

June 15, 2023

SPACE, OCEAN AND EARTH INSIGHTS



# SOE'23

The quest to inspire a universe  
of extreme explorers

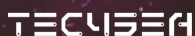
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**The quest to  
inspire a universe  
of extreme  
explorers**









1.

**Presentation**

2.

**Program**

3.

**Chairs, Speakers & Presenters**

4.

**Organisers, Sponsors & Supporters**

# WELCOME TO SOE23!

Portugal belongs to a nation of pure navigators and explorers. Our ancestors started their quest centuries ago, crossing uncharted seas and unveiling new territories! This fearless, unabated, bold, and adventurous character lingered on and explains why the Portuguese people remain engaged in breaking down frontiers to expand the horizons of humankind. Although historically and intrinsically connected with the ocean, we aspire to go farther: to outer space! And guess what? There's a lot in common between ocean and space exploration.

After the success of last year's event, the Space, Ocean and Earth Insights (SOE) workshop is back. The event is organised by INESC TEC – and co-organised by the UT Austin Portugal Program, the TEC4SEA Infrastructure, the Institute for Astronautical Sciences and Space For All Nations –, under the auspices of GLEX.

A handful of experts from around the world – including renowned scientists from industry, technology, policymakers and other key stakeholders – will come together to talk you through state-of-art research across several fields of knowledge feeding into space, ocean and earth exploration.

SOE23 will take a deep dive into them with an agenda on "The Quest to Inspire a Universe of Extreme Explorers". Without losing sight of past and present, SOE23 will use strategic foresight to foster discussion between invited panelists and the audience about the future directions of space and ocean research, to highlight points of intersection that demonstrate that when we learn more about one (extreme) environment we are on our way to gain more insights about the other.

This initiative points out the importance of the cooperation between scientists, policy makers, stakeholders, and the technology industry to leverage the potential of the space-earth-ocean interaction.



# PROGRAM

14:00-14:10 **Opening Session**

Álamo Meneses (*Angra do Heroísmo Council*) & Ana Pires (*SOE Scientific Coordinator and Analog Astronaut*)

14:10-14:20 CHAIRS

Yvette Gonzalez (*IIAS, National Fellow and Women's 16 of the Explorers Club*) & Ricardo Conde (*Portuguese Space Agency*)

14:20-14:55 ANCHOR 1

João Carlos Nunes (*Azores University | Geosciences Department*)  
Christyl Johnson (*NASA Goddard Space Flight Center*)

14:55-15:30 ANCHOR 2

Alfredo Martins (*CRAS | INESC TEC*)  
Amy L. Kukulya (*Woods Hole Oceanographic Institute*)

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Coffee-Break

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15:50-16:55 ANCHOR 3

Moriba K. Jah (*UT Austin*)  
Luis Sentis (*UT Austin*)  
Carlos Espejel (*ispace*)  
Aidyl Gonzalez-Serricchio (*IIAS*)

Musical Moment:

**BRING PORTO TO TERCEIRA ISLAND**  
*INESC TEC Jazz Band*

17:05-18:10 Round Table

Moderator: Christyl Johnson  
Eduardo Silva (*INESC TEC | TEC4SEA*)  
Telmo Carvalho (*IPMA*)  
Richard Garriot (*The Explorers Club*)

18:10-18:15 **FLAD SCIENCE AWARD ATLANTIC 2023 - INITIATIVE**

Elsa Henriques (*The Lyso-American Development Foundation | FLAD*)

18:15-18:30 **Wrap-Up and Closing Session**

Rui Oliveira (*INESC TEC*) & Richard Garriott (*The Explorers Club*)



## OPENING



**José Gabriel do Álamo de Meneses**  
Mayor of Angra do Heroísmo Council

He was born in July 10 of 1959, in the Parish of Santa Cruz, municipality of Praia da Vitória. José Álamo Meneses is graduated in Environmental Engineering by the Faculty of Sciences and Technology - University of Lisbon, and has a PhD in Civil Engineering from the University of Rhode Island, USA. Currently, he is the Mayor of Angra do Heroísmo since 2013 and he is also an University Professor. He was the Director of the Sciences Department of the University of the Azores, and was the founder and leader of the Association of Environmental Defense "Gê-Quest". He is the author of several studies and publications in the areas of environmental impact assessment and management of water resources in insular and coastal regions. He was also a member of the Regional Government of the Autonomous Region of the Azores, in its 10th, 9th, 8th and 7th mandates, respectively: between 2008 and 2012, he served as Regional Secretary for the Environment; between 2004 and 2008, was the Regional Secretary for Education and Science; between 2000 and 2004, was the Regional Secretary for Education and Culture; and finally between 1996 and 2000, he was the Regional Secretary for Education and Social Affairs.



**Ana Pires**  
ISEP | INESC TEC

Ana Pires is a Researcher at INESC-TEC's Centre for Robotics and Autonomous Systems. She is involved in several sustainable sea/marine mining projects, geotechnologies, geoengineering, and georesources. Her research is focused on Space-Earth-Sea interaction, Space Resources, Space Mining, geotechnics, geophysics, and the development of geo-technologies or geo-robotics for Space exploration. She was also the first Portuguese woman to finish with success the Scientist-Astronaut Program, under the framework of Project PoSSUM (Polar Suborbital Science in the Upper Mesosphere) supported by NASA's Flight Opportunities. Ana Pires is passionate about exploring extreme environments. She is a Specialist Diver (SSI Certification) and she was also selected to be part of the main crew 281 of the "Pegasus" team to carry out an analog mission in the Mars Desert Research Station (MDRS), located in Utah (USA), owned, and operated by the Mars Society. Since 2018 she has made efforts to promote human space flight, astrogeology, technology, robotics, and STEAM outreach activities in Portugal. Currently, she is the Co-Chair of Knowledge Management of "Space For All Nations|SFAN", an initiative developed under the scope of the International Institute for Astronautical Sciences (IIAS).

## CHAIRS



### Yvette Gonzalez

Yvette is a humanitarian, researcher, space suit technician, and space industry strategist. With over two decades of emergency response experience rebuilding communities in active war, conflict, natural disasters, and epidemiological outbreaks, she focuses on space technologies to solve Earth challenges. She carries out her climate and atmospheric research with Native Sky (funded by the Explorers Club | Exodus, Travels Exploration Without Boundaries grant); clinical research with University of Plymouth Clinical Epidemiology Research Group, anthropological/meta-research with the Metafuturism Lab, and bioastronautics research with the International Institute for Astronautical Science. As a space industry consultant she supports emerging space countries to build their space agencies as well as science and technology roadmaps. Of Native American and Mexican heritage, she leads efforts providing access to space science and STEM for underrepresented, Indigenous, and marginalized communities.



### Ricardo Conde

Ricardo Conde graduated in Electrical and Computers engineering from Instituto Superior Técnico (IST) – Technical University of Lisbon, with a background in Telecommunications, Radio frequency, and Space and Ground Systems. Ricardo has more than 30 years of working in the industrial and institutional space sector. He began his professional career in 1991, having been linked to the Aeronautics and Space sector since 1993. Since 2019, Ricardo has been a member of the board of directors of the Portuguese Space Agency, and in 2020 he was appointed President of the Agency. He has been participating as a panelist and keynote speaker in several International Space Congresses, particularly on the emergence of new space agencies as new actors in space, Space sustainability and the role of Space in Earth sustainability. In 2022, Ricardo was the chairperson of the Eureka Network, the larger international network to promote Science and Innovation for SMEs. Currently, he is the Portuguese representative and head of delegation in the Council of the European Space Agency (ESA), in the European Southern Observatory (ESO) and in the Council of the Square Kilometre Array Observatory (SKAO).



## SPEAKERS



### João Carlos Nunes

Born in S. Miguel Island, Azores (1962); Degree on Geology, Oporto University (1985) and PhD on Volcanology, Azores University (2000); Assistant Professor at Azores University; Scientific Director of INOVA – Institute of Technological Innovation of Azores; Individual Member of the GGN – Global Geoparks Network/International Association on Geoparks; Catalyst of EGN Working Group “Volcanic Areas”; Evaluator of UNESCO/Global Geoparks Network and Honorary Advisor of the CVGA - Chinese Volcanic Geoparks Alliance; Scientific Coordinator of Azores UNESCO Global Geopark; Researcher at the GeoBioTec Research Centre of Aveiro University, and the Infante D. Luis Research Institute, Lisbon University; Eurogeologist (EFG - European Federation of Geologists) and Consultant for several companies, private and public institutions of the Azores, on the areas of volcanology, geoconservation, mineral and thermal waters and geothermal resources; author/co-author of several peer-reviewed papers on international and national scientific magazines, including as editor and corresponding guest editor; supervisor of about twenty Master and PhD thesis on Portuguese universities; conference chair of international and national meetings.



### Christyl Johnson

Christyl Johnson is NASA Goddard's deputy director for technology and research, investments, responsible for formulating the center's future science mission and technology goals and objectives. Johnson came to NASA Goddard from the White House Office of Science and Technology Policy, where she served under the President's science adviser as the executive director of the National Science and Technology Council (NSTC). Prior to joining the White House staff, Johnson served as the assistant associate administrator in NASA's Office of the Administrator. Prior to her appointment to the Office of the Chief Engineer, Johnson served as the associate director for exploratory missions in the Office of Earth Science, where she managed the formulation and development for all exploratory missions. Johnson began her career at Langley Research Center in Hampton in 1985 in the Remote Sensing Technology Branch. Johnson held a variety of project management and senior engineering positions at Langley involved in the design, development and application of state-of-the-art and advanced systems and subsystems for atmospheric, aeronautic and space flight research missions. Johnson earned her bachelor's degree in physics from Lincoln University, a master's degree in electrical engineering from Pennsylvania State University, and a Ph.D. in systems engineering from George Washington University.





## Alfredo Martins

Alfredo Martins is currently a Professor with the School of Engineering (ISEP), Porto Polytechnic Institute (IPP); and a Research Coordinator with the Robotics and Autonomous Systems Group, INESC TEC, Portugal. He currently participates in various international EU and H2020 (EUScores, Atlantis, UNEXUP, Nettek) and national deep sea (Nessie, Hypersea) marine robotics research projects. He has a vast experience in mobile robotics, having worked with autonomous robots, since 1993, in multiple international (NATO, EU FP7, H2020) and national research projects addressing search and rescue, security, environmental monitoring, underwater mining and marine and deep-sea robotics. With an extensive list of publications in both land, aerial, underwater, and surface autonomous robots, his research interests include the perception, navigation, control, and coordination of mobile robots with particular emphasis on marine robots.



## Amy L. Kukulya

Amy Kukulya is a leader in development and operations of autonomous underwater systems (AUVs) and their capabilities at Woods Hole Oceanographic Institution, specializing in scientific applications. She is a Principal Investigator and Expedition Leader and recently launched a new lab called Scibotics. Some current Projects include SharkCam, TurtleCam, under-ice rapid response, developing tags in Taglab@whoi.edu and over-the-horizon shipless operations for a variety of climate studies. Working with robots has brought her from the Arctic to Antarctica. Her technical skills include configuration and operations of AUV systems, including navigation, imaging capabilities and new sensor development. She has either led or participated in over 95 oceanographic expeditions to date. Apart from her technical skills, she is passionate about promoting education/outreach initiatives. She is the lead developer of SharkCam as featured on Shark Week. Her work has also been featured on several Discovery Channel and PBS productions as well as the Boston Globe, Washington Post and National Geographic Magazine.



## Moriba K. Jah

Moriba Jah is the Chief Scientist and a co-founder of Privateer, a data and intelligence platform empowering the future of space sustainability. Moriba is an associate professor of Aerospace Engineering and Engineering Mechanics at The University of Texas at Austin. He serves on many professional bodies and is a Fellow of multiple organizations including TED, American Institute of Aeronautics and Astronautics (AIAA), American Astronautical Society (AAS), International Association for the Advancement of Space Safety (IAASS), Royal Astronomical Society (RAS), and the Air Force Research Laboratory (AFRL). He has served on the US delegation to the United Nations Committee On Peaceful Uses of Outer Space (UN-COPUOS), is an elected Academician of the International Academy of Astronautics (IAA). Moriba received his B.S. in Aerospace Engineering from Embry-Riddle Aeronautical University, Prescott, Arizona, and his M.S. and Ph.D. in Aerospace Engineering Sciences from the University of Colorado at Boulder, specializing in astrodynamics and statistical orbit determination.



## Luis Sentis

Luis Sentis is a Professor in the Department of Aerospace Engineering and Engineering Mechanics at the University of Texas at Austin. He is also a General Dynamics Endowed Faculty Fellow, and an executive member of UT Austin's Good Systems. He received his Ph.D. and M.S. degrees in Electrical Engineering from Stanford University. He was a La Caixa Foundation Fellow while at Stanford. In Austin, he leads the Human Centered Robotics Laboratory, a laboratory focusing on control and design of humanoid robots, application of robots to in space and naval domains, and studies on community embedded robotics. He is co-founder of Aptronik Inc, the UT Robotics Consortium, and the Portfolio Graduate Program on Ethical AI. He was the UT Austin's Lead for DARPA's Robotics Challenge with NASA Johnson Space Center where won the NASA Elite Team Award. His research has been funded by the US Office of Naval Research, NASA, National Science Foundations, US Army, US Special Operations, US Air Force, and DARPA.





## Carlos Espejel

Carlos Espejel is ispace's Space Resources Utilization (SRU) Lead. Espejel leads ispace's ISRU Working Group, while developing ISRU; technology and strategic roadmaps, Consortiums, Partnerships and Commercial projects, as well as the Lunar Ore Reserve Standards (LORS). Espejel has a Bachelor's Degree in Mechanical and Mining Engineering at the University of Queensland (UQ), a Master's Degree in Mining Engineering at UNSW, a PhD in Mining Engineering at UQ, a Postdoctoral Project on ISRU in Luxembourg, and currently part of the science team at PROSPECT (ESA). Espejel has 12 years experience in the mining industry as a Strategic Mine Planning Engineer, for companies as Glencore and Anglo American. At the same time Espejel has 5 years' experience in the Space Industry.



## Aidyl Gonzalez-Serricchio

Aidyl Gonzalez-Serricchio is an Outreach Director and Senior Researcher at the International Institute of Astronautical Sciences. With a Doctorate in Molecular Genetics from the California Institute of Technology, she has over 15 years of experience in STEM education, research accessibility, citizen science, and social justice. Her research focuses on sperm motility and mitochondrial defects using roundworms, and she has published several peer-reviewed papers on the topic. Aidyl Gonzalez-Serricchio is a multifaceted scientist dedicated to advancing STEM education, promoting research accessibility, and advocating for social justice. Her passion for science communication and citizen science is evident in her work as an educator, research scientist, and senior postdoctoral fellow for the Center of Excellence in Genomic Science at CalTech. With a Doctorate in Molecular Genetics from the California Institute of Technology, she completed her postdoctoral work on myotonic dystrophy at the Institute of Genetic Medicine at the University of California, where she gained valuable experience in translational research.





## Eduardo Silva

Eduardo Silva is the Coordinator of the TEC4SEA platform at INESC T C. Previously he was the Coordinator of the Centre for Robotics and Autonomous Systems (CRAS) at INESC TEC until 2019. He is also a Professor at the School of Engineering (ISEP) of the Porto Polytechnic Institute (IPP). He has a PhD in Electrical and Computer Engineering from the University of Porto. His main research areas are marine robotics, control architectures, perception, and navigation for autonomous robots. He has participated in more than 20 research projects, including iVAMOS! and UNEXMIN EU projects, as well as UNEXUP and INSite Upscaling projects funded by EIT Raw Materials. He has more than 80 publications in the area of the Field Robotics.



## Telmo Carvalho

Telmo Carvalho is the Executive Board Member of the Portuguese Institute for the Sea and Atmosphere – IPMA (2018-2023). He is also the Deputy Coordinator of the Portuguese Committee for the Ocean Decade of the UN (2021-2030). He has a degree in Anthropology and a Master in Science Policy. He has worked on scientific policy and information management in marine sciences and technologies to establish "bridges" between scientific knowledge and other sectors of society. Between 2015-2018, he was the advisor of the Minister of the Sea for Marine Sciences and the Marine Environment areas. He was also the Ocean Office Coordinator of Portuguese Science and Technology Foundation (2015) and national delegate to several European and international organizations. Between 2009 and 2014 he was also the Executive Director of EurOcean. Telmo Carvalho is author and co-author of several articles and books on scientific policy and on ocean matters.

## FLAD SCIENCE AWARD



### Elsa Henriques

Elsa Henriques holds a PhD in Mechanical Engineering from Instituto Superior Técnico of the University of Lisbon. She is an associate professor at Instituto Superior Técnico in the scientific area of mechanical technologies and industrial management and since 2019 she is a member of the executive board of Luso American Foundation for Development. She is the author of more than 100 scientific papers published in indexed journals in the area of manufacturing. Since 1991, she has been responsible for different curricular units in undergraduate and graduate programs and has supervised numerous master's and doctoral theses in close collaboration with national and international industry. She has been involved in the MIT Portugal initiative, participating in the elaboration of the doctoral program "Engineering Design and Advanced Manufacturing", of which she was coordinator. She has participated and/or coordinated several research and development projects, with national and European funding, always in interaction with industry. She was a national delegate in the 6th and 7th Framework Program of the European Commission.



## CLOSING SESSION



### Richard Garriot

Richard Garriott de Cayeux is a founding father of the videogame industry and the commercial spaceflight industry, a flown astronaut, and the first explorer to have explored pole to pole, orbited the Earth, and reached the deepest point in the Ocean. Richard has been inducted into the computer gaming hall of fame and received the industry lifetime achievement award. He is credited with creating the now ubiquitous term “avatar” for one’s virtual self and the category of massively multiplayer games (MMORPGs). He authored the acclaimed Ultima Series and has built 3 leading gaming companies including Origin Systems and Destination Games. He cofounded Space Adventures and is the sixth private astronaut to live aboard the International Space Station. The son of a NASA astronaut, he became the first second-generation astronaut, served on NASA advisory Council, and has been a key leader in civilian and commercial space through institutions such as the Challenger Center for Science Education, the XPRIZE Foundation, and Space Adventures. Richard is an avid explorer; having traveled around the globe from the jungles of the Amazon to the South Pole, the deep seas of the Titanic and hydrothermal vents to orbiting the earth aboard the International Space Station, and most recently to Challenger Deep, the deepest point in our Oceans.



### Rui Oliveira

Rui Oliveira is a Member of INESC TEC’s Board of Directors, accountable for the institution’s International Affairs, and has been the National Co-Director of the UT Austin Portugal Program since 2018. He is an Associate Professor at the Informatics Department of the University of Minho. He has been the director of the Computer, Science and Technology Center (CCTC) from 2005 to 2010 and the High-Assurance Software Laboratory (HASLab), a research unit of the University of Minho and INESC TEC, from 2010 to 2015. He is the coordinator of the Minho Advanced Computing Center and the National Contact Point to EuroHPC. He received his PhD. Degree in 2000 from the École Polytechnique Fédérale de Lausanne. His work has been focused on epidemic communication protocols, large-scale data management and high-performance transactional middleware for cloud computing and data science. He currently serves on the Steering Committees of the IEEE SRDS, ACM/IFIP/USENIX Middleware and IFIP DAIS conferences, of the Atlantic International Research Center (AIR Center) and the Collaborations to Enable Transnational Cyberinfrastructure Applications (CENTRA). He is vice-chair of IFIP Working Group 6.1.



## PRESENTERS



### João Carlos Nunes

Azores University | Geosciences Department

#### *Why Azores Islands exist...here?*

(Some) FAQ – *Frequently Asked Questions* about the Azores Islands includes: i) WHY are they located here, in this part of the Atlantic Ocean?; ii) HOW did they form?; iii) WHEN did they form?; iv) WHICH island formed first?... and which was the last one?

The answers to those (and other!) questions are to be discussed during this talk – why you should not miss it – allowing you to better understand the relevance of these “9 small rocks” dispersed for about 600 km on the North Atlantic Ocean, and best known by their geographical location (the North Atlantic “aircraft-carrier”), geotectonic framework (the Azores Triple Junction), meteorological importance (the Azores High or the Azores anticyclone), or volcanological significance, with 16 active volcanic system, that includes calm and relaxed eruptions, but also violent and explosive volcanoes.

For almost six centuries those idiosyncratic features have deeply formatted the Azorean Man (“...for us, Azoreans, geography is as important as history”) and, like all Azores Islands are oceanic volcanic islands with deep roots on the surrounding ocean floor ...“like mermaids, Azoreans have a double nature: we are made of flesh and stones. Our bones sink into the sea”: Vitorino Nemésio writer states!



### Christyl Johnson

Deputy Director for Technology and Research Investments, NASA Goddard Space Flight Center

#### *Harnessing technology to bring sustainable human presence to Mars*

Over the past couple of decades the global space community has had a vision of sending humans to Mars – not just for a quick visit, but to have a sustainable presence there. In order to enable this vision, innovations in communications, navigation, sustainable food production, protective habitation materials, high tech health devices, space weather, and so many other areas must be integrated into operations. This talk will highlight some of the visioning that will need to be explored and demonstrated to ensure mission success.

## PRESENTERS



### **Alfredo Martins**

Associate Professor at ISEP and Research Coordinator at the INESC TEC's Center for Robotics and Autonomous Systems

#### ***Robotics in extreme underwater environments***

Underwater robotic systems allow us to reach to places where human presence is extremely hard to achieve or even impossible. In this talk new robotic tools developed for the exploration of some extreme and confined underwater scenarios will be presented. From the experience with the robotic exploration of these environments and taking into account current robotic and technology solutions, new and emerging challenges in the exploration of the deep sea will be addressed.



### **Amy L. Kukulya**

Research Engineer, PI, Woods Hole Oceanographic Institution,

#### ***Exploration Through the Eyes of a Robot***

Autonomous underwater vehicles (AUVs) have evolved from pre-programmed seafloor mapping drones to multi-mission, adaptive sampling surveyors in the past several years. Mission duration for propeller driven vehicles has expanded from hours to weeks. Long-range AUV technology redefines autonomy and, therefore, what is possible by opening up many new opportunities to how we can sample and survey our oceans. In this talk, I will highlight new ways we have been surveying with multiple platforms and show how multi-vehicle, multi-mission techniques can rapidly advance our understanding of a rapidly changing ocean.





### **Carlos Espejel**

Space & Earth Mine Planning  
Engineer, ISPACE EUROPE SA

#### ***Development of the Cislunar Economy***

The moon is no longer out of reach, and the development of the cislunar economy is quickly becoming a reality. In this presentation, we will explore the concrete efforts that are driving this growth, including the enabling of lunar transportation and in-situ resource utilization (ISRU). We will delve into the latest innovations and developments, including ispace's recent M1 mission, as well as strategic partnerships and commercial projects that are working with ispace to create a thriving cislunar economy. By leveraging the resources available on the moon through ISRU and transportation, we can create new opportunities for exploration, scientific discovery, and the development of the cislunar economy.



### **Luis Sentis**

UT Austin

#### ***A future for Human Centered Robotics***

Human Centered Robotics advocates for developing robotic capabilities that benefit communities, individuals, and industry at fulfilling their goals, increasing their wellbeing, and improving their productivity among other key human and industrial development factors. To study this general question, traditional robotic studies need to transcend their engineering and computational corpus of study, and promote the use of approaches that directly measure impact on humans and communities by robots. Such approaches may include areas from group communications, to data informatics, to ethnography, to urban design, to human factors among methods of interest. At the same time, we must remind ourselves that many roboticists are driven by the idea of creating general purpose robots that provide some of the physical and cognitive versatility that people provide in tasks that are dull, dirty and dangerous. In this talk I will discuss both topics and the connection between them: embodiment of complex general purpose robots and their potential use and improvements to working and urban communities.



## **Moriba K. Jah**

Chief Scientist and Co-Founder of Privateer, Associate Professor of Aerospace Engineering and Engineering Mechanics at The University of Texas at Austin

### ***The Case for Space Environmentalism***

Nowadays it seems that just about anywhere you look, you find evidence of humanity collectively behaving as though we were purposefully choosing extinction for ourselves; the aggregate of our decisions and actions is resulting in a progressively unsustainable way to live. Orbital space is included in this existential dilemma and is experiencing this in spades. In this presentation, Moriba Jah presents evidence of this orbital crisis and makes the case for orbital space to be treated as a finite resource in dire need of environmental protection. He discusses how Traditional Ecological Knowledge (TEK) should be used as a basis of tenants with which to achieve space environmentalism and sustainability, as well as the rôle of AI as high tech to apply ancient TEK in solving this problem. He presents a few of our knowledge gaps where the need for more science is critical to space sustainability.



## PRESENTERS



### **Aidyl Gonzalez-Serricchio**

Outreach Director of IIAS / Principal Investigator of the Citizen Science SoilScience

### ***Climate Change's Impact on Soil Health***

The Soil Science Lab is a citizen-science longitudinal study that addresses environmental issues with a social justice cause. The project has been successfully piloted and supported through a collaboration with Foldscope, which enables participants to visualize tiny things like bacteria and microorganisms and larger samples like insects, plants, fabrics, and tissues. Participants who create an online identification number in the Soil Science system, collect samples and report their observations into the Microcosmos database or app can access data from all participants worldwide. The information can be used for their analysis and projects. It can spark conversations and collaborations with other students and educators in other countries so that they might seek solutions together.

The project includes workshops and tutorials that guide participants through performing, collecting, and submitting data into the soil science database. These workshops provide individuals with the necessary knowledge and skills to properly collect and submit data, which will be used to analyze the impact of climate change on soil health.

The Citizen-Science Soil Lab project's outcomes include

- increasing the number of observations in the database,
- increasing student research opportunities,
- offering professional development opportunities for educators, and
- providing real-world data to support environmental protection.

This project is an excellent example of how an education in science can foster a socially responsible population that recognizes the relationships between people, places, and scientific systems while promoting cultural understanding and discerning fact from bias while critically analyzing data for validity and relevance.

## INESC TEC JAZZ BAND



### Bringing Porto to Terceira Island

The INESC TEC Jazz band was created in 2013 as a group of people looking for an excuse for making music in between the tight schedule of R&D at INESC TEC.

It is currently composed by the following members:

- Ana Paula Silva - voice
- Carlos Gaspar Pacheco - double bass
- Pedro Campos - piano
- Pedro Senna - acoustic guitar
- Rui Rodrigues - percussion

The band's repertoire ranges from jazz classics to reinterpretations of pop (and not so pop) themes.



## MEDIA PARTNER



### Marc Bluhm

Marc Bluhm is an astro, portrait, landscape, and street photographer. As a German on-screen commercial and voice actor, portraits and capturing human stories sparked his professional photography career. In 2019 he was introduced to the space and science research teams at the International Institute for Astronautical Sciences, moon mission teams, Planet Labs, Austrian Space Forum, and SpaceWatch.Global where he had the opportunity to capture planetary geology training at the original Apollo training sites near Flagstaff, industry events in Berlin, space workshops in Porto, and astronaut analog training in Innsbruck. He has quickly become an avid astrophotographer, supporting research teams focused on night sky phenomena such as the aurora borealis and noctilucent clouds. Marc is part of the Sky Indicators x Climate research team working on climate solutions. He has supported expeditions in Kenya, the Baltic coast of Germany, Norway, Finland, Sweden, and several remote communities in Arizona, New Mexico, and Texas, capturing landscape and wildlife. In 2022, Marc had the rare opportunity to participate in a Master-street and portrait photography workshop in Rome, Italy with Steve McCurry and Eolo Perfido. His first solo exhibition was hosted in Berlin in 2022.



**SPACEWATCH GLOBAL**

## ORGANISER



The Institute for Systems and Computer Engineering, Technology and Science (INESC TEC) is a private non-profit research institution, dedicated to scientific research and technological development, technology transfer, advanced consulting and training, and pre-incubation of new technology-based companies. As part of its mission to develop science-based knowledge with societal impact, INESC TEC relies on interdisciplinary research teams organised to address societal challenges or application markets with transnational relevance.

To address the market needs, INESC TEC's internal arrangement relies on the TEC4, that promote the innovation made by the institution. TEC4SEA is one of those structures that specifically develops technological solutions to overcome the deep-sea challenges and empower the Sea Economy through sustainable approaches to explore and exploit living and non-living ocean resources. By ensuring an advanced platform for tests, research development, and interdisciplinary collaboration around sea-related topics through its TEC4Sea, INESC TEC has turned into a key stakeholder in designing and implementing national strategic infrastructures roadmaps for the Sea Economy.

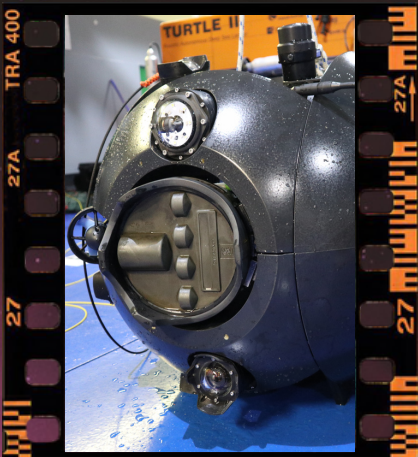
In 2021, INESC TEC was the driving force to sign a Memorandum of Understanding (MoU) with the International Institute of Astronautical Sciences (IIAS) to establish a partnership covering six areas of intervention: science, technology, engineering, mathematics, education, and space research. The Portuguese partner entities include the Portuguese Space Agency (Portugal Space), the Porto School of Engineering (ISEP) and the Faculty of Sciences of the University of Porto (FCUP). This partnership aims to promote equitable and inclusive access to innovative opportunities for collaboration and research.





## CRAS (INESC TEC's Centre for Robotics Autonomous Systems)

To address the scientific challenges of the institution, INESC TEC's internal arrangement relies on 13 research centres. One of those centres is named Centre for Robotics and Autonomous Systems (CRAS) and all the scientific work developed by INESC TEC in 6 main areas of research - i) autonomous navigation; (ii) long-term deployments; (iii) sensing, mapping, and intervention; (iv) multiple platform operations; (v) space-earth and space-water interaction and validation using innovative robotic technologies; (vi) exploration of underwater geological resources – is conducted by the INESC TEC researchers associated with this centre. CRAS shows an excellent scientific track record and vast experience in underwater technologies, geo-robotics for complex environments, research projects, advanced technology development for the sea, its operation and technology transfer.



## CO-ORGANISERS



### **UT Austin Portugal Program**

This FCT Partnership with the University of Texas at Austin was the main organiser of the first edition of the Space, Ocean and Earth Insights Workshop in 2022 in Porto. SOE's agendas align well with the Program's Area for Earth-Space Interactions, which supports transatlantic cooperation in complex engineering systems and science towards a holistic approach to space technologies, sea, climate and clean energy. The Scientific Coordination of this core area of the Program is in the hands of Professors Luisa Bastos (FCUP, Portugal), Afzal Suleman (IST and the University of Victoria, Portugal/Canada) and Patrick Heimbach (UT Austin, USA).

### **TEC4SEA Infrastructure**

TEC4SEA is a research infrastructure designed to support research, development, and test of marine technology for operation in the ocean environment, and is included in the Portuguese Roadmap of Research Infrastructures. It is open to both the R&D community and the industrial sector, and provides the equipment, expertise, and logistics needed to support those communities in developing, evaluating, and validating technological solutions designed for maritime environments, thus fostering and advancing the blue economy.





## International Institute for Astronautical Sciences

The IIAS is a DBA for Integrated Spaceflight Services and a United States (US) research and education institute specializing in suborbital operational science capabilities, flight engineering systems, aeronomy, and bioastronautics. Through immersive training, testing, and research within high fidelity operational environments, IIAS enables professional suborbital flight preparation and deployable scientific research payloads. IIAS provides essential services to a safe and cost-effective microgravity and suborbital qualification program, serving as an unbiased integrator versed in combined human and payload integrations in the process of suborbital research and training. IIAS conducts upper-atmospheric, intravehicular (IVA) and extravehicular activity (EVA) pressurized suit, and space technology research. The program combines microgravity, high-altitude, geoscience, flight test engineering, space medicine, and operational science courses. All training courses are designed and instructed by former NASA astronaut instructors as well as IIAS team scientists.



## Space for All Nations

Space For All Nations (SFAN) is part of the IIAS and PoSSUM Project, and with the other two sister outreach initiatives (PoSSUM13 and The Out Astronaut Project) is developing, fostering, and facilitating access to space science, research, and opportunities that are open to everyone. Space For All Nations helps emerging space nations work among themselves to participate in pure science ventures of global importance while creating opportunities for these nations to collaborate with established space nations. Space For All Nations helps its member institutions develop STEM outreach activities within their own nations to inspire the next generation of space professionals.

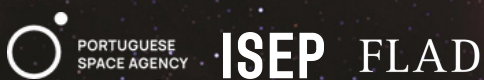


## Global Exploration Summit

The Global Exploration Summit (GLEX) was created in 2019 around the commemoration of the 500th anniversary of the Magellan's Circumnavigation and turned to be the most inspiring explorers meeting where the world's leading explorers, scientists and researchers share the latest discoveries, the most innovative technologies and the new missions that promise to revolutionize the future of exploration and humanity. The eco-responsible event preserves the pledge signed in the first edition with the Lisbon Declaration, where the club's members and international officials committed to an effort to inspire the world to protect our planet, animal species and natural resources, and accelerate the sharing of scientific knowledge.



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