

# NEWS No. 1

April 2022

**INTERNATIONAL ASSOCIATION  
OF VOLCANOLOGY AND CHEMISTRY  
OF THE EARTH'S INTERIOR**



*This Newsletter is intended to keep IAVCEI Members and individual scientists informed about the activities of the Association and its bodies, and the actions of the IAVCEI Executive Committee. Past issues are posted on the IAVCEI website. Your comments are welcome. The IAVCEI Newsletter may be forwarded to non-members who may benefit from the information.*

## FROM THE PRESIDENT



Photo by © Francesca Zizola

Dear colleagues,

I hope you're well and safe. For two years now the Covid-19 pandemic has strongly disrupted the way we live and work, reminding us how vulnerable humanity may remain in a modernizing global world. Lockdowns and travel restrictions have strongly impacted our meeting plans and the working conditions of many researchers, especially younger ones. However, the scientific community has also demonstrated its high potential of resilience, by rapidly finding anti-Covid vaccines, by developing effective online exchanges, and by counteracting the danger of disinformation and fake news.

We do expect that 2022 will offer us positive perspectives towards a gradual recovery over the pandemic, global economic rebound, and renewed physical attendance to scientific meetings. In particular, we are getting closer and closer to the 11<sup>th</sup> Conference Cities on Volcanoes in Heraklion (Crete), on June 12–17, that will become the very first big IAVCEI meeting since 2019. We thus hope that many of you will participate, both in presence and online. Thereafter you will find updated information on COV11 and other activities recently developed by the IAVCEI or with its support.

Before that reading, however, one cannot escape mentioning the tragedy that is hitting the heart of Europe, namely the war imposed on Ukraine by the Russian federation since February 24. Peaceful collaboration and mutual respect beyond borders are intrinsic values of scientific research and of our Association. They are also key rules for a good understanding between neighboring countries. The Russian attacks on Ukraine, and the terrible suffering imposed on the Ukrainian people for now seven weeks, flout these values and the freedom rights of every country.

This tragedy has motivated widespread protests from the worldwide scientific community and outpourings of solidarity in favor of Ukraine. Official statements were early published by the International Science Council (<https://council.science/current/news/isc-statement-ukraine/>) and by many other scientific Organizations, among which most Association members of IUGG. After reaching a consensus, the IAVCEI Executive Board published its own statement on March 16 (see below). This statement, in particular, refers to the courageous call of over

600 Russian scientists - among whom several of our colleagues – to stop the war launched by their President. Russia is indeed an important country member of IAVCEI and we've been honored to have Georgii S. Gorshkov and Sergei A. Fedotov as past Russian Presidents of IAVCEI (1971–1975 and 1979–1983, respectively). In coherence with his statement, the IAVCEI thus disagrees with externally raised suggestions of a general embargo on manuscript submissions by Russian scientists, many of whom disapprove the ongoing war. Finally, protesting against the war upon Ukraine does not prevent us from denouncing tragic wars that hit other parts of the world.

**Patrick Allard**  
April 20, 2022

## IAVCEI statement upon the war to Ukraine

“The IAVCEI Executive Committee strongly condemns the war imposed on Ukraine by the Russian Federation, a war that is provoking a humanitarian crisis that is worsening by the day. IAVCEI is an international scientific association of volcanologists promoting mutual respect and peaceful collaborations beyond borders, with the key objective of mitigating volcanic risk. We thus deplore the terrible suffering imposed on the Ukrainian people and we express our total solidarity with scientists speaking out against the war in both Ukraine and Russia.

In particular, we endorse the courageous appeal of our Russian colleagues to stop the war (<https://trv-science.ru/en/2022/02/we-are-against-war-en/>)\*. Without forgetting tragedies that hit other parts of the world, IAVCEI stands with the International Science Council and other worldwide scientific associations calling for an immediate end of the war to Ukraine.”

**IAVCEI Executive Committee**  
March 16, 2022

\*Access to this link has been shut down since then.

## UPDATES ON IAVCEI ACTIVITIES

### ■ COV11 (June 12–17, 2022)

The preparation of COV11 in Crete in June 2022 is actively going on. More than 800 abstracts were submitted and 340 participants already registered for both physical and virtual attendance. In order to favor additional attendance, the early registration deadline has been extended until April 15. As regards the Field Trips the deadline for booking is April 30. Check updates on the new COV11 website: [www.citiesonvolcanoes11.com](http://www.citiesonvolcanoes11.com)

### ■ Implementation of Commissions' webpages on IAVCEI website

Our website continues to be gradually upgraded. Over the past three months Eugenio Nicotra, our webmaster, has successfully managed with Commissions' boards and our private partner Guarant the migration on IAVCEI website of the former webpages of 14 Commissions, Networks (ECR-NET, INVOLC) and e-Volcano Platform. All these now dispose of similar templates and tools as subdomains on the main IAVCEI webpage.

### ■ Early Career Researchers webinars

The second online webinar of the IAVCEI ECR Network was held on 10 February 2022, on the theme "Mass Movements and their Associated Hazards". It involved two successive talks followed by questions: the first one by Engielle Paguican (Caraga State University, Philippines) on 'Volcanic debris avalanche deposits and what they tell us about edifice collapse', and the second one

by Alexis Bougouin (Laboratoire Magmas et Volcans, Clermont-Ferrand, France) on 'Experiments of impulse waves generated by gravity-driven flows: Focus on tsunami generation by pyroclastic flows'.

### ■ 2022 IAVCEI Award for Volcanic Surveillance and Crisis Management

The call for submitting nominations was launched on January 13, with a submission deadline fixed at March 11. The submitted nominations are now being examined by the IAVCEI Award Committee. The winner of 2022 VSCM Award will be revealed and honored during a dedicated ceremony on occasion of COV11 in Heraklion.

### ■ WOVO renewal

As detailed in the previous Newsletter, we sent a Survey to worldwide Volcano Observatories and/or Institutions in charge of monitoring volcanoes in order to check their willing, expectations and recommendations with respect to our project of rejuvenating the WOVO (World Organization of Volcano Observatories). Initiated on the 1<sup>st</sup> of September 2021, this survey was closed on 26 March 2022 after several recalls. By the end, highly positive and constructive answers were received from a representative number of VOs from various parts of the world. The results will now be shared with and discussed by the think tank in charge of proposing recommendations to rejuvenate the WOVO.

## OBITUARIES

### C. Dan Miller (1942–2021)

C. Dan Miller passed away on October 22, 2021, at the age of 79. Dan was an accomplished geologist, communicator about volcano-hazards, and leader of the U.S. Geological Survey's (USGS) Volcano Disaster Assistance Program (VDAP). He was also an avid aviator and a valued friend and colleague.



Dan's graduate studies focused on neoglacial deposits in the Washington State Cascades and the Colorado Rocky Mountains. These Quaternary studies were excellent preparation for similar work at volcanoes. In 1974, he was hired by Rocky Crandell and Don Mullineaux, whose USGS Volcanic Hazards Project was then based in Denver. During his early career, he studied postglacial volcanism at Mount Shasta, responded to the 1980 eruption of Mount St. Helens, and investigated young explosive volcanism of the Inyo Dome chain. In 1985, Dan joined the Cascades Volcano Observatory (CVO) in Vancouver, Washington. Highlights include assessment of volcano hazards in California, assessment of hazards to siting Nuclear Power Plants in the Pacific Northwest, recognition of the enormous prehistoric debris avalanche from Mount Shasta, and work on recent volcanism at Medicine Lake.

Throughout his career, Dan was an ambassador for the USGS in other countries. Beginning in 1976, he variously worked in Ecuador, focusing on Cotopaxi Volcano; assisted Indonesian colleagues with his expertise in explosive volcanism; assisted with archaeological discoveries in El Salvador; and was instrumental in organizing scientific exchanges between Kamchatkan and American volcanologists. Dan's collaboration with Russian volcanologists continued even after his retirement in 2004. Dan led the USGS-USAID Volcano Disaster Assistance Program from 1992 through 2004. Under his leadership, VDAP's volcano-hazard mitigation efforts expanded from Latin America to countries around the globe. Some notable responses that

Dan led included crises at Rabaul, Popocatepetl, Soufriere Hills, Tungurahua, Guagua Pichincha, Cotopaxi, Mount Pago, and Nyiragongo.

Throughout his career, Dan was an articulate spokesman for the USGS and the field of volcanology. In the field, he was invariably perceptive and insightful and commonly was a step ahead of everyone else in recognition of deposits and their significance. Dan also had a knack for explaining volcanic processes and the threat they posed for the benefit of scientists, politicians, news and documentary reporters, and laymen. Dan's generosity was legendary, and he always displayed a keen sense of humor and zest for life that made him a joy to have as a friend and colleague.

**Jim Vallance, John Ewert, Rick Hoblitt, Willie Scott,  
Jeff Marso, John Pallister and Andy Lockhart**

## Wimpy Tjetjep (1953–2021)

Wimpy Tjetjep, former Director of the Volcanological Survey of Indonesia (VSI), passed away in Jakarta on November 14, 2021, at the age of 68.

Wimpy was born on the 27 January 1953 in Makasar, capital of Southern Sulawesi, Indonesia. After getting his degree in Geology at the Institute of Technology of Bandung, he moved to France where he obtained a DEA in Geophysics in 1981 at the Institut National Polytechnique de Lorraine, Nancy, then his PhD in 1983 on "Application of gravimetry to geothermy and volcanology".

Back in his country, Wimpy Tjetjep was nominated Director of the volcanology section in the Volcanological Survey of Indonesia (1984–1992), then Director of whole VSI for the period 1993-1998. During these two mandates he actively developed the monitoring of Indonesian volcanoes and international collaborations of VSI with several countries, including France where he had studied.

In 1987–1991 he was responsible for the Indonesia-French cooperation (partnering with J-C. Sabroux then G. Poupinet for the French side).

After leading the VSI, Wimpy Tjetjep exerted various other responsibilities, as expert in natural resources at the State Ministry for Regional Autonomy (1999–2001), General Director of Geology and Mining Resources at the Ministry of Energy (2011–2003), Chief of the Agency for Research and Development at the same Ministry (2003–2005), then becoming himself Minister in charge for Economic Affairs at the Ministry of Energy (2005–2013). For his various services, he was honored in 2011 with the title of Commander of the National Order of Merit of the Republic of Indonesia.

Wimpy was a dynamic and joyful character. Playing bridge was his great hobby and in 2006–2010 he was president of the Indonesian Union of bridge clubs (GABSI). His is survived by his wife, Andi Ranty Patola Yusuf, his daughter Jessy Agita and his son Wahvu Ariardi.



**G. Made Agung Nandaka, François Beauducel,  
Jean-Christophe Sabroux and Patrick Allard**



## CONFERENCE REPORTAGE

# International Conference on Mitigating Volcanic Risks in the Virunga Region

## March 19–21, 2022

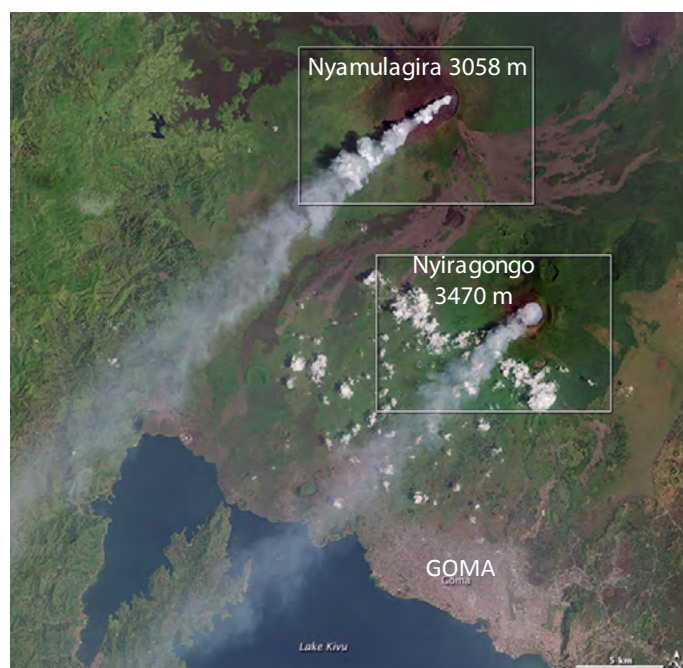
RÉPUBLIQUE DÉMOCRATIQUE DU CONGO  
 MINISTÈRE DE LA RECHERCHE SCIENTIFIQUE ET INNOVATION TECHNOLOGIQUE  
 Observatoire Volcanologique de Goma



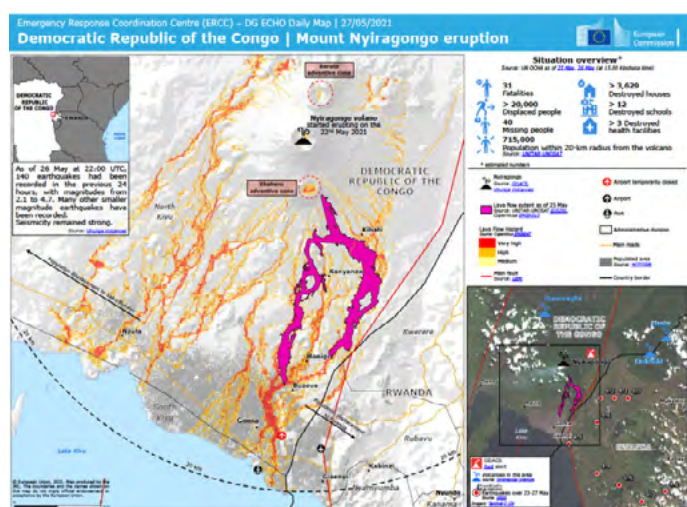
An international Conference on the Mitigation of Volcanic Risks in the Virunga Region was held in Goma (Democratic Republic of Congo) on 19–21 March 2022. This project was built up through interactions between the Goma Volcano Observatory (GVO), the DRC's Ministry for Scientific Research and Technological Innovation, and the IAVCEI following the catastrophic May 2021 eruption of Nyiragongo volcano. Locally organized and supported by the DRC Government and the North-Kivu Authorities, the Conference has involved over 250 participants including several Ministers, Deputies and Senators, Kivu's Civil Defense Authorities, Representatives of the local populations, Professors and Directors of DRC's Universities and Research Institutes, the Goma Volcano Observatory (GVO), scientists from five other African countries (Rwanda, Burundi, Cameroon, Ethiopia, Egypt), and 22 foreign experts (both in person and online) from Belgium, Luxembourg, France, Italy, Sweden and the USA under scientific coordination of the IAVCEI.

### Background and motivations

Nyiragongo and Nyamulagira, in the Virunga volcanic area of the Kivu Rift (western branch of the Eastern African Rift System),



Modified Natural-color Landsat-8 image, NASA Earth Observatory, Feb. 2015



are two of the most active volcanoes in the world. Nyiragongo, in particular, is famous for hosting a long-lived lava lake of highly fluid leucite-bearing nephelinite magma in its summit crater (3470 m asl). The dynamics, height level and volume of this lava lake vary over time, depending on inner changes in the plumbing system and the rift tectonic activity. The key concern with Nyiragongo lava lake is that it is perched some 1.5 km in height above a densely inhabited (around 1.5 million people) region just north of Lake Kivu, directly threatening the nearby cities of Goma (RD Congo) and Gisenyi (Rwanda). Another potential hazard arises from the proximity of the volcano (and its dyke intrusions) to the gas-charged Lake Kivu (whose deep water layers contain about 300 km<sup>3</sup> of CO<sub>2</sub> and 60 km<sup>3</sup> of methane in solution).

In the past 44 years the region was heavily impacted by three fissural eruptions of Nyiragongo, in January 1977, January 2002 and May 2021. These eruptions involved sudden N-S fracturing of the volcanic pile (mainly along its southern flank), effusion of fast moving lava flows due to drainage out of the lava lake, ash-rich outbursts due to inner crater collapses, and underground radial dyke propagation. These events were either preceded (1977), accompanied or followed (2021) by intense VT seismicity reaching M4-5. These three eruptions destroyed crops, villages, infrastructures and up to 10% of the city of Goma in 2002, making numerous victims, tens of thousands of homeless, and forcing the spontaneous or ordered evacuation of several hundreds of thousands of people. Therefore, being able to anticipate such sudden eruptions and to alert the populations in due time is both of crucial importance and a great challenge for the staff of the Goma Volcano Observatory (GVO). The 2021 eruption, in particular, had no obvious precursor in the preceding weeks or months and took everyone by surprise. It was the very first eruption instrumentally recorded at Nyiragongo thanks, in great part, to the sustained Be-Lux partnership of GVO in developing and maintaining seismic and geodetic monitoring of the volcano since 2005. During the eruptive and seismic crisis in May-June 2021 a group of 27 foreign experts from 11 countries assisted GVO in interpreting the recorded data through daily online meetings.

After this crisis, the Director of GVO solicited our help to co-organize a conference in Goma where both scientific and operational recommendations could be provided in order to



improve the surveillance of Nyiragongo and better mitigate hazards and risks from its future eruptions. As a first step, the IAVCEI organized on 29 October 2021 a special webinar dedicated to the May 2021 eruption (199 participants). Then, through repeated exchanges with GVO a scientific program was gradually built up for the Conference that happened on 19-21 March 2022. The overall conference program is given below.

By the end, 22 foreign experts with competences in various fields of volcanology (seismology, geodesy, geology-petrology, gas geochemistry, remote sensing, hazard assessment and mapping, crisis management and communication), familiar or not with Nyiragongo, participated both physically and remotely to the conference.

These were: François Kervyn, Caroline Michellier and Benoît Smets, MRAC (Musée Royal d'Afrique Centrale), Belgium; Nicolas d'Oreye and Adrien Oth, ECGS (European Centre for Geodynamics and Seismology), Luxembourg; Nicolas Theys, Belgium Institute for Space Aeronomy, Brussels, Belgium; Karen Fontijn, ULB (Université Libre de Bruxelles), Belgium, and vice-president of INVOLC-IAVCEI; Dario Tedesco, University Naples-2, Italy; Aline Peltier, IPGP, La Reunion, Director of Piton de la Fournaise Volcano Observatory; François Beauducel, IPGP, Paris, France; Valérie Cayol, Oryaëlle Chevrel and Guillaume Boudoire, LMV-OPGC, Université Clermont-Auvergne, France; Santiago Arellano, Chalmers University, Sweden; Jean-Christophe Sabroux, Paris, France; Francois Darchambeau, KivuWatt, Belgium; Pierre Briole, ENS (Ecole Normale Supérieure), Paris, France; Jake Lowenstern, USGS, USA, Director of VDP; Marcello Liotta and Mario Mattia, INGV, Italy; Patrick Allard, IPGP, France, and Roberto Sulpizio, Univ-Bari, Italy, representing the IAVCEI.



The Goma Conference was remarkably organized by the RDC's government and the north-Kivu Authorities, who made it a major national event despite persisting curfew conditions (banners and posters in Goma airport and in the city, efficient logistics and assistance, active participation of local population's representatives, Zoom connection and real-time English/ French translation, etc.).

The three days of conference allowed numerous oral presentations, very open questions and discussions, and intense public debates between representatives of the local population, GVO and the Congolese Authorities about lessons to be drawn from the 2021 eruption and its impacts. Four working groups finally met separately to delineate a series of written recommendations. These recommendations, currently under completion prior to their officialization, will serve to define the next strategic plan of GVO and the requirements of financial assistance from both RDC's government and big funding Organizations (World Bank, etc.). Positive falls of the conference include planned actions for developing the monitoring network on Nyiragongo, training young GVO staff, better coordinating of GVO's international partnerships, improving communication with local communities, promoting GVO as a privileged training centre for African volcanologists, etc. It is hoped that these various recommendations will be followed by concrete actions despite local obstacles. As a matter of fact, the Conference further highlighted the great challenges faced by GVO in managing volcanic risks in the Virunga region (difficulties in

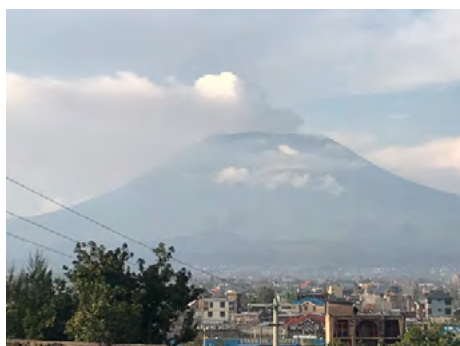


field access, insecurity on field operations and in maintaining the instrumental network due to persisting armed conflicts or stealing, local rivalries, broad poverty...).

Having held this International Conference in Goma, with a huge media coverage and under the eyes of local populations, constitutes a strong commitment of the RDC government. The IAVCEI will remain available to encourage this step ahead in a low-income region of Africa, threatened by two very active volcanoes, in conformity with the 6<sup>th</sup> objective of its Statute and By-Laws: "To be the international reference body for advice on scientific policies relating to volcanic processes, hazards and risks".

## GOMA Conference Programme

JOUR	HEURE	THÉMATIQUE	INTERVENANT	
<b>JOUR I</b> <b>Samedi</b> <b>19 mars 2022</b>	08H00-08H30	Arrivée et enregistrement des participants		
	08H30-08H35	Arrivée de Monsieur le Gouverneur de la province du Nord-Kivu		
	08H35-08H40	Arrivée des Honorables députés		
	08H40-08H45	Arrivée de leurs Excellences messieurs les Ministres		
	08H45-08H50	Arrivée de son Excellence monsieur le Premier Ministre, Chef du Gouvernement		
	08H50-08H55	Arrivée de son Excellence monsieur le Président de la République, Chef de l'État		
	<b>CÉRÉMONIE D'OUVERTURE</b>			
	09H00-09H30	Hymne national		Protocole d'État
		Mot de bienvenue		Son Excellence Monsieur le Gouverneur de la province du Nord-Kivu
		Mot de circonstance		Son Excellence Monsieur le Ministre de la Recherche Scientifique et Innovation Technologique
		Discours d'ouverture officielle de la conférence		Le Président de la République, Chef de l'État / Le Premier Ministre, Chef du Gouvernement
		Présentation des délégations et Photo de famille		Protocole d'État
	09H30-10H00	Pause-café		Hôteses
	<b>PANEL 1: EXPOSÉS D'ORIENTATION DES MINISTRES/ M. TUVÉR WUNDI</b>			
	10H00-10H15	<b>Exposé 1:</b> État des lieux de la gestion des volcans dans les Virunga et de la prévision de leurs éruptions volcaniques.		Prof MUHINDO Adalbert, DG-OVG
	10H15-10H30	<b>Exposé 2:</b> Surveillance des volcans et prévention des catastrophes volcaniques: contexte global et spécificités des Virunga.		Prof ALLARD Patrick, Président de l'IAVCEI, France
	10H30-10H45	Présentation du Plan de contingence au nord Kivu		Ministre de l'Industrie/Gouverneur honoraire du Nord Kivu
10h45-11h00	Prise en charge des blessés et malades après une éruption volcanique		Ministère de la Santé	
11h00-11h15	Prise en charge humanitaire des victimes d'une éruption volcanique		Ministère des Affaires Sociales	
<b>DE L'ÉTAT ACTUEL DES VOLCANS ACTIFS DES VIRUNGA / Prof KABENA Odette</b>				
11H15-11H25	Quel plan d'aménagement pour un territoire en zone volcanique?		Ministère de l'Aménagement du Territoire	
11H30-11H40	Opportunités économiques du gaz méthane du lac Kivu		Ministère des Ressources Hydrauliques et de l'Électricité	



JOUR	HEURE	THÉMATIQUE	INTERVENANT
<b>JOUR I</b> <b>Samedi</b> <b>19 mars 2022</b>	11H45-12H00	<b>Jeu de questions-réponses</b>	Prof KABENA Odette, UNIKIN
	12H05-12H30	Introduction de la visite et <b>Présentation des posters</b>	Chercheurs
	12H35-13H30	Pause-Repas	
	<b>PANEL 2: EXPOSES SCIENTIFIQUES: PREVISION ET PHÉNOMÉNOLOGIE DES ÉRUPTIONS VOLCANIQUES / Prof KABENA Odette</b>		
	13H30-14H10	1. Mécanismes de génération des magma et phénoménologie des éruptions volcaniques 2. Crises volcaniques au volcan Piton de la Fournaise (île de la Réunion): des observations à l'alerte 3. Aléas volcaniques en Afrique de l'Est: évaluation à partir des études géologiques et collaborations 4. Histoire éruptive de la chaîne volcanique des Virunga	<ul style="list-style-type: none"> <li>• Prof ZANA André, DG-CRG /Sismicité, Prof MAMBO Hilaire, UNIKIN /Gaz volcaniques</li> <li>• Dr PELTIER Aline, IPGP, OVPF-La Réunion, France</li> <li>• Dr FONTIJN Karen, ULB, Belgique</li> <li>• Dr SMETS Benoît, MRAC, Belgique</li> </ul>
	<b>Prévision et phénoménologie des éruptions volcaniques / Prof KABENA Odette</b>		
	<b>SESSION SIGNAUX SISMIQUES ET GEODESIQUES /SALLE 1</b>		
	14H27-14H37	<b>Exposé 3:</b> Essais sismiques et sismicité pré-éruptive au Nyiragongo: cas de l'éruption du 22 mai 2021	Prof MAVONGA Georges, M. RUSANGIZA Rigobert, OVG
	14H39-14H49	<b>Exposé 4:</b> Suivi des mouvements de magma dans la province volcanique des Virunga à l'aide de la rationalisation de l'amplitude sismique (SARA).	M. SUBIRA Josué, OVG
	14H52-15H14	<b>Exposés 5-6:</b> Contribution du groupe Be-Lux aux moyens de surveillance sismique et géodésique du Nyiragongo et au suivi de l'éruption de mai 2021	Dr D'OREYE Nicolas, MNHN/ECGS, Belgique Dr OTH Adrien, ECGS, Belgique
	15H16-15H26	<b>Jeu de questions-réponses</b>	
	15H28-15H38	<b>Exposé 7:</b> Caractéristiques géodésiques des trois dernières éruptions fissurales du Nyiragongo (1977, 2002 et 2021)	M. CIRABA Honoré, OVG
15H40-15H50	<b>Exposé 8:</b> Imagerie satellitaire des intrusions de dyke et croissance des volcans de rift: Nyiragongo 2002	Dr CAYOL Valérie, UCA, France	

JOUR	HEURE	THÉMATIQUE	INTERVENANT
<b>JOUR I</b> <b>Samedi</b> <b>19 mars 2022</b>	15H52-16H02	<b>Exposé 9:</b> Quantification des flux de magma lors des crises volcaniques par modélisation numérique en temps-réel des données GNSS	Dr BEAUDUCEL François, IPGP, France
	16H04-16H14	<b>Exposé 10:</b> Simulation et imagerie des coulées de lave <i>(en ligne)</i>	Dr CHEVREL Oryaëlle, UCA, France
	16H16-16H26	<b>Jeu de questions-réponses</b>	
	16H28-16H40	Résumé des travaux de la 1 <sup>re</sup> journée	Prof KABENA Odette, UNIKIN
		Fin de la 1 <sup>re</sup> journée	
	<b>Prévision et phénoménologie des éruptions volcaniques / Prof KANDA Valentin</b>		
	<b>SESSION GAZ VOLCANIQUES DES VIRUNGA ET LAC KIVU /SALLE 2</b>		
	14H27-14H37	<b>Exposé 11:</b> Géochimie des gaz au Nyiragongo: leçons des éruptions de 2002 et 2021	Prof TEDESCO Dario, Università Campania, Italie
	14H39-14H49	<b>Exposé 12:</b> Évolution des dégazages volcaniques au Nyiragongo avant et après l'éruption du 22 Mai 2021	M. YALIRE Matthieu, OVG
	14H52-15H02	<b>Exposé 13:</b> Étude et suivi des panaches de gaz du Nyiragongo et du Nyamulagira depuis le sol / Ground-based survey of volcanic plume emissions from Nyiragongo and Nyamulagira	Dr ARELLANO Santiago, Chalmers Univ., Suède
	15H04-15H14	<b>Exposé 14:</b> Approche spatiale pour le suivi des émissions de gaz et aérosols volcaniques des volcans actifs des Virunga <i>(en ligne)</i>	Dr THEYS Nicolas, IASB, Belgique
	15H16-15H26	<b>Jeu de questions-réponses</b>	
	15H28-15H38	<b>Exposé 15:</b> Pollution des eaux par les émissions gazeuses du Nyiragongo	Prof BALAGIZI Charles, OVG
	15H40-15H50	<b>Exposé 16:</b> Mécanisme de la formation du gaz dans le lac Kivu	Prof MAMBO Hilaire, UNIKIN
	15H52-16H02	<b>Exposé 17:</b> Éruptions limniques des lacs volcaniques: Lac Nyo et Lac Kivu, analogies et différences	Prof SABROUX Jean-Christophe, ex-CNRS, France
16H04-16H14	<b>Exposé 18:</b> Stabilité de la stratification des eaux du lac Kivu	Dr DARCHAMBEAU François, Contour Global, Belgique	
16H16-16H26	<b>Jeu de questions-réponses</b>		
16H28-16H40	Résumé des travaux de la 1 <sup>re</sup> journée	Prof KANDA Valentin, CRGM	
	Fin de la 1 <sup>re</sup> journée		



JOUR	HEURE	THÉMATIQUE	INTERVENANT	
<b>JOUR II</b> <b>Dimanche</b> <b>20 mars 2022</b>	08H30	Mise en place terminée	Hôtesse	
	08H35-8H50	Synthèse des travaux de la 1 <sup>er</sup> journée	M. MUKADI Isidore, MRSIT	
	<b>Évaluation et gestion des impacts socio-environnementaux / Modérateur M. SYAIKAMBA John – Société Civile</b>			
	<b>SESSION IMPACTS, GESTION DE CRISE ET COMMUNICATION / ASSEMBLEE PLENIERE</b>			
	08H55-09H05	<b>Exposé 19:</b> Best Practices for Volcano Observatories: international collaboration, data sharing and communication ( <i>en ligne</i> )	Dr LOWENSTERN Jacob, VDAF, USA	
	09H07-09H17	<b>Exposé 20:</b> L'accès aux données lors des crises volcaniques:exemples et recommandations ( <i>en ligne</i> )	Dr BRIOLE Pierre, ENS, France	
	09H19-09H29	<b>Exposé 21:</b> Gestion des risques volcaniques avant, pendant et après la crise de Mai 2021	M. MAKUNDI Joseph, Protection civile / RD Congo	
	09H31-10H00	<b>Exposé 22:</b> Sécurité de la population et de ses biens pendant une crise volcanique	Général de Brigade MULAND NAWAJ Godefroid/ École de guerre de Kinshasa	
	10H02-10H12	Pause-café	Hôtesse	
	10H17-10H27	<b>Exposé 23:</b> Scénario des coulées de lave et le plan de contingence	Prof MUHINDO Adalbert, DG-OVG	
	10H29-10H39	<b>Jeu de questions-réponses</b>		
	10H42-10H52	Interlude musical		
	10H54-11H04	<b>Exposé 24:</b> Activité séismique du bassin du lac Kivu et son impact sur le volcanisme dans les Virunga	M. MAHINDA Celestin, DS-OVG	
	11H06-11H16	<b>Exposé 25:</b> Impacts humains et enseignements de la gestion de crise au Nyiragongo en mai 2021	Dr MICHELLIER Caroline, MRAC, Belgique Dr MORIN Julie, Université Cambridge, UK	
	11H18-11H28	<b>Exposé 26:</b> Leçons tirée par le groupe BeLux du déroulement et du suivi de l'éruption volcanique du Nyiragongo de mai 2021	Prof KERVYN François, MRAC, Belgique	
	11H30-11H40	<b>Exposé 27:</b> Organisation Mondiale des Observatoires Volcanologiques (WOVO): place de l'OVG dans le contexte global et africain	Prof ALLARD Patrick, IAVCEI	
11H42-11H52	<b>Jeu de questions-réponses</b>			
11H52-12H02	Film documentaire sur l'éruption volcanique			

JOUR	HEURE	THÉMATIQUE	INTERVENANT
<b>JOUR II</b> <b>Dimanche</b> <b>20 mars 2022</b>	<b>Travaux en groupes</b>		
	13H05-15H05	Groupe 1: Stratégies pour la surveillance des volcans des Virunga et l'anticipation de leurs éruptions	Prof ZANA André, DG-CRG / Dr OTH Adrien, ECGS
		Groupe 2: Caractérisation des aléas et impacts potentiels des éruptions volcaniques dans les Virunga	M. MAHINDA Celestin, DS-OVG / Prof ALLARD Patrick, IAVCEI
		Groupe 3: Communication, prévention et gestion des risques liés aux éruptions volcaniques dans les Virunga	M. KAMBALE Etienne / Dr MICHELLIER Caroline, MRAC
		Groupe 4: Consolidation du prochain plan stratégique de l'OVG	Prof MUHINDO Adalbert, DG-OVG / Dr KERVYN François, MRAC
	<b>RESTITUTION EN PLÉNIÈRE</b>		
	15H10-15H20	Saynète	
	15H22-15H32	Rapport des travaux du Groupe 1	
	15H34-15H44	Rapport des travaux du Groupe 2	
	15H46-15H56	Rapport des travaux du Groupe 3	
15H58-17H36	Échanges		
17H38-16H40	Résumé des travaux de la 2 <sup>ème</sup> journée Fin de la 2 <sup>ème</sup> journée	M. KABONGO Kanimba	



JOUR	HEURE	THÉMATIQUE	INTERVENANT	
JOUR III Lundi 21 mars 2022	08H30	Mise en place terminée	Hôtesse	
	08H35-08H50	Synthèse des travaux de la 2 <sup>ème</sup> journée	Prof KANDA Valentin, DG- CRGM	
	<b>PANEL 3: Plan quinquennal de l'OVG / Prof KABENA Odette</b>			
	08H55-09H30	Présentation du plan stratégique de l'OVG consolidé	Prof MUHINDO Adalbert, DG-OVG et Rapporteur du groupe 4	
		<b>Jeu de questions-réponses</b>		
	09H35-10H05	Pause-café	Hôtesse	
	<b>PANEL 4: Plaidoyer d'appui technique et financier face aux enjeux de l'OVG / Prof KANDA Valentin</b>			
	10H10-12H00	Toutes les représentations diplomatiques en RD Congo		
		UNION EUROPÉENNE		
		JICA		
		BELESPO		
		FMI		
		OCHA		
		USAID		
		PNUD		
UNESCO				
UNICEF				
UNOPS				
Banque Mondiale				
OMS				
AIEA				
MRAC				
MONUSCO				
Centre européen de Géodynamique et de Sismologie, Luxembourg				
INGV, Italie				
Musée Royal de l'Afrique Centrale				
Musée National d'Histoire naturelle du Grand-Duché de Luxembourg				
USGS/VDAP				
Consortium scientifique Guillaume Boudoire UCA				
12H00-14H00	Pause-Repas			



## WORKSHOP REPORTAGE

# The 2<sup>nd</sup> European VOs-VAACs workshop took place successfully in November 2021

The COVID-19 pandemic has severely affected the capability of scientists to travel and attend meetings face to face, but it has never discouraged the willingness and wish of working hard on things we consider in the forefront of our responsibilities. Under this assumption the 2nd European VOs-VAACs workshop took place on-line over three days in November 2021.

## Background

State Volcano Observatories (SVOs) and Volcanic Ash Advisory Centers (VAACs) of meteorological agencies in the world are required to collaborate within the framework of the International Airways Volcano Watch (IAVW) with the purpose of mitigating the potential impact of volcanic eruptions on air traffic through effective communication procedures. SVOs are in charge of monitoring volcanoes, as per contracting state agreement, and to provide timely information on imminent or ongoing eruptions. Along with Volcano Research Institutions (VRIs), they can provide real-time information on eruption intensity, plume height, ash dispersion rate and other parameters helpful for characterizing the event. VAACs are responsible for forecasting the areas potentially contaminated by volcanic ash and for disseminating their forecast products in a timely manner through the established channels, to support decision-making by civil aviation authorities, air traffic control and airlines.

The Eyjafjallajökull eruption in 2010, and also the Cordon Caulle 2011 and Kelud 2014 eruptions, revealed that there was a lack of an established communication channel between SVOs, VRIs and VAACs and the need for reinforcing the dialogue for a more effective operational response. In the past decade several initiatives have aimed to clarify roles and responsibilities, to facilitate the sharing of data and information, to design good practices and to benefit from the reciprocal exchanges and lessons learned. As part of these activities, it is worth mentioning the series of Best-Practices workshops held every two years by the VAACs as well as the Best-Practices meetings held by VOs every three years (Pallister et al. 2019; Lowenstern et al. 2022). Other initiatives aimed at linking these two communities include the series of International Volcanic Ash Workshops held each four years as an WMO initiative, which supports exchanges between the aviation and volcanology groups worldwide. In 2019, a workshop organized in Exeter within the European project EUROVOLC managed to bring together almost all VOs in Europe and the two VAACs responsible for the mainland European airspace.

## Objective

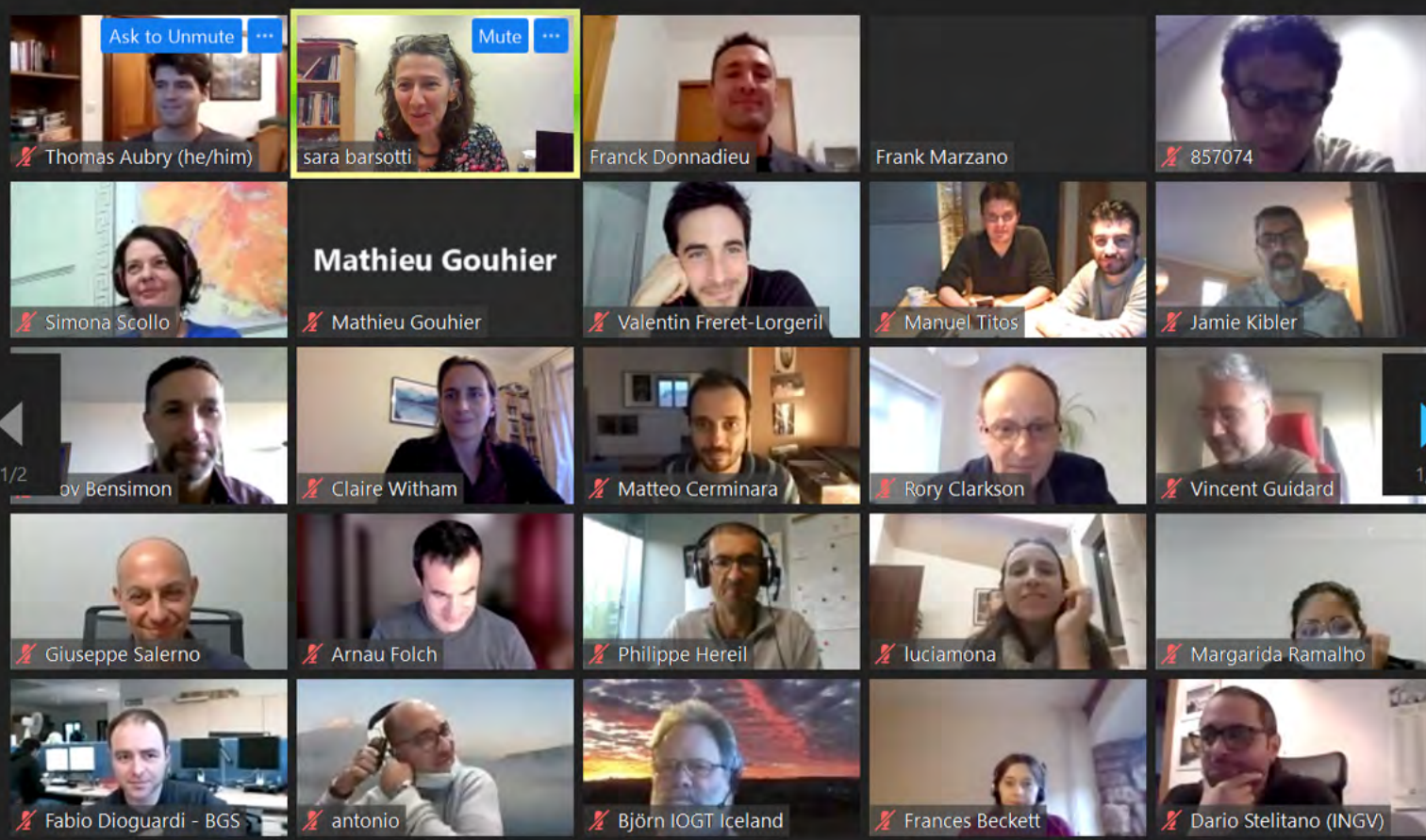
In Europe, Volcano Observatories (VOs), Volcano Research Institutions (VRIs), Volcanic Ash Advisory Centers (VAACs) and aviation end-users still need to build trustful relationships to consolidate and optimize the way of working together toward

an efficient response to a volcanic eruption with potential for air traffic disruption. In addition to communication strategies improvement, there is a need for scientific data integration, and new tools, new technologies, new softwares need to be continuously shared, explained and introduced for the benefit of the entire community.

As a follow-on from the 2019 EUROVOLC meeting, a second volcano-aviation workshop was held on-line on 8-10 November 2021. It took place in the framework of EPOS-SP (European Platform of Observing Systems – Sustainable Phase – Task 5.1.3 – <https://www.epos-eu.org/epos-eric/sp-project>) and EUROVOLC networking activities (WP4 – <https://eurovolc.eu/>). The main objectives which motivated the organization of the workshop were to:

1. Review the status of the roadmap defined during the 2019 Exeter workshop and identify where and how the advances have been achieved, but also to identify where to keep improving;
2. Update the VOs on the new expected version of VONA (Volcano Observatory Notification for the Aviation) and understand how it will be possible to fulfill the new requirements;
3. Show the results of new research in the field of plume height estimates, mass eruption rate, ash cloud detection and retrieval;
4. Introduce the new results on the potential impact of volcanic shock-waves on aircraft (with the presentation of preliminary products of hazard assessment);
5. Present the latest efforts in database collection to be used for long-term hazard evaluation;
6. Review and update good practices in the event of volcanic eruptions from volcanoes monitored by European VOs.

The workshop was structured over three main themes: 1) Procedures at VAACs and International roadmaps; 2) Research and implementation into operations and 3) Volcanic databases and procedures at VOs. Lectures were given by representatives of VAACs from London, Toulouse, Washington and Montreal; by researchers from IPGP, INGV, IMO, CNR, OPGC, UK Met Office, University of Rome, BGS, University of Cambridge, and Rolls-Royce, the Karthala Volcano Observatory (Comoros islands), KNMI (Dutch Volcano Observatory) and University of Bergen (with monitoring responsibilities for Jan Mayen volcanic island – Norway).



## Attendance

The workshop was well received, and achieved successful participation with interesting talks and active discussions. A total of 81 people participated in the workshop with around 60 attendees on each day. The participation was distributed as follows:

### From VOs:

- IMO – Iceland
- INGV – Italy
- IPGP – France
- HSGME – Greece
- OVCV – Cape Verde
- KNMI – Holland
- CIVISA – Azores
- CSIC – Spain
- KVO (Comoros Islands)

### From VRIs:

- University of Bergen – Norway
- CNR – Italy
- University of Geneva – Switzerland
- University of Rome – Italy
- OPGC – Université Clermont Auvergne – France
- BGS – UK
- USGS – USA
- SI – USA
- University of Lille – France
- University of Cambridge – UK
- BSC – Barcelona Supercomputing Center

### From VAACs:

- London
- Toulouse
- Washington
- Montreal

### Other agencies from the aviation sector:

- Eurocontrol
- ISAVIA – Iceland
- Icelandair
- Safety Committee of the Icelandic Airline Pilots Association
- German Air Line Pilots' Association
- Rolls Royce
- ENAV – Italy

## Main outcomes

The workshop offered the opportunity to revisit the roadmap defined during the 1<sup>st</sup> European VOs-VAACs workshop in 2019 to guarantee a continuity in actions and planning ([https://eurovolc.eu/wp-content/uploads/2020/05/EUROVOLC\\_D4.4.pdf](https://eurovolc.eu/wp-content/uploads/2020/05/EUROVOLC_D4.4.pdf)). In addition, new objectives have been identified and specific actions agreed. As good practices, there is an agreement between parties to exercise those volcanoes which do not erupt frequently (like in Greece, Norway, Dutch Caribbean) and also to organize debriefing of the most recent eruptions in Europe (like Fagradalsfjall, Etna, Cumbre Vieja). A lot of attention was dedicated to the issuance of VONA (Volcano Observatory Notice to the Aviation) and the need to publish them on open servers to facilitate their sharing and usage, in addition to the necessity of reporting the plume height unit and its uncertainty (when



available). The new VONA structure (as suggested by ICAO) will become operative in 2023 along with the elevation of the VONA to a recommended practice. In this regard, VOs have been informed of these new requirements and the suggestion came out for an international initiative (led by WOVO for example) to develop a software to distribute amongst the VOs to facilitate the transition to the new standard. More broadly, the WOVO, whose ongoing renewal project was presented, could become the right framework for future exchanges and decisions between VOs (IAVCEI) and ICAO. A specific call was also made to ask for input from VOs in Europe on the new suggested reshaping of WOVO, inviting the representatives to respond to the survey sent by the President of IAVCEI in autumn 2021.

Scientific questions regarding short-lived transient eruptions and how to account for the significant ash concentration limit in new quantitative volcanic ash products for aviation were raised. The Toulouse VAAC agreed to lead engagement with the VOs to work together on this.

Finally, an initiative is ongoing to make available all the material provided during the workshop, the discussions and open actions, including the creation of a special edition of a scientific journal to facilitate its distribution and raise awareness amongst our community.

## In conclusion

In addition to the achieved progress stated above, the main successful objective has been to let people know each other, create connections and establish new working procedures. Knowing our partners and collaborators is the first step needed to achieve a result which requires coordinated actions to be successful. All the attendees appreciated the value of the workshop and they all recognized the necessity of similar events to become a good practice at European level. We all desire that a series of such workshops will be formally established in the future.

## On-line material

More information and links to the presentations given during the workshops are still accessible here: <https://drive.google.com/drive/u/0/folders/1Hu7dXEfqzCxsdZICN2R0wGNw2pGfZjvy>

### The authors (and workshop organizers)

**Sara Barsotti (IMO), Claire Witham (UK Met Office),  
Simona Scollo (INGV), Lucia Gurioli (OPGC),  
Franck Donnadieu (OPGC)**



## CONFERENCE REPORTAGE

# II International Conference “Volcanic Eruptions: Contributions of Research and Monitoring for Volcanic Risk Management”



One of the most important challenges for science is to ensure that the knowledge and information generated by scientists can be assimilated and used by the population in their daily lives. This same challenge is observed with scientific research in volcanology, which, despite the fact that it may initially be perceived as merely descriptive and easy to understand, is extremely diverse and interweaves, with its various specialties, complex concepts that many times are difficult to understand or assimilate by the decision-making authorities and the population exposed to the volcanic hazard.

It is in this quest to eliminate knowledge barriers that the Geophysical Institute of Peru (IGP), an organization that belongs to the Ministry of the Environment of Peru (MINAM) and responsible for monitoring and studying volcanic activity in this South American country, organized by second consecutive year an international conference that brought together volcanology scientists from around the world to discuss how the knowledge obtained from monitoring and research on volcanoes can contribute to improving the living conditions and safety of people against possible volcanic eruptions.

The II International Conference “Volcanic Eruptions: Contributions of Research and Monitoring for Volcanic Risk Management” was held virtually on November 17, 18 and 19, 2021, and was an appropriate opportunity to remember the five years of uninterrupted eruptive activity of Sabancaya, the only active volcano in Peru that since November 2016 has been expelling ashes and gases that eventually harm neighboring populations. In this edition, the IGP, once again, had the scientific support of the International Association of Volcanology and Chemistry of the Earth’s Interior (IAVCEI), the Latin American Volcanology Association (ALVO), the Volcano Disaster Assistance Program (VDAP-USGS), and the Research Institute for the Development of France (IRD). There were 3 long but useful days of work, through which the public that followed the event through social networks was able to learn about the latest progress in volcanology and the experiences of volcanic crisis care in the world during 2021.

## Session 1: Volcanic Monitoring and Forecasting

This session was held on November 17 and kicked off the event. Diego Gómez (SGC) and José Del Carpio (IGP) were the moderators. The first exhibition showed the achievements in real-time monitoring of Peruvian active volcanoes since the end of the 1980s, when the IGP carried out the first studies on the Sabancaya volcano (Hernando Tavera, IGP). Next, one of the most anticipated presentations of the conference took place, concerning the multidisciplinary monitoring of the Cumbre Vieja volcano, the most mediatic volcanic eruption in 2021 that occurred on the Canary Island of La Palma, Spain (David Calvo, INVOLCAN).

Then, José Del Carpio (IGP) took stock of the eruptive process of Sabancaya, volcano that began its eruption in 2016. Other volcanic monitoring experiences were presented in this session. Thus, it became known as the Etna volcano in Italy was monitored in its recent eruption by seismic and infrasound methods (Luciano Zuccarello, INGV), as well as the deformation monitoring during the eruption of the La Soufrière volcano, St. Vincent (Karen Pascal, M.V.O.).

The IGP finally presented a final piece of work regarding the implementation of a real-time classification system for seismovolcanic signals based on artificial intelligence (Adolfo Inza, IGP), which is currently used by the National Volcanological Center (CENVUL), a service of the IGP dedicated to monitoring Peruvian active volcanoes 24 hours a day.

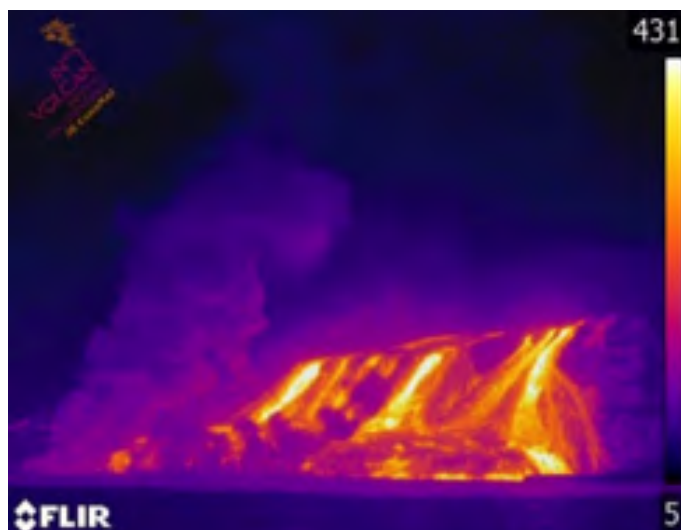


Figure 1 – Photograph of the Cumbre Vieja volcano obtained by INVOLCAN using the infrared thermography technique (Image: INVOLCAN).

## Session 2: Scientific Research in Volcanology

The second session of the conference took place on November 18, moderated by Marco Rivera (IGP) and Felipe Aguilera (UCN, Chile). The presentations of this session were related to the knowledge of the Peruvian volcanoes, for which the scientific community has a special interest, either in knowing their internal dynamics, their eruptive chronology, the characteristics and effects of their recent eruptions, and their current activity.

Roberto Sulpizio (IAVCEI) began the session by giving a complete overview of what the IAVCEI is, how it works and the activities it makes for the promotion of volcanology studies worldwide. Pablo Samaniego (IRD), who presented recent works and contributions to the geological knowledge of Peruvian volcanoes, gave the master conference for this session. Next, the following presentations were developed: study of the internal structure of the Misti volcano using seismic noise tomography (Riky Centeno, IGP); analysis of the deformation recorded in the Ampato-Sabancaya volcanic complex (2014–2019) (Gregorio Boixart, IDEAN-UBA-CONICET); spatial and temporal analysis of the seismic crisis around the Casiri and Purupuruni volcanoes (Yanet Antayhua, IGP); study of the structure and internal dynamics of the Ubinas volcano inferred from seismic and infrasound data (Roger Machacca, IGP); characteristics of the recent great explosive eruption of the Misti volcano that occurred 2050 years ago AP (Christopher Harpel, USGS-VDAP) and the evaluation of the deformation of active Peruvian volcanoes (Katherine Vargas, IGP).

This session shows that Peruvian volcanoes, beyond being systematically monitored on a daily basis, are studied by Peruvian researchers with the support of foreign aid workers who try to decipher those aspects that make them unique, in addition to generating information that allows authorities and population understand its peculiarities.



Figure 2 – Roberto Sulpizio (IAVCEI) highlighted the objectives of IAVCEI and the contribution of this organization in the development of volcanology on the planet (Image: IGP).

## Session 3: Volcanic Risk Management

The importance of this session is summed up in the following question: how do we make volcanology knowledge useful to people? Therefore, Peruvian and foreign researchers highlighted how to use volcanological information for the benefit of populations, either through innovative studies or experiences in volcanic emergency management.

This last session took place on November 19, directed by Luisa Macedo (IGP) and Susana Layana (UCN, Chile). Benjamin Van Wyk de Vries (IGCP-UNESCO Geoheritage for Resilience Project) gave the master conference for the session, entitled “Volcanic geoheritage and its use for resilience to natural hazards and sustainable development”. Next, Luisa Macedo (IGP) presented the results of the evaluation of the perception of Arequipa population about the volcanic risk of El Misti. Anthony Flinzola revealed the disastrous events that occurred in April 2021 at the Piton de la Fournaise volcano, Réunion Island (France), where university students lost their lives while visiting the volcano.

During the second part of the session, Gloria Patricia Cortés (SGC) highlighted the usefulness of volcanic hazard maps, essential products for the process of interaction and communication between volcanologists, authorities and communities. Ivonne Lazarte (IGP) detailed the scientific contributions in the preparation of the evacuation plan in the district of Mariano Melgar in case of an eruption of El Misti volcano. Finally, Ramón Espinasa (UNAM) explained how volcanic risk management is carried out in Mexico, with examples of the Colima and Popocatepetl volcanoes as more symbolic cases.

In general terms, this II International Conference “Volcanic Eruptions: Contributions of Research and Monitoring for Volcanic Risk Management” allowed to show the work of the Peruvian and world volcanological community during a year in which the covid-19 pandemic monopolized the interest of the population and limited the actions of the volcanological observatories. Despite this circumstance, new volcanic emergencies were attended and, with this, scientific knowledge continued to expand for the benefit of those who are exposed to the fury of volcanoes.

All the works presented at this event are available on the following website:

[https://www.igp.gob.pe/eventos/internacional/2021/erupciones\\_volcanicas/](https://www.igp.gob.pe/eventos/internacional/2021/erupciones_volcanicas/)



Figure 3 – Poster of the volcanic risk perception survey disseminated in the city of Arequipa by the IGP.

## ITRF2020

# International Terrestrial Reference Frame (ITRF2020)

Communication from Zuheir Altamimi, President of the International Association of Geodesy (IAG) and Head of ITRF Center

The IGN-IPGP team in charge of the realization and maintenance of the International Terrestrial Reference Frame (ITRF) has published a new ITRF version called ITRF2020, on April 15, 2022.

What is the current rate of sea level rise in different regions of the globe? How does our Earth deform under the effect of continental drift, seismic phenomena, or the melting of ice caps? How the Earth's center of mass is varying? How to determine the position of a point on the surface of a constantly deforming Earth and compare it to a position estimated decades apart? The answers to these fundamental questions for understanding the dynamics of our planet make it necessary to update the International Terrestrial Reference Frame (ITRF) that is maintained by the ITRF research group at IGN-IPGP, and whose new release called ITRF2020 was published on April 15 and accessible here: <https://itrf.ign.fr/en/solutions/ITRF2020>.

The ITRF2020 brings significant improvements compared to previous achievements: it confirms the estimate of the position of the center of mass of the Earth as it was determined in 2016, but also provides its seasonal variations; it improves the accuracy of the scale of the frame at the millimeter level, which represents a gain in precision of a factor of 8 on the measurement of the size

of the Earth (compared to that determined in 2016); it provides a precise quantification of co- and post-seismic displacements caused by, among others, devastating earthquakes, such as that of Chile in 2010 and Japan in 2011.

The stakes of ITRF in Earth science applications are considerable. It is the reference for precise orbits determination of the satellites which observe our planet; it is an essential standard for scientists, astronomers, geophysicists, climatologists around the world who study Earth's deformations and variations. Finally, it is for all those passionate about geodesy or the evolution of our planet, an essential source of information.

The ITRF2020 is available at:  
<https://itrf.ign.fr/en/solutions/ITRF2020>.

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## POSTGRADUATE COURSE REPORTAGE

# Postgraduate Course in Volcanology – 9<sup>th</sup> Edition

The ninth edition of the Postgraduate course in volcanology consisted of 110 teaching hours, equivalent to 11 ECTS credits. It took place from the 18<sup>th</sup> to the 31<sup>st</sup> of October 2021, during the academic course of 2020–2021.

The course combined theory sessions on site with field trips to the natural Park of the Garrotxa Volcanic Zone and the Girona volcanic field.

The outcrops visited during the course are: Crosa de Sant Dalmai volcano, Puig d'Adri outcrop, Castellfollit de la Roca cliff, the basalt columns of Sant Joan les Fonts, Pomareda outcrop, Croscat volcano, the outcrop from the Santa Margarida volcano, Rocanegra volcano and Montsacopa volcano.

#### The contents of the course were:

- Origin, transport, and evolution of magmas
- The eruptive process. Types of eruptions and their products
- Field methodologies and criteria
- Volcanic processes modelling
- Volcanic monitoring
- Volcanic hazard analysis

The course was addressed to graduates in geology, physics, or similar subjects, and professionals dedicated to monitoring and controlling volcanic risk and danger from around the world.

This ninth edition was attended by twenty-three students, coming from five different countries: Spain (11), Argentina (2), Mexico (4), Colombia (2) and Chile (4). Most of them were geologists, graduate students, or professionals from research centres in volcanology and seismology.

The students valued the course with a 4.85/5 and stated in the assessments that they found the content very appropriate, comprehensive, and complete, and that the field trips had been very instructive and with great applicability.

Nineteen students were awarded with scholarships, thanks to the contribution of the Olot City Council and the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI).

The Postgraduate Course directors were Joan Martí Molist, research professor at BCNCSIC, and Adelina Geyer Traver, researcher at BCN-CSIC.

The rest of the faculty were Carmen López Moreno, from the National Geographic Institute, Gerardo Aguirre, geologist and professor at Universidad Nacional Autónoma de México, Xavier de Bolós, postdoc at Universidad Nacional Autónoma de México, and Llorenç Planagumà, geologist and director of Tosca, SL.

The Postgraduate Course in Volcanology is organised by Fundació d'Estudis Superiors d'Olot and Fundació Universitat de Girona, in collaboration with the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI), Geosciences Barcelona – CSIC, Geography and Territorial Thought Department at the University of Girona, the Natural Park of the Garrotxa Volcanic Zone and Olot City Council-Espai Cràter.





## BOOK OFFER

# Super Volcanoes Robin George Andrews

We would like to announce the edition of the *Super Volcanoes: What they Reveal about Earth and the Worlds Beyond* by Robin George Andrews. As an IAVCEI member, you are eligible for the book discount of 30 %.

If interested, please click [here](#) and add the code WN001 when prompted at the checkout.

