

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 ~~Beyond~~In addition to the ~~competitions~~competition, the drawings reflect impressions and thoughts,
20 ~~providing an opportunity to~~and illustrate the children's point of view. From drawings ~~arise~~one 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 geophysics ~~and, as~~ As part of the ~~National~~Italian
27 Civil Protection Service, ~~#~~INGV provides ~~important~~vital 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 tsunamis 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 ~~a culture~~the 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 ~~responds~~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.

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55 **2. The calendar projects**

56

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

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.

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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 ~~experiments~~games, 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, when~~ to 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 2005, personally rewarding the winners.

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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).~~

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130 **3.2. The 2016 calendar**

131 For the 2016 calendar we have ~~chosen the~~choose 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 tell~~ is communicating to the
134 scientific community ~~on~~regarding the relationship between children and ~~the~~ planet Earth.

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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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2004 – 2005 Calendar "A natural phenomenon called earthquake"

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

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

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

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 ~~you one can~~ 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.

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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 also~~brought by the ~~phenomena related to the~~Sun. 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 ~~writewrite~~' 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 21st century. We

208 suggested topics on climate, oceans and seas and continental water to sensitize the younger
209 generation ~~about~~to the Earth beauty and ~~the~~ natural resources, as well as natural hazards and the
210 relation between ~~human's~~humans and Earth's health. Children responded by sending drawings of
211 ~~rainbow~~rainbows, waterfalls, volcanoes and flower fields, but also with images ~~against~~
212 ~~the~~showing 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 ~~telling~~on
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 the 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).

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223 ~~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 ~~Earth~~Earth's ecosystem. The alteration of the ~~planet~~planet's natural climate
233 cycle ~~requires~~calls for responsible and efficient use ~~for~~in 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 sar  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 winning~~becomes a winner again.

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244

245 Fig. 3. The back cover of the 2009 calendar dedicated the 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).
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249 *2011 Calendar "I'm a Scientist too! Science and scientists from the children point of view"*

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

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

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

268
269 *2012 Calendar "Mission Possible: let's save the world"*

270 The theme was inspired by the International Year of Sustainable Energy for All, designated by the
271 United Nations General Assembly to promote research of new green technologies and to focus on
272 environmental problems and the future of the Earth. Our planet provides all ~~those~~ the resources that
273 ~~have allowed~~ allow life to flourish. Many of these resources depend on delicate balances and are not
274 unlimited. We consume more resources than the Earth can generate. Almost all of the energy and
275 raw materials we use to produce or build what surrounds us and what we needed to live comes from
276 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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306 Fig. 5. One of the drawing selected for the 2012 calendar. ~~In the~~The drawing shows a very complex project
307 of an eco-volcano, with very detailed instructions and precise statements on the low cost of the project and
308 on the absence of pollution (edited by INGV Laboratorio Didattica e Divulgazione Scientifica and INGV
309 Laboratorio Grafica e Immagini).

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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 ~~off~~feeding 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 ~~peoples~~ people 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 signal~~ 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 ~~Earth~~ Earth's surface, ~~enhance~~ promotes 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 the 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 ~~catch~~ gauge the

361 effects of the training activities and the motivations ~~for participation of participants.~~ These studies

362 provided information over the ~~years on the liking~~ 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 ~~build~~ perform a more general

365 analysis ~~of~~ on how the scientific message ~~is~~ has been received, ~~how~~ 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 ~~depressing~~ distress? Generally, children

376 ~~use~~ cope with worry by using less problem-focused ~~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 ~~hand~~ 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.

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392 The author declare that she has no conflict of interest. Figures are from INGV publications.
393

394 **Acknowledgement**

395
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397 participated to the competitions with drawings that have intrigued, touched, enchanted, and
398 surprised us. We are grateful for everything they have chosen to share with us.

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401

402 **References**

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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