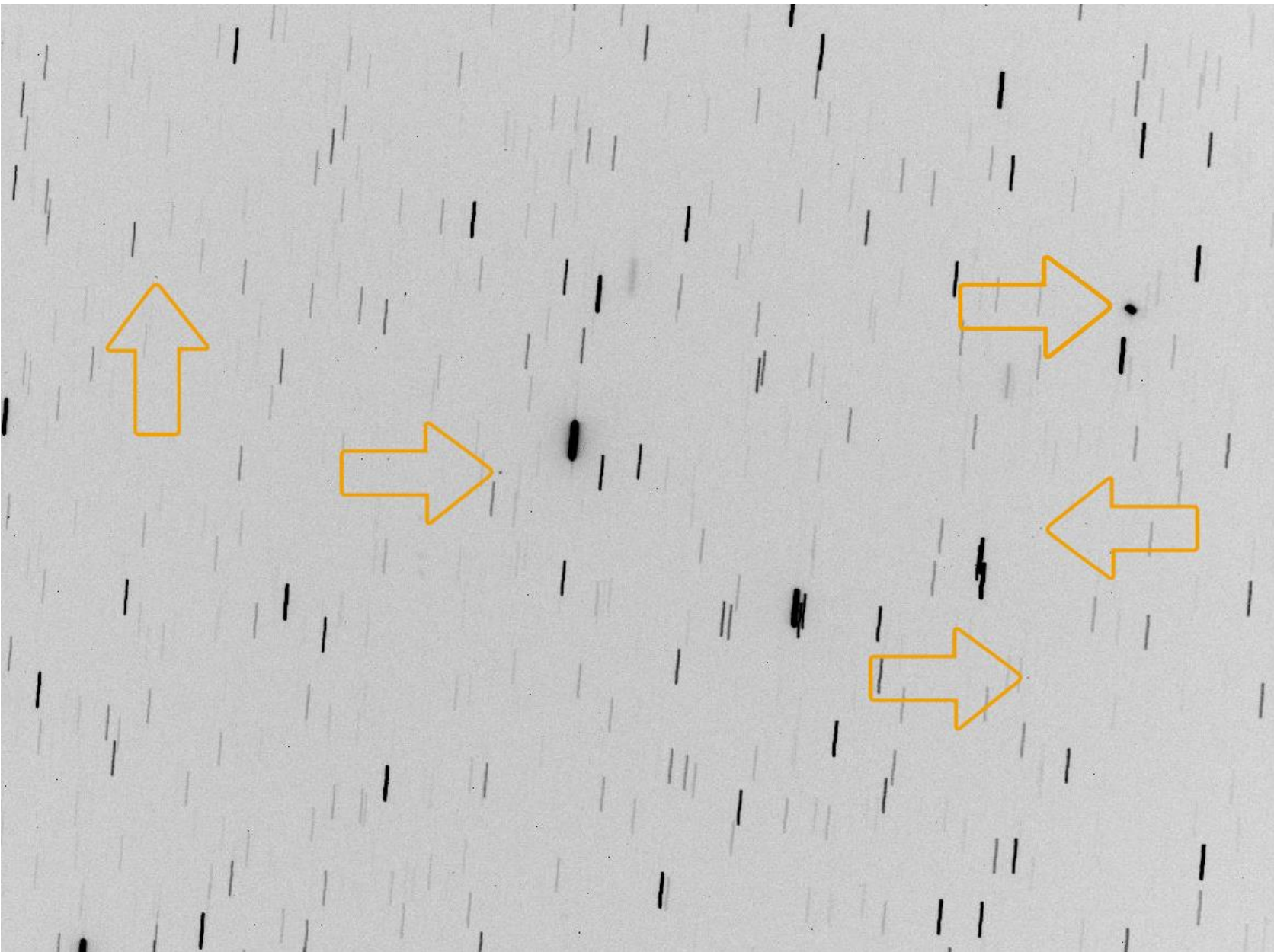
The proposed site for the telescope installation: the Olorgesailie pre-historic site



Winner of the 1st round of ISONscope: the project of the Center for Basic Space Science, the National Space Research and Development Agency, the Federal Republic of Nigeria

The proposed site for the telescope installation:
the Center for Basic Space Science's grounds, Nsukka





ISONscope aims at contributing to achieving SDGs, in particular, by promoting studies of space objects based on optical observations as well as enhancing the inclusiveness in addressing the space debris problem and planetary defence.

The Keldysh Institute intends to ensure the implementation of the second round of the ISONscope opportunity in the future.

Consortium for Sharing Data on Space Objects

(The joint project with the University of Texas at Austin, USA)

Rationale

- A comprehensive framework for sharing data on anthropogenic space objects is necessary to ensure access to outer space, address space debris mitigation and remediation, and establish an international body responsible for space traffic management (STM) in the decades to come.
- Existing impediments:
 - national security concerns, especially of space-faring nations;
 - commercial interests of space situational awareness data providers;
 - the lack of specific deadlines before the onset of the tragedy of the commons;
 - the timescale of the problem is longer than typical elective periods and corporate plan spans;
 - still limited public discourse on the space debris problem and STM.

