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Editorial Office
Geoscience Communications
To the attention of Dr Francesco
Mugnai

Object: Manuscript submission

Dear Editor,

We submit the revised version of the paper GC2020-3 "Focus on glaciers": a geo-photo exposition of vanishing beauty" for the special issue issue "Five years of Earth sciences and art at the EGU (2015- 2019)".

We thank you, Mariele Neudecker and the other reviewer for the constructive and stimulating comments, which led to significant improvements of this paper.

We rewrote almost completely the paper, and we let it be reviewed by professionals in language editing, to address the comments of both reviewers, and in particular, points 6 and 8 of reviewer 1. As regards as reviewer 1, we added the reference to Agenda 2030, and stressed the peculiarity of our exhibition, if compared with other visual initiatives, by adding details on the photograph choice, the public engagement, the feeling of both exhibitors and visitors.

As regards as the stimulating comments of reviewer 2, Mariele Neudecker, we added more references to other important initiatives as Project Pressure, Chasing Ice, and others, to show the context in which our exhibition lays and the differences. In particular, we tried to explain the importance and value of our exhibition in involving people in the delicate theme of the climate crisis, through high-impact photographs, although for us it was not possible to have time-lapse images of the same subject, being almost all bound to single campaigns, rarely, if never, in the same places.

We also corrected the captions, adding more details on the projects, and corrected Figure 3, since there was a mistyping mistake. We uploaded the revised figures as supplementary material.

Kind regards



Giuliana Rossi, on behalf of the co-authors

Reviewer 1:

We kindly acknowledge the reviewer for his/her time, accurate reading, appreciation, and valuable comments that have been of help in improving our manuscript. In the following, we reply to his/her comments point by point.

1) ***Does the paper address relevant scientific questions within the scope of G.C.?***

Yes, this contribution fits with G.C. aims and scope, since the authors' wish have been the communication of a particular aspect of climate change, through a strict connection between science and art.

2) ***Are the scientific methods and assumptions valid and clearly outlined?***

Yes, the strategy of communication, engagement, and selection of the pictures for the exhibition is clearly reported, as well as the audience response expected from the authors. Also, the relation between the pictures, the places where they have been taken, and the specific issues of each are well reported.

A suggestion would be citing in paragraph 4 the initial number of pictures submitted for the internal call (before the selection of the final 26 for the exhibition), in order to understand the real participation to the initiative.

Thank you for the excellent suggestion. We added the number in the text. We received 130 photographs, among which we chose about 20% for the exhibition.

3) ***Are the results sufficient to support the interpretations and conclusions?***

Yes, the good number of visitors and adopted communication strategies seem to confirm the engagement and vehiculation of the message the authors wanted to transmit through the pictures.

Thank you for this appreciation.

4) ***Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Does the paper present novel concepts, ideas, tools, or data?***

It can be improved. The original contribution is not very clear: the organisation of an exhibition of pictures, independently on the topic, is not an innovative approach for communication. The authors should stress more the attention given to details, such as public engagement and feelings.

We clarified better in the manuscript what the originality of our contribution consists of. We agree with the reviewer that it is certainly not a novelty to organise exhibitions to communicate. Several photo exhibitions have been organised during these years by professional photographers and artists within projects devoted to enlarge the public awareness on this theme, using the art to strengthen the message (e.g., <https://sulletraccedeighiacciai.com>, <https://www.project-pressure.org/mariele-neudecker-and-project-pressure-partnership/>). We shall add some reference to these initiatives in the revised manuscript, underlining their importance. As a specific example of initiatives aimed at integrating art and science, we also included the Extreme Ice Survey program (<http://extremeicesurvey.org/>), which produced a photography book (Balog et al., 2012) and a documentary film, "Chasing Ice" (<https://chasingice.com/>), winner of an Emmy Award in 2014.

However, it is unusual for scientists to organise exhibitions, as we did, making available the materials collected during scientific campaigns for study purposes different than the themes of the exhibition, thanks to the personal sensibility of the authors of the pictures. As

reported in the article, all the authors are scientists involved in scientific activities on research cruises and not professional photographers. Some other online collections from scientists are available, like the one managed by the National Snow and Ice Data Center, https://nsidc.org/data/glacier_photo/, or the “Repeat Photography Project” of the USGS Northern Rocky Mountain Science Center, focussed on the Glacier National Park, https://www.usgs.gov/centers/norock/science/repeat-photography-project?qt-science_center_objects=0#qt-science_center_objects. Another repository of pictures on various geoscience themes shot by the scientists is the images archive of EGU (<https://imagedo.egu.eu/>). In this case, the archive is accessed by the scientific community, although geosciences involve a vast community. Only in some cases, the best photos, awarded during the annual conference, are printed as cards and reach a wider public. Our goal, on the contrary, was to fill the gap between research and society: the exhibition becomes the way to bring scientists near the public, and precisely, adult people, in working age, in an environment extraneous to science. The venue was chosen among the places not usually used for scientific dissemination activities as the ones used for Science Cafè or conferences, but it was the hall of a chamber of commerce usually crowded during working hours. We wanted to talk about science, describing where the photos were taken, in which conditions, for which specific research project. Some of us received many technical questions not only on climate change but on the geology and geomorphology of glaciers as well, thus adding value and a scientific significance to the artistic quality of the images. This experience may be further stimulated within the research community, also to keep track and record of the fast changes occurring in the global glaciers, as well as finding among our pictures other themes to be exposed in similar exhibitions.

We added such considerations to clarify the originality of our contribution. We also added that the exhibition is now permanent in OGS premises, visible to all our visitors and collaborators.

Balog, J. (2012) *Ice: Portraits of Vanishing Glaciers*, Rizzoli, 288 pp.

8) *Is the language fluent and precise?*

It has to be improved. The overall style of the entire manuscript is too informal and double-check typos and grammar errors over the entire manuscript is strongly suggested.

To ensure an adequate level of English, we used a professional English editing service to improve the overall style of the final version of the manuscript.

9) *Are the number and quality of references appropriate?*

Yes. The topics related to climate change are usually well referenced in the manuscript. Also, science and communication have some references. I suggest adding a reference to the European Agenda 2030 and the Goals for Sustainable Developments in paragraph 1.

Thank you for this note. We added in the manuscript the following reference :

United Nations: *Transforming our World: The 2030 Agenda for Sustainable Development*. A/RES/70/1 41 pp., 2015.

<https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>

We also referred to the SDG n. 13 “Climate Action”, specific target 13.3 “Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning”, addressed by our exhibition.

Reviewer 2 Mariele Neudecker

Dear Dr. Neudecker,

We kindly acknowledge you for your time, the critical reading of our work, and the valuable comments, criticisms, and suggestions that have been of help in improving our manuscript. In the following, we reply to your comments, point by point.

1) *I would imagine that this text would include some more detail and comparison of the subject and also of the urgently needed steps for us all to take. It is one side of the issue to document “so-called: vanishing beauty”, it is really key to also to show the other side and document the wrong-doings of humanity, for example, the way food gets produced, handled, shipped and distributed; also the way we deal with waste of our products, etc. transport and travel, etc.*

Our concepts of world and environment must necessarily change for a new coexistence of human society and nature. OGS is significantly involved in educational and outreach activities aimed at increasing public awareness about the environmental impacts in the ocean (e.g., pollution, plastic, overfishing) and we choose to use different communication strategies to convey this message. The purpose of this particular exhibition was to attract the interest of the general public to environmental problems and, in this case, not to teach and disseminate good practices for our everyday life, what we do on other occasions.

2) *I would look at, for example, the organisation Project Pressure and make various international comparisons as there are various groups doing this kind of documentation. Compare notes?! E.G.: <https://www.project-pressure.org/> (quote from the website: Since 2008, Project Pressure has been commissioning world-renowned artists to conduct expeditions around the world for the purpose of creating an exhibition visualising the climate crisis.) It would be good to show awareness of this and see the bigger picture in the thesis and investigate that in a critical way.*

Thank you for your valuable suggestion and your personal involvement in such an exciting project. Art and science events, as you point out, are not a novelty and we are aware that several photo exhibitions have been organised during the last years by professional photographers and artists within projects devoted to enlarge the public awareness on this theme, using the art to strengthen the message (e.g., <https://sulletraccedeighiaccai.com>, <http://www.project-pressure.org>). As additional examples of initiatives aimed at integrating art and science, we will also include the Extreme Ice Survey program (<http://extremeicesurvey.org/>), which produced a photography book (Balog et al., 2012) and a documentary film, “Chasing Ice” (<https://chasingice.com/>), winner of an Emmy Award in 2014. We added citations to all these activities in the manuscript, and we better clarified that it is unusual for scientists to organise exhibitions, as we did, making available the materials collected during scientific campaigns for study purposes different than the themes of the exhibition, thanks to the personal sensibility of the authors of the pictures. Some other online collections of pictures from scientists are available, but the archives are known (and accessed) mostly by the scientific community only and not public at large (e.g., https://nsidc.org/data/glacier_photo/, https://www.usgs.gov/centers/norock/science/repeat-photography-project?qt-science_center_objects=0#qt-science_center_objects, <https://imageo.egu.eu/>).

A different example is given by the way some scientists succeed in visualising their data, so to make them almost artistic: it is the case of Ed Hawkins (National Centre for Atmospheric Science at the University of Reading - <https://earth.gizmodo.com/this-climate-visualization-belongs-in-a-damn-museum-1826307536>), Antti Lipponen (Finnish

Meteorological Institute- <https://earth.gizmodo.com/a-new-visualization-turns-global-warming-into-pop-art-1828625479>). Our goal was to fill the gap between research and society: the exhibition becomes the way to bring scientists closer to the public, and precisely, adult people, in working age, in an environment extraneous to science. The venue was chosen among the places not usually used for scientific dissemination activities as the ones used for Science Cafè or conferences, but it was the hall of a chamber of commerce usually crowded during working hours. We also wanted to talk about science, describing where the photos were taken, in which conditions, for which specific research project. Some of us received many technical questions not only on climate change but on the geology and geomorphology of glaciers as well, thus adding value and a scientific significance to the artistic quality of the images. This experience may be further stimulated within the research community, also to keep track and record of the fast changes occurring in the global glaciers, as well as finding among our pictures other themes to be exposed in similar exhibitions.

3) *The loss of mass with glaciers would be important to visualise, hence to show some in comparison would be essential?*

We agree with you that having the photo comparison of the same glaciers over the years is of high communication impact (as already done in other initiatives, as <https://sulletraccedeighiacciai.com> or “Chasing Ice” - <https://chasingice.com/>)).

As our exhibition is an a-posteriori collection of photos shot during short term scientific OGS campaigns for study purposes different than the time-lapse documentation of melting glaciers, we could not document the transformation over the years of the different places. However, we believe worth exploiting the large number of OGS’s photographs to witness the grandeur of a landscape that is in danger of extinction. We will better clarify this point in the manuscript.

4) *Somehow the last sentence is asking for more: we need to see the climate crisis, we need to understand the problems and we all need to be aware what to do, what is it to do first? I am saying this provocatively I hope, as a lot of us do know, and still don’t do it.*

Disappearing of glaciers is a piece of striking evidence that global warming is happening here and now, and will (probably) profoundly affect how our entire society will function in the future. Global warming is an entity of such vast temporal and spatial dimensions, so interconnected with all human activities, that seems to defy not only our control but also our understanding. Our concepts of world and environment must necessarily change for a new coexistence of human society and nature. Communication activities as our exhibition and other actions we, at OGS, and others are doing, are essential to highlight the problem and make it relevant to the general public. The debate about climate change communication strategies is still active, and catastrophic frames are controversial (see Public Understanding of Science 2019, Vol. 28(4) 401–416).

The exhibition project is still ongoing: pictures are now exposed at OGS premises, and our colleagues are encouraged to collect new material during scientific expeditions to propose updated versions of the exhibition. In future events, we shall try to further involve the visitors, through short surveys, aimed to verify whether the message has passed, and the awareness level has increased after visiting the exhibition.

We added these considerations in the paper.

“Focus on glaciers”: a geo-photo exposition on the vanishing beauty.

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Abstract. ~~The encounter of scientific~~Scientific research, respect for the environment, and passion for photography ~~created, throughout the years, merged into~~ an exceptional heritage of images ~~shot~~collected by ~~the~~ researchers and technicians of the National Institute of Oceanography and Applied Geophysics -OGS-. ~~The images were taken during the past~~ scientific expeditions ~~conducted~~ all over the world. ~~The OGS researches to widen scientific knowledge~~ in the fields of ~~Earth~~earth and ~~Ocean Sciences, to widen the scientific knowledge~~ocean sciences, to raise ~~the~~ environmental awareness and conservation of natural resources, and to mitigate ~~the~~ natural risks.

In this paper, we describe ~~the exposition of artistic pictures that we set up a photographic exhibition organized using some of the OGS images~~ to draw ~~the public~~ attention ~~of the general public~~ to the ~~striking~~ effects of global warming.

~~In our exhibition~~ In the artistic images displayed, the glaciers ~~run~~were the ~~performance, with the~~protagonists. Their infinite ~~grey~~greyish-blue ~~shadows, the shades and impossible~~ shapes, ~~were~~ worthy of a great sculptor, ~~and the contact boundaries with rocks or with the rock or the sea, were~~ sometimes sharp and dramatic, ~~and~~ sometimes so nuanced ~~to appear as that they looked like~~ water-~~colour.~~ colours.

The beauty of the images ~~attracts~~attracted the attention of the public ~~onto~~ unknown realities ~~and allows, allowing~~ us to document the dramatic retreat of the Alpine glaciers, and to show the majesty of the Arctic and Antarctic landscapes ~~jeopardised by the climate change. Glaciers, which are, in fact, almost all in a negative mass balance, and with fated to vanish under the present climate warming trend, they will vanish.~~

~~The choice of the exhibition location allowed us to reach a broad public of working-age adults, who are difficult to involve in outreach events.~~ The authors ~~of the images~~ were present ~~at~~during the exhibition, ~~and the visitors could satisfy their to respond to visitors' curiosity on the about~~ research issues, ~~the targets, the emotional and environmental context in which, and the pictures were shot,~~ technical details, or aesthetic choices. ~~The choice of the location allowed to reach a broad public of adults, in the working age, often challenging to reach. The paper presents a summary of this experience, of importance both for the authors and the visitors of the photographs.~~

1 Introduction

~~The route towards a sustainable world requires a profound change in the way we deal with the planet's resources, which will involve everyone: institutions, businesses, consumers and citizens will be called upon to collectively create a new model of development.~~

In September 2015, the United Nations General Assembly approved the Agenda 2030 for Sustainable Development, i.e., a plan of ~~actions~~action that ~~institutions, stakeholders, consumers, and citizens all countries (policy and citizen)~~ have to ~~take, over~~respect in the ~~future~~coming years, to achieve sustainable development ~~in~~by 2030- (United Nations, 2015). The Agenda 2030 is composed of 17 ~~Goals for main~~ Sustainable Developments ~~Goals~~ in areas of utmost importance for humanity and the planet. ~~The action~~Action against climate change is at the ~~heart~~core of Goal 13- (Take urgent action to combat climate change and its impacts)-, ~~and~~. In particular, target 13.3 ~~suggests that countries~~ "Improve education ~~and~~, awareness-~~raising and human and institutional~~

capacity on climate change are among the activities needed to achieve the goal: mitigation, adaptation, impact reduction, and early warning". Limiting future global warming to 1.5°C requires rapid, far-reaching, and unprecedented changes in all aspects of society, but it would imply clear benefits to people and natural ecosystems while ensuring a more sustainable and equitable society (IPCC, 2013).

AtBy the end of 2019, the interest in climate change and the dangerous effects of present global warming dangers has had become very popular/widespread. The actions of Greta Thunberg, and the movement—"Fridays for future"—Future" movement played a primary role to increase their increasing people's awareness of people and to promote the promoting public debated/debates on this issue. In 2020, it became evident that an increasing number of people are making small but effective steps in the direction of plastic and emission reduction, energy saving, and environmental protection. The so-called 'Greta 'effect' led wealthy philanthropists and investors from the United States to donate almost half a million pounds to establish the Climate Emergency Fund (e.g., Taylor, 2019). A-The idea is to spread the money widely to many groups in relatively small increments for small but effective actions. However, just a couple of years ago, this topic was not the case. Even if there was a mostly ignored, notwithstanding the already high consensus of over 80% among scientists on/about the anthropogenic impact on global warming (AGW), the public opinion was not aware of such a large percentage. Hence, the it or denied its existence. The primary reason for denying/inducing people to deny AGW in/during public debates was the apparent lack of agreement of the/between scientists (Cook et al., 2014/2016, and references therein). The We recognize that the problem of communication between scientists and the general public is an essential issue in many science fields. The recent paper of Lacchia et al. (2019) analyses/analysed the difficulties for their communication between geoscientists to communicate to and non-geoscientists. It results that According to the general study, public is opinion about geosciences often more focused/focuses on the negative environmental impacts of the geoscience issues/geosciences activities (e.g., energy supply, mineral resource exploitation) rather than on their role, essential to energy supply, but also environmental protection. Therefore, the authors suggest to the in developing basic knowledge on our planet and for environmental protection. To overcome such prejudices and in agreement with the recommendations for science communication (Dahlstrom, 2014), Lacchia et al. (2019) recommended that other geoscientists to also include their feelings and affect, such as, e.g., their motivations for their/the research, when outlining the impact of their own studies on knowledge and society to reach a broader audience in agreement with the recommendations for science communication (Dahlstrom, 2015). Effective communication with a large audience can ensure the broad support necessary for policy-makers to take the necessary actions; once they are convinced of the firmness of the scientific results (Liverman, 2008). The combination of Science/science and Art/art is becoming increasingly popular to improve/for improving the ways/connection between science is communicated to communicators and the public (e.g., Malina, 2010). Among the various communication strategies, photography is a practice of straightforward communication to that is able to easily catch the interest of the public on critical questions easily. Photography. Furthermore, photography is the perfect combination of art and science; because it naturally attracts people from all walks of life for all with different reasons/backgrounds or motivations. The proliferation of smartphones and software applications dedicated to image editing has made taking photos a big part of photography a common gesture in our lives. Every image can be seen/appear differently by various people, creating to the observers, eliciting emotional responses in the viewer. Great. Impressive photos can come/derive from either a scientific or artistic approach, but "great photos often come from a combination of both art and science" (Stone, 2017). The creation of the image/a photograph requires emotion and imagination, but/although creativity and beauty can be engineered in post-production using editing software and the knowledge gained from studying what people like. Great photos often come from a combination of both art and science (Stone, 2017). Several photo exhibitions have been organized during the past a few years by professional photographers and artists worldwide in the framework of specific

projects devoted to enlarging public awareness of the climate crisis by using the art to strengthen the message (e.g., Macromicro non profit Association, 2020) or to create an eye-opening performance to incite social and political change (e.g., Neudecker and Project Pressure Partnership, 2015). Other initiatives focused on integrating art and science, such as the Extreme Ice Survey (Balog et al., 2012; 2019), which produced a photographic book and a documentary movie that won an Emmy Award in 2014 (Chasing Ice, 2020). Online photographic collections from scientists are available through specific projects, such as those managed by the National Snow and Ice Data Center (2020), which is supported by NASA and the National Science Foundation (NSF) or by the USGS Northern Rocky Mountain Science Center (2019), which is focused on Glacier National Park. Another photographic repository collected by scientists is managed by the European Geoscience Union (EGU, 2019). Every year, during the EGU General Assembly, after a contest to choose the most beautiful photo, the photos with the most votes are granted, printed and freely distributed as postcards to reach a wider public and show the beauty of our planet.

Hence, considering the large number of pics taken during OGS various scientific surveys, many in the polar areas, and following the recommendation of the Agenda 2030, we thought it could be an excellent opportunity to set up Drawing on the rich image collection of the OGS, which is scientifically engaged all over the planet, we decided to organize a photographic exhibition focused on the glaciers and ice sheets distributed at different latitudes to convey a strong message to the public on the devastating effects of climate change-

Since the polar areas on our planet, which aligns with the recommendation of the Agenda 2030, and their particular with the already mentioned specific target 13.3 of the Sustainable Development Goal n. 13, "Climate Action".

Ice sheets in polar areas and mountain environments at high altitudes (glaciers above 2500 m) have been shown to react particularly rapidly to the present climate changewarming (Shepherd et al., 2018; 2019), we focussed2020). For this reason, we specifically focused on images of glaciers, ice caps, and icebergs as an efficient way of communicating to communicate the perception of the fragility of that such environments, which are presently jeopardised by climate changes. The originality of our exposition, compared with the ones mentioned above, is that the authors are scientists involved in scientific activities during research cruises and not professional photographers. Our goal, in fact, was to close the gap between research and society: the exhibition became a way to bring scientists near the public, and specifically, working-age adults, in an environment, jeopardised by the climate changes, usually unrelated to science. The images were taken during the scientific research activity or activities on research vessels or in the field activities, and they reflect the intimate attitude of the person and the sense of wonder of human beings in front of the supreme beauty of nature and, combined with the artistic side of the scientist. During the exhibition, the visitors could were able to satisfy their curiosity on the research issues aspects, the context in which the pictures were shot, collected, the technical photographic details, or and specific aesthetic choices. This paper presents a summary of this experience, of importance which impacted both for the authors and the visitors.

2 OGS mission and strategic view

The National Institute of Oceanography and Applied Geophysics - OGS is a public research institute sponsored supported by the Italian Minister of University and Scientific Research (MUR). The institute is active in the research fields of geosciences of the solid earth and oceans to widen the increase scientific knowledge, to mitigate geohazards, exploit and conserve natural resources, and raise the environmental awareness and conservation of natural resources, in from a sustainable development view, and to mitigate geohazards perspective. The OGS employs a staff of approximately 300 people, and it promotes researches research through the joint use of its main research infrastructures infrastructure (i.e., research vessels and an aircraft, monitoring networks, aircrafts and onshore and offshore monitoring networks).

Due to its long-term collaboration with the energy industry, the OGS developed high-technology competence and skills in acquiring, processing, interpreting, and modelling onshore (surface and

borehole) and offshore geophysical and oceanographic data. The ~~OGS~~ interdisciplinary character ~~gives precious~~ of the OGS has allowed it to produce fundamental contributions to the challenges of the present time. In particular, ~~both in global~~ OGS research activities have enabled assessment of the ~~past~~ and ~~local change studies enables assessing the~~ current and ~~past~~ state of the environment to define future scenarios, considering natural forcing and human activities, ~~also exploiting and to exploit~~ the most advanced computing technologies for climate model data production and analysis. ~~Analogously, at the various disciplines contribute~~ local or global scale. Further, multidisciplinary studies contributed to the ~~studies and activities related to one of the~~ definition of strategies to reduce the greenhouse effects: ~~the of~~ CO₂ through its sequestration in geological storage.

In agreement with the general principles of the European Charter for Researchers and Code of Conduct, the OGS is extensively engaged in dissemination and communication activities. The OGS ~~strategy of~~ communication ~~strategy~~ includes ~~organizing the organization~~ and ~~participating participation~~ in public events to maintain ~~an open~~ dialogue with ~~the~~ stakeholders, ~~the~~ citizens, and ~~the~~ young people and to share knowledge and outcomes ~~that may be in support of help to~~ society. ~~Among these, several dissemination events were performed within international initiatives, such as the European Researchers' Night, the Pint of Science Festival, or local initiatives, such as the Trieste festival of the scientific dissemination (NEXT), or appointments with science in the historical Cafè of Trieste.~~

3 ~~The visual~~ Visual communication and the exhibition

The main elements of the communication process derive from ~~Shannon's the models of Shannon~~ (1948) and ~~Berle's Berlo~~ (1960) ~~models. They~~. The main elements are ~~the~~ sender (the person transmitting the message), ~~the~~ receiver (the person receiving the message), ~~the~~ message (the communication subject), ~~the~~ channel (the communication vehicle), and ~~the~~ context (where, how, and when the message is sent). The ~~general~~ difficulties of the scientific community ~~to communicate in transferring~~ their research results and ~~consequences insights~~ are well known. ~~This, and this~~ is particularly true when the *message* concerns ~~the~~ environmental ~~problems, issues~~ and ~~communication~~ is addressed to the general public or ~~the~~ political class. ~~The~~ ~~photographie~~ Photographic books and ~~photographie~~ exhibitions ~~are a provide~~ precious ~~opportunity for support to convey~~ knowledge because they allow ~~observing the images with slow to be observed and pondered~~ more ~~reflective reading time. The photography, as slowly. Photography, which is~~ a *channel* of communication, uses a universal language that can reach a large number of people, especially ~~in our days, where today, when~~ the bulk of the information ~~passes is mainly conveyed~~ through images. Indeed, photography is much more immediate than ~~a~~ text, and it provides a quantity of information that can be perceived at one glance, and ~~that can~~ be quickly memorized. Therefore, we ~~considered identified~~ photography as ~~an~~ powerful and efficient *channel* ~~to communicate for communicating~~ the need ~~for protecting the environment, jeopardized to protect~~ specific environments that are strongly endangered by global change. ~~When selecting~~ During the ~~picture selection of the photos~~ for the exhibition, ~~we preferred preference was given to~~ high-quality ~~pictures images~~ evoking emotions on ~~the~~ natural beauty that could be lost, ~~more than document in time-lapse the same scene to show the ice melted with time. We aimed to transmit a positive message of hope that something we can still do to reduce the climate crisis. On the other side, we could not document the transformation over the years of different places, as photos were often shot during unique short term scientific campaigns.~~

Among the elements of visual communication, the *context* is as important as the *message* and the *channel*. In our case, the photographic exhibition was set up in a ~~public place very passed through. This choice of location allowed us popular, often crowded workplace~~ to reach the ~~widest range of visitors, including~~ working-age ~~public (18-64 years), involving~~ people ~~that who~~ generally do not attend public conferences or other dissemination events. The exhibition ~~itself~~, intended as ~~a union an ensemble~~ of multiple images ~~, each of which~~ of easy and quick ~~perception, produces a strengthening of reading, strengthened~~ the *message*, even ~~in the face of a fleeting passage as it can be in the public place, we have chosen through a short, often rushing view.~~

4 The exhibition

The photographic exhibition “Focus on glaciers” took place in Trieste ~~in~~ during October 2016, in the lobby of the early-XIX century neoclassical palace, initially ~~the~~ seat of the ~~Stock Exchange~~ (stock exchange established by Maria Theresa of Habsburg), and now headquarters of the Trieste Chamber of Commerce. ~~The venue was specifically chosen to attract people who cross the lobby daily for work activities.~~ The exhibition was scheduled among the public events ~~offoreseen for~~ the *Settimana del Pianeta Terra* (Figure 1), ~~(in English The Week of the Earth planet), an Italian Planet,~~ Figure 1), a scientific festival ~~that through events diffused all over the spread throughout the~~ Italian territory, ~~aims aiming~~ to promote ~~the~~ geosciences and to increase ~~public~~ awareness for the reduction of ~~the~~ natural risks. The ~~pictures of photographs for~~ the exhibition were selected after an OGS internal call to collect ~~photos images~~ focused on glaciers, ~~shot acquired~~ during scientific expeditions and field trips in the polar areas, or other ~~relevant~~ regions. Indeed, the OGS researchers and technicians, throughout the years, collected an exceptional heritage of ~~pictures, working as both scientist and artist. high-quality images.~~ For each ~~shot, with the time and scientific context,~~ ~~photograph,~~ the authors had to provide ~~their motivations the information about the place, the year and season, the scientific context,~~ and a comment, ~~on the motivation, emotional context, and technical details.~~ A committee, formed by geoscientists ~~expert who were experts~~ in photography and ~~with~~ communication skills, selected the ~~photos best suited to images that were most suitable for~~ the exhibition, following the principles expressed in ~~chapter~~ Section 3. Aesthetic and technical criteria ~~lead mainly guided~~ the choice of the ~~pictures, and photographs, but~~ particular attention was also paid to the message that the image could convey to the ~~public. The pictures of the showing were 26, partly receiver. The committee received 130 photographs, from which 26 images were chosen for the exhibition, corresponding to approximately 20% of the original photographic set. The photographs mainly illustrated the two polar regions, but also from as well as the Alps and other mountainous regions. The exhibition was freely accessible to whom every day attends or works at the the Chamber of Commerce. Commerce’s visitors and employers and therefore to working-age adults (18-64 years). At the exhibition opening and, as well as on the occasion of some other conferences related to the Earth Planet public event, the authors of the photos photographs were present, and direct interaction directly interacted with the public was possible (Figure 2). In the following, we present the areas where the pics were taken, grouped in two main domains: the polar regions, and the mountain chains (Figure 3). In the following, we present the areas where the photographs were taken, grouped into two main domains: the polar regions and mountain chains (Figure 3).~~

4.1 The polar regions

Polar amplification –(i.e., ~~a more significant the exacerbated effects of~~ climate change ~~near at~~ the poles ~~than in with respect to~~ the rest of the hemisphere–) has been ~~well~~ documented ~~in within~~ climate change studies, ~~through~~ both ~~from~~ historical and instrumental observations and model simulations ~~and its.~~ The causes ~~of this effect~~ are still a matter of discussion (see Stuecker et al., 2018 2019, and reference therein). In Antarctica, ~~from 1992 to 2002,~~ the total average ice loss ~~per year~~ was 43 gigatons ~~per year during the 1992–2002 decade,~~ but ~~from 2012 to 2017,~~ it ~~has sharply~~ accelerated to an average of 220 gigatons per year ~~from 2012–2017~~ (Shepherd et al. 2018). The Arctic region is warming even ~~faster more rapidly:~~ the Svalbard Archipelago, ~~which is located between 74° and 81° north latitude,~~ has experienced the fastest air temperature increases in ~~recent the last three~~ decades (Nordli et al., 2014), and climate model projections ~~show showed that~~ this trend ~~will keep going would continue~~ until the end of the XXI century (Førland et al., 2012). ~~Further, it has been estimated that 2011). Consequently, the accelerated mass loss of the glaciers in western Svalbard are losing mass at an accelerating rate, which implies implied~~ an increased contribution to sea level (Kohler et al., 2007; Nuth et al., 2010). In a few years, the Arctic sea ice will disappear during the summer ~~months season,~~ opening new ~~commercial and tourist~~ routes ~~through the North Pole:~~ the routes from the Far East to Europe can be shortened by sailing along the

Siberian coast instead of via the Suez Canal. ~~The~~ Furthermore, easy access to the Arctic ~~Sea also~~ makes Ocean will make the large oil fields ~~beneath its waters of this area~~ very attractive, ~~although with the additional potential environmental risk represented by their exploitation can pose high environmental risks. The~~. On the other hand, the exceptional melting ~~and retreat~~ of the ice shelf in the Ross Bay in Antarctica, ~~testified~~ documented by the OGS researchers in 2018, enabled the acquisition of ~~data in~~ important information in unexplored areas ~~never explored before. However, the~~ that were inaccessible during the past years. The white ice coverage in polar areas, either as sea ice or continental ice sheets, helps to regulate the Earth's climate, by reflecting ~~more of the Sun's most solar energy~~ ~~into~~ back to space ~~than does, whereas the~~ dark water. Without sea ice, Earth absorbs ~~more~~ oceans/seas absorb most of the solar radiation, ~~implying an even warmer further contributing to Earth and~~ climate- ~~warming~~. Earth's climate warming affects not only ice extension and glaciers but also human lifestyles. In particular, Nordic peoples, such as ~~the~~ Eskimos, risk seeing their livelihoods strongly compromised, and animal species such as ~~the white bear~~ polar bears are threatened with extinction (Giovannini and Speroni, 2019), ~~while the~~. The Svalbard Global Seed Vault (~~a, which hosts and protects world seed bank varieties~~ to prevent accidental loss of diversity), is now in potential danger.

4.1.1 Antarctica

The OGS has ~~researched~~ continuously developed research in Antarctica ~~continuously~~ since 1988; with funding from the *Programma Nazionale di Ricerche in Antartide* ~~or~~ (PNRA, ~~directed by~~), ~~through~~ the MUR and from Europe within the ~~programs~~ programmes of the *Scientific Committee for Antarctic Research* (SCAR) ~~and the International Arctic Science Committee (IASC). High~~. OGS researchers and technicians have developed considerable skills in the geological, geophysical, and biological fields ~~have matured~~ during many geophysical/oceanographic/geological research campaigns in Antarctica with the research vessel (~~R/VRV~~) OGS-Explora, ~~or with the RV Italia, and~~ other research vessels. ~~In~~ belonging to OGS's international partners. During 2019 ~~the~~, OGS acquired the ~~R/V~~ "RV "Laura Bassi", ~~ruled~~, an icebreaker class ICE 05 E0 that is managed in cooperation with the *Consiglio Nazionale delle Ricerche* (CNR) and the *Agenzia Nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile* (Enea). ~~Still~~ ENEA). Furthermore, the OGS participated ~~to~~ in several onshore international projects ~~on the plateau,~~ in remote field operations, at the Italian Bases (Mario Zucchelli and Concordia), ~~and ruling;~~ in collaboration with the Argentine Antarctic Institute, ~~it has managed~~ the Antarctic Seismographic Argentinian-Italian Network since 1992 (Russi et al., 2010).

~~In~~ During Antarctic campaigns, ~~the~~ expeditions on research vessels, researchers ~~and~~ technicians, and crew stay on board for ~~about~~ approximately two months, ~~and~~ sharing every moment of life during data acquisition and convivial breaks. They bring home the feeling of a magical experience despite the often harsh environment and the hard work, together with ~~data or samples, they bring home~~ many ~~pictures~~ photographs of the beautiful landscapes ~~met~~ crossed during the cruise or the fieldwork. Our exhibition included ~~pictures~~ images from the XXI, XXVIII, XXIX, XXX, XXXI campaigns to Antarctica (Figure 3a, Figures 4-7). The icebergs, seracs, and cliffs of ice fronts ~~are~~ were the main ~~characters~~ photographic subjects (Figures 4-6), with the alternation of white snow and ice and blue ice, ~~due to~~ generated by the ~~compaction and~~ compression of the air bubbles, ~~with snow and white incorporated in the~~ ice (Figures 4a, d; 5; 6a-c). Figure 7 shows the ~~single~~ sole animated subject of the whole exhibition: a lonely, small penguin drifted on an iceberg, in the ~~mid~~ middle of Antarctica.

4.1.2 Svalbard Islands

The OGS started its research activity in the Svalbard archipelago ~~already~~ in 1971. ~~Then, since with~~ an exploration-seismic cruise funded by Norsk-Agip (Deluchi, 2013). Since 2001, ~~its~~ OGS researchers ~~were~~ have been involved in several research cruises (four with the ~~R/VRV~~ OGS-

Explora, but also with Norwegian, German, and Spanish vessels, also thanks to the Eurofleets (EC-FP7 project), as well as on land, within international projects (Figure 3 b), often below the umbrella of the *International Arctic Science Committee (IASC)*. The Svalbard treaty bans military activities in the Arctic, but not the research bound to mining or hydrocarbon exploration. It is this was the case of the *Paleokarst* research project funded by Industry & the Norwegian Research Council (“*Paleokarst Reservoirs: An integrated 3D approach to heterogeneity, reservoir and seismic modelling*”), jointly funded by industrial partners and the Norwegian Research Council, which aimed to study with geophysical methods the structure and physical properties of an onshore proxy of analogous to the reservoirs at depths below the Barents seafloor. Within this project, the focus was on the study of the permafrost, and the researchers were conducted research while living on a remote camp onshore (Figures 8b, d) in sight of the mouths of several glaciers (Figures 8b, d) and had to apply strategies to prevent polar bear attacks. This project was followed by the PNRA project – “*Integrated Methods to study PERmafrost characteristics and Variations In an Arctic natural laboratory (Svalbard)- IMPERVIA*”, which was another field work campaign focused on the study of permafrost (Rossi et al., 2018). Other projects focused developed offshore from the western and southern margin of Svalbard have focused on the present and past oceanographic characteristics of the Western Spitsbergen Current (the northern branch of the warm North Atlantic oceanic current) and its impact on the dynamics of ice streams (fast flowing ice on continents) and glaciogenic system, on the reconstruction of the palaeoclimate, and the paleo-Svalbard-Barents-Sea ice sheet finalized to palaeoclimatic reconstructions. Further research activities targeted the identification of biological oases associated to seepage and/or with seepage activities in relation to the presence of gas hydrates developing at the seafloor. In most of these the last two cases, the photos were taken collected from research vessels, during transfer the transfer to different study areas or sailing back to land, after several days or months spent on-board activity, often with under harsh climatic conditions, rough sea or completely blind in the thick fog or in the winter darkness, with the snowy mountains snow-covered land appearing like a mirage (Figures 8a, c; 9a, b).

During In a field camp in the Skanskbukta bay Bay (Figure 9 e), 3b, Figure 9c), with the basecamp encircled by breathtaking breath-taking mountains, with small waterfalls and creeks, the OGS researchers also witnessed several huts, as vivid memories of the human activities at the beginning of the last century.

4.2 Mountain chains: the Alps and the Rocky mountains Mountains

For During 2019, for the first time, the International Panel on Climate Change (IPCC) has released in 2019 a report on the present impacts of climate change in on the world's mountains. The world's mountain environments. The surface air temperature in Western the mountains of western North America, the European Alps, and High Mountain Asia increased at an average rate of 0.3°C per decade over recent during the last three decades, hence, therefore outpacing the global warming rate (IPCC, 2019). The snow-cover coverage duration, depth thickness, and extent reduced on decreased by an average by of 5 days per decade, especially for those at lower elevations. In From 2006–2015, the mass change of the glaciers in almost of the mountain regions (excluding the polar areas (Canadian and Russian Arctic, Svalbard, Greenland, and Antarctica)), was about approximately $-490 \pm 100 \text{ kg m}^{-2}\text{yr}^{-1}$ ($123 \pm 24 \text{ Gt yr}^{-1}$). The regionally averaged mass budgets were mostly negative (less than $-850 \text{ kg m}^{-2}\text{yr}^{-1}$) in the southern Andes, Caucasus and central Central Europe, and least negative in High Mountain Asia ($-150 \pm 110 \text{ kg m}^{-2}\text{yr}^{-1}$). Sparse and unevenly distributed measurements show have shown a progressive increase in the permafrost temperature, for example, by with a shift of $0.19 \pm 0.05^\circ\text{C}$ on average for about approximately 28 locations in the European Alps, Scandinavia, Canada, and Asia during the past decade.

4.2.1 The Alps

Between the end of the 19th and the beginning of the 21st century, the average air temperature ~~in~~ on the Alps rose by ~~about~~ approximately 2°C, i.e., more than twice the temperature increase observed ~~in~~ throughout the ~~entire northern hemisphere~~ Northern Hemisphere. Over the same period, the rainfall ~~has shown~~ mass recorded an increasing trend in the northern part of the Alps, and a decreasing trend in the southern sector.

Since the end of the ~~Small~~ Little Ice Age (around LIA, ca. 1850), ~~there has been in Europe~~, a general retreat of the glaciers in the Alps, occurred, although it was locally interrupted by two short-lived phases ~~in~~ of re-advance, which occurred during the 1920s and 1970s. ~~Overall~~ However, it has been estimated that the glacial ~~areas~~ area in the Alps ~~have~~ has been severely reduced by ~~about~~ approximately half since 1850. ~~The~~ the end of LIA and that the rate of reduction has considerably accelerated since the 1980s, ~~overall~~ especially on the southern side of the chain. According to the last cadastre of the Italian glaciers, ~~completed in~~ (Smiraglia and Diolaiuti, 2015, in), over as few as fifty years, the total area has decreased from 527 to 368 square kilometres. ~~This has led, leading~~ to the extinction of 180 glaciers. Nigrelli et al. (2015) related the recent ~~evolution of~~ glaciers glacial shrinking with the climatic variations documented by the meteorological stations, providing an accurate picture of the fast rapid regression of the glaciers, and quantifying the relationships between climate and glaciers.

However, we can ~~hypothesise~~ hypothesize that, at least in some cases, the combined action of the ~~increase in~~ temperature increase and ~~the decrease in~~ precipitation decrease that occurred after 1980 influenced the evolution of glaciers. ~~The extent~~ According to the present rate of glacier decline ~~in the face of and according to~~ the observed climatic warming trends ~~allows us to assume a further regression of glacier fronts in this sector of, the glaciers in the Italian Alps in the near future, are expected to disappear by 2050~~ (Santin et al., 2019).

In the frame of the PNRA project “Subglacial lake exploration in the Whillans Ice Stream region (West Antarctica) - WISSLAKE project, financed by the PNRA,”, the OGS researchers performed geophysical tests on the Alpine glaciers to evaluate the feasibility of the applied methods in quantifying the glacier thickness and structure (Figures 10a, b, c; Picotti et al., 2017). The geophysical methods have been used on the glaciers of the Adamello and Ortles-Cevedale massifs (Italy) and the Bernese Oberland Alps (Switzerland), as well as on the Whillans Ice Stream (West Antarctica). Many ~~site inspections~~ sites were ~~done in~~ inspected along the Alpine chain to find suitable sites for the application of ~~these~~ such techniques. The retreating glaciers ~~bare~~ bared their surface structure and crevasses, creating fascinating graphic effects (examples from ~~the~~ Mont Blanc, Figures 11 b, c).

4.2.2 Canada

The annual and seasonal average temperatures across Canada increased during recent decades, with the most significant warming ~~in~~ occurring during the winter ~~season~~ seasons. In particular, from 1948-2016, northern Canada recorded an increase ~~in 1948-2016~~ of 2.3°C compared to the 1.7°C of the whole country.

Unlike the Alps, in Canada, the precipitation averaged over the country has increased by ~~about~~ approximately 20% from 1948 to 2012 (Vincent et al., 2015). ~~Already in~~ Nevertheless, during 2007, the glaciers’ volume loss ~~of glaciers~~ was estimated as much as $22.48 \pm 5.53 \text{ km}^3 \text{ yr}^{-1}$, but such a high rate has recently ~~the retreat~~ further accelerated, ~~so that a~~ A glacier such as the Peyto Glacier in the Rocky Mountains and part of Banff National Park has lost ~~about~~ approximately 70-~~per cent~~% of its mass in the past 50 years. ~~To use geophysical methods to study the retreat of glaciers around the world, the~~ OGS researchers also performed ~~some~~ site inspections ~~also~~ in Banff National Park to further test the geophysical methods applied to the study and monitoring of glacier retreat around the world (Figure 11 a).

5 Final remarks

~~The IPCC assessed that limiting global warming to 1.5° C requires rapid, far-reaching, and unprecedented changes in all aspects of society (IPCC, 2013). Limiting global warming to 1.5° C compared to 2° C would imply clear benefits to people and natural ecosystems while ensuring a more sustainable and equitable society. The route towards a sustainable world requires a profound change in the way we deal with the planet's resources, which involves everyone: institutions, businesses, consumers, citizens, called upon to create together a new model of development. In 2020, it is there for everyone to see that an increasing number of people are making small, but effective, steps in the direction of plastic and emission reduction, energy saving, and environment protection. The so-called 'Greta effect' led wealthy philanthropists and investors from the United States, donating almost half a million pounds to establish the Climate Emergency Fund (e.g., Taylor, 2019). The idea is to spread the money widely, to lots of groups, in relatively small increments for small but effective actions.~~ **Conclusion**

The OGS exhibition "*Focus on glaciers*" ~~used the beauty of the pictures, images and the impression of majesty, and peace that the glaciers can inspire in the visitors to vehiculate~~ used the beauty of the pictures, images and the impression of majesty, and peace that the glaciers can inspire ~~in the~~ visitors to ~~vehiculate~~ transmit the message of environmental fragility and its protection. In ~~the past recent~~ years, the OGS has already participated in photographic exhibitions of research activities ~~in Trieste, for the (Night of Researchers (2013) and in Rome, to celebrate the first in Trieste, in 2013; 30 years of the Italian research programme in Antarctica (in Rome in 2015). The present one), but the Focus on glaciers exhibition was the first time that attempt by the OGS to use research pictures were used for sensitising photography to animate people on climate change themes. A critical aspect was that~~ The authors of the photographs are research scientists engaged with the arts to improve the ways science is communicated to the public, but also they were involved in offshore and inland scientific activities as well as effective actors in the artistic production, following one of the ways that means by which art and science can work together (Malina, 2010).

~~The~~), even if they are not professional photographers. The message was vehiculated that some prompt actions can still help to reduce the climate crisis was conveyed through the emotion that streamed from the pondered view of single, high-quality images, representing the beauty in danger of vanishing. beauty of glaciers.

As our exhibition was an a posteriori collection of photographs taken during short-term scientific offshore expeditions or inland campaigns, almost never in the same place, it was not possible to document the temporal transformation of the studied areas as a consequence of climate warming. However, we judged worthy of using the large number of photographs witnessing the magnificence and grandeur of a fragile landscape that is in danger of extinction. The criterion of high quality from a technical point of view, but also of quality and strong emotional impact strength, drove the accurate selection of the images. This choice was aimed to obtain at obtaining a fast and immediate reading of the message by the receivers. It is receiver. This was the case of for the collapsed icebergs shown in Figure Figures 5a, 5d, and 5d and of Figure 6a, of; the blue ice iceberg floating in the rough sea of (Figure 4d; and); or the lonely penguin of set on a drifting iceberg (Figure 7, a) as an emblematic symbol of all the animal living species in danger of extinction due to the climate crisis. The picture of Figure 8d and the graphiegraphical effects shown in transmitted by Figures 11 b, c well represent the 11b and 11c dramatically document glacier melting and the possible desolation of the future aspect landscape. The multiple vision contemplation of the 26 pictures photographs as a whole produced a strengthening of the message that the viewer perceives, perceived even in a fleeting passage in through a public, crowded place.

The Therefore, the exhibition was opened in 2016, from October 17th to October 31st (i.e., one week beyond the end of became the "Settimana del pianeta Terra" The Week of Earth planet) way to bring scientists closer to the public, taking specifically into consideration the working-age adults (18-64 years) in an environment typically unrelated to science. The location seat of the lobby of the Chamber of Commerce of Trieste was appeared to be an excellent choice: about approximately 100

people every day ~~visit~~crossed the ~~place~~location for their business, so ~~that we can~~could easily quantify the engaged audience ~~in about~~of approximately 2000 persons (~~working-age population~~) of people from different social classes, cultural ~~level~~levels, and nationalities. Moreover, during the opening of the exhibition and on the occasion of some other conferences, related to the Earth Planet public event, approximately 250 people had the unique opportunity of interacting with the authors to interact directly. ~~People typically ask how climate change will affect their life. Although with the authors of the photographs. The most common question asked addressed the modality of the ongoing climate changes and the immediate answer may be that climate change is now a crisis, the last thing to do, as a communicator, is impact on the present lifestyle. The authors had the duty to calibrate their answers in order to convey a simple but strong message without the use of complicated scientific or technical language or, worse, without making people feel powerless. The message of equal importance is: 'we have to act fast, and we can do it!'. on the action on or mitigation of the climate crisis. In contrast, the very important message to convey was the necessity of acting fast and the possibility of success. Vivid conversations occurred near the panels hosting the pictures artwork, while the visitors satisfied were delighted to satisfy their curiosity both on either the technical aspects of the research and, the development of the climate change studies, and/or the context in~~during which the geoscientists took the ~~picture, as on~~photographs, or about more technical photographic details ~~on~~such as the camera exposure, ~~or~~the eventual possible post-processing work, or aesthetic choices. Surprisingly, some technical questions regarded not only the topic of climate change but also the geology of polar areas and the geomorphology of glaciers, adding further scientific value to the artistic quality of the images.

The feedback received ~~confirmed on~~the exposition accomplished Dahlstrom's (2015) recommendations (2014) and confirmed the observations ~~of~~made by Lacchia et al. (2019) about the importance of including ~~in the~~emotional or challenging aspects during science ~~communication a touch of feeling, communications such as the research motivation, or anecdotes on the life on board or~~or descriptions related to logistics, routine duties and lifestyle in extreme contexts. ~~The exhibition "Focus on glaciers" can be considered as the first event~~We believe that the choice of showing images of environments closer to our heritage, such as the Alps, facilitated the researchers in the delicate and difficult attempt of transmitting the message that the climate crisis is a real problem affecting all of us and that each small contribution from everybody can make a difference. The slow but inexorable vanishing of glaciers is striking evidence that global warming is effectively occurring here and now, and it will probably deeply affect the way our entire society will act in the future. Global warming is an entity of such vast temporal and spatial dimensions that is so interconnected with human activities that it seems to defy not only our control but also our understanding. Our concepts of the world and the environment must necessarily change to allow new awareness and to promote a sustainable and respectful coexistence between human society and nature. Communication activities, such as the *Focus on glaciers* exhibition, and other outreach actions promoted by OGS and other institutions, are critical to highlight the problem and make it relevant to the general public. The debate about climate change communication strategies is still active, and catastrophic frames are controversial (König and Jucks, 2019).

The exhibition project is still active: the pictures are presently displayed on OGS premises, and our colleagues are strongly encouraged to collect new images during their scientific expeditions to upgrade the exhibition. This experience may be further stimulated within the research community to keep track of and record the rapid changes occurring in the Earth's glaciers. The exhibition "Focus on glaciers" can be considered the first event for the OGS of a new way of communicating for the OGS, on the themes of climate change, and or on other themes of utmost importance for our society. In this perspective, we think that Researchers can develop alternative topics on the basis of the pictures collected during routine work that can be exposed through future similar exhibitions. Moreover, adding multimedia supportsupport, also showing life-moments of the life during fieldwork or episodes related to the scientific campaigns, would be of importance to catch the visitor's attention and communicate more effectively. ~~Moreover, also showing pictures of~~In the

~~environment closest course of future events, we will further involve visitors through short surveys to us, verify whether the Alps, helps to make transmitted message was easily accessible and the researcher experiences nearer to level of awareness obtained after the ones visit of the exhibition.~~

Author contributions.

~~GR, GB and AS conceived the idea of the exhibition and wrote the paper. RGL, SP and SS read the paper and provided comments and corrections for improvements. DC and GR realised the maps of Fig. 3. GR and AS composed all the other Figures of the paper. GR, GB, DC, LF, RGL, MEM, SP, SS provided the images selected for the exhibition. PG and FP cured the installation of the exhibition and the advertising of the event.~~

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Competing interests

~~The authors declare that they have no conflict of interest.~~

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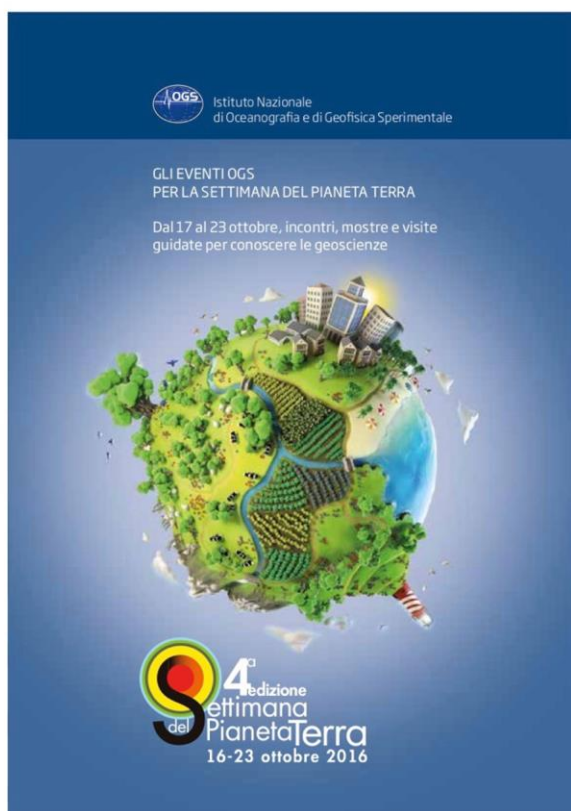
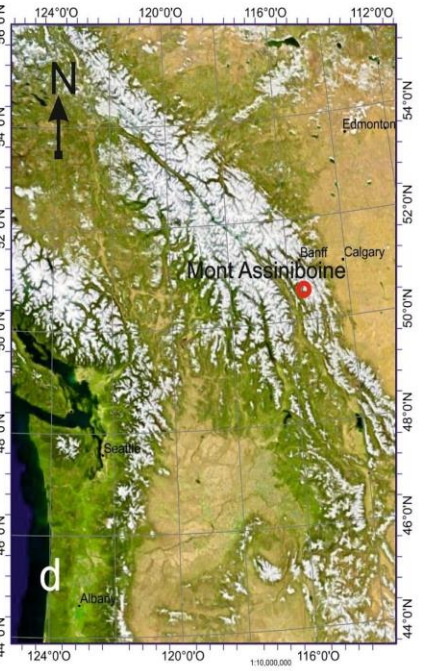
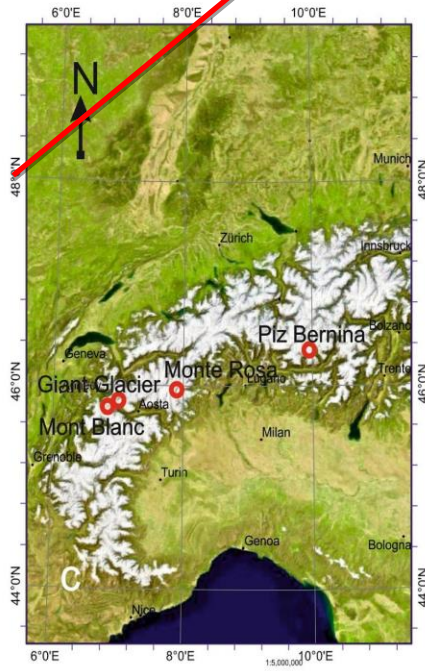
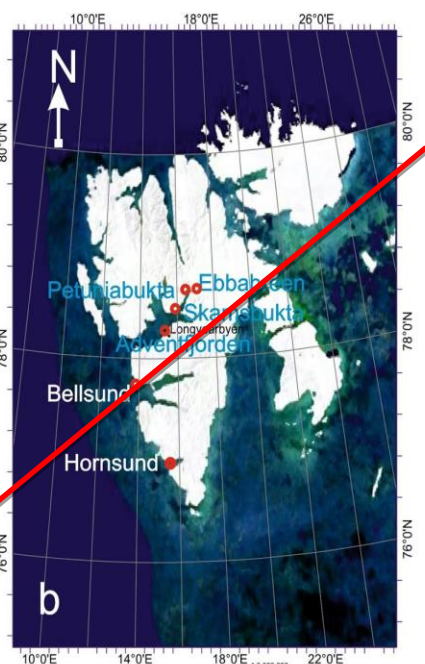
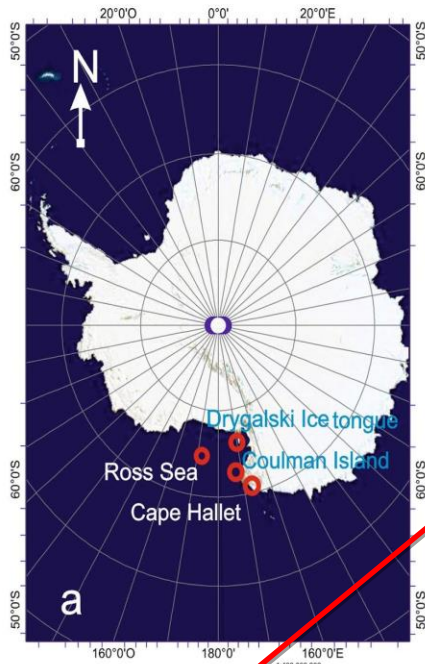


Figure 1: A sample of the flyer that [reports reported](https://www.settimanaterra.org) some of the events organized by the OGS during the Settimana del Pianeta Terra (Planet Earth Week, <https://www.settimanaterra.org>)-<https://www.settimanaterra.org>). The opening of our exhibition “_Obiettivo Ghiacciai: una bellezza che sta scomparendo”_ took place on October 17th, 2016.



Figure 2: ~~Some pics~~ Photos taken during the exhibition.



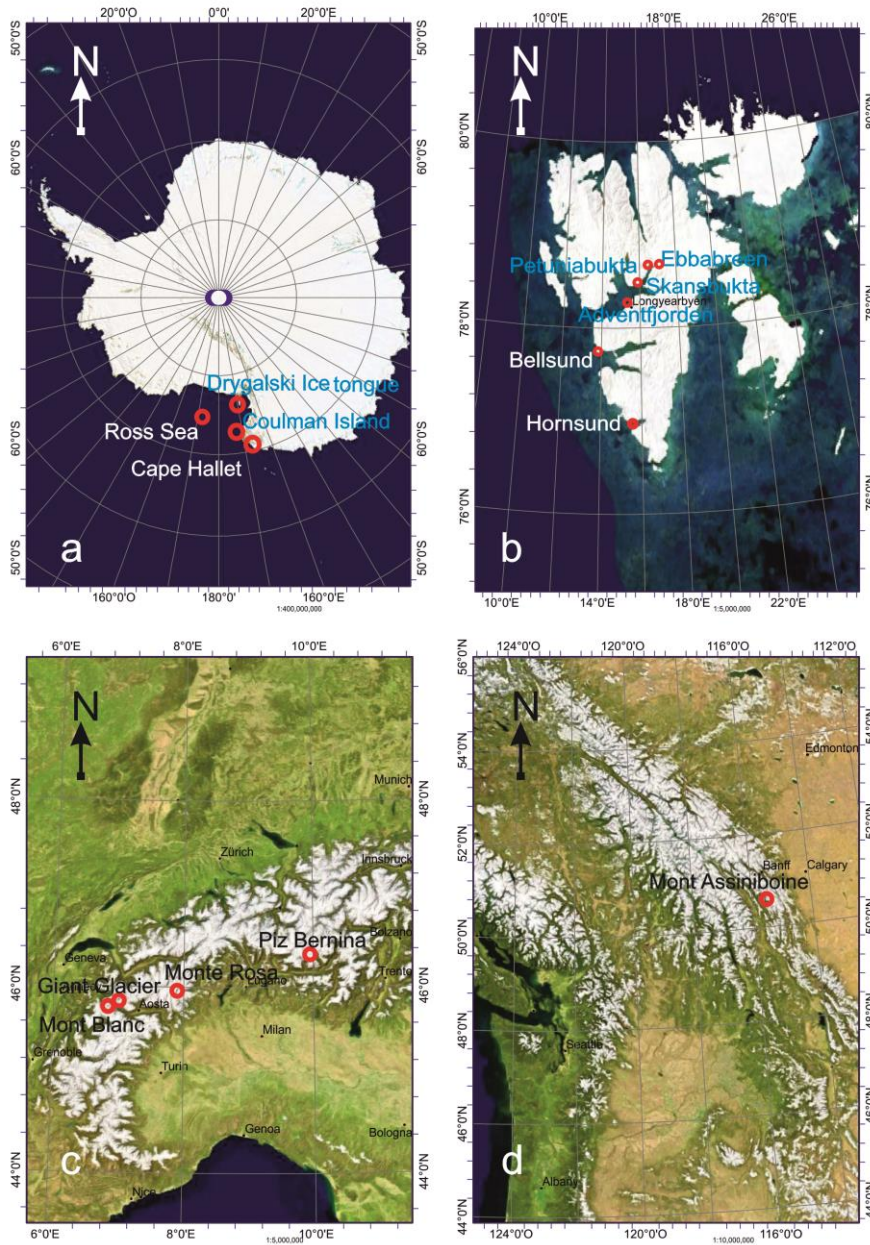



Figure 3-3: Maps of the geographical domains where the pictures of the exhibition [have been were](#) taken. a) Antarctica; b) Spitzbergen island in the Svalbard Archipelago; c) [The the](#) Alpine chain; d) [the](#) Rocky Mountain chain, in Canada (for the topography Bright Earth eAtlas base map v1.0 (AIMS, GBRMPA, JCU, DSITIA, GA, UCSD, NASA, OSM, ESRI),  AU 3.0.).



Figure 4.4: Icebergs in Antarctica. a) Iceberg, XXI PNRA Antarctic expedition, project [“Western Ice Sheet Evolution –WISE”](#); b, c) Sea ice view during the shipping (Ross Sea). XXI PNRA Antarctic expedition, project WISE; d) Floating blue iceberg (Ross Sea). XXVIII PNRA Expedition, [ROSSLOPE II project, project “Paleomagnetism of sedimentary cores from the Ross Sea outer shelf and continental slope-ROSSLOPE II”](#).



Figure 5.5: Icebergs and ice tongues in Antarctica. a) Collapsed iceberg (Ross Sea). XXIX PNRA Expedition, ROSSLOPE II project; b) Iceberg wall (Ross Sea). XXI PNRA Antarctic expedition, project WISE; c) Floating blue iceberg (Ross Sea). XXVIII PNRA Expedition, ROSSLOPE II project; d) Drygalski ice tongue (Ross Sea). XXXI PNRA Expedition, [project “*Holocene climatic fluctuations in sub-millennial recorded in sedimentary sequences expanded the Ross Sea –HOLOFERNE-project.*”](#).

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Figure 6: ~~Antarctica~~ [Antarctic](#) landscapes. a-c): XXVIII PNRA Expedition, ROSSLOPE II project. a) Iceberg stacked in Cape Hallett (Ross Sea); b) Campbell glacier detail (~~South-Western~~ [southwestern](#) Ross Sea); c) Floating blue iceberg (Ross Sea); d) Drygalski ice tongue (Ross Sea). XXXI PNRA Expedition, HOLOFERNE project.



Figure 7:7: A lonely penguin on a drifting iceberg (Ross Sea). XXI PNRA Antarctic expedition, project WISE.

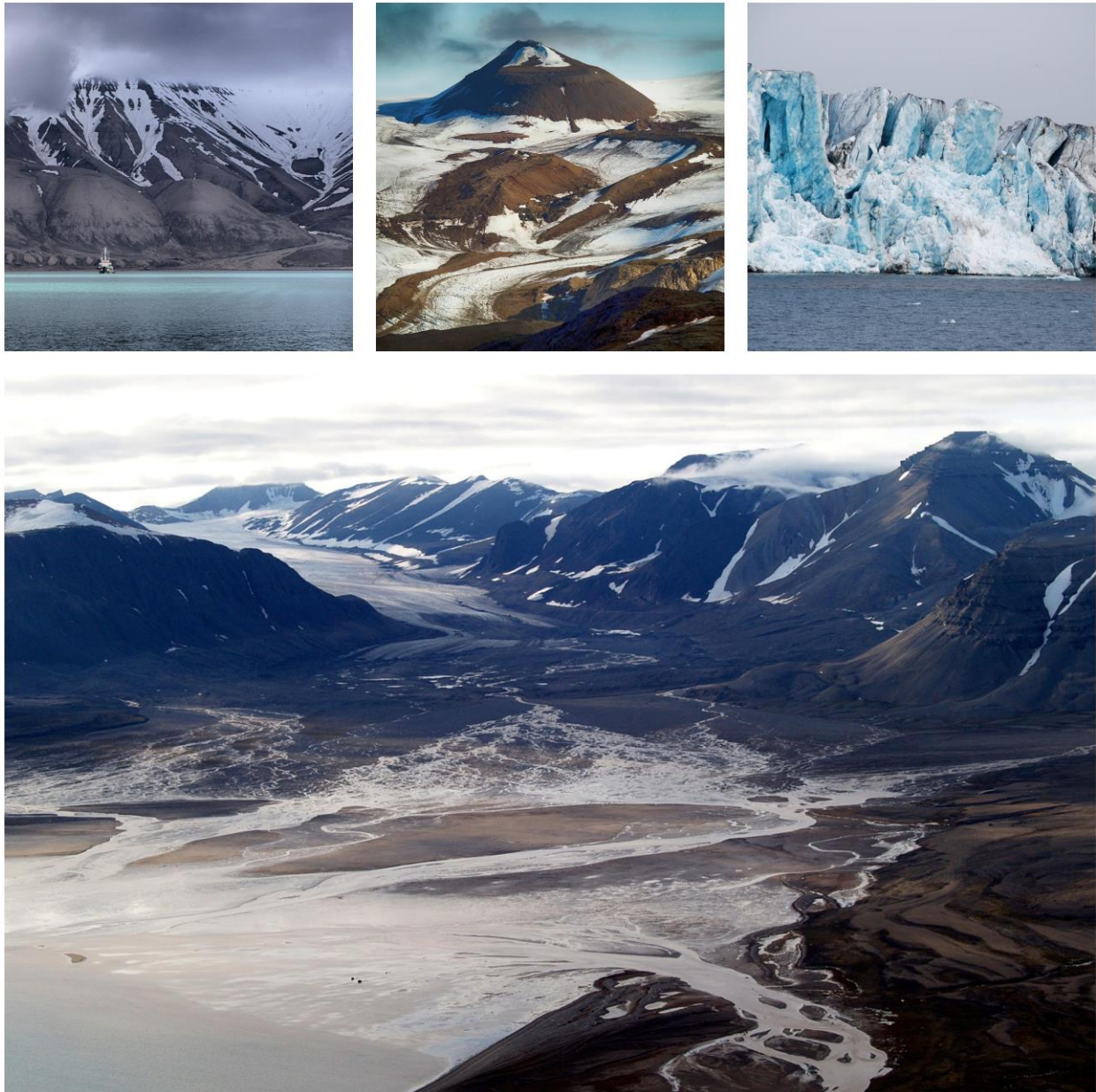


Figure 8:8: Svalbard landscapes (Svalbard archipelago, Norway). a) Longyearbyen Bay, Tundra landform. R/V Polarstern expedition PS99-1a, [BURSTEREurofleets2](#) project; [“Bottom currents in a stagnant environment- BURSTER”](#); b) A view from the Wordiekammen plateau ~~toward~~[towards](#) the Ebbabreen, with the nunatak Bastonfjellet., Paleokarst project; c) Front of the Bellsund ice stream (SW Svalbard). RV Ian Mayen 2009 expedition, [University of Tromsø-UiT-](#), [“Glaciations in the Barents Sea Area –GLACIBAR”](#) project; d) From the Wordiekammen plateau ~~toward~~[towards](#) the Petunia Bukta, with the waters ~~offrom~~ [Horbyedalen and Ebbadalen](#), Paleokarst project.

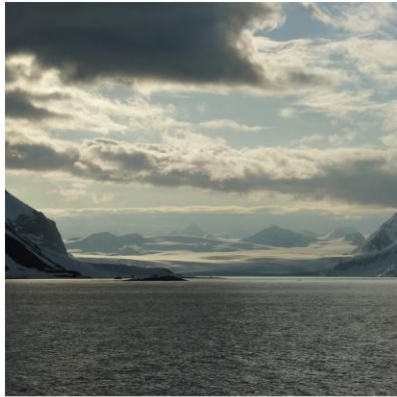


Figure 9.9: Svalbard landscapes. a) Hornsund Fjord, Spitsbergen. RV G.O. Sars, expedition 191, [*“Present and past flow regime on contourite drifts west of Spitsbergen Area- PREPARED” Eurofleets2*](#) project; b) Ice coverage of the Svalbard ~~Islands~~ [*‘Islands’*](#) northwestern coast. R/V OGS Explora, [*“Petroleum Assessment of the Arctic North Atlantic and adjacent marine areas- PANORAMA”*](#) project; c) Skansbukta Bay (on the left), Billefjorden (centre) with Bünsow Land cliffs (front). Field trip [*“Poli Arctici Skansbukta basecamp”*](#), the “Northern Rangers” group.

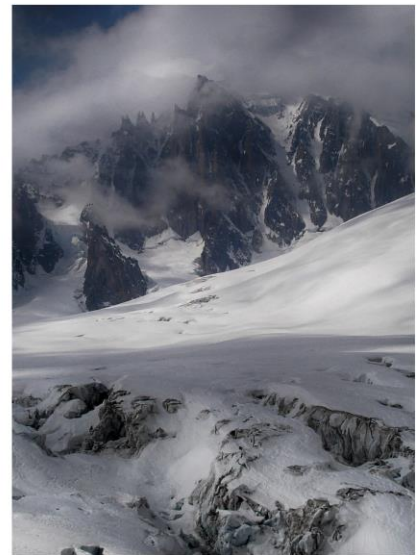


Figure ~~10~~10: Mountain landscapes. a) Piz Bernina (Italy); b, c) PNRA-WISSLAKE project: b) Monte Rosa (Italy); c) Giant Glacier, Mont Blanc (Italy).



Figure 11.11: a) A glacier on Mount Assiniboine, British Columbia, Canada. Field trip in the framework of the SEG 2009 Summer Research Workshop on “CO₂ Sequestration Geophysics”; b, c) A minor glacier in the Mont Blanc group (Italy). Field trip in the frame of the Near Surface Geoscience 2015 - 21st European Meeting of Environmental and Engineering Geophysics - 2015.