INTERNATIONAL UNION OF GEOLOGICAL SCIENCES (IUGS)

Reporting Form for IUGS Affiliated Organizations 2021

1. Name of Affiliated Organization

International Geoscience Education Organisation (IGEO) (registered in Bengaluuru, India, in 2015)

Reporter : Dr Roberto GRECO, Brazil (Email: greco@unicamp.br)

Web address : http://www.igeoscied.org

2. Overall Objectives

IGEO aims to promote geoscience education at all levels, to work for the enhancement of quality in the international provision of geoscience education and to encourage all developments that raise public awareness of the geosciences, in particular among young students.

3. Relate Goals to overall IUGS Scientific Objectives

IGEO's objectives support the IUGS scientific objectives, in particular the objective of: 'strengthen public awareness of geology and advance geological education in the widest sense.'

4. How has organization been actively involved with IUGS related activities?

IGEO has supported the IUGS Commission on Geoscience Education (COGE) this year by, for more details, please see the IUGS-COGE annual report. By a proposal of IGEO Chair three new members have been included in the IUGS-COGE in order to reduce gender gap. Unfortunately the same proposal for the IGEO Executive committee was not yet implemented, at the moment have no women member in his committee.

5. Structure and Organization

IGEO's Senior Officers are elected every four years by the International Council during the quadrennial International Conference of Geoscience Education (GeoSciEd conference). During the 8th GeoSciEd held in July 2018, the new council was elected for the quadrennium 2018-2022.

Executive Committee

Chair	Roberto Greco, Brazil (greco@ige.unicamp.br)
Vice-Chair (Elected)	**VACANT**
Past Chair	Shankar Rajasekhariah, India (rshankargeo@gmail.com)
Secretary	Anish Warrier, India (akwarrier@gmail.com)
Treasurer	Jean-Luc Berenguer, France (berenguer@unice.fr)
Web Manager	Takashi Sawaguchi, Japan (tsawa@toyo.jp)
Newsletter Editor	Michael Passow, USA (michael@earth2class.org)
9th GeoSciEd Convenor	Ichiro Matsumoto, Japan (chromim@edu.shimane-u.ac.jp)
Co-opted advisor	Chris King (chrisjhking36@gmail.com)
Co-opted advisor	Nir Orion (nir.orion@weizmann.ac.il)

The Council currently consists of members from 48 countries (full details at: http://www.igeoscied.org/?page_id=22). Council meetings are held every two years, alternating between the GeoSciEd conference and the International Geological Congress (IGC). The Council last met during the VIII GeoSciEd in Brazil in 2018.

Since 2018 two regional chapter start their activities. Latin America IGEO chapter really active that contribute to increment the participation on IGEO in all latin america. https://laigeo.cloudaccess.host/

A European Chapter also start its activities since 2019.

At the moment we are running the election process for fill the Vice-Chair vacancy.

We are working in a new constitution as the previous one have already 20 years and today do not fit with the need of the organization.

We are also working in an Code of Ethic for the members of the organization.

IGEO's Chair is *ex officio* Chair of the Examination Board of the International Earth Science Olympiad (IESO), which is IGEO's flagship activity. IESO has its own organisational structure which was described in detail in the annual report for 2012 to IUGS.

6. Interaction with other International Organizations and Projects

IGEO closely relates to the Commission on Geoscience Education, Training and Technology Transfer (IUGS-COGE). IGEO's GeoSciEd conference provides every four years a platform for members of all international organizations concerned with or interested in geoscience education at all levels (from kindergarten to university), to present and discuss their activities. Furthermore, teachers, geoscience educators, pupils and officials of ministries for education from all over the world are involved in the annual IESO, where pupils, about 18 years of age from across the globe, compete using their geoscience competencies.

In the year 2015, two important agreements were signed for Collaboration with the International Association for Promoting Geoethics (IAPG) and with the International Association for Geoethics (IAGETH) to mutually promote the activities and further the goals of the organisations. IGEO was one of the supporting partners for the first ever conference on Resources for Future Generations, 2018 (http://rfg2018.org/en/RFG/2018/Rfg-Highlights/Partner-Organizations).

7. Chief Products

- *The International Conference on Geoscience Education (GeoSciEd):*

  IGEO's quadrennial "GeoSciEd" conference provides a forum for members of all international organizations concerned with or interested in geoscience education at all levels to present and discuss their activities. It is the most appropriate forum for exchanging ideas, sharing experiences and forging collaborations among participating teachers/geoscientists. The eighth edition of the GeoSciEd conference was held in July 2018 in Brazil. The 9th GeoSciEd will be held at Shimane (Japan) in 2022.

- *The International Earth Science Olympiad (IESO):*

  During IESO, gifted secondary / high school students from the world over come together. The students have previously been selected at the national level and, along with guest

students if any, are accompanied by mentors and observers. The International Jury, consisting of mentors and observers who are essentially teachers, geoscientists or geoscience educators from the participating countries, discuss and finalise question papers for the written and practical tests. IESO also offers the prospect to discuss different approaches to geoscience education throughout the world. Thus, IESO is a unique opportunity to identify best practices/ approaches from around the globe. Something unique about IESO (and something special that sets IESO apart from all other international science olympiads) is the International Field Team Investigation in which mixed groups of students (of different nationalities, diverse cultures and varied backgrounds) work as teams in a friendly and co-operative (as against competitive) manner on a topic both outdoors and indoors and prepare a PowerPoint presentation. The Earth System Project is an activities where students in mixed group choose a theme and prepare a poster and made poster presentation. In 2021 we introduce new activities not compulsory but that could increase the experience of the students an Earth System Pledge (students write a pledge about the commitment that they take about how to use their knowledge in Earth Science in the future), Earth Science and Art (student present their art piece like poem, paint, sculpture, music, song ...), and Mission to Mars that was an app for smart-phone where international team play togheter. The topic was the Indian Monsoon. Both these items of activity have been a run-away success.

- *Educational Session/s during the International Geological Congress*, every four years.

  Sessions specifically dealing with geoscience education (at different levels and with different perspectives) are convened during the International Geological Congress (IGC) held every four years.

- *International Syllabus on Earth Science Education and plan for accompanying textbook*

  The recommended minimum syllabus requirement for school-level Earth science education was published on the IGEO and IUGS-COGE websites at the beginning of last year. This followed a survey of the content of national syllabi and an exercise to ensure that the major content of syllabi across the world was covered by the international syllabus. An article on the development of the international syllabus, including a copy of the syllabus itself, appeared as: King, C. (2015). The international geoscience school syllabus and its development. *Episodes International Journal of Geoscience,* 38.1, 57-74. An accompanying textbook it's alreday available in IGEO website http://www.igeoscied.org/teaching-resources/geoscience-text-books/ .

- *Earth Learning Ideas (ELI)*

  The Earthlearningidea website continues to publish a new idea for the teaching of Earth science every two weeks. Around 300 ideas have been published in English and there are more than 900 translations of these activities on the website (or linked to the website) in Spanish, Catalan, Norwegian, Italian, German, Portuguese, Polish, Chinese (Mandarin), South Korean and Tamil. The activities are currently being downloaded at a rate of more than 50,000 per month, giving more than 4 million downloads in all. The Earthlearningidea blog has now been accessed in more than 10,000 towns and cities of 200 countries across the world. Fifty more activities are already in the pipeline for publication next year and beyond.

- *Teacher Training Workshops:*

  Earth science, unfortunately, is neither a separate subject of study nor is it comprehensively represented in the school curriculum of many countries. Teachers from the Arts, and not the Science stream, often teach earth science topics in schools in the form of lectures and

without any hands-on and mind-on activities. That school teachers are not formally trained in the teaching of earth sciences is a glaring omission, covering both the aspects of content knowledge and interactive teaching skills (for example, using the laboratory, outdoors and computer learning environments) that form the heart of earth science education.

In the light of the above, the way earth science is taught in many schools needs a radical shift from classroom lectures to field work and hands-on activities, observations and deduction. This challenge can only be met by the systematic professional development of teachers. The objective of the workshops should be to provide teacher participants with practical teaching and learning strategies and techniques. The participants should experience active learning in the lab, outdoor and classroom learning environments with learning materials (worksheets and activities) that can readily be implemented in their schools. Such workshops are available and are proving very effective in some countries.

- *Public relations activities and communication strategies within the IGEO/IESO membership*

  Senior Officers, Council members and members of the IESO community have been publicising IGEO and IESO whenever and wherever they attend meetings/ conferences etc. The official website of IGEO (http://www.igeoscied.org) has been upgraded and with new interactive features provides a more dynamic platform for members to collaborate. The IESO website (http://www.ieso-info.org/) also provides useful information to the geosciences community. Besides, IGEO periodically publishes its newsletter which contains not only IGEO and IESO matters but also forthcoming events pertaining to geoscience education, educational resources, reports on geoscience education-related activities. The Newsletter is published on the IGEO website. IGEO is in social media as Facebook and twitter.

8. Chief Accomplishments 2021 and Plans for 2022

8.1. Chief Accomplishments 2021

A) IESO2021 ONLINE

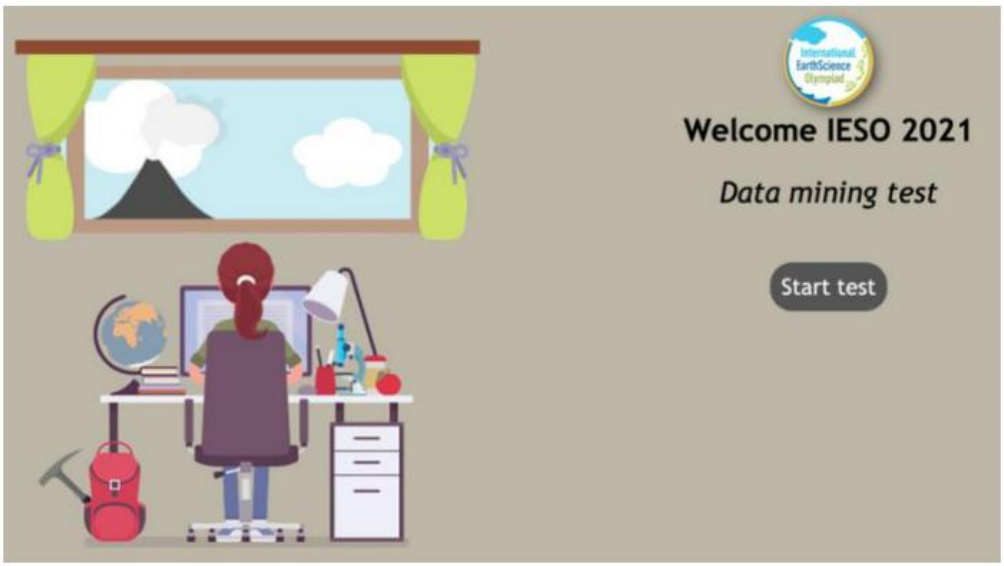
Due to the COVID-19 pandemic, the International Earth Science Olympiad was held online during August 25-30, 2021. The Examination Board (the commission that take care of the IESO activity) take care of the organization in order to provide a model for an IESO online. The activities proposed for IESO 2021: Data Mining Test, National Team Field Investigation, Earth System Project, Mission to Mars, Earth Science and Art and Earth System Pledge. Students can choose to participate to one or more of the activities proposed.

Despite the delicate pandemic situation in some countries, where the preparation of the national selections was strongly disrupted, 199 high school students participated, representing 33 countries.

Data Mining Test: Access to the data online to resolve case studies. We are accumulating large amounts of data of all types (numerical, images, text, etc.). Exploiting them requires the mining and exploitation of these data. The development of digital technology makes it possible to generate raw scientific data which must be processed and interpreted to feed the Research (including geoscience). At school, it is often the synthesis produced by the scientists that is proposed to the students to serve the construction of their investigations. The objective of the Data Mining Test was to imagine pedagogical scenarios allowing to raise awareness among students to one of the principal elements of geoscience: data! This allows students to understand how scientists can acquire/process/exploit data to obtain knowledge, particularly using digital technology. For IESO 2021, the Data Mining Test consisted of a scientific investigation using data online. A series of questions will guide the

student, step by step. Knowledge can help the student … but analysis of the data may be sufficient! Two case studies were proposed: Volcanic paroxysms of the Etna volcano in 2021 (satellite images, GPS data, seismic tremors …) and a virtual investigation in an old bauxite mine.

Taking advantage of this online edition, new types of tests were proposed such as the 'data mining test'.



184 students from 33 countries completed the test successfully! Thanks to EDUMED Observatory team (University Côte d'Azur, France) for this new test. This experiment seems to have been appreciated by the students.

National Team Field Investigation (NTFI): The main reason behind IESO is to inspire earth science educators with the 'state of art' teaching strategies and techniques. Therefore, it includes activities that are unique and special when compared to other science Olympiads (e.g., the International Team Field Investigation (ITFI) and the Earth System Project (ESP). These activities demonstrate the essence of the scientific exploration of our physical world. A good scientist can define a clear research question, conduct a study based on modern research tools and analyze the results through logical sequence thinking.

The National Team Field Investigation (NTFI) is the online version of the International Team Field Investigation (ITFI) carried out during IESO so far. This year the mentor get the opportunity to take care of all the aspects of an team field investigation and was an excellent opportunity to understand the meaning and objective of ITFI. Moreover, it was an opportunity for a rigorous

evaluation process.

Outcomes:

Despite the local constraints created by the COVID pandemic in each country, mentors have shown creativity and determination in finding local solutions. Finally, 36 studies from 23 countries were prepared and presented. The same evaluators (None of them was a mentor) evaluated all the studies. Moreover, an evaluator could not assess a project presented by students from their country. The evaluation was based on a rubric of 19 items. Twelve items evaluated the quality of the research project (65% of the final score), and seven items considered the presentation's quality (35% of the final score).

The grading scale of the projects included the three following levels."

Excellent: Projects that scored in the range of 88 - 100 (20% of the studies).

Very good: Projects that scored in the range of 80 - 88 (25% of the studies).

Good: Projects that scored in the range of 70 - 80 (30% of the studies).

The following are two representative mentors' feedbacks that indicate an overall satisfaction from the process and the outcomes of the NTFI.

"…It opens research avenues for the coming years with my undergraduate students, and it is fantastic we could start this with high school kids in the context of IESO."

"…this part (the NTFI) was the most appreciated by our students: they really enjoyed working together and playing the role of true scientists either in the field as analyzing the data collected and raising conclusions…"

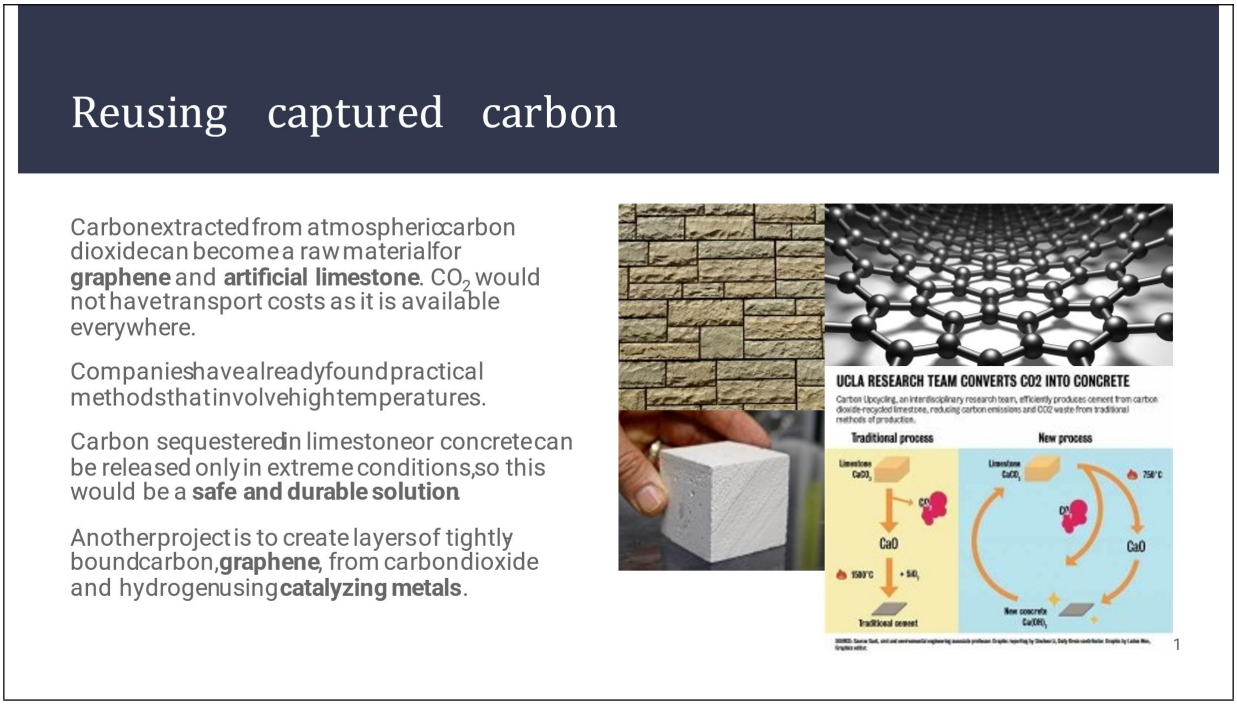
Earth System Project (ESP)

ESP is a cooperative activity in which students (from different nationalities, varied backgrounds and diverse cultures, and socio-economic development) come together and work as a team – much as scientists do today. The multi-national groups of students work on an ESP topic that encompasses many spheres of the Earth System. They research by collecting and analysing relevant data from the Internet and then reason them out. Importantly, they make Earth System connections – demonstrate how the phenomenon concerning the ESP topic is linked to several subsystems of the Earth. Thus, young students get a glimpse of how earth scientists carry out research, appreciate the interconnectedness of the earth system and its implications to human activities, and their impacts on the Earth's natural system. ESP lays emphasis on the evaluation and development of scientific skills like data collection and analysis, reasoning, system thinking, communication and collaboration, and oral and written presentation.

Separate discussion meetings were held for students (156 no.) and mentors (65 no.) to familiarise them with the nitty-gritty of ESP. The students from 33 countries, grouped in 26 teams (6-8 in each team), worked on the "Interrelationships of the COVID Pandemic (OR Carbon Sequestration) with the Earth System". Three-time zones (Asia-Oceania, Europe+the Middle East, and the Americas) were recognised to facilitate the teams to make PowerPoint presentations of their results in two parallel sessions before International Juries who, using the already published rubric, graded the teams as Excellent, Very Good and Good. Appropriate certificates were provided to these team members and participation certificates to the rest.

In their feedback, students described their participation in ESP in different ways: "An opportunity to meet & work with new people", "Enjoyable", "Fun", "Exciting", "Interesting", "Useful, "Helpful", "Unforgettable", "A unique experience" and so on. Invariably, every student loved the concept of international cooperation! The overall opinion was; ESP was ESP – **E**ndeavour

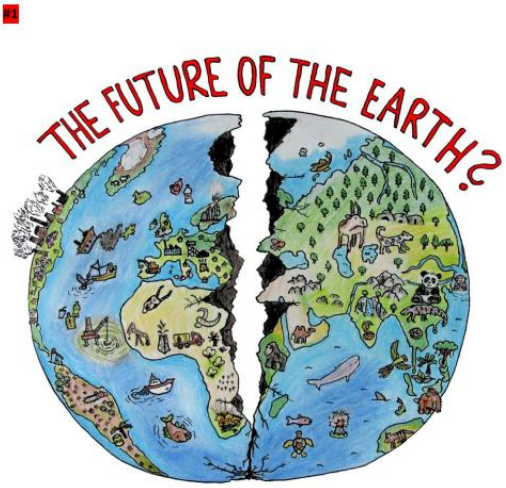
Superbly **P**erformed. Responses from students and mentors to a questionnaire pointed out aspects that need correction in the future online editions of ESP. Several International Jury members, Amey Naik (Mumbai), Ms Shimmi Kumari (Bengaluuru) and Shwetha Shetty (Kuwait) offered timely help.

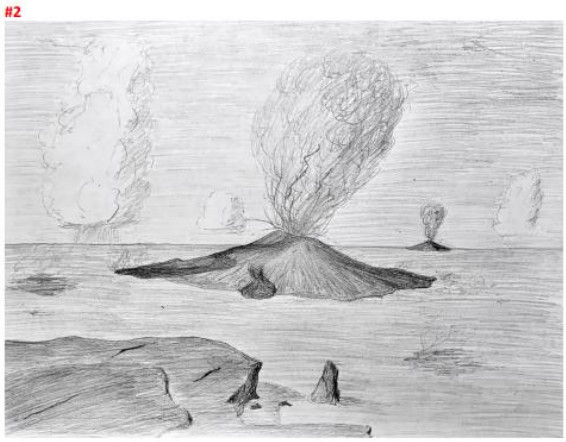


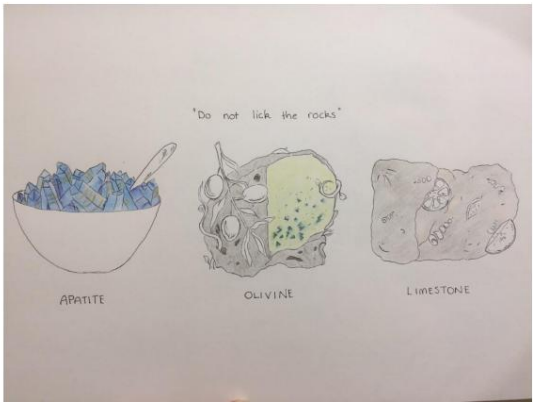
A sample slide from an ESP presentation

IESO Art and Science - Sharing of Earth Systems Art and Creativity

All IESO students are excellent at Earth Science, but their talents do not end there. Many of them are excellent artists in various media including the visual arts, writing, and theatre arts. This was an opportunity to share some of their poems, paintings, sculptures, rap songs, earth science memes etc. Submissions were meant to be socially appropriate and address environmental or Earth systems issues or concepts. Many of the submitted artistic pieces were included in the closing ceremony. This was a great place for students to communicate their emotions regarding the science that we study. Students can also use this international publication of their art on their resumes. There were two categories of Art. Earth systems art represented a concept of message related to Earth Systems. Art for Art's sake was something beautiful that you do not see a relation to Earth Systems. Here you find some of the art most voted by the IESO students.







Olivia Anderson, AUS-S01

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The Earth System Pledge

We worked with all our students to teach them about Earth Systems and the solar system. The pledge was a place for the students to let us, and their peers, know how they were going to use their knowledge and skills in the future. The students were asked to submit their Earth System pledges to their mentors for approval before being submitted to the IESO Jury. Several Earth System Pledges were selected for public recognition during the closing ceremony.

The student Earth system pledge will be helpful in applications for jobs and to go to university. It is not just what you know, but what you plan to do with it that is important. Will your students plan to help an issue facing their community, country or the world? Will they work on earthquake warning or mitigation? Which Earth systems spheres interest them the most? The more specific the better. A good pledge was less than 200 words long. All pledges considered worthy by the IESO Jury were recognized as such. This can be helpful for students in the future.

Mission to Mars

This activities was based on an app developed by a member of the Examination Board. International teams of IESO students play together to finalize the Mission passing trough many challenge. Students use the app and communicate in real time to take decision on move on in the activity. A funny and engaging way to learn more about Earth and Space science.

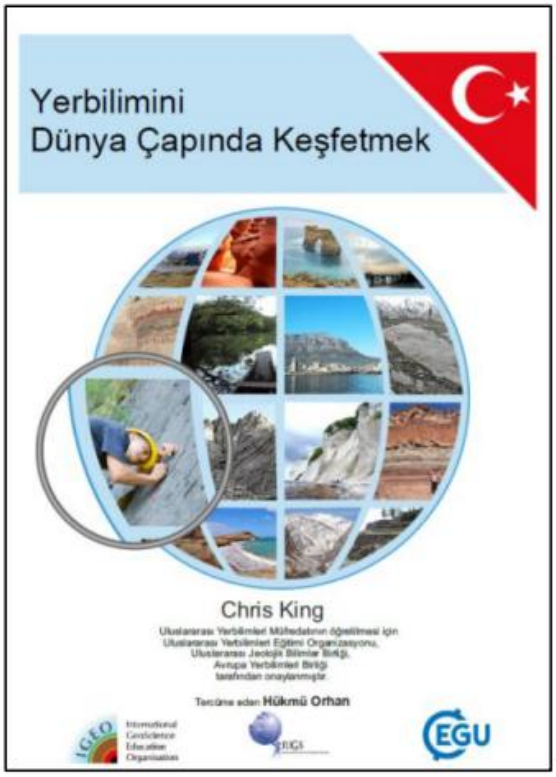
- **A workshop to share hands-on activities for the classroom**

An online workshop was also offered during IESO to all teachers supervising the students. An online seminar was organized and led by the EGU field officers, and some forty teachers discovered the field officers' initiative. The participation of the EGU was beneficial, in particular: in helping with the registration fees of three countries for their first participation, and finally in mobilizing the team of EGU field officers for the seminar.

B) Exploring Geoscience across the World now available in Turkish

IGEO is delighted to announce the first full translation of the Exploring Geoscience across the world textbook – into Turkish. The translation is the work of Hükmü Orhan on behalf of the Turkish Earth Science Education Working Group, which was founded in December 2019. Professor Dr. Hükmü Orhan is a retired member of the Geological Engineering Department of Konya Technical University, Konya, Turkey and has led this tremendous translation work. As a result, teachers of geoscience across Turkey will now have access to a readable and professionally checked textbook, approved by the IGEO, the International Union of Geological Sciences (IUGS) and the European Geosciences Union (EGU).

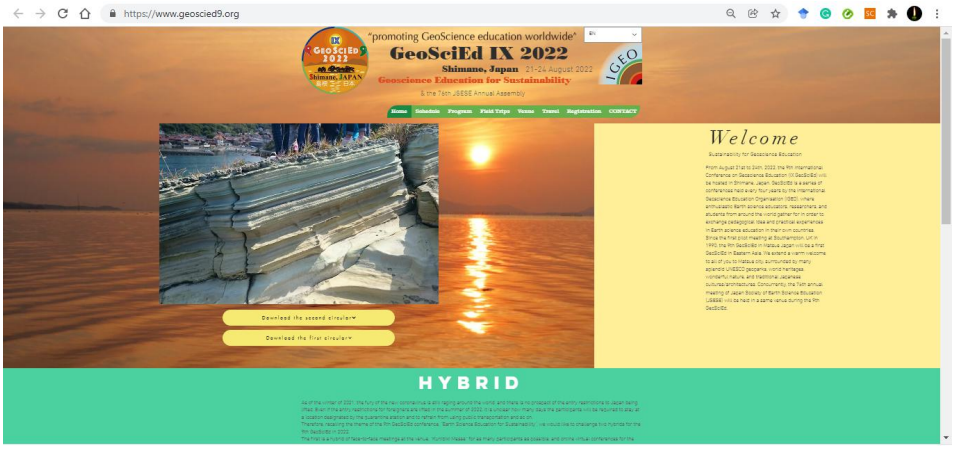
Like the international version of the textbook and its two companions, the Turkish translation is available as a pdf file free-of-charge on the IGEO website at: http://www.igeoscied.org/teaching-resources/geoscience-textbooks/ and http://yerbilimleri.org/index.php/kitaplar/.



C) Planning for the 9th GeoSciEd Conference in Japan (21-24 August 2022)

The ninth edition of the Geoscience Education Conference (GeoSciEd) is planned in the hybrid mode. In this regard, the second circular was released recently which has all the details regarding the sessions and the schedule of the conference. Call for abstract its already open.

https://www.geoscied9.org/



9. Specify how any IUGS Allocation for 2021 was used.

IUGS kindly made available a grant of USD 5000 to IGEO, which we most gratefully acknowledge. We receive this grant following our request for develop a Platform Virtual trip to Mars, in other words a smart-phone App where have to interpret data, make observations and choice.
A private sponsor cover all the cost for the development of the Mission to Mars App used during IESO and still available for download with the name My Mission to Mars. That was great because in that way we get a great app and at the main time we can save the money with the aim to use it for support the participation of delegate from developing countries to the next GeoSciEd. That is really important as is the main event of IGEO and there will be the possibility to have presencial participation. The participation on the event allow to follow many presentations and workshop and provide ideias and enthusiasm for act in favour of Earth Science Education in the home country.

We already informed the IUGS treasurer about this save on the 2021 grant.

10. Budget Request with Justification for 2022 (only applicable to low income affiliates)

While thanking IUGS for its financial support to and patronage of IGEO, we request for IUGS grants for the following two activities:

- **The 9th GeoSciEd in Japan during August 2022**.

  The conference will be held in hybrid mode and we are hoping that a large number of delegates will participate in presence. The funds for the 9th GeoSciEd will be used to support the travel/registration fees/local hospitality of scientists from developing nations whose research abstracts have been accepted for oral/poster presentation in the presencial mode. **Fund Requested: USD 5000 $.**

- **IGEO call for Earth Science Education activities in developing countries.**

  Developing countries are struggling in promote Earth Science Education activities even for the lack of resources. Each country have specific situation and challenge, in order to be effective we need to be flexible and meet the real need of earth science educator that operate in these different context. For that reason we would like to support project that comes directly from Earth Science Educator in developing countries. The kind of activities that we would like to support are national Earth Science Olympiad, teachers workshop, participation in training activities, Earth Science Exhibition. Others activities could be supported if meet the aims of promote at local level Earth science education. The plan is to support 5-10 project with USD 500-1,000 each. All the iniciative support will need to use in all the materials and website the IGEO and 60years IUGS official logo. This will be a great way to promote the celebration of the 60years of IUGS in developing countries.
  Fund Requested: USD 5000 $

Itemized request for IUGS Grants for the year 2022.

IGEO Activities	Financial support requested from IUGS for 2022(USD)	Financial support already received from IUGS for 2021(USD) and saved for use in 2022
9th GeoSciEd	5,000	5,000
IGEO call for Earth Science Education activities in developing countries.	5,000	
Total financial assistance requested	10,000	

11. Does your website have a link to IUGS?

Yes (http://www.igeoscied.org/).

12. Is the IUGS logo posted on your website?

Yes (http://www.igeoscied.org/).

13. Name, address and e-mail of person preparing this report

Prof. Dr. Roberto Greco

Address: Universidade Estadual de Campinas, Instituto de Geociências, Rua Carlos Gomes, 250 CEP 13083-855 – Campinas-SP (Brazil)

E-mail: greco@unicamp.br

The information content in this report have been collected from the members of Executive Committee of IGEO and Examination Board of IESO.

Yours sincerely

ROBERTO GRECO
Chair, IGEO 2018-2022