

1    **10 years with Planet Earth essence in the primary school children drawings**

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6

7    **Abstract**

8    "10 years with Planet Earth" is the title of the calendar realized in 2016 by the Istituto Nazionale di  
9    Geofisica e Vulcanologia - Italian Geophysics Research Institution - for primary school. The  
10   Calendar Competition is a project conceived to support and complement 15 years of dissemination  
11   activities with schools. We have printed the calendars for 10 years, each year with a different  
12   subject related to a World in constant evolution. Each year we have launched competitions asking

13   children to send drawings on the themes-chosen theme, to stimulate learning about Earth Sciences  
14   and Planet Earth dynamics. Our aim is raisingto raise awareness on water resources availability,  
15   prevention of natural disasters and planet sustainability. We have received about 10,000 drawings  
16   from students of more than 200400 schools. For each yearly competition, we have chosen the most  
17   significant drawings and we have included them in the calendar. The authors of the drawings have  
18   been awarded by scientists, journalists, artists and science communicators and even by a minister.

19   BeyondIn addition to the competitionscompetition, the drawings reflect impressions and thoughts,  
20   providingan opportunitytoand illustrate the children's point of view. From drawings ariseone can  
21   sense a great sensitivity, consideration, responsiveness, and respect for the Planet and a positive  
22   feeling for Science.

23

24    **1. Introduction**

25   The Istituto Nazionale di Geofisica e Vulcanologia (hereinafter INGV) is one of the most important  
26   international research Institution in the field of geophysicsandas. As part of the NationalItalian  
27   Civil Protection Service, itINGV provides importantvital support for seismic and volcanic risk  
28   mitigation programs on a global scale and for emergency management. INGV is entrusted with the  
29   surveillance of the seismicity of the national territory, the activity of Italian volcanoes and the early  
30   warning for tsunami in the Mediterranean area, through technologically advanced instrumentation  
31   networks. Particular attention is devoted to the dissemination of scientific culture and the  
32   development of aculturethe awareness of risks and prevention. INGV manages the museums  
33   dedicated to Geophysics and Volcanology - the Geophysical Museum of Rocca di Papa, the  
34   Vesuvian Observatory, the Aeolian Information Centres - and collaborates in the scientific

35 management of the Laboratory Museum of Earth Sciences of Ustica and the Volcanological  
36 Museum of Nicolosi. In these museums, ~~we planned and collaborated in the creation of INGV~~  
37 created permanent and temporary scientific exhibitions and installations (Pagliuca et al., 2007;  
38 Avvisati et al., 2015; D'Addezio et al., 2015). Furthermore, during national and international events  
39 and festivals, INGV researchers and technicians offer outreach initiatives on Earth Sciences  
40 (D'Addezio et al., 2014).

41 ; Di Nezza et al., 2018. We organize every year ~~yearly~~ educational and outreach activities for  
42 schools- (Pessina et al., 2012, Lanza et al., 2013; Musacchio et al., 2015a; 2015b, 2019; Amici and  
43 D'Addezio, 2018. The goal is to ~~responsible~~ respond to the needs and the requests of the community  
44 on issues regarding our planet, and to engage society in a correct, straightforward and efficient  
45 communication on scientific research and technological innovations. In a world that ~~requests~~ needs  
46 citizens to be more informed, aware, and able to make crucial decisions about their own health and  
47 safety, knowledge is crucial to handle doubts and take decision with consciousness.  
48 Activities Educational activities are designed to help raise awareness about Earth sciences and  
49 research ~~activities~~, as well as ~~intrigue, interest, and~~ stimulate on interest in scientific culture.

50 This work summarises 10 years of INGV's calendar competitions, and describes an experience of  
51 Earth Science education by drawings. The project, that involve scientific subject and its artistic  
52 representation by drawing, have been presented at the EGU session Earth sciences and Art. The  
53 paper describes the project and investigates the impact and effectiveness of our approach.

## 54 55 **2. The calendar projects**

56 One of the most successful INGV initiatives is the creation of ~~the school~~ calendars, designed for the  
57 schools and realized thanks to competitions among the children of primary schools. The  
58 ~~scope~~ objective is to provide a pleasant ~~stimulus~~ occasion for discussion among scientists, teachers,  
59 and students. The initiative achieved great participation and appreciation, as every year schools join  
60 in with enthusiasm by sending drawings made by children on a ~~specified~~ specific theme, different  
61 ~~each~~ that changes every year, and is chosen ~~among~~ geophysics and within the subjects of Earth  
62 ~~Science~~ subjects. Earthquakes, volcanic eruptions, tsunamis, magnetic storms and other phenomena  
63 are manifestations of the complexity and dynamicity of our planet, which began more than four  
64 billion years ago and never ended. In the past decades, ~~the problem of~~ we recognized that global  
65 warming ~~was added to~~ Earth dynamism is part of Earth's dynamism and that it will have profound  
66 impact profoundly ~~on~~ future ~~generation, wh~~ generations, although we are already called now to  
67 face facing the crises of climate change.

68  
69 spiegare

70 ~~Involving children of~~ By involving primary school children in this project ~~give us~~ we have the  
71 chance to ~~both~~ bring science ~~and school~~ closer to them and also to investigate the children's point of  
72 view ~~about~~ on the Earth, Science, Environment, and Sustainable Behaviour. Indeed, the content of  
73 children's drawings may provide insight into their feelings and thoughts about the world and ~~its~~  
74 ~~functioning~~. Drawings are the way it function. Drawing is an important activity for children because  
75 ~~they increase~~ ~~since it stimulates~~ their imagination ~~they are, and~~ an amazing way of displaying  
76 emotion. Children's drawings can tell you so much about their fears, joys, dreams, hopes and  
77 nightmares. The drawings of young children have attracted and interested many authors in the field  
78 of education (Farokhi and Hashemi, 2011; Cherney et al., 2007). ~~In our project children's drawings~~  
79 ~~represent useful tools in providing~~ The use of drawing as a tool for science teaching and learning, is  
80 described and discussed in literature (Phyllis, Eds, 2017). For examples, drawings have been used to  
81 investigate learning strategies (Van der Veen, 2012), to analyse children volcanic risk awareness  
82 (Brasini et al., 2020), and the children perceptions of Environment (Günind, 2012). In our project  
83 children's drawings may represent useful tools that provide valuable information for the assessment  
84 of children's environmental perceptions and their major expectations and concerns for the future.  
85

86 ~~With the exception of the first calendar, a launch call for the initiatives were prepared. The calls~~  
87 ~~included a brochure illustrating main motivations on the theme choose and starting points for~~  
88 ~~discussion.~~

89 ~~The collected drawings were then~~ The first calendar has been realized as a result of an educational  
90 project with a school (see the description of the 2004 – 2005 Calendar). The success of the initiative  
91 suggested the repetition of the experience, expanding to all Italian primary schools the invitation to  
92 participate. Launch calls were prepared for each competition. The calls included a brochure  
93 illustrating the main motivations behind the chosen theme and some starting points for discussion.

94 Information on the competition was spread via institutional websites, and via social media.  
95 All the INGV venues and locations contributed to the calls diffusions, even in occasion of education  
96 and outreach activities carried out in their venues. As a result, we collected drawings from schools  
97 distributed in the entire Italian territory. The first four calendar editions were organized by the  
98 INGV Settore Formazione e Divulgazione Scientifica (Training and Educational Office). Starting  
99 from the 2009 calendar, I have coordinated the competitions with the INGV Laboratorio Didattica e  
100 Divulgazione Scientifica (Educational and Outreach Laboratory).

101 For each calendar the drawing selection were managed by a working group, composed by  
102 researchers and graphic experts, occasionally with science communicators and/or psychologists.  
103 The collected drawings were selected based on their relevance to the theme, originality,

104 pleasantness of the general composition and attractiveness and, last but not least, the inherent  
105 message. For some calendars, also texts have been chosen among those sent by the children,  
106 together with the drawing. In the final selection we have considered the gender and ages balance  
107 and the uniformity in the geographic distribution of the winners.

108 The graphic designs of the calendars were ~~studied~~ developed and realized by the INGV Laboratorio  
109 Grafica e Immagini (Graphics and Images Laboratory) (Riposati et al., submitted). Each graphic  
110 project was inspired by the theme of competition and realized by taking ~~care of~~ into account the  
111 heterogeneity of drawings, realized with using different techniques, colors and subjects, and always  
112 maintaining keeping the centrality of focus on the children's work. In Educational materials produced  
113 by INGV, in addition to copies of the calendars, educational materials produced by INGV were sent  
114 to the participating schools. Copies of the calendar were distributed also to the schools participating  
115 to INGV projects and events.

116 Events were organized ~~for~~ to award the ~~awarding of the winning children~~. The winners. They were  
117 hosted in the INGV venue in Rome, with their classmates ~~whenever possible, and with their~~,  
118 teachers and often with their relatives. They received certificates and, medals, games and scientific  
119 experimentsgames, and T-shirts with the logo of the competition (Fig. 1). For the award ceremonies  
120 we. We invited scientists, journalists, artists, and science communicators, usually experts on  
121 calendar themes. A remarkable event have been occurred in October 20, 2005 at the INGV  
122 headquarter in Rome, whento the award ceremonies. Remarkably, the Italian Minister of Public  
123 Education ~~decided to demonstrate her appreciation and came to the INGV headquarter in Rome to~~  
124 support ~~for the initiative towards schools with her presence, rewarding the event in October 20,~~  
125 personally rewarding the winners.

126  
127 Fig. 1. Award ceremonies. On the right a student winner with the T-shirts made for the 2009 calendar; on the  
128 left the winner's awarding of the 2010 edition (Photos by Luigi Innocenzi).  
129

### 130 3.2. The 2016 calendar

131 For the 2016 calendar we have ~~chosen thechoose~~ drawings used in the past ~~years~~ calendars,  
132 dedicated to the Earth (Fig. 21). This initiative gave us an opportunity to reflect and, evaluate what  
133 the, and sum up the message that these ~~10 years~~ year long project can tellis communicating to the  
134 scientific community ~~on~~ regarding the relationship between children and the planet Earth.

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136  
137 Fig. 1. The cover page of the 2016 calendar made with a collage of all previous calendar covers (edited by  
138 INGV Laboratorio Didattica e Divulgazione Scientifica and INGV Laboratorio Grafica e Immagini).  
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142 *2004 – 2005 Calendar "A natural phenomenon called earthquake"*

143 The first calendar was inspired by the project "When the Earth has a stomach ache" (Burrato et al.,  
144 2004). In 2000 a small size earthquake hit a town near Rome. This event was strongly felt by  
145 teachers and students of the local primary ~~school~~school, and ~~sprang~~suggested the idea of a project  
146 focused on earthquakes. Children, who have been taught about earthquakes, can be engaged to use  
147 their artistic expressions, ~~providing information on and demonstrate~~ their awareness on ~~earthquake~~  
148 ~~property this phenomenon~~ through drawings (Izadkhah and Gibbs, 2015). The aim of the project was  
149 ~~for the children to gain knowledge of what learn about the causes of~~ earthquakes and to  
150 ~~familiarize~~become familiar with a phenomenon ~~often~~ considered random and unforeseeable.  
151 Moreover, an important task of the project was to train students and teachers to behave properly  
152 during the occurrence of an earthquake. At the end of the project ~~we the researcher team~~ realized a  
153 calendar that displays earthquakes using the kids' original drawings and texts, showing their own  
154 impressions ~~and experiences~~ on earthquake, ~~and~~ on shaking effects ~~and~~. In accordance with the  
155 ~~researchers' efforts, most students have focused on what they have learned about the simple~~  
156 behaviours that can help reduce the damage.

157

158 *Calendar 2005 – 2006 "Once upon a time there was a Volcano"*

159 Drawings of this calendar were chosen among 853 works dedicated to volcanoes. ~~From the~~The  
160 drawings ~~emerges~~show the fascination and ~~the~~ fear that the "mountains of fire" arouse in children.  
161 Month after month, children tell us the legends of the past regarding volcanoes. Hephaestus, the god  
162 of fire in the Greek mythology, that had his nether forge in the ~~inner~~interior of Etna, working  
163 alongside the Cyclopes, giants ~~having with~~ a single eye. Many drawings represented the volcano as  
164 an island ~~recalling, such as~~ the ~~homonymous~~ island of ~~Vulcano~~ in the Eolian archipelago, the  
165 dwelling of the ~~homonymous~~ god of fire ~~for~~of the ancient roman people, ~~Vulcano~~. It's from  
166 Vulcano Island itself that, at the end of the Middle-age, the mountains of fire were given the name  
167 volcanoes. Children ~~also~~ represent ~~also~~ volcanoes in their activity, ~~illustrating with the~~ damage of  
168 eruptions ~~with~~, fire and flames, housing in danger and frightened people, but also the role of  
169 volcanoes for the life of the planet with the emissions of flowers and fish from craters and the  
170 slopes of the volcano covered with vegetation.

171

172 *Calendar 2006 – 2007 "Telling the Story of the Earth"*

173 In this calendar, children drew the Earth's History and the many different living beings that have  
174 dwelled on it, showing Mother Earth's diversity and grandeur. We received 2200 drawings,  
175 illustrating the children's point of view on the history of the planet, from the origin of the Universe  
176 and of the solar system, the first forms of life, the differentiation of species in the waters and then  
177 on ~~the~~ land, with dinosaurs, ~~volcanoes~~, mammals and humans. Through the children's drawings  
178 youone con follow the story of an extraordinary adventure, a Universe full of energy, seas and  
179 oceans ~~erowed~~~~of~~crowded with life forms, with the unmissable giant dinosaurs among luxuriant  
180 vegetation, grappling with smoking volcanoes ~~and~~ luxuriant vegetation, the beginning of the human  
181 race, with human ancestors and other hominids engaged in hunting, and finally the incoming of  
182 civilization.

183

184 *Calendar 2007 – 2008 "Living with a Star"*

185 ~~In~~On the occasion of the International Heliophysical year (IHY) ~~we dedicated to the Sun~~, the 2007  
186 competition were dedicated to the Sun, "our star" (Fig. 32). Thanks to the COST269 project  
187 partnership, schools from 8 European countries - Czech Republic, Cyprus, Finland, France, Italy,  
188 Poland, Spain and United Kingdom - participated to this competition. Drawings ~~have been~~were  
189 chosen among about 1300 works. Realized in all the languages of the participating countries, this  
190 calendar ~~has~~ collected images of many suggestions ~~that~~the drawing inspired by "our star" ~~evokes~~ in  
191 children." Fantastic images were produced of the Sun, sitting in ~~the~~ space with other celestial  
192 bodies, ~~with~~ rockets and satellites, and spreading out coloured rays. ~~Drawings~~There are drawings  
193 that recall life on Earth, the ~~sun~~Sun and the rainbow and the warm rays in the beaches in summer.  
194 ~~Images~~There are images related primarily ~~to~~ the idea of energy and life ~~that~~the Sun brings with it,  
195 ~~but~~alsobrought by the phenomena related to theSun. Finally, Sun interaction with the Earth at  
196 different latitudes: eclipses, auroras, the Sun in summer and non-Sun in winter, in some cases  
197 probably inspired by personal children experiences.

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201 *2009 Calendar "The Earth of tomorrow is today in my hands"*

202 For the UNESCO International Year of Planet Earth we focused on the issue of human  
203 responsibility on the sustainability of the planet, trying to stimulate young students' ~~attention~~ in ~~but~~  
204 becoming active citizens of tomorrow. Children's relationships with nature for environmental  
205 education ~~have~~has been ~~already~~ explored using 'draw and write' methodology (Kalvaitis and  
206 Monhardt, 2012). Climate change will have multiple effects on human health and is the defining  
207 young human challenge for development ~~challenge~~ of young human in the 21<sup>st</sup> century. We

208 suggested topics on climate, oceans and seas and continental water to sensitize the younger  
209 generation aboutto the Earth beauty and the natural resources, as well as natural hazards and the  
210 relation between humans' and Earth's health. Children responded by sending drawings of  
211 rainbowrainbows, waterfalls, volcanoes and flower fields, but also with images against  
212 theshowing concern for environmental degradation and the indiscriminate use of the planet's  
213 resources, disrespectful behaviours fought. Disrespectful behaviour is sometimes with  
214 contribution of represented as fought "Superheroes" or protectors. Moreover, drawings tellingon  
215 natural environments and everyday life highlight virtuous and environmentally friendly behaviour,  
216 respect for environment and the importance of taking care (Fig. 43).  
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219 **Fig. 2.** The back cover of the 2007-2008 calendar dedicated to the Sun and realized, through a partnering  
220 of European countries in the COST269 project, in 8 languages (edited by INGV Settore Formazione e  
221 Divulgazione Scientifica and INGV Laboratorio Grafica e Immagini).

222 Laboratorio Didattica e Divulgazione Scientifica and INGV Laboratorio Grafica e Immagini).  
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226 *2010 calendar "Precious Earth"*

227 The 2010 calendar still focused children's attention on planet Earth and the effect of human activity  
228 on the Earth. We asked children to use creativity and sensitivity to design create a message, by  
229 drawing an image to promote planet Earth. The title, Precious Earth, was chosen to underline  
230 that how our existence completely depends on the planet Earth, where we have been evolved. We  
231 are part of it and will continue to be so if we manage to maintain a dynamic balance between a  
232 sustainable life and the EarthEarth's ecosystem. The alteration of the planetplanet's natural climate  
233 cycle requires calls for responsible and efficient use forin the future and in parallel the promotion  
234 and development of alternative energy sources that our planet is potentially rich in. From the  
235 collected drawings and texts emerges a great sensitivity for the issue, sense of respect for the planet,  
236 the a consciousness of its beauty and uniqueness and the sadness for activities that perceived as  
237 wrong damaging for the planet. Also from, the texts suggest the same sensitivity emerges, i.e.: *Va  
238 bene cercare un altro mondo ma se ti trattiamo bene sarà sempre bello chiamarti casa* It's okay to  
239 look for another world but if we treat you well it will always be nice to call you home. *Chiudo gli  
240 occhi e sogno un mondo pulito e nessuno alza un dito. Sogno le persone rispettose dell'ambiente e  
241 la natura tornare vincente* I close my eyes and dream of a clean world and nobody raises a finger. I  
242 dream of people who respect the environment and nature become winningbecomes a winner again.  
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245 | [Fig. 3. The back cover of the 2009 calendar dedicated to the Earth and to the today responsibility to](#)  
246 | [protect the environment \(edited by INGV Laboratorio Didattica e Divulgazione Scientifica and INGV](#)  
247 | [Laboratorio Grafica e Immagini\).](#)

248 | **2011 Calendar "I'm a Scientist too! Science and scientists from the children point of view"**

249 | In the International Year of Youth, established by the United Nations General Assembly, the theme  
250 | was selected with the purpose of giving shape to the image finding how children have of see the  
251 | world of science, scientists and research, and its potential and its future perspective, as well as the  
252 | image they have of scientists and research. Children were given the suggestions and asked to create  
253 | a drawing from three suggestions drawin: (1) How do you imagine a scientist? How do you imagine  
254 | the daily activities of a researcher? (2) What is the invention you consider the most important  
255 | among all those you know? (3) What would you invent?

256 | During the competition, 986 drawing were collected. What we got is a colorful and busy world, full  
257 | of young scientists confident in the power of science and technology, engaged in inventing devices  
258 | to make you us happy, to travel in space and time, and to solve the problems of the Earth (Fig. 54).

259 | A sample of 200 drawings have been analyzed in order to test and tune a classification scheme and  
260 | to infer some considerations of the perceived image of science, scientists and inventions from the  
261 | child's point of view (Rubbia et al., 2015). The analysis reveals a persistent gender stereotype  
262 | related to scientists, since 70% of the depicted persons were male and 45% of girls draw male  
263 | scientists. The image of a 'mad scientist', mainly related to male scientists, is still present (15%).  
264 | Female scientists are drawn by girls; they are represented as young, not crazy and are usually good-  
265 | looking. Scientists of both genders are young, and this is a positive image, in that scientists may be  
266 | perceived as closer to everyday life (Rubbia et al., 2015).

267 |

268 | **2012 Calendar "Mission Possible: let's save the world"**

269 | The theme was inspired by the International Year of Sustainable Energy for All, designated by the  
270 | United Nations General Assembly to promote research of new green technologies and to focus on  
271 | environmental problems and the future of the Earth. Our planet provides all these the resources that  
272 | have allowed life to flourish. Many of these resources depend on delicate balances and are not  
273 | unlimited. We consume more resources than the Earth can generate. Almost all of the energy and  
274 | raw materials we use to produce or build what surrounds us and what we needed to live comes from  
275 | the Earth. A land that feeds, warms and offer us beauty.

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282 In the brochure of the call we have suggested some priority for the mission:  
283 1) counteract the pollution of air, water and soil;  
284 2) stop global warming and the destruction of ecosystems;  
285 3) develop new green technologies.

286 ~~The children's~~ Children's fantasy ~~enhanced offered~~ us ~~to the~~ images of a planet with rainbows, trees,  
287 clean rivers and lakes, ~~the desire to be useful creating~~ ~~pedals~~ school buses ~~powered by~~ ~~pedals~~, eco-  
288 volcanoes, machines that convert waste into flowers. In fact, the real ~~children's~~ challenge ~~for~~  
289 ~~children~~ was ~~to draw~~ inventions. ~~Green~~ We can see green' ideas and technologies based on solar  
290 energy for high-speed ~~train~~ ~~trains~~ or pizza ovens, ~~obtaining the~~ energy ~~that comes~~ from  
291 ~~destroying~~ ~~destruction of~~ weapons or ~~by~~ harnessing volcanoes (Fig. 65). In other words, Sustainable  
292 Development that is able to meet the needs of the present without compromising those of future  
293 generations.

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298 **Fig. 4.** The design chosen for the 2011 calendar cover, summarizes the main themes present in the drawings  
299 sent by the children. Smiling scientists, confident of the potential of science, engaged in enthusiastic  
300 discoveries to improve planet life (edited by INGV Laboratorio Didattica e Divulgazione Scientifica and  
301 INGV Laboratorio Grafica e Immagini).

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305 **Fig. 5.** One of the drawing selected for the 2012 calendar. ~~In the~~ The drawing ~~shows~~ a very complex project  
306 of ~~an~~ eco-volcano, with very detailed instructions and precise statements on the low cost of the project and  
307 on the absence of pollution (edited by INGV Laboratorio Didattica e Divulgazione Scientifica and INGV  
308 Laboratorio Grafica e Immagini).

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312 **2013 Calendar "In the heart of the Earth"**

313 What ~~do~~ students of primary schools imagine there is inside the Earth? Scientists agree for a  
314 representation of the interior of the Earth, but ~~so~~ far no one has yet gone to check it. Inside the  
315 Earth, temperature and pressure increase progressively until ~~reaching~~ ~~they~~ ~~reach~~ very high values,  
316 ~~capable of~~ ~~that~~ challenge any technology known to date. We went to the moon, but we have not been  
317 able to go for more than a few kilometres inside the Earth. From the 1034 drawings we have  
318 received, the interior of the Earth is definitely very colourful and sometimes animated by turtles,  
319 butterflies and fire-breathing dragons. In some cases it consists of candy, cream and chocolate,  
320 ~~through~~ precious stones and fire ~~feeding~~ ~~off~~ volcanoes. Some drawings were inspired by legends and

321    myths alluding to the existence of underground, hidden and mysterious worlds, also inhabited also  
322    by peoplespeople and fantastic creatures.

323

324    *2014 Calendar "The Magic of Water"*

325    Water is an essential part of the Earth ~~and contributes to make unique our~~~~making~~ it a rare planet.  
326    Precious and indispensable to life, water is a wealth we are claimed to protect. Consciousness helps  
327    us to increase~~By increasing~~ awareness ~~avoiding~~we can avoid water wasting or ~~pollution~~polluting of  
328    water.

329    We received 1195 children's drawings, where water is represented in its plentiful manifestations, in  
330    the atmosphere and on the Earth's surface (Fig. 76). Placid waters of lakes and lagoons, pouring  
331    waterfalls where the sun is reflected, ~~along with~~ more troubling water that gives rise to glaciers and  
332    ice figures and polluting boats. There are also suggestive images that remind us of extreme events  
333    such as floods and very powerful rain ~~phenomena, representing, which represent~~ a sign of  
334    awareness. In fact, the understanding ~~water multiple~~of water's varied and sometimes powerful  
335    manifestations in the atmosphere and on the EarthEarth's surface, enhancepromotes a correct use of  
336    the territory and a behaviours of respect and attention towards~~for~~ the natural environment.

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340    **Fig. 76.** The back page of the 2014 calendar dedicated to the water (edited by INGV Laboratorio  
341    Didattica e Divulgazione Scientifica and INGV Laboratorio Grafica e Immagini).

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345    **4.3. Final considerations**

346    The 10 years of INGV's calendar competitions directly involved about 400 schools. In addition, at  
347    least 500 other schools have been reached by the initiative each year by receiving copies of the  
348    calendar. We have collected about 10,000 drawing. These data indicate a good level of impact of  
349    the calendar drawing competition approach. With the exception of the first calendar, resulted from a  
350    specific in presence educational activity, the scientific messages were conveyed without a direct  
351    interaction with researchers. The launch call brochures represented only a starting input. Teacher  
352    had the opportunity to organize special lessons to raise pupils awareness on the competition topics  
353    and to better develop the calendar theme subject. The interaction with researchers can be enhanced  
354    in future competitions by organizing, for the participating schools, lectures and workshops using  
355    distance learning technologies. This could more effectively convey the scientific messages to  
356    teachers and students. Moreover, a direct interaction, even if at distance, can give the possibility to

357 have a feedback on the efficacy of the initiative on raising knowledge and awareness.  
358 The organization of training and outreach activities ~~implies the analysis of can benefit from~~  
359 ~~knowledge of the~~ cognitive and emotional outcomes ~~by intercepting the experience of~~ the  
360 beneficiaries. Projects with schools and with public have been analysed in order to ~~eat~~~~h~~gauge the  
361 effects of ~~the~~ training activities and ~~the~~ motivations ~~for participation of participants~~. These studied  
362 provided information over the ~~years on the like~~~~ing~~ amount of popularity and effectiveness of training  
363 ~~proposal~~ in various contexts (D'Addezio, 2019; D'Addezio *et al.*, 2014; Lanza *et al.*, 2013;  
364 Musacchio *et al.*, 2015a; Musacchio *et al.*, 2015b). Moreover, we can ~~built~~~~perform~~ a more general  
365 analysis ~~ef~~on how the scientific message ~~is has been~~ received, ~~h~~ow ~~on the ability of~~ scientists ~~are~~  
366 ~~efficient~~ in transferring concepts, ideas, information in a correct but also captivating way.  
367 ~~Besides~~Apart from the ~~competitions~~competition, the drawings we received in ten years of  
368 continuous ~~dialogue~~activity with schools depict ~~children~~children's impressions and reflections,  
369 ~~providing and provide~~ an opportunity to ~~illustrate~~understand the children's point of view. ~~A critical~~  
370 ~~analysis of the~~In fact, children's drawings ~~should take in consideration the relation to both the Earth~~  
371 ~~Sciences and the images that surround children today. The information children have about an~~  
372 ~~environmental issue will be crucial for their mental representation. Children's drawings can thus~~can  
373 provide valuable information on the development of children's environment perceptions (Farokhi  
374 and Hashemi, 2011). ~~But how~~How do young people cope with global problems, such as climate  
375 change, ~~potentially worrying~~potential sources of worry and ~~destressing~~distress? Generally, children  
376 ~~use~~cope with worry by ~~using~~ less problem-focused ~~e~~oping behaviour and more distancing ~~to~~cope  
377 ~~with~~worry and place trust in researchers and technological development to a higher degree ~~than~~  
378 ~~adults~~(Ojala, 2012). Our analysis shows ~~the same~~that this attitude ~~can be observed~~ in the ~~children~~  
379 ~~perception~~children's drawings. In fact, ~~from the drawings and texts we have collected~~, a great  
380 consideration, a deep environmental concern and respect for the planet ~~arise from the drawings and~~  
381 ~~texts we have collected~~emerge. As ~~shown~~ in other ~~work~~experiences, children demonstrated a  
382 positive relationship with nature (Kalvaitis and Monhardt, 2012). A similar positive relation  
383 ~~emerges from our drawings~~ between children and science and scientists, ~~also emerges from the~~  
384 ~~calendar drawings~~. Science and technology are perceived as powerful tools, ~~that are~~ capable to  
385 ~~handed~~handle the continuous challenges humanity is facing. Moreover, children represent  
386 themselves as users of these tools to solve problems and improve the world. In this light, the  
387 outcome ~~we have catch from~~of the calendar project, ~~raise~~hopes~~give us~~hope that similar initiatives  
388 can contribute ~~to increase~~in ~~increasing~~ the knowledge of the Earth and ~~of~~ the fragile human  
389 ecosystem in the hearts and minds of future active citizens.  
390  
391

392 The author declare that she has no conflict of interest. Figures are from INGV publications.

393

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395

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401

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487

488 Dear Editor and Reviewers,

489

490 Please find below my point by point response (blue) to the editors' comments (black).

491 Note that the line numbers indicated in the response refer to the manuscript Giuliana\_daddezio\_revision.pdf.

492

493 Since the article has been submitted for publication in a GC special volume on Earth sciences and  
494 art , at least a commentary on how this work relates to the topic of the special issue is required in  
495 the manuscript.

496

497 **Done (line 50-52)**

498

499

500 In addition to the corrections suggested by the reviewers, the manuscript needs very major revision  
501 by an English speaking reviewer for style, grammar, and language.

502

503 **Done**

504

505 Below some detailed comments.

506

507 1. Avoid each acronym, unless you have defined it in the text (e.g. INGV, COST269)

508

509 **Done**

510

511 2. Use adjective Italian instead/together with the adjective “National”

512

513 **Done**

514

515 3. Despite you have given some hints about the dissemination activity of INGV, consider to revise  
516 it in a more focused way and to cite some of the works published by your colleagues and you in the  
517 field of education.

518

519 **Done (line 41-44)**

520

521

522 4. Reinforce -by adding more references – the state of the art in geo education by drawings.

523 Probably there is no literature on a project similar to yours (making calendar with drawings of  
524 children), but there are several general papers on educating in Earth science through drawings that  
525 deserve attention.

526

527 **Done (line 79-83)**

528

529 5. Add details about your activity: who organized the competition for the calendars? who was  
530 evaluating the drawings? which are the criteria of selection? how the invitation to participate has  
531 been disseminated to schools? there was an a priori selection of participants? How did you fund this  
532 activity?

533

534 Done (line 89-107)  
535  
536 6. Fig. 1 is not relevant for the understanding of the text and, it can cause problems for the privacy  
537 of underage children. Unless you have parental permission to publish it, please remove it.  
538  
539 Done  
540  
541 7. A table to summarize the main data (theme, how many drawings, how many schools, costs) of  
542 each calendar can be of help to have an overview of what has been done over the years.  
543  
544 This work aims to discuss the project in general. I do not believe that a detailed table can be useful,  
545 even also because for some calendars precise data are difficult to find.  
546  
547  
548 8. The number of received drawings or participating schools is a good indicator of popularity.  
549 However, you should say something about related educational activities. There have been special  
550 lessons for the pupils before or after their drawings? There was a take-home message to involve the  
551 families in the educational process?  
552  
553 Done (line 358-369)  
554  
555