



1 **Graphic design and scientific research: the INGV experience**

2 Daniela Riposati¹, Giuliana D'Addezio², Francesca Di Laura¹, Valeria Misiti² and Patrizia Battelli³

3 ¹ Istituto Nazionale di Geofisica e Vulcanologia, AC, Via di Vigna Murata 605, 00143 Rome, Italy

4 ² Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Sismologia e Tettonofisica, Roma1, Via di Vigna Murata
5 605, 00143 Rome, Italy

6 ³ Istituto Nazionale di Geofisica e Vulcanologia, ONT, Via di Vigna Murata 605, 00143 Rome, Italy

7 *Correspondence to:* Giuliana D'Addezio (giuliana.daddezio@ingv.it), Via di Vigna Murata 605, 00143 Rome, Italy

8

9 **1. Abstract**

10 Part of the INGV activity is focused on the production of resources concerning Educational and Outreach projects on
11 Geophysics and natural hazard topics. The forefront results of research activity, in fact, are periodically transferred to
12 the public through an intense and comprehensive plan of scientific dissemination. In the past 15 years, graphic and
13 visual communication has become an essential point of reference supporting institutional and research activities.
14 Positive experiences are the result of a strict relationship between graphic design and scientific research, in particular
15 the process concerning the collaborative work between designers and researchers. In projects such as the realization of
16 museum exhibition or the production of illustrative brochures, generally designed for broad-spectrum public, the goal is
17 to make easier the understanding and to support the scientific message, making concepts enjoyable and fruitful through
18 the emotional involvement that visual image can arouse. The graphics and editorial products, through composition of
19 signs and images by using different tools (colors, form, lettering) on different media (print, video, web), link to create a
20 strong identity “INGV style”, in order to make them easily recognizable in Educational and Outreach projects. A
21 project product package might include a logo or other artwork, organized text and pure design elements such as shapes
22 and colour, which unify the piece. Colour is used not only to help the “logo” stand out from the international overview,
23 but in our case to have a unifying outcome across all the INGV sections. A recent and stimulating experience has been
24 the collaboration between INGV project design and its reference scientific community in order to create edu-games,
25 products specifically designed for scientific dissemination. The edu-games have been designed to be an efficient
26 combination of educational content and playful communicative aspects, with the aim therefore to learn while having
27 fun.

28

29 **2. INTRODUCTION**

30 The Istituto Nazionale di Geofisica e Vulcanologia (INGV) is one of the largest European research institutes of
31 geophysics, geochemistry, seismology and volcanology. INGV pays special attention to Education and Outreach
32 projects through publications for general public and/or devoted to schools, scientific divulgative exhibitions and
33 dedicated Internet pages.

34 The Laboratorio Grafica e Immagini (hereafter Laboratorio) is the reference structure of the INGV for the graphic and
35 visual communication, supporting institutional and research activities. Since 2001, the Laboratorio has become an
36 important partner of the INGV scientific community for the realization of a reference point for the creation of visual
37 design products.

38 In the consideration of increasingly emphasis on the value of graphics in grant proposal (National Science foundation,
39 2004), the Laboratorio provides advanced graphics support for the editorial lines of the main European research
40 projects infrastructures and partnerships involving INGV. Among these we describe the case of SPACE EARTH,



41 EMSO-ERIC, TSUMAPS-NEAM, IAPG, AGITHAR, FIERI and SaveMedCoast.
42 The laboratorio's support for editorial productions is also combined with the development and production of new web
43 layouts dedicated to the representation of issues relating to Earth Sciences and their dissemination to the general public.
44 In this regard, we present the ScienzaInsieme project. As already mentioned particular attention was given to *ad hoc*
45 production designed for education and outreach projects. Over the years the activities of the Laboratorio Grafica e
46 Immagini have turned to the conception, design and realization of the popular character editorial materials, in both
47 ordinary and institutional purposes at exhibitions, demonstrations and special events. Exhibitions and specific
48 installations that has designed and implemented for exhibits about science and scientific communication (D'Addezio et
49 al, 2014; D'Addezio et al. 2015; Rubbia et al. 2015). In this purpose we present the multi-year participation of the
50 INGV at the Festival della Scienza di Genova, an unmissable appointment for all science enthusiasts, professionals and
51 not only and the New Space Economy European ExpoForum, held in Rome in December 2019.

52

53 **3. THE PARTNERSHIP BETWEEN GRAPHIC DESIGN AND SCIENTIFIC RESEARCH**

54 Main Laboratorio's tasks focused on finding the right relationship and cohesion between interpretation of scientists
55 work through the use of graphic design using proper images and products. The goal is to elaborate appropriate solutions
56 to transfer purely scientific information addressing the messages not only to the pertinent scientific community but also
57 to general public, looking for the right compromise between visual design of the graphic work and the one of the
58 scientists. But what do we mean by graphic design, what is graphic design and why it is so important for graphic
59 composition in scientific communication? Graphic design is the process of visual communication, and problem-solving
60 through the correct use of typography, space, image and color. Graphic attracts viewer and graphic designers use
61 various methods to combine words, symbols, and images to create a visual representation of ideas and messages. The
62 importance of communicate complex ideas with clarity, precision and efficiency avoiding ambiguity and confusion, was
63 initially developed in the field of data visualization and information design (Tufte, 1983). In these themes, graphical
64 excellence is what gives to the viewer the greatest number of ideas in the shortest time, with the least ink in the smallest
65 space (Tufte, 1983). A graphic designer may use a combination of typography, visual arts and page layout techniques to
66 produce a final result. Common uses of graphic design may include corporate identity, publications, posters, website
67 graphics and elements, product packaging. For example, a product package might include a logo or other artwork,
68 organized text and pure design elements such as images, shapes and color which unify the piece. Composition is one of
69 the most important features of graphic design, especially when using pre-existing materials or various elements.
70 In visual scientific communication, common uses include the development of the institutional identity of research
71 bodies and scientific projects, the layout of publications, posters for sector conferences, web communication, design of
72 the entire visual communication of exhibitions aimed at the general public (from logo to panels, up to gadgets and web
73 promotion).
74 In any case, the opted of graph is to operate a constant mediation between scientific concept to be represented, and
75 visual form that can represent it more clearly.

76

77 **4. THE INGV STYLE**

78 The exposed approach was used for INGV productions endorsing the creation of a INGV identity: an image strongly
79 characterized in terms of style, an INGV brand productions highly recognized in the scientific community. This
80 "identity" has played an important role on different products, addressed to a target audience or for contents. The most
81 important product was the restyling of the INGV logo.



82

83 **4.1 The INGV new logo**

84 Considering the almost thirty-years life of the INGV logo, we proposed and realized its restyling mainly modernizing
85 the image of the previous one. The INGV logo consists of two parts: one graphic and the other textual. For the text,
86 assuming an idea of modernity, the Arial bold black 100%, has been replaced by a more actual and clean DIN Pro Bold
87 Condensed gray 90%, used in small/caps. The graphic part represents a schematic and sectioned reproduction of the
88 Earth, has lost the elements that strongly characterized it, the serrated lines simulating parallel and meridians. The
89 element has therefore returned to a simpler sphericity, accentuated by the chromatic nuance. This solution has already
90 been declined in the production of new editorial projects and on the occasion of national and international events as we
91 will see later (see Figure 1).

92

93 **4.2 The INGV anniversary**

94 One of the most important events that involved the Laboratorio was the INGV twentieth anniversary in 2019. We
95 studied the logo for the event, starting from the analysis of the keywords of the title: - twenty years, - geosciences -
96 travel / future. Analyzing the visual communication of the publications dedicated to geosciences, it was found that
97 frequently the most used image is stratigraphy and secondly mountains. For this purpose, we have developed a graphic
98 project very tied to the institutional image to which we have added a horizontal sign that reminds the stratigraphy and
99 visually represents the separation between before and after, above and below and remembers an arrow indicating the
100 movement towards the future, obtaining a strong but not didactic “symbolic” element. The yellow color evokes the
101 preciousness of gold on special occasions. We then developed the coordinated image, adapting it to the various
102 materials provided for the event (internal signage, presentations, web promotion, gadgets) so that it lent itself to
103 versatile configurations, also with respect to problems related to reproduction and spaces available, while maintaining
104 visual integrity intact (Figure 2).

105

106 **5. CORPORATE IDENTITY FOR RESEARCH PROJECT**

107 **5.1 SPACE EARTH www.spaceearth.net**

108 The Laboratorio realized the entire branding of the INGV spin-off company SPACE EARTH: a team of engineers,
109 physicists and geologists with a long experience in research and business management. The company aimed to add
110 value from the results of more than 60 years of experience on Space Earth designs and develops applications, software
111 and hardware products for the Aerospace, Maritime and Environment fields, in cooperation with major European and
112 Italian public and private organizations, universities and research centers. The Spacearth Technology logo was
113 conceived to graphically summarize the content of the message: “Space-Earth-Technology”. For this purpose, familiar
114 forms have been used, such as two intersecting circles, to represent the Earth and the space that surrounds it at first, and
115 to a more in-depth reading of the relationship between SET project and INGV, the area that allowed the project to be
116 born and develop.

117 Chromatically, a single color was chosen that refers to the “iconic blue of the sky”, to reaffirm the meaning and add an
118 emotional value to the pictogram. Even the chosen lettering is simple, linear, sans serif, just to reaffirm the modern and
119 technological aspect of the whole and to give the logo further immediacy, making it easy to decipher and therefore to
120 remember (Figure 3).

121

122 **5.2 EMSO-ERIC www.emso.eu**



123 The European Multidisciplinary Seafloor and water column Observatory (EMSO), aims to explore the oceans, to gain a
124 better understanding of phenomena happening within and below them, and to explain the critical role that these
125 phenomena play in the broader Earth systems. EMSO is a consortium of partners sharing in a common strategic
126 framework scientific facilities (data, instruments, computing and storage capacity). Formally it is a European Research
127 Infrastructure Consortium (ERIC), legal framework created for pan-European large-scale research infrastructures.
128 The contribution of the Laboratorio on the brand of this very important infrastructure was a “textual” intervention: the
129 acronym “ERIC” was inserted in the logo already developed.
130 On the textual insert, the same color nuance was used in the gestural element of the EMSO logo: this solution allowed
131 us to link the different parts with a simple but at the same time extremely effective interpolation in terms of image
132 return: it was possible to risk a “untying” between the various components that would certainly have weakened the
133 overall image. A whole series of products have therefore been designed and manufactured under the new brand EMSO-
134 ERIC (Figure 4; Dañobeitia, et al., 2019).

135

136 **5.3 TSUMAPS-NEAM Project www.tsumaps-neam.eu**

137 Tsunami risk assessments and warning systems need Probabilistic Tsunami Hazard Assessment (PTHA) as input and
138 reference. TSUMAPS-NEAM will develop the first homogeneous long-term PTHA for earthquake-induced tsunamis,
139 which is presently unavailable for the coastlines of the NEAM region (NE Atlantic, the Mediterranean, and connected
140 seas). TSUMAPS-NEAM will also promote an informed process of outreach, guidelines definition, and capacity-
141 building initiatives dedicated. The development of standardized PTHA products (hazard and probability curves, maps,
142 documentation, web-tools for their analysis) is the first step to include also tsunamis in multi-hazard risk assessments.
143 In designing the project logo we focused on some elements, deliberately moving away from the classic idea of graphic
144 representation of Tsunami, the wave. In fact, we believed that focusing on different elements allowed us to achieve a
145 more original and therefore highly recognizable creation: here is the stylization of the “hands” to signify the help that
146 the scientist's job can represent in the probabilistic study of tsunami hazard. The choice of colors was focused on how to
147 distinguish anthropic element from natural element, therefore a full orange was associated with human element and one
148 blue with the other. The fusion of the two colors in the intertwining of the hands which, as we have seen, wants to
149 represent cooperation, giving life to a transparency that increases the desired effect (Figure 5).

150

151 **5.4 International Association for promoting Geoethics (IAPG) www.geoethics.org**

152 IAPG is a multidisciplinary, scientific platform for widening the discussion and creating awareness about problems of
153 Geoethics and Ethics applied to Geosciences. IAPG promotes geoethics through international collaboration with
154 Associations and Institutions. The Laboratorio Grafica e Immagini has been supporting the IAPG activities for many
155 years. The great novelty of Geoethics had to start with a strong, recognizable image: for this reason, we started with
156 design of the logo, which would then be declined on all “new brand” products. We focused on the idea of interaction
157 between human activities and Earth system: the use of circular elements, their concentricity gave us the possibility of
158 creating a substantially spherical solution, with a core where patterns and textures were concentrated to represent social
159 diversity and stylized a point of intersection between Geosciences, Sociology, Philosophy and Economy. The products
160 made have been manifold (Figure 6).

161

162 **5.5 AGITHAR – Accelerating Global Science in Tsunami HAZard and Risk analysis [www.agithar.uni-](http://www.agithar.uni-hamburg.de)** 163 **hamburg.de**



164 AGITHAR - is a network created to improve, standardize, and promote tsunami research. We therefore concentrated on
165 a reinterpretation of tsunami wave, where the play of colors, shades and textures inserted, plays down the idea of
166 danger, which is instead treated by insertion of different colors both for lettering and for other graphics. The proposal is
167 extremely expendable given the box in which all graphic elements are contained and therefore allows its use that can
168 range from classic web use to the uses foreseen in the coordinated image (Figure 7).

169

170 **5.6 FIERI**

171 FIERI (forum for International cooperation among environmental research infrastructures) is an international open
172 platform for improving global, coordinated and long-term cooperation between Research Infrastructures and Networks
173 in environmental domain. What we thought in creating the logo was to highlight the connection aspect, a sort of
174 synapse that connects to Earth, forming a sort of global network. For colors we focused on a very green, modern and
175 bright idea, as well as for the used lettering (Figure 8).

176

177 **5.7 SAVEMEDCOAST - www.savemedcoasts.eu**

178 SAVEMEDCOASTS aims to respond to the need for people and assets prevention from natural disasters in the coastal
179 zones of the Mediterranean Sea, undergoing to increasing sea level rise due to climate change, coastal land subsidence,
180 tsunamis and storm surges impacts. The focus are coastal zones prone to sea level rise. The objective is the
181 stakeholder's preparation in facing the effects of these potential impacts. In these consideration, in the project logo
182 realization, we focused on wave graphics and anthropic element. We therefore extremely stylized and differentiated
183 them with the use of color. For lettering we used a sticks font, very squared accompanying it in the leaflet to another
184 font from another family but more versatile. There were many products made by the Laboratorio for this project. In this
185 regard, the declination of the logo was fundamental: finding the most suitable solution easily allowed us to impose the
186 recognition of the new "brand" on the scientific community of reference (Figure 9).

187

188 **6. WEB PRODUCTS: relating to Earth Sciences and their dissemination to the general public**

189 **6.1 SCIENZAinsieme - www.scienzainsieme.it**

190 The ScienzaInsieme project faced with the need to create a common portal to multiple National Research Bodies and
191 Universities, with the aim of creating a system that becomes a lasting structure over time, through which advertise
192 scientific events dissemination. We have chosen to identify the evocative pictographs elements that represent both
193 science than sharing. Infinity is a very ancient symbol, used in different areas and whose birth is explained in
194 heterogeneous ways but all related to concept of quantity, time and space.

195 • The symbol of inverted eight - associated with alchemy, to Hermeticism and Gnosticism - as a variant of Ouroborus,
196 the snake or dragon that bites its tail, represents the theory of eternal return, the cyclical nature of all things. It is
197 attributable to all that can be represented through a cycle which, after reaching its end, starts again from the beginning,
198 to infinity. It was first represented in an ancient funeral text Egyptian, found in Pharaoh Tutankamun Tomb.

199 • Its origin in Roman times is attributable to the use of CI letters indicating very large, higher values to 1000.

200 • As a mathematical symbol, (∞ - lemniscata), it was first adopted in 1655, to identify a very large number, just because
201 those two eyelets they can be endless paths.

202 • The analemma, which in astronomy indicates a particular geometric curve in the shape of eight, which describes the
203 position of the Sun in different days of the year, at the same time and in same location. A path that always begins and
204 ends in the same point thus representing "The eternal coming and going weather". Starting from the study of this



205 symbol in its perfect geometry, we chose to deform one of the two mirror parts to create two communicating sets,
206 through which the contents they mix to give shape to a new entity, in a virtuous circle and infinite of sharing and
207 creation (Figure 10).

208

209 **7. EDITORIAL PRODUCTS: The interaction between graphic design and scientific production for the** 210 **reference scientific community and for scientific dissemination in a popular context.**

211 **7.1 The Laboratory for High-Pressures and High Temperatures of experimental geophysics and volcanology** 212 **annual Report**

213 In recent decades, the dizzying development of knowledge on technology and materials science has made it possible to
214 build tools capable of reproducing environmental conditions that control the dynamics of chemical-physical processes
215 inside and on the Earth's surface. Among these processes, those relating to seismicity and magmatism-volcanism are of
216 particular economic and social importance for the number of victims and the extent of damage they cause. In this
217 context, the Laboratory for High Pressures and High Temperatures of Experimental Geophysics and Volcanology
218 (HPHTLab) has developed at INGV. The Laboratorio then created the editorial graphic project of the Annual Report of
219 the HPHT Lab. The report is aimed essentially at an audience of professionals and at the editorial level represents an
220 excellent combination of graphic design and geoscience research, also intended for its more advanced sectors (Figure
221 11).

222

223 **7.2 School calendars**

224 A significant part of the work is focused on the achievements for scientific dissemination. For example, the celebration
225 of 10 years of a very successful initiative: the calendar dedicated to the primary schools designed to support and
226 integrate the outreach activities conducted for over fifteen years with the schools (D'Addezio, submitted). The graphic
227 design was aimed at producing an "object" that would gather the 10 calendars with a common target: The Planet Earth,
228 10 years with the Earth seen by the children (Figure 12).

229

230 **7.3 EDU GAMES**

231 In recent years, attention in themes of education has focused on the production of scientific games, an efficient
232 combination of educational content and playful communicative aspects, with the aim therefore to learn while having
233 fun. Among these productions, Escape Volcano, Mareopoli and Cacth the Plate stand out for interest and public
234 success.

235

236 **7.3.1 Escape Volcano**

237 The game we present is devoted to transmit basic notion on volcanoes and its eruption types and also on environmental
238 and earthquake risks (Di Nezza et al., 2019; Misiti et al., 2019). Basically, the game is composed by plastic billboard
239 160*200cm which represents a volcano with its magmatic chamber. Small chambers, ten in total, are located along the
240 conduit up to crater. The goal of the game is to reach the crater before volcano eruption overcoming different tests. Four
241 pawns, that represent small volcanoes, are positioned in the magmatic chamber. Minimum 2 and maximum 4 teams are
242 supposed to play. To move from one chamber to the next one the players have to roll a dice. On the faces of the dice are
243 reported tests that players have to pass. The game has been thought and realized with some high school students in the
244 frame of Alternanza Scuola Lavoro project. The design and construction phase involved first of all:

245 - analysis of the idea developed by the students;



246 - study of target audience;
247 - and evaluation of problems related to production and practicality of use of instrument, in order to make it easy to
248 handle, easily transportable and reproducible even with simple and economic means.
249 The centerpiece of the game is a large format billboard, designed to allow at least 20-25 players to participate
250 simultaneously. As it was not a self-explanatory game, it was necessary to emphasize the visual aspect to enhance
251 emotional impact on participants. With this aim we have chosen to characterize the whole coordinate, from game board,
252 to various components such as: cards, assembly boards of the pieces, 3D pieces, dice and rules, with pastel colors and a
253 playful lines graphic, easily adaptable to youth target audience tastes.
254 The sinuous forms with which the volcano was represented refer directly to classical iconography, however deprived of
255 the didactic aspect and of any scientific reference, just to highlight the playful character of the instrument. We have
256 chosen to characterize the various parts of the game through icons, deliberately winking at the social ones, to seek a
257 familiar connection in visual baggage of today's kids, which would make involvement in the activity even more fluid.
258 Even the typographic choices have been oriented in this sense. The use of a calligraphic character (Princess Ivy) that
259 strongly connoted the visual aspect, in main titles of all the game components, is dictated by the need to create a
260 dominant visual element of entire project that conveys a sense of dynamism, of freedom, but also lightness. The
261 prerogative of calligraphic characters is precisely to have the graces, the ascendants and descendants very elaborate and
262 pronounced, which refer to handwriting trait and allow users to create a more "artistic and emotional" visual. This,
263 however, at the expense of readability, which in fact has been supported by the use of explanatory texts, of a simpler
264 (Rotis serif) font. Great weight was also given to the use of black color, which aimed to make style of the entire product
265 more adult in older children's eyes, in order to involve them without diminishing their age. Proposing a too childish
266 aspect could have created a preconception in adolescent participants, thus reducing effectiveness of message and ability
267 to receive information. (Figure 13).

268

269 7.3.2 Mareopoli

270 The game is inspired by the famous board game MONOPOLY. It will be realized in two formats, a big version in order
271 to be played in groups at recreational-scientific laboratories, and a small version as a gift for participants and as a take-
272 home message (Locritani et al., 2018). The game describes scientifically tides and historical theories on their origin
273 from the greek period till the end 18th century (Taramaschi, 2013). Many scientists have tried to understand and
274 interpret this phenomenon. Among the oldest the game quotes Aristotle and Eratosthenes, but also other eminent
275 seventeenth century scientists such as Galileo Galilei, up to the physicists who formulated modern theories as Newton
276 and Laplace. Finally, the game gives scientific information on cross-cutting issues related to tides as: renewable energy,
277 biodiversity and ecosystem conservation. This game is the result of continuous collaboration between researchers and
278 graphic designers: working together simplified scientific concepts and translated them into compelling and direct
279 images. The most relevant historic and scientific topics have been simplified into fundamental concepts, while
280 maintaining a common conceptual and stylistic line, and choosing two-dimensional drawings, although some shading is
281 used to introduce a sense of background, perspective or motion. Nevertheless, it has been attempted to keep drawings as
282 simple, plain and clear as possible in order to convey specific ideas in a more effective way. All illustrations have been
283 made in the Laboratorio with painting techniques (Figure 14).

284

285 7.3.3 Catch the Plate



286 Catch the plate is a game as simple as it is addicting. Children and young people, from 11 to 16 years old, will always
287 be able to play perfectly under the guidance of a conductor. The participants of the game must divide into teams made
288 up of a minimum of two players. The team with the youngest player will start. The team that starts, will roll the dice.
289 Each roll of die determines which card or token must be drawn and consequently the actions to be carried out combined
290 with each one, listed below:

291 1) *EARTHQUAKE CARD*

292 2) *VOLCANO CARD*

293 3) *TECTONIC PLATE*

294 The objective of the game is to place the largest number of tectonic plates, earthquakes and volcanoes to get the highest
295 score. The game is thought to teach children and people how the Earth moves, and how is made the Earth crust.

296 *EARTHQUAKE CARD*

297 A card with the earthquake epicenter drawn is delivered. The goal is to guess where to place the epicenter on the basis
298 of questions shown on cards. Placing correctly, you win 3 points. If the team requires an extra clue to guess it gets 2
299 points (in case of exact answer). You can also give your turn to the opposing team that in case of correct answer wins 1
300 point.

301 *VOLCANO CARD*

302 A volcano made of das is delivered. The goal is to guess where to place the volcano on the base of the application
303 shown on cards. By positioning correctly, you win 3 points. If the team requires an extra clue to guess it gets 2 points
304 (in case of exact answer). You can also give your hand to the opposing team that, in the case of a correct answer, wins 1
305 point.

306 *TECTONIC PLATES*

307 Main Earth plates are 15 in total. Players will have to draw a plate from a basket and place it correctly on the board. If
308 the team misses the plate, it is put back into play. Guessing the plate immediately wins 3 points (Figure 15).

309

310 **7.3.4 Geo Trivial**

311 The latest product created within the edu-games is the GEO-Trivial. As it is known, games have the power to ignite
312 imaginations and place you in someone else's shoes or situation, often forcing you into making decisions from
313 perspectives other than your own. This makes them potentially powerful tools for communication, through use in
314 outreach, disseminating research, in education at all levels, and as a method to train the public, practitioners and
315 decision makers in order to build environmental resilience.

316 By creating the Geo Trivial game we thought to revisit the classic Trivial, thus producing a scientific game, a tool to
317 learn more about the amazing world of geosciences by enjoying. This new game belongs to a INGV editorial project
318 dedicated to education and outreach (Figure 16, work in progress).

319

320 **8. GRAPHIC DESIGN AND SCIENTIFIC RESEARCH**

321 **8.1 INTERACTIVE EXHIBITION**

322 **8.1.1 Il pianeta dei cambiamenti: la tettonica delle placche: una teoria rivoluzionaria - Festival della Scienza di 323 Genova 2018**

324 The exhibition aimed to tell the fundamental steps, discoveries and intuitions that provided intellectual and disciplinary
325 credibility to the Plate Tectonics Theory, one of the most important scientific acquisitions of the twentieth century. Its
326 enunciation followed a golden age for the discoveries of Earth Sciences, helped the scientific community to accept the



327 basic ideas underlying the drift of the continents, laying the foundations for a change in our perception of dynamics of
328 the planet. By bringing together results from various disciplines, the theory has unveiled the dynamics of our planet,
329 forever revolutionizing Earth Sciences.

330 The study of the logo has therefore focused on the Earth and its complexity: the geometric elements can remember a
331 puzzle, a puzzle that is composed and decomposed like Earth, a planet that is always on move.

332 The exhibition was set up at the prestigious premises of Palazzo Ducale in Genoa, which, precisely because of their
333 uniqueness and beauty, have therefore allowed a setting of great impact (Figure 17). The exhibition welcomed visitors
334 in a play of light and color and accompanied him throughout the journey. We have indeed chosen this key of
335 interpretation (light and color) to characterize the exhibition. The public success was remarkable for the whole
336 initiative.

337 The exhibition is also having an editorial following: The Exhibition Catalog is in fact released, which has become a real
338 book that tells a history of changes. On the one hand the changes of our planet, a living and constantly changing
339 environment; on the other, the changes in the way of thinking, seeing and explaining the world that, over two thousand
340 years, have guided man in understanding the mechanisms that govern the evolution of the Earth. In figures 17 and 18
341 we show the logo, some creations (panels, gadgets and photos of the exhibition) including a visual summary of the
342 Catalog.

343

344 **8.1.2 Attenti agli elementi – Festival della Scienza di Genova 2019**

345 “Earthquakes: beware of the elements! Details that save lives”, created for the Festival della Scienza di Genova 2019
346 and now itinerant with appointments scheduled in many cities of Italy (Grottaminarda, Varese, Milano, L’Aquila, etc.).
347 The aim of the exhibition is to illustrate good practices to prepare for earthquakes and increase citizens' awareness
348 on the Earth dynamic environment in constant evolution.

349 In an interactive journey, visitors will discover how the different elements that make up a building react to earthquake
350 shocks and what is the role of land on which our houses are built.

351 In the graphic project for the exhibition we started from the choice of a vintage style, so that it would result in a
352 modern but not too minimalist appearance. The intent was to produce a "familiar and intimate" communication instead
353 of institutional, cold and authoritarian, so that the message was conveyed in an empathetic and welcoming way in order
354 to obtain a greater availability to transmitted concepts. The dominant color is orange, chosen as a compromise with red
355 which instead of evoking an emergency, is usually used to recall: cheerfulness, sociability, vitality and renewal. It
356 seemed perfect for this popular exhibition where dynamism is synonymous with awareness and action. The icon of the
357 house is the dominant element together with the crack in the ground and the chandelier that oscillates, now part of the
358 collective imagination related to earthquake risks related. The objective of the visual project was to produce a playful
359 visual communication that represented, together with the negative aspect of natural risk, also the positive aspect of
360 awareness of the structures and of the rules of behavior, which can save our lives and which are the focus of the
361 exhibition. In Figures 19 and 20 we show the main products made and some photos of the set-up.

362

363 **8.1.3 NSE Spac Forum**

364 INGV participated to the first NSE European Expoforum Italian edition, a point of reference for companies that
365 operates in Space sector, but also and above all for all those companies that orbit the New Space market: Universities,
366 SMEs, Research Centers, innovative companies. We have chosen to characterize our exhibition space by focusing
367 strongly on a visual element, an image of a volcanic eruption from space. This choice was then declined on the scientific



368 products, flyers, ad hoc created for the event (Figure 21 and 22).

369

370 9. Conclusions

371 Visual culture has become a prominent part of the cultural identity in the 21st century and consequently, is an important
372 tool with which to communicate science. On the other hand, visual material is typically treated as an add-on instead of
373 being an integrated part of the whole and there is a lack of identifying target audiences and refining visual elements for
374 them specifically (Rodríguez Estrada and Davis, 2014; Khoury et al., 2019). In our experience science communication
375 become more effective visual communications by integrating and incorporate elements of theory and practice from the
376 discipline of design. But if the wealth of these tools, especially considering online science communication, allows to
377 experiment with increasingly effective communication models, on the other hand the scientific image risks losing its
378 original explanatory function to adapt to technical requirements and aesthetic standards (Rigutto, 2017). To outlines the
379 importance of deep cohesion between graphic support and scientific message it is also the evaluation that usually
380 viewers tend to rely on preexisting levels of trust and peripheral cues, such as source attribution, to judge the credibility
381 of shown data (Li et al., 2018). The INGV experiences we present, between researchers, graphic designers, and other
382 visual communications highlight a great potential and a virtuous example of compromise between strictly
383 communicative needs and correctness of information which is the core of communicative and visual message. Finally,
384 we believe that this type of collaboration is a fundamental component in the dissemination of scientific information
385 towards the general public and in educational context.

386

387 10. Author contribution

388 Daniela Riposati is the Coordinator of the INGV Laboratorio Grafica e Immagini. Her contribution on this work have
389 been focused on writing, visual and content research, with the aim of creating a homogeneous and usable product.

390 Giuliana D'Addezio as Coordinator of INGV Laboratorio Attività con le scuole, cooperates closely with the
391 Laboratorio Grafica e Immagini. She provided research materials, ideas and inputs for discussion.

392 Francesca Di Laura is one of the fundamental components of the Laboratorio. Her contribution in drafting the paper
393 have been focused on the writing and general approach of the article.

394 Patrizia Battelli, new and recent entry into the Laboratorio, has contributed in drafting the paper with presence, valuable
395 advice and helping the general review.

396 Valeria Misiti helped as the scientific support for the edu-games produced by Laboratorio.

397

398 11. Acknowledgements

399 The Authors want to thanks all colleagues who have supported and sponsored over the years the activities. Thanks to
400 their support it has been able to achieve these results. In particular we want to thank Angela Chesi and Sabrina Palone,
401 two colleagues who have shared this trip with us for a few years.

402

403

404 The authors declare that they have no conflict of interest. Figures are from INGV publications and productions.

405

406

407

408 12. REFERENCES



- 409 Dañobeitia, J.J., Bardaji, R., Basset, A., Beranzoli, L., Berry, A., Blandin, J., Cannat, M., Carval, T., Coppola, L., Del
410 Rio Fernandez, J., Delory, E., Embriaco, D., Favali, P., Fredella, M.I., González Aranda, J.M., Gillooly, M., Giuntini,
411 A., Gourcuff, C., Hartman, S., Iudicone, D., Kutsch, W., Lanteri, N., Llínas, O., Magnifico, G., Marinaro, G., Materia,
412 P., Miranda, M., Petihakis, G., Pfeil, B., Piera, J., Pouliquen, S., Radulescu, V., Rodero, I., Ruhl, H., and Sarradin,
413 P.M.: A European Marine Research Infrastructure Strategy for an Integrated and Sustainable Ocean Observation
414 System. OCEANOBS' 19 Hawaii, 2019.
- 415 D'Addezio, G., Rubbia, G., and Marsili, A.: The experience of ScienziAperta, a week of scientific information and
416 dissemination. *Eng. Geol. Soc. Terr.*, 7, 103-107, 2014.
- 417 D'Addezio, G., Giordani, A., Valle, V., and Ripsati D.: 100 years after the Marsica earthquake: contribute of outreach
418 activities. *Geoph. Res. Abs.* 17, EGU2015-13401-1, 2015.
- 419 D'Addezio, G.: 10 years with planet Earth essence in the primary school children drawings. Submitted to this Volume,
420 (2020).
- 421 Di Nezza, M., Misiti, V., and Di Laura, F.: Escape Volcano: un nuovo gioco geo-scientifico. *Miscellanea* accepted,
422 2019.
- 423 Khoury, C.K., Kisel, Y., Kantar, M., Barber, E., Ricciardi, V., Klirs, C., Kucera, L., Mehrabi, Z., Jhonson, N., Kabin,
424 S., Valiño, A., Nowakowski, K., Bartomeus, I., Ramankutty, N., Miller A., Schipanski, M., Gor,e A. M. and Novy, A.:
425 Science-graphic art partnerships to increase research impact. *Commun. Biol.*, 2, 295, <https://doi.org/10.1038/s42003-019-0516-1>, 2019.
- 427 Li, N., Brossard, D., Scheufele, D. A., Wilson, P. H. and Rose, K. M.: Communicating data: interactive infographics,
428 scientific data and credibility. *JCOM* 17 (02), A06. <https://doi.org/10.22323/2.17020206>, 2018.
- 429 Locritani, M., Garvani, S., Di Laura, F., Merlino, S. and Talamoni R.: Giocando verso uno sviluppo sostenibile: il
430 contributo della sede INGV di Porto Venere nella realizzazione di giochi didattico-scientifici. *Miscellanea INGV* 39,
431 2017.
- 432 Misiti, V., Di Nezza, M., Di Laura, F., Cafarella, L., and D'Addezio, G.: ESCAPE VOLCANO: a new game on
433 volcanic hazards. *Geoph. Res. Abs.* 21, EGU General Assembly, 2019.
- 434 National Science Foundation: A guide for proposal writing, <https://www.nsf.gov/pubs/2004/nsf04016/start.htm>, 2004.
- 435 Rigutto, C.: The landscape of online visual communication of science'. *JCOM* 16 (02), C06_en., 2017.
- 436 Rodríguez, E., Fabiola, C., and Davis, L. S.: Improving Visual Communication of Science Through the Incorporation
437 of Graphic Design Theories and Practices Into Science Communication. *Sci. Comm.*, 37
438 <https://doi.org/10.1177/1075547014562914>, 2015.
- 439 Rubbia, G., D'Addezio, G., Marsili, A., and Carosi, A.: Science and scientists from the children point of view, an
440 overlook from drawings. *Geol. Soc. London, Spe. Public.* 419 (1), 161-170. <http://dx.doi.org/10.1144/SP419.11>, 2015.
- 441 Tufte, E.R.: *The Visual Display of Quantitative Information*. Graphics Press: Cheshire, CT, pp 1□197, 1983.
- 442



**Figure 1: Above the logo of the INGV dating back to 1986. Below the revisitation of 2018.
Copyright Laboratorio Grafica e Immagini INGV.**

443
444
445



Figure 2: INGV Twentieth anniversary products. Copyright Laboratorio Grafica e Immagini INGV.



447



SPACE EARTH TECHNOLOGY
 APPLICATION AREAS

With our expertise in several Geophysics applications, we offer highly customizable solutions in:

- Radio Propagation
- Space Weather
- High-Precision GNSS
- Marine Monitoring
- Environmental Geophysics
- Data Management and Elaboration

HIGH PRECISION GNSS

The presence of the ionosphere poses limits on the availability and reliability of the precise positioning and navigation services. Space Earth Technology is proud to introduce a series of solutions able to correct ionospheric errors and mitigate the ionospheric impact on GNSS services. The major errors caused by ionosphere are gradients of Total Electron Content (TEC) and diffraction effects when the signal is received at ground stations.

Mitigation on high accuracy positioning and navigation

An innovative GNSS-based service obtained through a software package (exporting IIS).

- a patented algorithm for detection. This research is aimed at minimizing forecasting of ionospheric disturbances.
- mitigation algorithms to improve position accuracy based on the aforementioned forecasting algorithm.

Navigation is provided against users' ionospheric conditions when both solutions is integrated in precise positioning services: Real-Time (Network Real Time Kinematic).

IONOSPHERIC PRODUCTS

Forecasting and forecasting are available to assist GNSS operations. All products are customizable to match user needs exploiting existing infrastructures.

PRODUCT	TIME SCALE	COVERAGE	APPLICATION
Schedule forecasting	Real-time	Local / Regional / Global	Early warning and identification of corrupted GNSS signals in real time
Range error forecasting	Real-time	Local / Regional / Global	Improvement of the accuracy of single frequency positioning
Prediction of TEC	Long-Term (1h - 10d) / Short-term (30-min)	Local / Regional / Global	Operation planning for GNSS related services
Mitigation service	Real-time	Local / Regional	Accuracy improvement on RTK services

Figure 3: The logo designed and created for the Space Earth spin-off and its declination in the project brochure. Copyright Laboratorio Grafica e Immagini INGV.

448



449



PA23F-1041
EMSO ERIC – European Multidisciplinary Seafloor and water-column Observatory European Research Infrastructure Consortium
Management of a distributed marine, Research Infrastructure for Improving scientific services and social demands based on environmental multidisciplinary high-resolution and high-quality data

Jorge Bordehore¹, Paolo Falco², Paola Marini³, Sara Bortolotti⁴, Maria Ines Garcia Pardo⁵, Andre Bando⁶, Jose Joaquin Hernandez Ruiz⁷, Malintha Cornaf⁸, Andrew Ryan⁹, Alvaro Pulido¹⁰, George Poulakis¹¹, Vital Rubakov¹², Henry Hoff¹³ and Jose Miguel A. Mirones¹⁴

¹IMM, CSIC, Ikerlan, UPM, Spain; ²IMM, Spain; ³IMM, Spain; ⁴IMM, Spain; ⁵IMM, Spain; ⁶IMM, Spain; ⁷IMM, Spain; ⁸IMM, Spain; ⁹IMM, Spain; ¹⁰IMM, Spain; ¹¹IMM, Spain; ¹²IMM, Spain; ¹³IMM, Spain; ¹⁴IMM, Spain

info@emso.eu | www.emso.eu

INTRODUCTION

EMSO is a consortium of European Countries combining a distributed Research Infrastructure (RI) with the ambition to lead the advancement of knowledge on the natural and anthropogenic processes in the ocean, seafloor and sub-seafloor, and to promote an inter- and multi-disciplinary approach. EMSO aims at illuminating the environmental processes of the complex interactions between geosphere, biosphere and hydrosphere, promoting excellence science and coordinating open sea observations for an interdisciplinary scientific research. Modern societies demand a better knowledge of the oceans. EMSO ERIC represents the ability to address the social benefits of ocean observations, meeting these social demands through services such as science, engineering and logistics, data management, communication and industry and innovation.

A RESEARCH INFRASTRUCTURE SERVING SCIENTISTS

Starting from a heterogeneous infrastructure design and a diversity of operational practices, the engineering effort consists in fostering interoperability between devices, systems and operations in order to decrease overall costs while increasing data quality and trust. A label attribution process is underway in order to guarantee data quality level. So, EMSO facilities are being standardized through the adoption of the EMSO General Instrument Module (GIMM) holding a suite of sensors.

EMSO large-scale facilities provide high-quality time-series at continental scale in the thematic areas of:

- MARINE ECOSYSTEMS**: Distribution and abundance of sea life, ocean productivity, fisheries, ecosystem function, long-term, carbon cycling, and climate feedback.
- CLIMATE CHANGE**: Ocean acidification, dynamics of water masses, ocean circulation, oceanic sea level rise.
- GEOHAZARDS**: Deep-sea vents, hydrothermal vents, seismic and volcanic activity, tsunamis.
- MARINE TECHNOLOGIES**: Ocean observation capabilities, from sensing to available workflow, data, data services, applications, and hardware system tests.

EMSO is already joining efforts with counter-part worldwide research infrastructures through the establishment of collaborations and formal links to work together on global environmental challenges. Moreover, the complementarities between EMSO and other environmental research infrastructures in Europe will extend the coverage and increase the quality of the observation data as well as the creation of innovative data products. These international agreements will leverage added value to the collaboration by favouring the exchange of knowledge, best practices, the alignment of the strategy of the different countries and the promotion of the science global dimension.

RESEARCH ACTIVITIES

Identifying noise sources by acoustics
 Using hydrophones with low and high frequency bandwidths to characterize the ocean noise identifying biological and anthropogenic sources.

Species' Identification and population dynamics estimation
 Detection and recognition algorithms applied to MTV camera data can identify automatically individual and population behavior as well as species presence in relation to cyclic and convergent habitat changes.

Testing new devices
 New water based cooling system has been developed and being tested for increase the power availability by a surface identification buoy. Critical goal is to provide the power budget to accommodate ocean observing service.

Discriminating biological activity from gas emissions
 Acoustic recordings combined with close surveillance to discriminate between the 2 possible signal sources: biological activity vs. gas emissions.

Monitoring of changes in water circulation and stratification on seasonal and inter-annual time scales
 Investigation on the long term changes of stratification and circulation on seasonal and inter-annual time scales to discern seasonal and long-term variability of hydrographic and biogeochemical parameters in the environmentally region.

Deep-sea observatories contribute to locate low energy seismic activity
 The Geo hazard assessment in the deep ocean can benefit of deep-sea observatories equipped with sensors measuring the ground shaking induced by seismic waves, and with sensors detecting water column pressure variations. Seismometers, Hydrophones, and Bottom Pressure Recorder are typically used for these purposes. In the Western Ionian, IMOS-ERIC observatory has detected low energy seismic activity not recorded by the land based network.

Modulation of hydrothermal fluid temperatures
 An autonomous temperature sensor was developed in black smoker chimney, CRACKS, and diffuse flow areas at the Lucky Strike hydrothermal field. The hydrographic and chemical water composition measured: High-temperature discharge (300°C), is essentially mineral, primary hydrothermal fluids, correlates to fluid pressure with low temperature discharge (10°C), due to the presence of a thermal boundary layer forming over basal of rise associated with diffuse outflow of warm fluids, correlates to tidal currents.

SERVICE ACTIVITIES

Geo-hazard Data
 Major active fault and high seismicity, volcanic and/or hydrothermal submarine mass movements, sea level rise and the associated risk to the Mediterranean sea are of the largest in the European basin. Better performance is required with broad-band seismometers and high-rate pressure sensors for tomographic and strain detection, are essential for characterizing some generation of early warning systems.

Operational Climate and Oceanography
 The evaluation of CO2, CO2S, EuroCO2, Oceanic, and other ERIC, like CO2, create an exciting scenario framework from which to build EMSO Operational Climate and Oceanography project. Climate and Oceanography project consists of: observing, data, information and services from marine field and observations. Moreover EMSO ERIC will contribute to improve the use of the data in the Earth Observation System of systems (global) programming, in order to share with the data and services from the other scientific projects and efforts, to enhance and facilitate observing systems.

Access
 EMSO provides access to researchers through national data operations and data management systems. The data is available to the user due to the deep archive, including user identification and control levels. The EMSO facilities aim to ensure the access of researchers to the data and hardware via sensors and software.

EMSO COUNTRIES AND INSTITUTIONS

FRANCE: CNRS/IFREMER
SPAIN: IMOS-ERIC
ITALY: CNR/INM
GERMANY: DLR/DFG
NETHERLANDS: Rijkswaterstaat
NETHERLANDS: Rijkswaterstaat
NETHERLANDS: Rijkswaterstaat
NETHERLANDS: Rijkswaterstaat

UK: British Antarctic Survey
UK: British Antarctic Survey
UK: British Antarctic Survey
UK: British Antarctic Survey

NETHERLANDS: Rijkswaterstaat
NETHERLANDS: Rijkswaterstaat
NETHERLANDS: Rijkswaterstaat
NETHERLANDS: Rijkswaterstaat

NETHERLANDS: Rijkswaterstaat
NETHERLANDS: Rijkswaterstaat
NETHERLANDS: Rijkswaterstaat
NETHERLANDS: Rijkswaterstaat

Figure 4: The EMSO ERIC logo and its declination in some products (congress stands, totems, posters). Copyright Laboratorio Grafica e Immagini ING.V.

450



451



452

Figure 5: The TSUMAPS NEAM Project coordinated image. Copyright Laboratorio Grafica e Immagini INGV.



453



Figure 6: Some achievements for the IAPG. Copyright Laboratorio Grafica e Immagini INGV.

454

455



Figure 7: The solution chosen for AGITHAR and some gadgets. Copyright Laboratorio Grafica e Immagini INGVI.



Figure 8: The FIERI solution. Copyright Laboratorio Grafica e Immagini INGV.

458
459
460
461



Finanziato dall'Unione Europea
 Aiuti Umanitari e Protezione Civile

SAVEMEDCOASTS
Final Conference
 www.savemedcoasts.eu

Rome, **December 5, 2018**
 INGV | Conference Room
 1st floor

ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA

SCIENTIFIC BACKGROUND
 Global sea levels continued to rise during the 19th century and increased up to about 10 cm during the 20th century. Today sea level is accelerating at an rate of about 30 cm per century under the effects of climate change. If greenhouse gas emissions will not be mitigated, global sea levels could rise even more than one meter by 2050 and coastal regions in the coming centuries. With these scenarios, the effects of storm surges, floods, coastal erosion and tsunamis will be amplified with severe consequences on coastal infrastructures, buildings, safety of the population, economy and cultural heritage. These impacts will therefore result in a potential socio-economic loss to face in the next years.

THE PROJECT
 SAVEMEDCOASTS aims to respond to the need for people and assets protection from natural disasters in the coastal zones of the Mediterranean Sea, undergoing increasing sea level rise (SLR) due to climate change, coastal land subsidence, tsunamis and storm surges impacts. The focus are the coastal areas prone to sea level rise and to prepare the stakeholders to the effects of these potential impacts. SLR projections for 2050 and high resolution maps of sea level scenarios are produced for selected areas of the Mediterranean region that includes seven UNESCO sites.

STAKEHOLDER ANALYSIS
 Stakeholders from Italy, Greece and Cyprus have been engaged to highlight gaps and needs, and mobilize society and policy making. Therefore, 100 local meetings and 100 questionnaires are based on the SAVEMEDCOASTS Stakeholder Survey in the solution oriented process. Our goal is to implement a consensus policy decision based on coastal management.

DIRECT IMPACT ON POLICY MAKERS
 SAVEMEDCOASTS' team supported to realize through this interview that "I did not know much about SLR, although I thought I knew. I am more aware on my need to be aware", said a stakeholder.

POLICY ACTION
 In Cyprus a parliamentary question was submitted by an MP who was interviewed, with regards to the actions planned from the State to address SLR problem.

EXPECTED SOLUTIONS
 The Municipality of Nicosia (Italy) asked SAVEMEDCOASTS to evaluate the SLR projections for the historical coastal city.

WEBGIS
 165 small coastal plains face the Mediterranean Sea. SAVEMEDCOASTS' geospatial data are shared by a specific webGIS accessible at www.savemedcoasts.eu.

EXPECTED SEA LEVEL RISE SCENARIOS FOR 2100
 The SLR projections for the Venice lagoon are shown in this graph. It has two scenarios: the RCP 2.6 and RCP 8.5 sea level scenarios. The potential inland advection of the coastline for 2050, relative to 2010, is highlighted in red on the map. Land subsidence from peatlands data is included in the graphs (IPCC AR5 scenario).

SAVEMEDCOASTS
 Sea level is rising at a rate of about 30 cm per century. This represents a threat of hazard for many coastal populations. Our mission is to the most responsible citizens of this. This phenomenon will already having severe consequences on the coastal coasts. Our project aims to help coastal communities and finding solutions for 2050 for the period use of the Mediterranean basin.

Figure 9: Savemedcoasts products. Copyright Laboratorio Grafica e Immagini INGV.

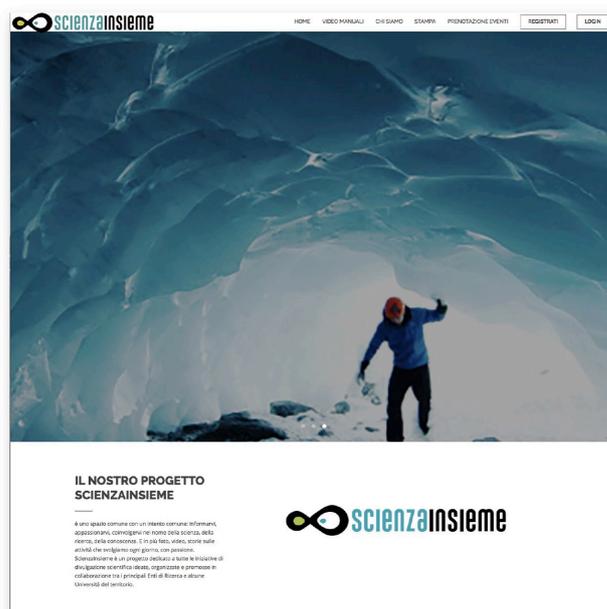


Figure 10: ScienzaInsieme products. Copyright Laboratorio Grafica e Immagini INGV.



Figure 11: The last issues of Annual Report of the HP-HT Laboratory. Copyright Laboratorio Grafica e Immagini INGV.



Figure 13: The billboard of Escape Volcano game. Copyright Laboratorio Grafica e Immagini INGV.

470
471



Figure 14: Mareopoli game. The game board, the playing cards, the dice and one of the illustrations created by the Laboratory. Copyright Laboratorio Grafica e Immagini INGV.

472
473



Figure 15: The billboard and the cards of Catch the plate Game. Copyright Laboratorio Grafica e Immagini INGV.

474

475



ilPIANETAdeiCAMBIAMENTI

LA TETTONICA DELLE PLACCHE: UNA TEORIA RIVOLUZIONARIA

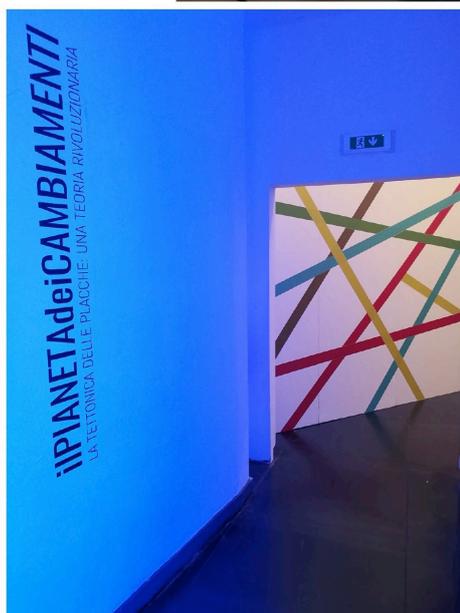


Figure 17: Some details of the exhibition layout *Il pianeta dei cambiamenti. La tettonica delle placche: una teoria rivoluzionaria* - Festival della Scienza di Genova 2018, at Palazzo Ducale (Genova, Italy). Copyright Laboratorio Grafica e Immagini INGV.



479



Figure 18: Some pages of the Exhibition Catalog: Il pianeta dei cambiamenti. La tettonica delle placche, una teoria rivoluzionaria. Copyright Laboratorio Grafica e Immagini ING V.

480

29



481

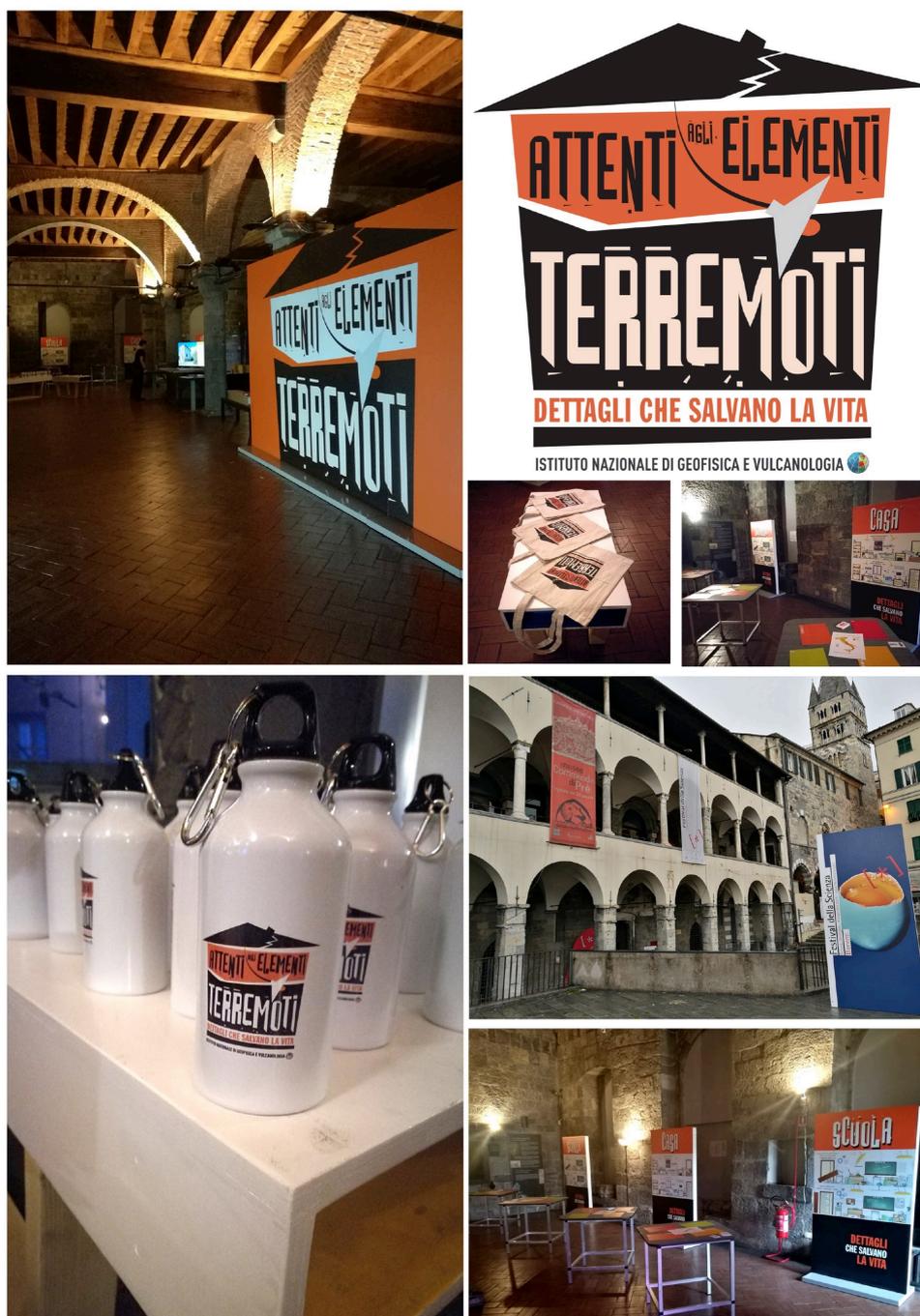


Figure 19: The exhibition at the 2019 Edition Science Festival (Commenda da Prè, Genova, Italy).

482



483



484

Figure 20: The booklet of the exhibition: Attenti agli elementi. Copyright Laboratorio Grafica e Immagini INGV.



485

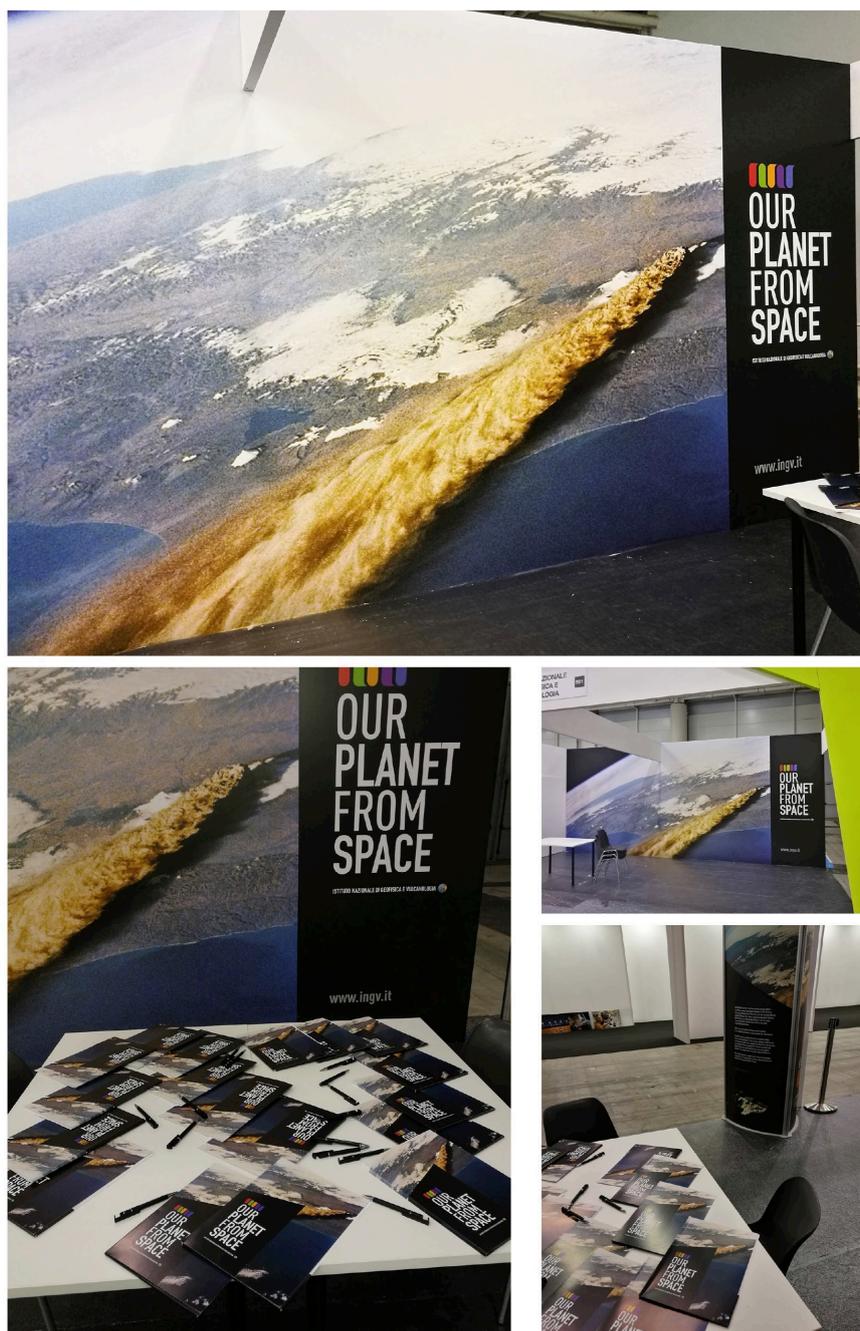


Figura 21: The INGV participation at the NSE Forum, December 2019, Rome, Italy. Copyright Laboratorio Grafica e Immagini INGV.

486



487

OUR PLANET FROM SPACE

COPERNICUS data and products for Earth monitoring and geophysical processes optimization

The Copernicus Earth Observation Programme (Copernicus) provides data, information and services, based on satellite Earth Observation capabilities with the aim to help the European and other global communities with Copernicus data and services for the benefit of Earth observation and monitoring. The Copernicus Earth Observation Programme (EO) is the main component of the Copernicus Programme and is the main component of the Copernicus Programme. The Copernicus Earth Observation Programme (EO) is the main component of the Copernicus Programme and is the main component of the Copernicus Programme.

SAR ocean mapping and estimation ocean analysis

SAR data are used for the detection of oil spills and other marine pollution. SAR data are used for the detection of oil spills and other marine pollution. SAR data are used for the detection of oil spills and other marine pollution. SAR data are used for the detection of oil spills and other marine pollution.

RAPID CHANGING MOTION: Coastline displacement and fault models

SAR data are used for the detection of oil spills and other marine pollution. SAR data are used for the detection of oil spills and other marine pollution. SAR data are used for the detection of oil spills and other marine pollution. SAR data are used for the detection of oil spills and other marine pollution.

ESTRAT. INDIRIZZO E POLITICA. PROCESSIONE

ESTRAT. INDIRIZZO E POLITICA. PROCESSIONE

Hyperspectral system analysis for geophysical applications: the PRISMA ASI-AGI project

PRISMA is the first Italian Earth Observation hyperspectral space mission and EO2 developed algorithm and products for geophysical applications.

PRISMA Data Characterization

PRISMA Data Characterization

Sea Drilling

Sea Drilling

Surface Characterization

Surface Characterization

Active Lava Flow

Active Lava Flow

Wildfire gas emissions

Wildfire gas emissions

OUR PLANET FROM SPACE

HYPERSPECTRAL SYSTEM ANALYSIS FOR GEOPHYSICAL APPLICATIONS: THE PRISMA ASI-AGI PROJECT

PRISMA (PRecursor IPerSpectral) of the application mission is the first Italian Earth Observation hyperspectral space mission of the Italian Space Agency launched on orbit in March 2019 with on board an innovative electro-optical instrumentation which combines a hyperspectral sensor with a panchromatic, medium-resolution camera.

In this frame INGV coordinates the scientific project ASI-AGI (Analisi Sistemi IperSpectrali per le Applicazioni Geoscientifiche Integrata) to develop specific algorithms and products for various geophysical applications.

ISTITUTO NAZIONALE DI GEOPISICA E VULCANOLOGIA

OUR PLANET FROM SPACE

GALILEO in GEOPHYSICS

GALILEO in GEOPHYSICS

INSY networks

INSY networks

INSY skills

INSY skills

OUR PLANET FROM SPACE

INSIEME
ROMA 16, 19 DICEMBRE 2019
PIER DI ROMA

ISTITUTO NAZIONALE DI GEOPISICA E VULCANOLOGIA

Figura 22: The production for the INGV participation at the NSE Forum, December 2019, Rome, Italy. Copyright Laboratorio Grafica e Immagini INGV.

488