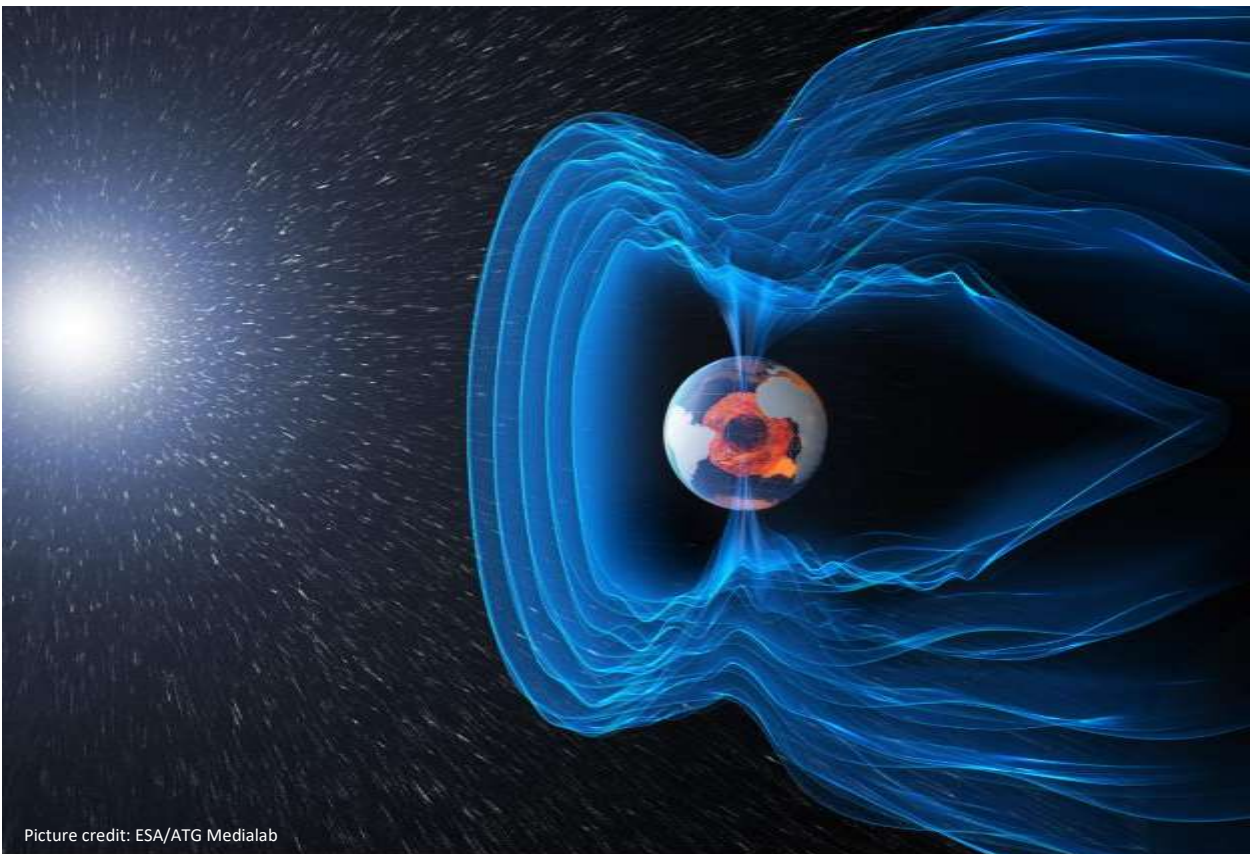


➔ SUMMER SCHOOL ALPBACH 2022

COMPARATIVE PLASMA PHYSICS IN THE UNIVERSE

July 12 – 21 | Alpbach/Tyrol – Austria

Details and further information see [the Summer School website](#).



Picture credit: ESA/ATG Medialab

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THE TOPIC: COMPARATIVE PLASMA PHYSICS IN THE UNIVERSE

Large parts of the visible Universe are filled with plasma, a highly ionised form of matter. The plasma environments are always highly dynamic, and can be observed from nearby in the Earth's magnetosphere out to supernovae and active galaxies. Ionised matter is threaded by magnetic fields, producing complex interaction processes and phenomena such as shock waves and charged particles accelerated to high energies. Observations of cosmic plasmas can be made both in situ (in the solar system) and remotely.

The Summer School programme will focus on different plasma regions (Earth, Planets, Sun, Across the Universe). The offered lectures cover existing and planned space missions, space mission design, and the principles of instrumentation for the required observations, in-situ measurements as well as remote sensing. The students will elaborate innovative space missions and formulate observational objectives for new satellite missions to advance the understanding of the behaviour and the coupling processes of plasma at several astrophysical scales.

The aim of the workshop is to develop four mission concepts - one by each team, to a point where a space agency could, in principle, take the concept over and start the mission assessment phase. The teams define the scientific objectives of their proposed space mission and provide a preliminary end-to-end mission concept including spacecraft, scientific instruments as well as mission and science operations that will meet their stated mission objectives.

Each student team will present a mission study to an expert review panel and to the other teams, tutors and lecturers on the last day.

The Summer School is organised by the Austrian Research Promotion Agency FFG and co-sponsored by the European Space Agency ESA and the national space authorities of the European Space Agency's member, associate and cooperating states. A traditional partner is the International Space Science Institute. It is also supported by Austrospace, the association of Austrian space industries and research institutions.

WORKSHOPS

The Summer School Alpbach is a unique opportunity to explore new objectives and mission concepts in a realistic context and with the support of professional space scientists and space engineers. The purpose of the Summer School is to foster the practical application of knowledge derived from lectures, to develop organisational and team work skills and to encourage creativity. The teams themselves are responsible for the selection of the subject of the project and for the team structure and working methods.

Students will be requested to:

- define and justify the scientific objects that can be best achieved by a space mission
- define the requirements that a space mission must fulfil to meet the scientific objectives identified as the goals of a mission
- design a space mission: spacecraft, payload, mission (launch vehicle, orbits) and operations
- prepare a written 10 page report of the above tasks
- prepare and present a 1 hour oral presentation to an expert review panel

Four student teams will be set up to define the scientific objectives of a space mission and a preliminary end-to-end mission design including the spacecraft, scientific instruments, mission, and science operations capable of meeting the stated objectives. Each of the four teams of about 15 students will define, study and design a scientific satellite mission using imaginative concepts.

The results of the projects will be delivered as short “mission studies” and presented by each team to an expert review panel and all other teams, tutors and lecturers on the final day of the Summer School.

The teams will be supported by tutors who are experts in the scientific aspects of the summer school topic and in space mission design. Each team has two tutors, one covering the scientific aspects and one covering the engineering aspects. In addition roving tutors will provide advice on scientific, engineering and programmatic aspects to all teams. The Head Tutor will coordinate the support provided during the Workshops.

The teams select a mission goal based on the information provided in the lectures and their own knowledge of the topic. They then define the scientific objectives of their proposed space mission and provide a preliminary end-to-end mission concept including launcher, spacecraft, scientific instruments as well as mission and science operations that will meet their stated mission objectives.

By the end of the workshop, the teams will have considered not only the scientific instrumentation, which can meet the chosen scientific requirements, but also the mission design (launch, transfer and orbit), the spacecraft design with all required subsystems, the ground segment, development schedule, risk and rough-order-of-magnitude mission cost.

The lectures present the current knowledge and gaps in our understanding to enable the students to select and formulate objectives for new space missions. The offered lectures will cover existing and planned space missions, space mission design, and the principles of instrumentation for the required observations, including remote observations/measurements.

Students will come to understand how the general constraints of operations in space, launcher capability and, as a driving constraint, how the availability of the required technologies will impact on the achievement of these goals. Students will learn how to form an international team to tackle the many issues connected with space mission design, and how to achieve the goals by working together as a team under pressure. These requirements are exactly those that arise in all space missions, and so the workshop is a good preparation for a career in space.

In order to monitor the progress of the project, each team will undergo the following three reviews:

- Objectives and Requirements Review on Friday, July 15
- Preliminary Design Review on Monday, July 18
- Final Design Review on Tuesday, July 19

These reviews are separately to each team; lecturers and tutors will attend and contribute advice, although the teams themselves will need, in the first place, to learn from the reviews and improve on eventual shortcomings.

Each team will prepare and give a one-hour presentation on their completed mission concept and submit a written report. A jury of experts will evaluate the mission concepts according to the scientific case, the technical feasibility, the innovative nature and competitiveness, and quality of presentation. The jury will evaluate the proposed concepts in each of these four categories and will give feedback to the teams. Each mission concept will be published on the Summer School website following the Summer School.

JURY EVALUATION GUIDELINES

The mission concepts will be evaluated by a Jury according to the following criteria:

A. THE SCIENCE CASE FOR THE MISSION

- The overall importance of the mission objectives
- Statement of scientific requirements to meet the stated objectives
- How much the expected results from the proposed mission advance the field

B. THE TECHNICAL CASE FOR THE MISSION

- The technical feasibility of the whole mission concept, including launch and orbit requirements and launcher constraints
- The suitability of the proposed payload as a whole and of the individual instruments to meet the stated goals (matching of payload and instruments to the requirements and mission goals)
- The technical feasibility of the proposed payload, including accommodation and other spacecraft resource requirements such as mass, power and telemetry
- Presentation of the Technical Readiness Level(s) of the mission components and the identification of enabling technologies
- The feasibility of the operational concept and its matching to the mission objectives

C. THE COMPETITIVENESS OF THE MISSION

- How well the mission competes with, or complements other missions (approved or planned)
- The value for money of the mission; the quality and breadth of the contribution compared with the expected cost category of the mission
- The identification of descoping options and their impacts on the scientific capability of the mission

D. THE QUALITY OF THE PRESENTATION

- The PPT presentation
- The presentation of the team
- The answers of students to questions of the Jury
- The written report

WELCOME TO SUMMER SCHOOL ALPBACH 2022

Alpbach occupies a beautiful location on a sunny plateau at approximately 1,000 metres above sea level.



Picture credit: Alpbach Tourism



Picture credit: Alpbach Tourism

SUMMER SCHOOL PROGRAMME

MONDAY, JULY 11

TIME	TOPICS AND SPEAKERS
INDIVIDUALLY	ARRIVAL OF PARTICIPANTS
16:00-18:30	REGISTRATION AT THE SCHOOL HOUSE
19:00	RECEPTION AT THE BÖGLERHOF

TUESDAY, JULY 12

TIME	TOPICS AND SPEAKERS
08:00	REGISTRATION
09:00	<p>OPENING</p> <p>Welcome: Michaela Gitsch, Summer School Director Moderator: Wolfgang Baumjohann, Chairman of Programme Committee</p> <ul style="list-style-type: none"> • Andreas Geisler, FFG, Head of Aeronautics and Space Agency • Margit Mischkulnig, Federal Ministry of Climate, Environment, Energy, Mobility, Innovation and Technology (tbc) • Christiane Helling, Space Research Institute Graz (tbc) • Joost Vanreusel, ESA Education, Head of ESA Academy (tbc)
10:00	COFFEE BREAK
10:30	<p>PLASMA EVERYWHERE</p> <p>Rumi Nakamura, Space Research Institute Graz</p>
11:30	<p>EARTH'S MAGNETOSPHERE AS PLASMA LAB</p> <p>Andris Vaivads, KTH Royal Institute of Technology</p>
12:30	LUNCH BREAK
15:00	<p>PLASMA AROUND PLANETS AND OTHER BODIES</p> <p>Ferdinand Plaschke, Technical University Braunschweig</p>
16:00	<p>IN-SITU MEASUREMENTS OF PLASMA</p> <p>Iannis Dandouras, Research Institute in Astrophysics and Planetology</p>
17:00	COFFEE BREAK
17:30	<p>WORKSHOP PREPARATION: PROJECT PHASES, TEAM BUILDING AND TEAM STRUCTURING</p> <p>Peter Falkner, ESA</p>
19:00	<p>JOINT DINNER AT THE BÖGLERHOF</p> <p>AFTER DINNER LECTURE GIVEN BY MARK MCCAUGHREAN, ESA'S SENIOR ADVISOR FOR SCIENCE & EXPLORATION</p>

WEDNESDAY, JULY 13

TIME	TOPICS AND SPEAKERS
09:00	SUN, HELIOSPHERE AND STARS Louise Harra, PMOD/WRC Davos
10:00	PLASMA ENVIRONMENTS ACROSS THE UNIVERSE Aurora Simonescu, Space Research Organisation of the Netherlands, SRON
11:00	COFFEE BREAK
11:30	REMOTE SENSING OF PLASMA Luca Fossati, Space Research Institute Graz
12:30	LUNCH BREAK
14:30	MISSION ANALYSIS Marcus Hallmann, DLR
15:30	COFFEE BREAK
16:00	MISSION AND SYSTEMS DESIGN Peter Falkner, ESA
17:00	WORKING TEAM MEETINGS
19:00	JOINT DINNER AT THE BÖGLERHOF
21:00	MISSION PREPARATION AT THE SCHOOL HOUSE

THURSDAY, JULY 14

TIME	TOPICS AND SPEAKERS
09:00	SPACECRAFT CONSTELLATIONS Jan Thoemel, University of Luxembourg
10:00	X-RAY TELESCOPES FOR PLASMA OBSERVATIONS Peter Predehl, Max Planck Institute for Extraterrestrial Physics
11:00	COFFEE BREAK
11:30	THE BIG PICTURE Günther Hasinger, Director of Science, ESA
12:30	LUNCH BREAK
14:30	WORKSHOP
16:00	COFFEE BREAK
17:00	WORKSHOP
19:00	JOINT DINNER AT THE BÖGLERHOF
21:00	MISSION PREPARATION AT THE SCHOOL HOUSE

FRIDAY, JULY 15

TIME	TOPICS AND SPEAKERS
09:00	INSTRUMENTATION – IN SITU Arno Wielders, ESA
10:00	INSTRUMENTATION – REMOTE SENSING TBD
11:00	COFFEE BREAK
11:30	SYSTEM ENGINEERING TBD
12:30	LUNCH BREAK
14:30	WORKSHOP
16:00	COFFEE BREAK
16:30	MISSION OBJECTIVES AND REQUIREMENTS REVIEW
19:00	JOINT DINNER AT THE BÖGLERHOF
21:00	MISSION PREPARATION AT THE SCHOOL HOUSE

SATURDAY, JULY 16

TIME	TOPICS
09:00 – 16:00	GUIDED MOUNTAIN WALK
17:00	MISSION PREPARATION AT THE SCHOOL HOUSE
19:00	JOINT DINNER AT THE BÖGLERHOF
21:00	MISSION PREPARATION AT THE SCHOOL HOUSE

Picture credit: MA Jakob



SUNDAY, JULY 17

TIME	TOPICS
INDIVIDUALLY	MISSION PREPARATION AT THE SCHOOL HOUSE
19:00	JOINT DINNER AT THE BÖGLERHOF
21:00	MISSION PREPARATION AT THE SCHOOL HOUSE

MONDAY, JULY 18

TIME	TOPICS AND SPEAKERS
09:00	SIMULATION (& LAB MEASUREMENTS) Nicolas Aunai, Laboratoire de Physique des Plasmas, Ecole Polytechnique Palaiseau
10:00	WHY DON'T WE HAVE FUSION YET? Anthony Donné, EUROfusion
11:00	COFFEE BREAK
11:30	GROUND BASED AND ACTIVE EXPERIMENTS Silke Britzen, Max-Planck-Institute for Radioastronomy
12:30	LUNCH BREAK GROUP PICTURE WILL BE TAKEN DURING LUNCH BREAK
14:30	WORKSHOP
15:00	COFFEE BREAK
16:30	MISSION PRELIMINARY DESIGN REVIEW
19:00	JOINT DINNER AT THE BÖGLERHOF
21:00	MISSION PREPARATION AT THE SCHOOL HOUSE

TUESDAY, JULY 19

TIME	TOPICS
09:00	MISSION PREPARATION AT THE SCHOOL HOUSE
16:30	MISSION FINAL DESIGN REVIEW
19:00	JOINT DINNER AT THE BÖGLERHOF
21:00	MISSION PREPARATION AT THE SCHOOL HOUSE

WEDNESDAY, JULY 20

TIME	TOPICS
09:00	MISSION PREPARATION AT THE SCHOOL HOUSE
16:00	INDIVIDUAL TEAM REHEARSALS
19:00	JOINT DINNER AT THE BÖGLERHOF
21:00	MISSION PREPARATION AT THE SCHOOL HOUSE

THURSDAY, JULY 21

TIME	TOPICS AND SPEAKERS
00:00	LATEST DELIVERY OF PRESENTATION MATERIAL "BED TIME"
09:00	PRESENTATION TEAM A NOTE: team presentation sequence defined by lucky draw
10:00	QUESTION AND ANSWER PERIOD
10:30	COFFEE BREAK
11:00	PRESENTATION TEAM B NOTE: team presentation sequence defined by lucky draw
12:00	QUESTION AND ANSWER PERIOD
12:30	BUFFET LUNCH SERVED AT THE SCHOOL HOUSE
13:30	PRESENTATION TEAM C NOTE: team presentation sequence defined by lucky draw
14:30	QUESTION AND ANSWER PERIOD
15:00	COFFEE BREAK
15:30	PRESENTATION TEAM D NOTE: team presentation sequence defined by lucky draw
16:30	QUESTION AND ANSWER PERIOD
17:00	CLOSING REMARKS BY PETER FALKNER, HEAD TUTOR
17:15	MEETING OF THE JURY
19:30	FAREWELL DINNER AT THE CONGRESS CENTER ANNOUNCEMENT OF JURY EVALUATION AWARD CEREMONY

HOW TO GET TO ALPBACH REGION

Picture credit: Alpbach Tourism



DISTANCES

- 50 km from Innsbruck
- 150 km from Munich
- 140 km from Salzburg
- 160 km from Bozen
- 440 km from Vienna

TRAVELLING BY CAR/RAIL/PLANE

- reach Alpbach by car on the Inntal motorway A1, exit Kramsach and go 12 km to Alpbach via Brixlegg and Reith
- nearest mainline railway stations: Wörgl (25 km) and Jenbach (20 km)
- fly into Innsbruck, Salzburg or Munich

Express trains (ICE, IC, EC) stop at the express train stations Jenbach or Wörgl. Regional trains stop at the Brixlegg or Rattenberg stations.

Guests arriving by train to Wörgl or Jenbach or Brixlegg can use the buses to Alpbach free of charge by producing a valid booking confirmation or accommodation voucher. For train connections see the [ÖBB rail schedule](#).

LOGISTICS

HOTEL BÖGLERHOF

Familie Duftner

Nr. 166, 6236 Alpbach

Telephone: +43 5336 5227

[Website of Hotel Böglhof](#)

[Email address of Hotel Böglhof](#)



The Hotel Böglhof is the Summer School Hotel. It is located in the centre of Alpbach, next to the church and within 10 minutes walking distance from the School House.

Joint dinners for all Summer School participants help in forming a strong community spirit. All participants (students, tutors, lecturers and accompanying persons) will have dinners throughout the period of the Summer School at the Hotel Böglhof.

Vouchers for the dinners including one free drink per evening will be distributed to all Summer School students upon registration.

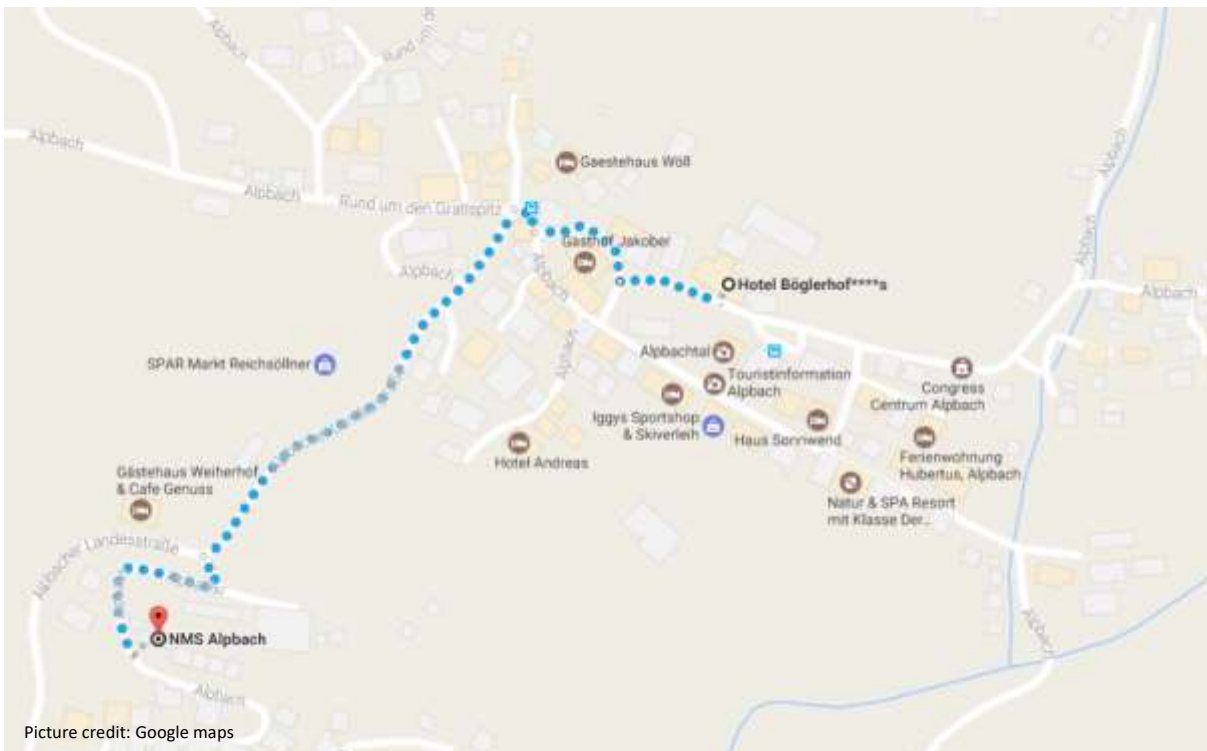
Lecturers and tutors staying at the Böglhof have dinners included in the room arrangement.



The price for the evening meal at the Hotel Böglerhof for lecturers/tutors/guests who are not staying at the Böglerhof is € 29 per evening and can be paid at the end of the stay at the Böglerhof reception.

Accompanying persons are welcome to join for dinner.

THE SCHOOL HOUSE



All lectures and the workshops are held in the School House of Alpbach (NMS Alpbach) located at 10 minutes walking distance to the Hotel Böglerhof. There are no lectures during the weekend. The mission design work continues and the School House will be open for work.

Lectures, final student presentations and student rehearsals will take place in the lecture hall (audimax). 60 Alpbach students will be grouped into four teams (Blue, Red, Orange, Green). Each Summer School student team will work in a dedicated classroom.

The daily joint dinners will take place at 7 p.m. at the Hotel Böglerhof. The workshop activities continue after dinner at the School House.

INFRASTRUCTURE AVAILABLE AT THE SCHOOL HOUSE

- Access to the Internet: 1 fixed notebook allocated to each team (with LAN) in the classrooms
- Personal notebooks (students)
- Wireless access point (WiFi)
- 1 classroom per team (flip charts, chalkboard, beamer, WiFi, 1 laptop)
- Computer room (team laptops, printers, library)
- STK Edu tool
- Copying machine

MATERIAL AVAILABLE FOR THE USE OF STUDENTS

- Books (small library) & reports
- Access to online journals
- Internet address lists
- Server for
 - uploading information material/tools of tutors and lecturers
 - for exchange between students (e.g. mini CDF, STK)

COFFEE BREAKS

Coffee breaks take place at the School House. In addition each team will be provided with a coffee machine in the classroom.

LUNCHESES

There are no arrangements for lunches. A supermarket is within walking distance from the School House and small restaurants and a coffee shop in the village of Alpbach.



PICTURES

Photos will be taken during the Summer School Alpbach (including a group picture) to be used and published by FFG for the purpose of reporting on the Summer School Alpbach.

THE PROGRAMME COMMITTEE

CHAIR	Wolfgang Baumjohann, Space Research Institute Graz
SUMMER SCHOOL DIRECTOR	Michaela Gitsch, FFG
VICE SUMMER SCHOOL DIRECTOR	Wolfgang Baumjohann, Space Research Institute Graz
HEAD TUTOR	Peter Falkner, ESA
CHAIRMAN OF THE JURY	TBD

PROGRAMME COMMITTEE MEMBERS

Kader Amsif	Centre National d'Etudes Spatiales CNES
Anastasios Anastasiadis	Greece
Paal Brekke	Norway
Natacha Callens	ESA
Immacolata Donnarumma	Agenzia Spaziale Italiana ASI
Peter Falkner	ESA
Isabel Pérez Grande	Universidad Politécnica de Madrid, Spain
Christian Gritzner	DLR
Andreas Geisler	FFG
Arpad Kis	Geodetic and Geophysical Institute of the Research Centre for Astronomy and Earth Sciences, Hungarian Academy of Sciences
Rumi Nakamura	Space Research Institute, Graz
Dan Alin Nedelcu	Astronomical Institute of the Romanian Academy
Mark McCaughrean	ESA
Johannes Ortner	Austria
Tilman Spohn	International Space Science Institute
Jan Thoemel	Université du Luxembourg

SUMMER SCHOOL TUTORS

HEAD TUTOR

Peter Falkner, ESA

ENGINEERING TUTORS

Christian Gritzner	DLR
Marcus Hallmann	DLR
Günter Kargl	Space Research Institute, Graz
Michele Lavagna	Politecnico di Milano
Greta de Marco	Rhea (in ESA)
Jan Thoemel	University of Luxembourg
Arno Wielders	ESA

SCIENCE TUTORS

Charlotte Götz	ESA
Iannis Dandouras	Research Institute in Astrophysics and Planetology
Florine Enengl	University of Oslo
Matteo Guainazzi	ESA
Elise Knutsen	LATMOS
Anna Millilo	INAF
Peter Predehl	Max Planck Institute for Extraterrestrial Physics
Ferdinand Plaschke	Technical University Braunschweig

SUMMER SCHOOL LECTURERS

Nicolas Aunai	Laboratoire de Physique des Plasmas, Ecole Polytechnique Palaiseau
Silke Britzen	Max Planck Institute for Radio Astronomy
Iannis Dandouras	Research Institute in Astrophysics and Planetology
Anthony Donné	EUROfusion
Peter Falkner	ESA
Luca Fossati	Space Research Institute Graz
Marcus Hallmann	DLR
Louise Harra	PMOD/WRC Davos
Günther Hasinger	ESA
Mark McCaughrean	ESA
Rumi Nakamura	Space Research Institute Graz
Ferdinand Plaschke	Technical University Braunschweig
Peter Predehl	Max Planck Institute for Extraterrestrial Physics

Aurora Simionescu
Jan Thoemel
Andris Vaivads
Arno Wielders

Space Research Organisation of the Netherlands
University of Luxembourg
KTH Royal Institute of Technology
ESA

SUMMER SCHOOL JURY

JURY CHAIRMAN

TBD

JURY MEMBERS

Natacha Callens
Andreas Geisler
Rumi Nakamura
TBD

ESA
FFG
Space Research Institute, Graz

Observing Member:

Peter Falkner ESA, Head Tutor

Summer School Awards are to be awarded for the best projects in the categories:

- The Science Case for the Mission
- The Technical Case for the Mission
- The Competitiveness of the Mission
- The Quality of Presentation

ADMINISTRATIVE STAFF

ADMINISTRATION/PHOTOGRAPHER

Michel A. Jakob, Austria

TECHNICAL MANAGEMENT

Thomas Margreiter, Alpbach