

## Summer School Alpbach 2023

### **Exoplanets: Understanding alien worlds in diverse environments**

July 10 – 20 | Alpbach/Tyrol – Austria

Further information: <https://www.summerschoolalpbach.at/>



### The Summer School Alpbach 2023

For the 46th time, the Summer School Alpbach, a challenging space program aimed at talented science and engineering students, has taken place in the Austrian Alps. Sixty students from all over Europe developed 4 satellite missions under the topic of „Exoplanets: Understanding alien worlds in diverse environments“ with experts from related fields. Among the students from various European countries, eight students came from Austria (TU Graz, University of Vienna, FH Wiener Neustadt, TU Wien). The Alpbach Summer School is organized by FFG together with ESA and the national space agencies of its member states. Austrospace, the association of the domestic space industry, financially supports the summer school.

After ten intensive days of developing, researching and discussing each groups' ideas, the students then presented the final products to the experts and fellow participants. The task of the students was to create a space mission that can become a feasible and realisable concept to be potentially used by a space agency. The challenge for students was to work together in

a highly intensive, international and inter-disciplinary environment and apply their newly learned knowledge to develop a concept.

Throughout the Summer School, the participants received lectures and workshops from various renowned experts. The groups then received individual guidance from the experts working with each group. Afterwards, the participants faced the challenge of applying said new knowledge to their own projects and working together to create an interdisciplinary space mission.

The mission was to present a developing idea that considered the most important aspects of a space exploration mission. The incentive was to balance out the challenge of starting out with a simple idea towards a fully developed competitive concept. In this process, it was especially important to consider various factors that make a project like this feasible. The participants had to define the scientific objectives and create a mission that will answer these preliminary questions. Other notable factors that create a comprehensive mission include space instrumentation, the mission design (launch, transfer and orbit) and spacecraft design.

In the end, all groups introduced their projects in an hour-long presentation to the jury. In each of the following categories, the jury announced a winner:

- BEST SCIENCE CASE FOR THE MISSION
- BEST TECHNICAL CASE FOR THE MISSION
- MOST COMPETITIVE MISSION
- BEST PRESENTATION

## The Teams, their missions & their awards

### Best Quality of the Presentation: Team Blue

#### “Exposure – ExoPlanet Origins and Stellar Ultraviolet Regime Explorer”

The mission by Team Blue is dedicated to studying exoplanet systems in the UV range. Its goal is to detect a significant amount of so-called Light Echoes of Exoplanets. This will help to lengthen the observation time and sensitivity in the UV compared to past missions’ capabilities. This team hopes to revolutionise the observation of exoplanets and advance our understanding of the formation and evolution of exoplanets and of the idea of habitability. Team Blue received the “Best Presentation” award, as they thoroughly explained each section of their presentation in an understandable manner. Additionally, the visualizations proved to be useful for further contextualization of the topic and the whole team was actively engaged in answering the jury’s questions.



## Best Science Case: Team Green

### "ARISTOTLE - Astrophysical Research Initiative for Space Telescopic Observations of Transiting Large Exoplanets"

The ARISTOTLE project by Team Green focuses on the characterization of the atmospheres of exoplanets, down to Super-Earths, in the mid-infrared (MIR) by performing the largest transit spectrophotometric survey to date. It aims to address the discrepancy of the high number of exoplanets detected and the small number of them that have atmospheres, a key feature to understand planetary features like habitability. The jury praised this project as the one that makes up the broadest and most compelling science case that not only fits the topic of this summer school but also manages to address pressing questions concerning our solar system and exoplanetary worlds. This mission would be incredibly valuable in terms of answering a broad range of scientific questions, according to the jury.



## Best Technical Case: Team Yellow

### “EXODUS – Exploring Exoplanet Evolution”

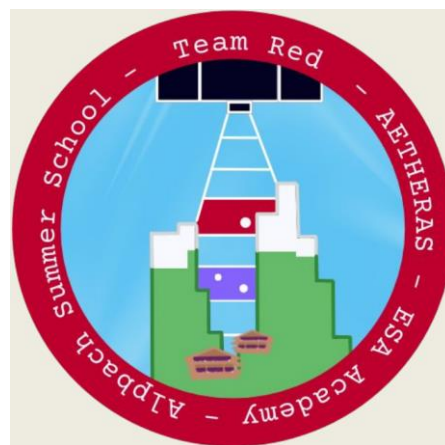
Team Yellow has proposed the project EXODUS, a single-telescope mission to study the largely unexplored range of sub-Neptune to Jupiter sized exoplanets on orbital periods over 100 days, to the jury. To distinguish two mechanisms of atmospheric escape, UV-driven mass loss and core-powered mass loss, the activity of the host star will be monitored in the UV. This team was awarded with the title “Best Technical Case” because their project was found to be the most thought-through and ambitious. The jury recognized the bold technical case put forward by team yellow that pushes the limits of feasibility but is nonetheless methodologically justified and derived from the scientific requirements.



## Most Competitive Mission: Team Red

"Aetheras - Deepening our knowledge of planetary system formation and evolution by studying atmospheric escape"

Project Aetheras by Team Red proposes to investigate key questions surrounding the exoplanet field by measuring proxies of atmospheric escape and magnetic fields in the NIR and UV. The space mission's investigation will include pressing mysteries such as the origin of the radius valley, the hot Neptune desert and the presence of a magnetic field in a planet in relation to atmospheric loss. Additionally, the team plans to actively involve the public in this mission, by incorporating social media, educational material, apps and interactive exhibitions as part of their project. Consequently, the jury was convinced of this idea as the most competitive mission. They praised its scientific value for money that the team achieved by focusing on a few highly relevant mission objectives and keeping the costs low.



## Taking it one step further: Post Alpbach 2023

Each year, following the Summer School Alpbach, the students get the possibility to further work on one of their missions at ESA Academy's Training and Learning Facility at ESEC-Galaxia in Belgium. For this year's so-called "Post-Alpbach" event the jury has selected the mission "EXODUS – Exploring Exoplanet Evolution" to be further developed. All participants from the Summer School are invited to apply to participate in the Post Alpbach Event out of which 26 will be selected to attend.

In this 5-day event, the students are invited to work at the educational Concurrent Design Facility, which is mostly used to assess the technical and financial feasibility of future space missions and new spacecraft concepts. The Concurrent Engineering approach applied at this facility is an approach to integrated product development that emphasises the response to customer expectations. Concurrent Engineering is a collaborative, co-operative, collective and simultaneous working environment where participants collaborate according to their specific field of expertise.

## Reviewing the past and looking into the future

A review of 45 Alpbach Summer Schools to date shows the importance for science and industry. The young researchers approach the solution of difficult tasks in an "unspent", unconventional and highly motivated manner and have to come up with resilient results under great time pressure (10 days). The learning curve is steep, the motivation impressive. The proposals presented contain a wealth of new ideas. Some of these ideas could be reflected in real projects and missions of ESA and national space agencies.

**The participants have the opportunity to go through a unique experience as the students get to:**

- learn to work under time pressure in an international and multidisciplinary team to achieve a common goal
- become familiar with a range of scientific and technical topics relevant to space mission planning
- learn what it takes to plan a space mission from A-Z
- learn to balance scientific goals and requirements with the realistic constraints of mission planning
- learn what it means to technically implement the scientific goals and to communicate and cooperate in a team accordingly (scientists and technicians do not always speak the same language).
- establish long-term friendships and acquaintances, from which a professional collaboration can develop
- draw on the wealth of knowledge and experience of the high-level lecturers and tutors on site

The 2023 participants continued the tradition of successful summer schools with many newfound friends, unforgettable memories and exciting final projects of each group. The

event has developed into a space-training centre with a recognized reputation. The Summer School proves each year that a "small" member country of ESA can achieve great things for the promotion of young European scientists. It has developed into an important step for its around 3000 graduates on their career path into space. In the end, every participant of the Alpbach Summer School receives a certificate of participation, which has opened many doors for taking a step further into research, industry and notable players such as the European Space Agency.

It is furthermore wonderful that many employees of ESA, the European space industry and research community have not only laid the foundation for their future careers during the Alpbach Summer School but have also returned to Alpbach as lecturers or tutors.