



UNISEC-Global The 65th Virtual Meeting

February 21st, 2026, 22:00-24:00
(Standard Japan time GMT +9)

65th Virtual UNISEC-Global Meeting
Hosted by UNISEC GLOBAL

Theme: Exoplanet

Date: February 21, 2026
Time: 22:00-24:00(JST)

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Moderator
Maxmilien Berthet
The University of Tokyo

<p>Searching for other worlds: what do we know about exoplanets?(T.B.C.) Elizabeth Tasker, JAXA</p>	<p>ExoKyoto3D: Visualizing Extrasolar Planets for Education and Research Yosuke Yamashiki, Kyoto University</p>
<p>How to Detect Habitable Planet Candidates and Advance This Goal with CubeSat Missions Taro Matsuo, Osaka University</p>	<p>SEIRIOS: Space Experiment of IR Interferometric Observation Satellite Satoshi Ikari, The University of Tokyo</p>

Grid of participants:

- Manol Avramov
- Haruka Yasuda, UNISEC-Global
- UNISEC office
- Rei Kawashima
- Elizabeth Tasker
- Maximilien Berthet
- 京都大学 山敷庸亮
- Taro Matsuo
- Satoshi Ikari
- UNISEC MX HERMES
- Charleston Dale Ambatali
- Mohamed Lotfy Taha Hassan
- Robert Cheatham
- Helen Haile
- Tetsuya Iwasaki
- Aliza Sarwat
- AHRON MARTINEZ
- Ivan Quinsaat_UP Diliman
- Bassem Boshra - SpimeSenseLabs
- Fredy Calle Bustinza (Space Agen...
- Mohamed Khalil
- DAVID JOSEPHAT SENG'ENGE / SJ...
- Derrick Tebusweke
- Simona Adhikari
- Leemar Bonite

The following report was prepared by UNISEC-Global Secretariat
February 21, 2026
Japan

Table of Contents

1	Opening Remarks	3
	Maxmilien Berthet, The University of Tokyo	3
2	Searching For Other Worlds: What Do We Know About Exoplanets?	3
	Elizabeth Tasker, Japan Aerospace Exploration Agency	3
3	ExoKyoto3D: Visualizing Extrasolar Planets for Education and Research.....	5
	Yosuke Yamashiki, Kyoto University	5
4	How to Detect Habitable Planet Candidates and Advance This Goal with CubeSat Missions ..	6
	Taro Matsuo, Osaka University	6
5	SEIRIOS: Space Experiment of IR Interferometric Observation Satellite.....	9
	Satoshi Ikari, The University of Tokyo	9
6	Announcement and Acknowledgment	11
	Haruka Yasuda, UNISEC-Global	11
7	Participant Statistics.....	12

1 Opening Remarks

Maximilien Berthet, The University of Tokyo

Dr. Maximilien Berthet is an Assistant Professor at University of Tokyo, Japan. He earned his Master's degree from the University of Durham and the University of Tokyo and his Ph.D. degree from the University of Tokyo. His Master's degree is in General Engineering, Aeronautics and Astronautics; he completed his Ph.D. in Aeronautics and Astronautics. He worked as a Research Fellow from April 2022 to October 2022 in Japan Society for the Promotion of Science. In November 2022, he became the Assistant Professor of the Department of Aeronautics and Astronautics. His research focus is on the dynamics of small satellites in Low Earth Orbit, applied to mission design for easier access to space via solar sails and drag sails. He is actively involved in research on space capacity building and the history of space development, with a focus on Southeast Asia.



Pictured: Dr. Berthet while giving the opening remarks

Highlights:

- Exoplanets are planets that orbit a star other than the sun
- Planets that are outside the Solar System
- **Field of exoplanet study is quite new**
- Why Focus on Exoplanets?
 - Pushing new frontiers in science by pushing the invention of new technology
 - Pushing new frontiers in space technology
 - by pushing the invention of sophisticated spacecraft or finding new methods
 - Spin-off applications
- Why now?
 - Until now, only focused on detection methods for exoplanets
 - 6000 discovered until now
 - Characterization is yet to be done
- Why at UNISEC?
 - **Exoplanet study aligns with UNISEC's vision 2030 of space education for all**

2 Searching For Other Worlds: What Do We Know About Exoplanets?

Elizabeth Tasker, Japan Aerospace Exploration Agency

Professor Tasker completed her PhD in astrophysics from University of Oxford in 2005. She is currently an Associate Professor at the Japan Aerospace Exploration Agency (JAXA), Institute of Space and Astronautical Science (ISAS). Her research focuses on numerical simulations of star and planet formation, protoplanetary disks, and planetary system evolution, often incorporating machine learning techniques. She is also involved in international outreach for missions such as Hayabusa2 and Martian Moons eXploration (MMX) mission.

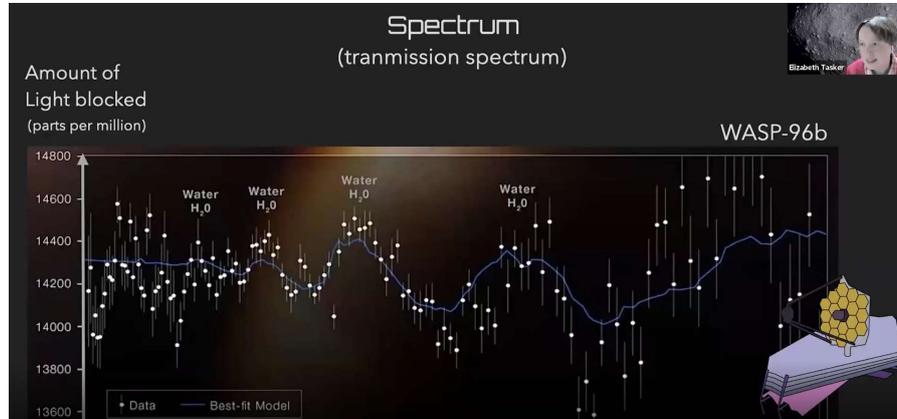


Pictured: Dr. Elizabeth during her presentation

Highlights:

- What we knew about planets from our own Solar System was that:
 - Planets should have approximately circular orbits
 - All the planets should orbit in the same plane
 - Either rocky or gaseous
 - If rocky, then nearer to star, if gassy then farther away from the star
- We start with a young star that is surrounded by a disk of gas
- Dust within that disc collides and sticks to form planets around the young star.
- It is likely that most stars can form a planetary system.
- The further you are from the central star the colder it is
 - After a certain point water vapor freezes into ice, that point is called ice line
 - Ice gives planets more building material, hence, planets before the ice line are smaller
 - And planets after the ice line are a lot bigger
- **Discovery of the first exoplanet around a Sun-like star 51 Pegasi b**
 - Radio velocity technique was used
 - Every planet gives the star a bit of wobble
 - The star and planet orbit a common point known as the centre of mass.
 - Which is very close to the star due to its mass and bigger planets result in bigger wobble
 - So, using this the mass of a planet can be found
 - **51 Pegasi b mass is comparable to that of Jupiter**
 - However, it has an orbit of only 4 days which does not make sense because
 - The closer you get to a star the smaller a planet should be
 - So, this new class of planet was called 'Hot Jupiter'.
 - Due to exchange of angular momentum planets can experience a drag force towards the star, and those forming beyond the ice line migrate inwards and end up in very close orbits
- **Then the first multi-planet system, Upsilon Andromedae, was discovered**
 - Which has a "Hot Jupiter," and 2 planets which aren't in the same plane
 - This happened because there were initially 4 planets
 - And the further away 2 planets got really close to each other
 - Resulting the 4th planet to eject out of the system
 - And the 3rd planet to gain an orbit in a different plane
 - Gravitational pull from this planet also influenced the 2nd planet
 - The "Hot Jupiter" was not influenced as it is very close to the star
- Discovery of Gliese 1214b
 - This planet was discovered by transit technique
 - Which measures the light the planet blocks as it orbits the star
 - By which, the radius of the planet can be found
 - Then by using radio velocity technique we can find the mass and get an avg density
 - Which we know is either rocky or gassy
 - **However, Gliese 1214b was too dense for gassy and too light for rocky**
 - So, it was considered to be a water world
 - Habitable zone limits are defined for Earth
 - As even if we know the starlight a planet receives cannot say how thick their atmosphere is
 - The boundaries of the habitable zone are defined by the carbon-silicate cycle. So, if there's no carbon-silicate cycle on the planet, the habitable zone does not apply.

- **Gliese 1214b is likely to not be habitable**
- There is another technique called transmission spectroscopy
 - Idea is molecules absorb different wave lengths of light
 - So, if you see which wavelengths of light are missing,
 - One can say what the upper atmosphere of the observed planet is made from
- This is what exoplanet search will be like in the coming future



Pictured: The spectrum of planet WASP-96b

3 ExoKyoto3D: Visualizing Extrasolar Planets for Education and Research

Yosuke Yamashiki, Kyoto University

Prof. Yamashiki graduated with a Doctor of Engineering from Kyoto University in 1999. He currently is a professor at Kyoto University. His research area includes qualitative evaluation of water resources, continental-oceanic mutual interaction, planetary water resources, habitability of extrasolar planets.



Pictured: Prof. Yamashiki during his presentation

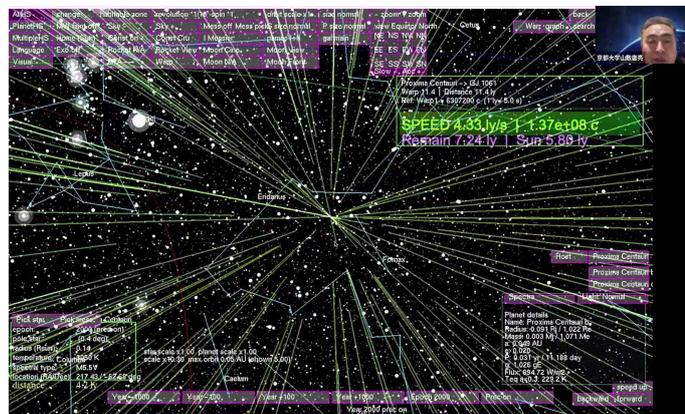
Highlights:

- ExoKyoto was made after discovery of exoplanets by Kepler telescope
- Here one can compare the exoplanet with planets of our solar system
- One can also analyze habitable zones with moisture, origin, and more
- There is also an option to only select habitable planets
- Similarly, there is option for Hot Jupiter, Hot Neptune, Super Earth, and so on
- **All the planet drawings are made by Prof. Yamashiki's students**
- Essentially the software is a star map with constellations that guide the user
- When a specific star or exoplanet is selected, the software gives a detail information
- There are also different tools to help locate an exoplanet or star



Pictured: Demonstration of ExoKyoto 2D

- The ExoKyoto 3D is currently under development
- Some features of ExoKyoto 3D are
 - It has a fancy system where all the planets are 3D
 - It has a warp mode for travelling
 - Users can launch a rocket from earth to the moon and back
 - The planets also have their rotation, moons, and features such as rings
 - Users can view the sky of any exoplanet and analyze the change in constellation shapes
 - Users can analyze spectrum of light of host star .



Pictured: Demonstration of ExoKyoto 3D

Q&A Session:

UNISEC Participant: *Is this software available in public domains? If yes, where can we access this?*

Prof. Yamashiki: Actually, not yet, we are planning to release this shortly. Even the 2D version is difficult to compile. So, if you have a intel compiler and you really want to learn, we can discuss it. But now we are trying to fix that.

UNISEC Participant: *Up to what certainty can we examine a planet's environment?*

Prof. Yamashiki: No, we cannot see any surface information about planets. Internationally they are trying to send a nano spacecraft just to take the picture of planet Proxima Centauri B. So, the nearest planet we cannot take pictures of yet. This is completely imaginary world.

4 How to Detect Habitable Planet Candidates and Advance This Goal with CubeSat Missions

Taro Matsuo, Osaka University

Dr. Matsuo graduated from Division of Particle and Astrophysical Science, Nagoya University in 2008. He has worked on high-contrast imaging at NASA JPL, new spectrograph at NASA AMES, and is currently working on Formation Fling interferometer collaborating with space engineers at the University of Tokyo.



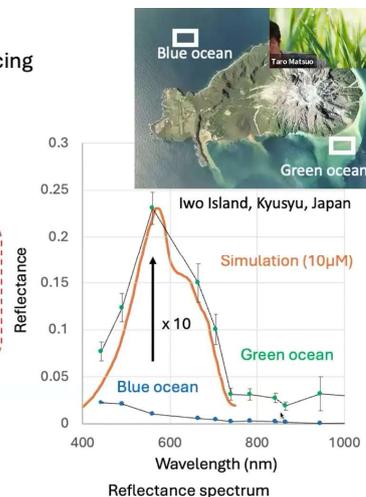
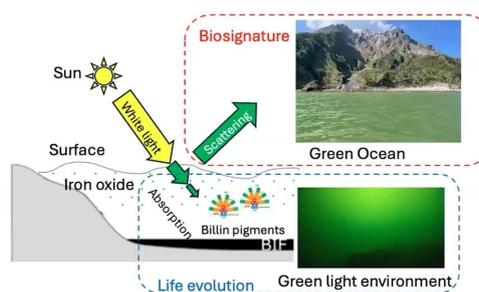
Pictured: Dr. Matsuo during his presentation

Highlights:

- **Since the discovery of exoplanets in 1995, more than 6000 exoplanets have been found**
- And 30% of the stars host an Earth sized or super Earth planets, habitable planets are abundant
- So, the next big milestone is to search for life on these habitable planets
- Difficulty faced for this are
 - The planets appear as point source of light
 - Planets are not observed properly as they are around bright stars
- Detecting life itself from light of an exoplanet is difficult
- Hence, a study of surface environment is done
- As life always interacts with the surface environment
- Correlation of life and surface environment of Earth
 - Oxygen concentration has gradually increased over the past 3 Giga year
 - After the first oxygenic phototrophs around 3 Giga years ago,
 - Cyanobacteria emerged and surfaced water gradually oxidized
 - Leading to the Global Oxidation Event (GOE)
 - This event is very important for Astrobiology
 - As, global scale change could be remotely detected even from a point source
 - GOE also promotes birth of Eucaryote and Multicellular organisms
- Is the ocean always blue?
 - Before birth of cyanobacteria, iron was speared into the ocean
 - And the color of ocean was blue but once cyanobacteria emerged in surface water
 - **They started releasing oxygen which then formed Iron hydroxide due to redox reaction**
 - This surface water observed UV, blue, and red light
 - Making the ocean green which essentially helps life growth
- Hence, even from a point source, a pale green dot is a good indication for life

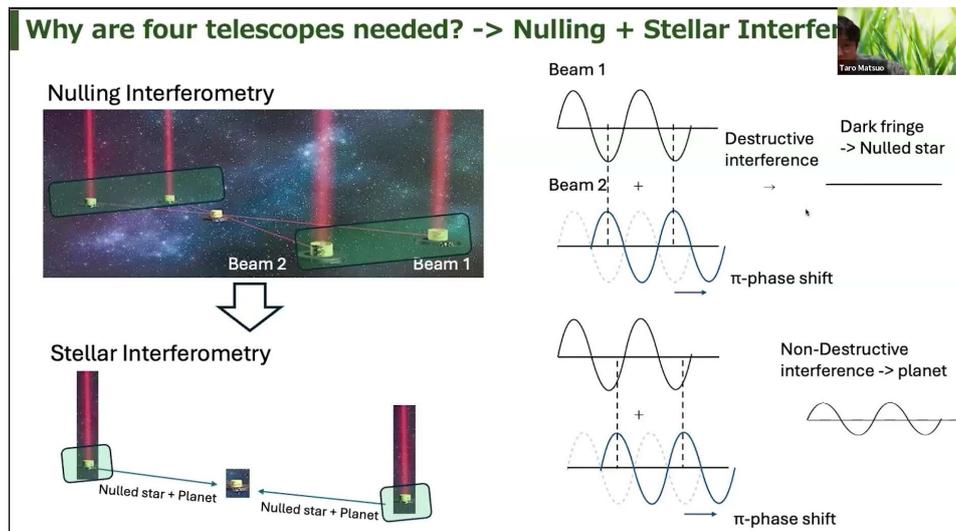
Green Oceans in the Archean era?

- Iron oxides effectively scatter green light, producing **~10× higher albedo** than typical blue oceans.
- They create a **distinct spectral edge** at 550 nm.
- Iron oxide concentration of **~10 μM** explains the observed remote sensing data.



Pictured: Dr. Matsuo comparing Blue Ocean and Green Ocean

- Due to existence of green oceans
- A telescope concept used for habitual detection is LIFE
 - LIFE: Large Interferometer for Exoplanets
 - It aims for characterization of thermal emissions from temperate habitual planets
 - Main objective is detecting biosignature gases like O₃ and CH₄
 - And increase the spatial resolution
 - This is to ensure separation of planet light from host star's light
- History and Status of Space Interferometry
 - More than 10 Space Interferometry concepts have been canceled
 - **LIFE like mission has been identified by European community**
 - NASA held discussion at Caltech regarding key issues on Space Interferometry
 - We have identified technologies like formation flying
 - Conclusion is to take step wise approach towards the large Interferometry mission



Pictured: Dr. Matsuo presenting telescope structure of LIFE

Q&A Session:

UNISEC Participant: *If there is no ozone initially, how can cyanobacteria survive because of UV?*

Dr. Taro Matsuo: Yes, we also take count of the negative impact of UV on the eco system. So, the attenuation coefficient of water shows, water can attenuate UV light efficiently. So, if living organisms exist below 5m, their life can survive. Also, once iron hydroxide is generated by oxygen, iron hydroxide more efficiently absorbs UV light. This means that UV light does not have a strict negative impact on the ecosystem, also the atmosphere could probably be helpful.

Prof. Yamashiki: *Is it widely agreed that similar oceans evolution is expected on other planets like Earth or just expectation?*

Dr. Taro Matsuo: Not expectation because first of all reduced iron could be spread in the entire ocean even outside Earth. In order to obtain green color ocean, we still in oxidated phototrophs. The key is that life should evolve to the oxidated phototrophs.

Prof. Yamashiki: *What do you think about habitual planet orbiting around dwarf?*

Dr. Taro Matsuo: Environment around these stars is totally different than sun like stars. I don't think this kind of evolution happens around this type of star. They emit the invisible light, and the oxidated phototrophs may not be able to efficiently emit oxygen. Another point is planet is always tidally locked, and the world doesn't have day and night, only day or night. As a first step for search for life planet around these stars are a early stage.

UNISEC Participant: *What minimum time is needed for Global Oxidation Event?*

Dr. Taro Matsuo: Yeah, based on a geological record at least 2 Giga years might be required. But it has not been researched.

5 SEIRIOS: Space Experiment of IR Interferometric Observation Satellite

Satoshi Ikari, The University of Tokyo

Dr. Ikari graduated with his PhD from the University of Tokyo Department of Aero/Astro in 2017. He was a researcher at Meisei University and a guest Researcher at German Space Center (DLR). Currently he is an Associate professor at ISSL (Intelligent Space Systems Laboratory), University of Tokyo.



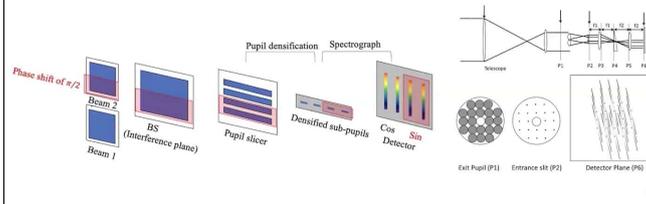
Pictured: Dr Ikari during his presentation

Highlights:

- Under Professor Nakasuka's Laboratory (ISSL), 16 satellites have been launched
- The next mission is SEIRIOS
- SEIRIOS is a formation Flying demonstration mission
- Formation Flying can achieve objectives that is not possible from a single spacecraft
- Limitations of single spacecraft
 - Formation flying can use multiple satellites to overcome size constraints of single spacecraft
 - Mission is at risk due to single point failure
- **Formation flying is different from Constellation**
 - Each spacecraft operates individually in constellation
 - Inter-satellite distance is very long; from 100km to 1000km in constellation
- Space Infrared Interferometers with FF
 - High resolution infrared observation requires long-baseline space interferometry
 - Around 100m baselines are necessary
 - Ground based observations are impractical due to atmospheric absorption
 - However, these mission plans were stopped
 - Due to high development cost and risk
- **So, to reduce this high cost and risk possible solutions are**
 - To develop micro satellites
 - Relax the required control accuracy from micrometer level to millimeter level
 - By using Densified Pupil Spectroscopy Interferometer
 - The combination of these 2 approaches is the SEIRIOS mission
- More about SEIRIOS mission
 - Space infrared interferometer with densified pupil spectroscopy by 3 micro satellites
 - SEIRIOS will have a docking form of 70kg and then the 2 CubeSats will deploy
 - Making formation flying between 2x 10kg satellite and 1x 50kg satellite
 - The interferometer will have a wavelength of 0.7-1 um and aperture diameter of 8.5 cm
 - Light from celestial body will reflect inside the mirror of the 2 10kg CubeSat
 - Which will combine inside the 50kg micro satellite and using DPSI will be observed

Densified Pupil Spectroscopy Interferometer (DPSI)

- Two reflected beams are **combined at the pupil plane** not at the focal plane
- The combined beams at pupil plane are sliced
- The sliced sub-pupils are densified by concave mirrors
- Input the densified sub-pupils to **spectrograph** to get spectra of the bodies
- The DPSI also works as a sensor for relative position and attitude.



Pictured: Dr. Ikari explaining DPSI and its use in SEIRIOS

- Mission Objectives of SEIRIOS
 - Establish real time formation flying control technology
 - Achieve on orbit measurement of infrared interference fringes with DPSI
- Direct imaging of Exoplanet is a future mission
- Formation flying sensors
 - CDGPS
 - Inter Sat Link
 - Optional Navigation
 - Laser distant meter
 - Fringe Image FB
 - Thrusters
 - Tip/tilt, Delay Line
- **SEIRIOS has a reference orbit of 600 to 800 km, Dawn-Dusk Orbit**
 - Where, if target is in the same direction as orbital plane, formation will be perfect
 - But if the target is inclined, the CubeSats will be required to incline as well
- Ground Equipment
 - Development of 6 Degree of Freedom Thrust Stand
 - EM and FM of propulsion system will be tested with this stand
 - This is important for accurate FF mission
 - Development of GNSS signal simulator
 - Relative navigation with GNSS-R is essential for accurate FF mission
 - Mr. Ikari and team are also developing HILS including GNSS RF signal simulator
 - Development of Air Bearing Table
 - 3 DoF relative motion emulation with frictionless table
 - To do a Formation Flying control test
 - Ground experiment for DPSI
 - Numerical simulator to confirm the control accuracy of spacecraft
 - Also developed ground testbed for delay line control
- SEIRIOS has been selected as a R&D theme of Space Strategy Fund
- And it will be launched in 2030FY

Q&A Session:

UNISEC Participant: *How precise and detection of the habitual world the James Web telescope did is it possible to do similar or more precise detection with the Formation Flying?*

Dr. Satoshi Ikari: Yeah, in the SEIRIOS mission our target is not exo planet right now. Our target is very bright stars and moons in our solar system. This mission is just a demonstration of Formation Flying and interferometer.

UNISEC Participant: *How does the propulsion system relax the Formation Flying alignment requirement?*

Dr. Satoshi Ikari: Yeah, using the DPSI, we can use the pupil plane from the attitude requirement it is relaxed. This is not just an interferometry part, it is a spectroscopy, we can extend the coherent lengths, and the positional requirement is also relaxed

6 Announcement and Acknowledgment

Haruka Yasuda, UNISEC-Global

Highlights:

- **Next Venue Announcement**
 - **The 12th UNISEC-Global Meeting**
 - To be held online
 - To facilitate all POC and students from all local chapters to participate
 - Date: **November 4, 2026**
 - Details will be announced later
 - In person **POC** gathering at Antalya, Türkiye, afternoon
 - **October 4, 2026**, in conjunction with IAC (T.B.D)
- **15th Nano Satellite Symposium to be held at Tainan, Taiwan**
 - November 9 – 11, 2026, with
 - PreMIC10 (Nov 9)
 - 2nd IoT Workshop (Nov 8)
 - 3rd Deep Space Workshop (Nov 8)
- **Nano-satellite IoT Constellation Program**
 - A new program launched by UNISEC-Global
 - Jointly design satellite bus (3-6U) with online guidance
 - Each satellite will be developed by each country with its own funding
 - Or if difficult, we will jointly search for international funds
 - All the satellites have the **same mission payload** to contribute to solving global problems
Or local problems as a constellation
 - Each country can have **one specific mission payload** for its own interest
 - Web: <https://unisec-global.org/iot.html>
 - **Next Step: Experiment IoT Transmission to ArkEdge Satellite**
 - Contact: iot@unisec-global.org
- **The Mission Idea Contest**
 - The information of MIC 10 will be announced in March
 - The 9th Mission Idea Contest: to the Moon
 - Theme: Lunar Mission
 - <https://www.spacemic.net/>
 - 25 abstracts were submitted from 14 countries
 - 10 finalists and 4 semi-finalists were selected
 - Recording of final presentation is available in website
 - Contact: info@spacemic.net
- **CLTP15 (CanSat/ CubeSat Leader Training Program)**
 - Completed: August 18 – 28, 2026
 - Venue: Nihon University, Chiba, Japan
 - Application deadline: April 22, 2026
 - Contact: secretariat@cltp.info
- **Launch Opportunity: J-Cube**
 - Special Discounted opportunities
 - 1U, 2U, 3U, deployment from International Space Station
 - Collaborate with UNISEC-Japan's University
 - Technical support will be provided

- Contact: info-icube@unisec.jp
<http://unisec.jp/serviceen/j-cube>

- **Next Virtual Meeting**
 - Date: March 21, 2026
 - Theme: T.B.D
 - Host: UNISEC-Global

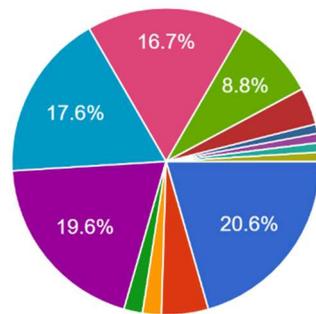
7 Participant Statistics

102 registered participants from 29 countries and regions for the 65th Virtual UNISEC-Global Meeting.

Country/Region	Registrants	Country/Region	Registrants
Argentine Republic	1	Timor-Leste	1
Bangladesh	1	Tunisia	1
Bhutan	1	Turkey	2
Bulgaria	3	Uganda	3
Dominican Republic	2	UK	2
Egypt	10	Uruguay	1
India	16	USA	4
Japan	21	Zambia	2
Kenya	2	Singapore	1
Lebanon	1	Somalia	1
Mexico	1	South Africa	1
Nepal	1	South Korea	1
Nigeria	8	Spain	1
Peru	1	Tanzania	3
Philippines	9		

Student or professional?

102 responses

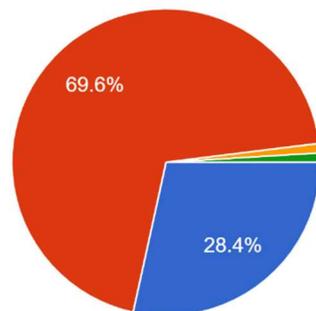


- Student (undergraduate)
- Student (master)
- Student (PhD candidate)
- Student (other)
- Professional (university)
- Professional (government, space age...)
- Professional (private company)
- Professional (NGO)

▲ 1/2 ▼

Have you studied or worked on exoplanet-related topics before?

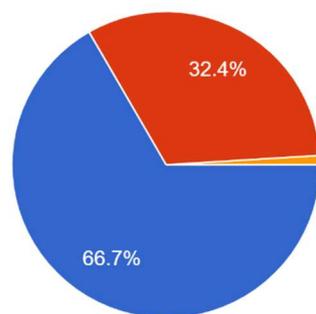
102 responses



- Yes
- No
- Media stories
- I have done work slightly overlapping with exoplanets, on space sails.

Have you participated in the UNISEC-Global Meeting previously?

102 responses



- Yes
- No
- CLTP1

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Thank you