Workshop on Earthquakes and Volcanoes
Barcelona, Hotel AYRE CASPE, 8-9 November, 2016

SCIENTIFIC REPORT

28 scientists from 10 different countries met in hotel AYRE CASPE in Barcelona on November 8 and 9, 2016, to attend the first International Workshop on Earthquakes and Volcanoes organised by IASPEI and IAVCEI, with the support of IUGG.

Earthquakes and volcanoes are among the most catastrophic geological processes and can cause tremendous impacts on population and the environment. Their occurrence is strongly correlated with plate tectonics and plate boundary dynamics. Volcanism is associated with both divergent plate margins and subduction zones, while large earthquakes occur mostly in subduction and transform zones associated with displacements on preexisting faults. Both earthquakes and volcanic eruptions eruptions are a consequence of the driven forces responsible for the movement of the tectonic plates, being the necessary energy provided by the Earth's interior heat.

Despite these common genetic links, earthquakes and volcanoes have traditionally been investigated separately by seismology and volcanology, respectively, without so much interconnection between the two. Only in few occasions, such as the development in last decades of volcano-seismology, have both disciplines joined efforts to understand common or related problems. This international workshop has provided a forum of discussion for IASPEI and IAVCEI members to analyse together the state of the art on the study of the causes and mechanisms of earthquakes and volcanoes, paying special attention on their common geodynamic causes, modelling and monitoring of these geophysical processes, vulnerability assessment methodologies, or education about these geophysical risk. This forum of discussion brought together research scientists at the forefront of both disciplines with PhD students and young scientists to address common questions related to both disciplines, and allowed to all them to . learn knowledge from the others and opened new ways for future collaborations and to jointly improve our knowledge on Earth Sciences.

The meeting was organised as a discussion forum rather than a typical scientific conference with a series of short oral presentations. It included four sessions covering the following topics: i) Geodynamic constraints of earthquakes and volcanoes, ii) Causes and effect relationships between earthquakes and volcanoes, iii) Modelling and monitoring, and iv) Quantification of uncertainty in forecasting earthquakes and volcanoes. Different oral presentations were given in each session, providing a general summary on each topic and promoting discussion among all

participants The workshop also included a general discussion session at the end of it, were participants discussed on the following topics:

- Summary of the main achievements of the workshop
- Recommendations to IUGG on how to strength the collaboration between IASPEI and IAVCEI
- Guidelines definition for future research of earthquakes and volcanoes from a common perspective
- Reducing seismic and volcanic risk by improving scientific knowledge on their causes and potential interactions
- Special Issue on earthquakes and volcanoes
- Future collaborations

Among the conclusions reached in that discussions, it is relevant to remark that participants enjoyed this type of small format workshop and all agreed in the need of promoting them among IUGG associations, as a practical and effective way to learn about what the others do and to identify common aspects and common interests. So, it was proposed to continue with this particular thematic workshop but also insisting to IUGG to promote other among the other associations. From a more scientific point of view, it was mentioned the need to quantify energy in such processes, particularly for volcanism where there are not sufficiently precise estimates on the energy of volcanic eruptions. It was also remarked the necessity to understand such process in a common geodynamic and lithospheric stress framework, to promote the installation of downhole observatories and to define world sites to investigate such processes from a multidisciplinary approach, and to improve our knowledge on rock mechanism from field and lab studies as a common aspected shared by both communities. It was also agreed to propose the edition of a book or special issue revising the state of the art of the main topic of this workshop, and it was proposed as a first option to try the Cambridge University Press Special Publications of IUGG, which would include the most relevant contributions to this meeting and also some invited papers and reviews on the topics covered by the workshop.

Scientific Program

Tuesday, November 8

09:00-09:30h. Presentation of the workshop. Main guidelines, aims and expected results (Joan Marti, ICTJA, CSIC, Barcelona, Spain)

Topic 1: Geodynamic constraints of earthquakes and volcanoes,

09:30-10:00h Global Earth: seismic and volcanic energy budget (Carmen López, IGN, Madrid, Spain)

10:00-10.30h Early signs of geodynamic activity before the 2011-2012 El Hierro eruption (Carmen López, IGN, Madrid. Spain)

10:30-11:00h. The construction of a homogeneous catalog of global instrumental seismicity: ISC-GEM (Antonio Villaseñor, ICTJA, CSIC, Barcelona, Spain)

Coffee break 11:00-11.30h

11:30-12:00h M6.7 Manipur, India, earthquake of January 4, 2016 Vis-a -Vis decadal seismicity records. (Brijesh. K. Bansal, Ministry of Earth Sciences, New Delhi, India)

12:00-12:30h Paleoseismology studies and Volcano-Tectonics of Faial-Pico and S. Jorge Ridges (Azores). A review (Antonio Brum, University of Lisbon, Portugal)

12:30-13:00h First-order estimate of the Canary Islands plate-scale stress field: Implications for volcanic hazard assessment (Adelina Geyer, ICTJA, CSIC, Barcelona, Spain)

13:00-13:30 Discussion

Lunch 13:30-15.00

Topic 2: Cause and effect relationships between earthquakes and volcanoes

15:00-15:30h. Volcano interactions: An overview on observations, statistical relevance, and models (Thomas Walter, GFZ,Potsdam, Germany)

15:30-16:00h. Bárðarbunga 2014/2015: Rifting, dyke propagation, caldera collapse and eruption in Iceland's Eastern Volcanic Zone (Kristin S. Vogfjörd, Icelandic Meteorological Office, Reykjavík, Iceland)

16:00-16:30 Seismic and volcanic events in Central Mexico: Lesson from paleoseismological excavations (María Ortuño, University of Barcelona, Spain)

Coffee Break 16:30-17:00

17:00-17:30h. Volcanism and tectonics in Italy: the main actors of recent earthquakes in Central Italy (Roberto Sulpizio, University of Bari, Italy)

17:30-18:00h. Earthquakes and magma transport in past four eruptions in Iceland, Fimmvörðuháls (2010), Eyjafjallajökull (2010), Grímsvötn (2011) and Bardarbunga-Holuhraun (2014-2015) (Armann Hoskuldsson, University of Iceland)

18:00-18:30 Discussion

<u>Wednesday, November 9</u>

Topic 3: Modelling and monitoring

09:00-09:30h. Automatic detection and classification of seismo-volcanic signals (Manuel Titos, University of Granada, Spain)

09:30-10:00h. Bidirectional interactions between tectonic events and seismic noise at volcanoes. (Roberto Carniel, Università di Udine, Friuli, Italy)

10:00-10:30h. Possible eruptive activity at Taal volcano (Philippines) inferred by Electromagnetic methods: Risk evaluation (Jacques Zlotnicki, CNRS, Clermont Ferrand, France)

10:30-11:00h. Advantages using Phase Cross-Correlation for searching temporal structural changes. Application to 2011 El Hierro eruption (Pilar Sanchez, ICTJA, CSIC, Barcelona, Spain)

Coffee break 11:00-11.30h

11:30-12:00h Optimizing the observation at depth: borehole measurements and downhole monitoring (María José Jurado, ICTJA, CSIC, Barcelona, Spain)

Topic 4: ***Quantification of uncertainty in forecasting earthquakes and volcanoes***.

12:00-12:30h. Reconstruction of the magmatic feeding system geometry during the explosive eruption of 1913 eruption at Fuego de Colima volcano (Mexico) and inferences on eruption triggering mechanisms (Silvia Massaro, University of Bari, Italy)

12:30-13:00h. The TOMO-ETNA Experiment: A joint active passive seismic survey for imaging the deep structure of Mt. Etna region and surrounding areas (Alejandro Díaz-Moreno, University of Granada, Spain)

13:00-13:30: Forecasting cascading extreme hazards (Joan Martí, ICTJA, CSIC, Barcelona, Spain) (Joan Martí, ICTJA, CSIC, Barcelona, Spain)

Lunch 13:30-15.00

15:00-17:00 General Discussion

List of participants

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