**ID:** 32

**Vesuvius 79 AD eruption: the human casts of Pompeii, their stratigraphic significance and hazard implication**

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The eruption of Vesuvius of 79 AD began with a sustained Plinian eruption column which deposited a pumice layer which buried the city of Pompeii under approximately 3 meters of lapilli. Intra-plinian pyroclastic density currents destroyed the city of Herculaneum. The collapse of the magma chamber accompanied by a strong seismic crisis caused the emplacement of a succession of violent PDC which completely buried Pompeii and killed the inhabitants still in the town. The bodies of 1214 victims were found at Pompeii and its suburbs during the archeological excavations. Plaster casts were made for 104 of the victims recovered in Pompeii. While inside buildings it is more common to recover only the skeletons, the casts almost always refer to bodies found in open places.

Only three groups have a photographic documentation that shows that they were on top of about three meters of pumice, sealed below by a few centimeters of fine ash.

The stratigraphic conditions needed to make a cast imply that all the casts, or almost all, were made on victims who lay on top of the pumice lapilli and on top of the ash deposit of the first flows to arrive in Pompeii.

The choice of many to flee at the same time, many hours after the beginning of the eruption, suggests that the collapse of the eruptive column and the formation of pyroclastic flows occurred with strong earthquake tremors which pushed away those who had sought refuge in the houses, now damaged or collapsing.

**ID:** 116

**Quaternary volcanic geology, eruptive history, and hazard implications of a natural laboratory at the easternmost sector of the Trans-Mexican Volcanic BeltGerardo Carrasco-Núñez; Jaime Alberto Cavazos-Álvarez**

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The easternmost sector of the Trans-Mexican Volcanic Belt is featured by contrasting and highly diverse Quaternary volcanism, which can be regarded as a natural laboratory. It includes: a) the Serdán-Oriental Basin (SOB), characterized by dominant monogenetic volcanism of bimodal composition comprising basaltic maar volcanoes, and cinder and lava cones, as well as isolated rhyolitic domes and tuff rings; b) the Los Humeros caldera complex; c) the prominent Cofre de Perote-Citlaltépetl volcanic range (CPCVR) dominated by large composite polygenetic volcanoes of andesitic-dacitic composition, including the active Citlaltépetl stratovolcano. Holocene activity has been reported in different locations, indicating a widespread distribution. To the north, a persistent ring-fracture activity linked to Los Humeros caldera reveals a highly contrasting composition (ranging from olivine basalts to andesite and to trachyte lavas), both effusive and explosive volcanism. A pre-Columbian eruption (840 yr. BP) occurred at El Volcancillo, a paired cone erupted contemporaneously aa hawaiite and pahoehoe basalt lava flows. In the middle part of SOB, Holocene activity is represented by Alchichica basaltic maar volcano, Las Derrumbadas rhyolitic domes, and Tepexitl tuff ring; while to the south, some other basaltic-andesite maar volcanoes, such as Tecuitlapa and Aljojuca were active in late Holocene times. Although the distribution of this active volcanism seems to be randomly dispersed, there are some indications that they may be controlled by regionally trending structural patterns. In addition to the active volcanism, regional instability conditions promoted by high relief contrast along the CPCVR must also be considered for hazard assessments.

**ID:** 138

**La caída de ceniza de Soche de 8.6 ka AP, un indicador de erosión del suelo en el norte de Ecuador**

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Las erupciones altamente explosivas usualmente generan caídas de ceniza de alcance regional. El arco volcánico en Ecuador muestra evidencias de erupciones explosivas durante el Holoceno. Así, el volcán Soche, localizado en el borde de Ecuador - Colombia, experimentó una poderosa erupción hace 8.6 ka (Beate B., 1996). Las cenizas volcánicas fueron dispersadas principalmente hacia el NW del volcán, alcanzaron el sur de Colombia hasta el Océano Pacífico. En este trabajo nos enfocamos en evaluar el volumen de ceniza de esta erupción, reconocer su distribución espacial y su relación con los materiales colindantes. Los resultados preliminares indican que en el poblado de Santa Bárbara a 12 km al NNE del volcán, el ME= 2.5 m, MP= 1.5 cm, ML= 0.8 cm, y está cubierta por un suelo negro de 0.2 m. En el eje principal, a 20 km al NNW el ME= 2 m, MP= 0.7 cm, ML<= 1 mm, y suelo de 1.08 m; mientras que, a 50 km ME= 0.55 m, y un espesor de suelo de 1.35 m. Utilizando el método de Pyle el volumen resultó en ~ $2.8x10^6$ $m^3$, y utilizando Legros 2000, resultó en ~$18x10^6$ $m^3$. Estos resultados son las primeras estimaciones del volumen de ceniza emitido por este volcán. Por otra parte, un indicador de erosión del suelo por actividades agrícolas es la aparición de la tefra de Soche. Nuestros resultados pueden ser útiles para el manejo de la agricultura además de contribuir con la reducción del riesgo volcánico en el norte de Ecuador.

**ID:** 232

**Tephra stratigraphic approach to eruptive history in Berlín-Chinameca volcanic area, Eastern El Salvador**

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Tephra stratigraphic approach is valuable for demonstrating eruptive history which enables us to evaluate volcanic hazard. This presentation will review previous studies and provides additional data on tephra stratigraphy in the Berlín-Chinameca volcanic area, eastern El Salvador, to remind the potential volcanic risk in the area.

Previous studies have mentioned some pumice layers, called Blanca Rosa, Jucuapa-1, Jucuapa-2, Jucuapa-3, Twin, Unit-A, Jucuapa-4, Pacayal-1, Pacayal-2, Pacayal-3, and Pacayal-4, from the bottom to the top (CEL, 1995; Kitamura, 2018; 2019). These tephras were divided to several groups by the chemical analysis of volcanic glass using wave-length-dispersive X-ray microprobe analyzer.

Several vitric ash layers as wide-spread marker tephra derived from distant volcanoes were identified in the area. A vitric ash found below the Pacayal-1 pumice is correlated to the Conacaste tephra (~51 ka) or the Congo tephra (~53 ka) from Coatepeque Caldera located in western El Salvador. The other vitric ash overlain by the Jucuapa-2 pumice is correlated to the Los Chocoyos tephra (~84 ka) from Atitlán Caldera in southern Guatemala and it overlies the Blanca Rosa pumice which broadly found in the area (Kutterolf, et al., 2008; Kitamura, 2018).

Areal distribution of the Jucuapa-2 pumice indicates that the origin is located to the northeast of Chinameca Volcano although it is difficult to be identified topographically for it would have been covered by postdated volcanic activities.

Although modern volcanic activity is mostly found in San Miguel Volcano, explosive eruptions also occurred repeatedly in Chinameca Volcano and neighboring area, almost every thousands years.

**ID:** 261

**Eruptive history of Usu volcano, Hokkaido, Japan, as revealed by trench surveys of the Higashi-Maruyama cryptodome**

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Understanding of whole eruptive history of active volcanoes is important for hazard assessment. Usu volcano is one of the most active volcanoes in Japan and has erupted at least 9 times since AD 1663. Usu volcano is unique in terms of its frequency of cryptodome-forming eruptions (e.g., Showa-Shinzan in AD 1943-1945). Dating of all cryptodomes at Usu volcano is essential to establish complete eruptive history of the volcano. Higashi-Maruyama is one of the Quaternary cryptodomes at Usu volcano. The cryptodome has not been dated previously because it is widely covered with humous soil and vegetations. We have attempted trench surveys of the cryptodome to clarify emplacement age of the dome. Two hand-dig trenches (depths 3.7 and 3.4 m) were excavated at the dome summit. The geological sections in the trenches comprise many Quaternary tephra layers, all of which were erupted from Usu volcano. The tephra layers show a remarkable angular unconformity. The lowermost Us-$b_1$ tephra (AD 1663) dips 45–70°, whereas the overlying younger tephras (AD >1663, 1769, 1822, 1853, 1902, 1943–45, 1977–78) are subhorizontal. The Us-$b_1$ tephra has been cut by many microfaults, whereas the overlying younger tephras have not been faulted. We infer that the Us-b1 tephra was uplifted and faulted by the growth of the Higashi-Maruyama cryptodome. We thus conclude that the Higashi-Maruyamacryptodome emplaced in AD 1663. The age of the Higashi-Maruyama dome (AD 1663), combined with previous geochronological data of Usu volcano, enabled to establish complete eruption history of Usu volcano.

**ID:** 328

**Registro eruptivo Plioceno tardío – Pleistoceno del cluster volcánico Nieve, campo volcánico Michoacán - Guanajuato (México)**

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Con base en un mapa geológico detallado soportado por nuevas edades radiométricas $^{40}Ar/^{39}Ar$, $^{230}Th/^{238}U$ y $^{14}C$, y análisis químico de roca total combinado con datos estratigráficos, se pudo establecer el registro geológico de los volcanes monogenéticos que conforman el *cluster* la Nieve. Este *cluster* de volcanes monogenéticos se sitúa a ~26 km al suroeste de la ciudad de Morelia, en la región centro – oriental del campo volcánico Michoacán – Guanajuato. La Nieve se ubica a lo largo de la zona de falla Huiramba que es considerada una zona de rampa de relevo vinculada al sistema de falla Morelia – Acambay, producto de un régimen tectónico controlado por extensión oblicua con dirección NNO. Los resultados también indican que al menos 21 volcanes monogenéticos se formaron durante los últimos 4 Ma al suroeste de la cuenca de Cuitzeo. Resultando en un volumen total emitido de hasta 17 $km^3$ y tasa eruptiva de 0.004 $km^3$/ka. Las rocas varían entre 53 y 64 % en peso de sílice. Con base en toda la información del registro geológico de la región, hemos atribuido que el establecimiento del *cluster* la Nieve ha estado controlado por el régimen tectónico y el basamento de la región, lo que ha provocado que los magmas que dieron origen a estás erupciones se modifiquen a composiciones intermedias y estos *batchs* de magmas hayan sido provenientes posiblemente de al menos dos reservorios profundos como lo refleja la relación Nb/Th-Ta/U, la coalescencia espacial y yacencia estratigráfica entre cada volcán independiente.

**ID:** 342

## Geological map of the Galeras Volcanic Complex, 1:25 000 scale: new perspectives on the stratigraphy and eruptive history

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The Galeras volcanic complex (GVC) is located in SW Colombia, 9 km of the city of San Juan de Pasto and near nine small towns (~465 116 urban and rural inhabitants). This study presents a new version of the GVC geological map at 1: 25 000 scale, first published in the 90s. The updated version combines new field observations, and existing literature reviews with remote sensing analysis and new geochronology, petrography, and whole rock geochemistry data. The resulting stratigraphic scheme integrates 24 lithostratigraphic units (as the basic mapped unit) into six informal lithosomes (as the main eruptive centers), with interpretations of the volcanological sequence in eruption unit terms (e.g., fallout, pyroclastic density currents, block and ash flows, etc.) and volcanic activity units (e.g., Epoch, Period, Eruption, Pulse) fundamental to understanding the volcanic evolution of the GVC throughout its history.

The GVC evolution comprises five andesite to basaltic andesite stratovolcanoes, namely: Cariaco, Coba Negra, Genoy, Urcunina, Galeras, and one adventitious cone called La Guaca. The oldest and western edifice named Cariaco corresponds to a stratovolcano dated between ~1.4 and ~1.2 Ma. Progressive vent migration to the east of Coba Negra (1138.2 ± 30.2 ka - 406 ± 3.2 ka) and Genoy (~364 - ~46 ka) edifices were controlled by sector collapses associated with tectonic control rather than caldera-forming events. Urcunina, smaller than the previous edifices, is the last eruptive center before the present active Galeras cone. Current seismic activity and constant degassing indicate the active state of the volcano.

**ID:** 391

**Discovering the hidden features of two unexplored crater-lake maars (axalapazcos) in the Serdán-Oriental basin volcanic field, México.**

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The nature of maar volcanoes has been widely discussed among the volcanological community in the last half-century. Nowadays, detailed stratigraphic descriptions combined with exhaustive mapping of their deposits provide reliable evidence to understand the origin and evolution of these volcanoes. This approach is particularly convenient for complex cases of convolute-shaped maars, which are partly formed by spatio-temporal migration of the explosive loci. This becomes an even harder task when studying crater-lake maars (known in México as *axalapazcos*), where observing the maar's inner anatomy is inaccessible. This work presents an effective mapping methodology for two Quaternary, convolute-shaped, crater-lake maars in the Trans-Mexican Volcanic Belt. We integrated conventional stratigraphic logging supported by grain size and geochemical analyses with modern, high-resolution remote sensing techniques to explore the surficial and subaquatic morphologies. The surface morphology was explored by drone-acquired photogrammetric analyses and 3D elevation models. The subaquatic terrain was explored by sonar mapping, which led to a detailed bathymetric configuration. The resulting maps revealed hidden morphological features in both maars, which would be imperceptible during a conventional fieldwork exploration. These features, combined with the stratigraphic logging, allowed us to identify the volcanic and sedimentary processes that acted during and after the onset of the eruptive activity of these volcanoes, allowing an accurate reconstruction of their eruptive histories. The methodology presented here can be reproduced not only for crater-lake maars but also for other geological scenarios where mapping subaquatic terrains is needed.

**ID:** 522

**The Neapolitan Yellow Tuff eruption (Campi Flegrei, Italy) studied from the conduit dynamics to the deposit**

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The Campi Flegrei (CF) is the most active caldera in Europe, currently in unrest, poses in a substantial risk to the numerous people who live in his surroundings. Reconstructing the story and the dynamic of past eruptions is a crucial need for understanding its eruptive behavior and hazard assessment. We focused on the conduit dynamics and depositional features of the Neapolitan Yellow Tuff (NYT) eruption, the last major caldera-forming eruption, which took place about 14.1 ka.

Discussing the eruptive dynamics of NYT we found that:

1) During the eruption the bubbles size distribution of the fallout pumice are from unimodal to polymodal reflecting single to multiple stages of bubbles nucleation; 2) the primary fragmentation process was purely magmatic (and not phreatomagmatic as previously proposed); 3) distinct chemical variations along the stratigraphic succession allow the characterization the different magma types that fed the eruption phases and trace their contribution-dispersal in distal settings; 4) the total deposit volume has been estimated in ca. 25 $km^3$ (15 $km^3$ DRE volume), which is similar to the volume we recalculated for the NYT caldera; 5) combining evidence inland as well as in marine cores, and new ultra-precise new campaign of $^{40}Ar/^{39}Ar$ single crystal dating various units, we suggest that NYT could have been formed during a long-lasting eruption cycle in a time spanning up to decades or centuries (contrary to the classical points of view of a single catastrophic event).

**ID:** 548

**Análisis de vulnerabilidad física y riesgos ante corrientes de densidad piroclástica y lahares en el Volcán Santiaguito, Guatemala.**

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El volcán Santiaguito es uno de los más activos de Guatemala. La actividad eruptiva explosiva y efusiva del Santiaguito se concentra, desde 1977, en el domo Caliente y se caracteriza por el crecimiento y destrucción de su cúpula y la generación de corrientes de densidad piroclástica, con alcances de hasta de 7 km. En el pasado, varias de estas poblaciones fueron afectadas por caída de ceniza, corrientes de densidad piroclástica y lahares. Un ejemplo ocurrió en el año 1983 con el descenso de un lahar por el rio Nimá 2 que destruyó casi en su totalidad la cabecera municipal de El Palmar y condujo a la reubicación de la población hacia la comunidad vecina, Las Marías. Posteriormente, en el año 1988, el Gobierno construyó el Nuevo Palmar, aproximadamente a 7 km del antiguo asentamiento.

El análisis de vulnerabilidad se basó en el análisis de exposición y de la vulnerabilidad física y social. Se realizó un censo a 1,600 casas y se recopilaron bases de datos del Ministerio de Salud y municipalidades del área. La integración de la información permitió calcular los rangos de exposición, vulnerabilidad social y económica por comunidad.

Los mapas obtenidos del análisis de vulnerabilidad se integraron a los mapas de amenaza por lahares y corrientes de densidad piroclástica, para obtener los mapas de riesgo. Dichos mapas pretenden ser una herramienta para la toma de decisiones de los gobiernos locales y direcciones de la SE-CONRED y con ello, disminuir el riesgo de desastre.

**ID:** 603

**Reassessment of the eruptive history of the Atitlán volcano: towards hazard evaluation**

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The Atitlán volcano is Guatemala's third most hazardous volcano after Santiaguito and Fuego. The Atitlán volcano is a composite volcano that buries the southern rim of the ~20 km-diameter Atitlan caldera in Guatemala's central plateau, inside of which other two stratocones (San Pedro and Tolimán) also exist. The Atitlán volcano has a symmetrical cone shape characterized by alternating deposits of lava flows and pyroclastic fall and density currents. Eruptions at the Atitlán volcano began 10,000 years ago, and at least nine historical events have been documented since the arrival of the Spaniards between the years 1469 and 1853. Previous works in the area were focused only on developing a regional geologic map of the Quaternary and Tertiary deposits without any detailed distinction, and on studying the largest eruption and evolution of the Atitlan caldera. This work presents an updated geologic map and stratigraphy of the Atitlán stratovolcano with a detailed distribution of lava flows and pyroclastic density currents (PDC). Additionally, new C14 ages confirm that hazards associated with PDC flooding have been frequent, and could impact more than 70,000 people living within 10 kilometers of the volcano summit in case of reactivation.

This work is the result of an inter-institutional and international collaboration between UNAM, INSIVUMEH, CONRED and Vivamos Mejor Association of Guatemala, founded by the Swiss Cooperation.

**ID:** 611

**3D-mapping and facies analysis of Cotopaxi volcano's 1877 primary lahar proximal deposits**

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Cotopaxi is an ice-clad strato-volcano. During explosive eruptions, huge primary lahars usually form when pyroclastic density currents (PDCs) flow on top of the glacier, instantaneously releasing these highly destructive flows. This process has occurred countless times during the volcano development and it is difficult to study individual episodes in detail due to deposition by new eruptions and growing vegetation.

A relatively flat and large plateau, above 3600 masl, is located all along the north and eastern foothills of Cotopaxi, where little vegetation grows and where lahars deposit during the initial stages of the flow. There, the primary lahar deposits from the latest great eruption of Cotopaxi, occurred in 1877, are still accessible in the surface. Detailed 3D-mapping of those deposits was performed using georadar surveys along several kilometers of transects. Also, componentry and granulometry measurements were obtained from samples taken off the deposit's matrix.

The 3D-mapping shows that the thicknesses of the deposit are in general lower than 12 m. The componentry analysis was focused on the juvenile clast content, while the granulometry was performed in the rage of -5 and 5 phi. All these parameters show a difference between the deposits from the northern and the eastern side. This suggests different mechanisms in the generation of the corresponding primary lahars, probably related to the shape of the crater, whose lower eastern border preferentially channelized PDCs during the 1877 eruption.

These results are useful input and calibration data for numerical models aiming to improve lahar hazard assessment at Cotopaxi volcano.

**ID:** 707

**Monitoreo del Campo Geotérmico Moyuta**

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Esta investigación se suscita a partir de la ocurrencia de un enjambre sísmico superficial, de origen tectónico, en el municipio de Conguaco, departamento de Jutiapa, Guatemala. Sumado a la inquietud de los habitantes de la zona, quienes refieren incrementos en la actividad fumarólica, del campo geotérmico de Moyuta. El enfoque de la investigación está orientado a determinar la posible conexión entre ambos fenómenos. Con base en estudios previos, con los que posteriormente se contrastaran resultados, se localizaron los sitios de muestreo de referencia, estos consisten en manantiales, fumarolas y mud pots. Para establecer el intervalo de muestreo se consideró la variación climática estacional de la región. El muestreo se realizó cada 3 meses durante un año. Los resultados obtenidos permitirán conocer el comportamiento, calidad y tipo de aguas termales. Lo que brinda conocimiento actualizado sobre el campo geotérmico en sí, posibilitando trabajar en áreas como la gestión de riesgos, aportando herramientas a las comunidades para accionar antes, durante y después de una emergencia y además para desarrollar la resiliencia, con el establecimiento de posibilidades para la creación de nuevas rutas geoturísticas, que podrían ser una fuente de desarrollo para las comunidades aledañas.

**ID:** 598

**Soil and soil-gas surveys for geothermal exploration at Tenerife, Canary Islands**

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The geochemical methods play a major role in both exploration and exploitation phases. The geochemical exploration assumes that fluids on the surface reflect physico-chemical and thermal conditions in the geothermal reservoir at depth. At those areas where the resources are either hidden or lie at great depths, soil and soil gas surveys are useful to investigate the presence of enhanced vertical permeability areas related to high temperature hydrothermal activity at depth and to outline the boundaries of a geothermal system, in conjunction with geophysical surveys. Soil and soil-gas surveys for geothermal exploration has been extensively carried out at Tenerife Island (Canary Islands). We present here the results of detailed soil and soil-gas exploration surveys, with a maximum of sampling density of 500 sampling sites per $km^2$ (maximum investigated area of 0.8 $km^2$). At every sampling site, we performed in-situ measurements of diffuse $CO_2$ efflux and $^{222}Rn$ activities in the soil gas atmosphere. In addition, soil gas samples were collected at a depth of 40 cm for further chemical and isotopic analysis. Simultaneously with the soil gas survey, soil samples were collected from the base of the B Horizon-Subsoil (☐50 cm) which were subsequently dried and sieved (80 mesh) for subsequent leaching to analyze those volatiles (As, B and $NH_4$) of interest that were fixed in the organic-clay fraction of the soils. The spatial distribution of soil gases confirms the presence of relative enrichment of non-reactive gases in the soil suggesting the existence of a significant contribution of deep-seated gases.

**ID:** 3

**Análisis de susceptibilidad por remociones en masa en el volcán Llaima (Andes del Sur), a partir métodos cuantitativos y cualitativos**

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Este estudio presenta un análisis de susceptibilidad a las remociones en masa para las laderas del volcán Llaima (38,69°S, 71,73°W, 3.179 m.s.n.m.). Se identificaron y cartografiaron las áreas que reúnen características para la generación de eventos gravitacionales superficiales a través de la metodología propuesta por Lara & Sepúlveda (2010), basada en la integración de diversos factores condicionantes. Las remociones existentes se categorizaron como sin- e inter-eruptivas.

Los resultados sugieren que el volcán Llaima es susceptible a la generación de remociones en masa de tipo caída de rocas, flujo de detritos y deslizamientos de suelo y rocas. Se obtuvieron valores críticos de susceptibilidad cerca de la cima en el
flanco N del edificio, área más susceptible a experimentar caídas y deslizamientos de roca, lo cual se corresponde con fracturas y desprendimientos de roca declarados. Lo anterior indica que es altamente probable que el volcán experimente nuevas remociones en masa en el futuro, especialmente durante nuevos ciclos eruptivos. Este trabajo proporciona una línea base para la evaluación del peligro volcánico por remociones en masa en el volcán Llaima, que requiere incorporar factores como la actividad eruptiva, la sismicidad y el control estructural del volcán.

**ID:** 183

**New geological mapping 1:5000 scale of La Fossa cone, Vulcano Island, providing insights on the eruptive behaviour and hazard assessment**

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A new geological map of the active La Fossa cone on Vulcano Island (Aeolian archipelago, southern Italy) at 1:5 000 scale is performed through original geological and structural fieldwork integrated with remote sensing analysis (UAV aerial photographs, satellite Landsat images and DEM shaded relief data). Several radiometric and palaeomagnetic ages and tephrochronological assignments from the literature, and a large set of petrochemical data have been also considered. Fieldwork and mapping are developed using a modern approach to volcano-stratigraphy based on a number of unconformity-bounded units combined with twelve lithostratigraphic units (including lithosomes), some of which further subdivided into members, that identify the main pyroclastic successions and lava flows, latitic to rhyolitic in composition. Accordingly, we provide a reappraised reconstruction of the eruptive history of La Fossa cone, dated back to ca. ~5.5 ka, which is characterized by major stages of construction of the cone separated by periods of quiescence and erosion, generally associated with shifts of the eruptive vents and corresponding craters, which are controlled by the major NE-SW tectonic trend. A particular focus is given to the age and products of the controversial Forgia Vecchia crater, and to the most recent activities of Pietre Cotte (1731-1739 AD) and Gran Cratere, including the last 1888-89 AD eruption, and the potential recurrence of phreatic eruptions. This map will serve as a basis for hazard assessment of La Fossa cone, which is visited by many tourists every year and shows an ongoing unrest phase started in September 2021.

**ID:** 345

**An ignimbrite of wide distribution in the Western Central Valley of Costa Rica: compositional characterization of Puente de Mulas ignimbrite**

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The Puente de Mulas ignimbrite (Chibanian age ~0.5 Ma) appears in the underground of a large part (~55 $km^2$) of the Western Central Valley and present southern flank of Central Cordillera of Costa Rica, emitted from an unknown covered vent into the paleocordillera. A textural, granulometric and compositional analysis of its deposits has been carried out from three boreholes located in the northwestern of the Pedregal quarry, in Belén of Heredia, for the identification of types of volcanic deposits and the creation of a model of the facies, which allows the construction of distinctive lithostratigraphic columns, and a correlation between them. With a thickness between 15 and 42 m, the ignimbrite is between two lava units of Colima Formation separated by paleosols. The facies correspond to welded, unwelded, with and without *fiammes*, and red weathered ignimbrite, which present different thermodynamic origins and thicknesses, distinguishable in the three cores. The facies differ in the abundance of the juvenile components (scoria), vitroclasts, lithoclasts, crystalloclasts, and matrix, and in the granulometric characteristics, which coincide in an increase in the degree of welding and crushing index towards the base of the ignimbrite, with colonnade development, which corresponds to an indication of a very hot andesitic pyroclastic density current with high lithostatic burden that caused the deformation of the juvenile materials, and where it is possible to observe their spatial behavior. A similar flow occurred 0.322 Ma, and then, the frequency of such events poses a question mark on the volcanic hazards in this region.

**ID:** 713

**Glacial stages in the Galeras Volcanic Complex**

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The Galeras Volcanic Complex (GVC) corresponds to an interfluve sector between Pasto and Guáitara watersheds. Located in the southern volcanic segment of Colombia, it covers ~617 km2, with a horseshoe-shaped collapse scar open to the west; its maximum and minimum heights are 4272 and 1300 m asl.

The GVC moraine deposit fronts are distributed between ~3100 and ~3600 m a.s.l. in the northern and eastern and in the upper and middle segments of the southern volcano flank. The moraine vestiges to the west were erased, possibly due to the strong denudation on the Guáitara watershed. To establish the glacial stages, 34 moraines were delimited from aerial and remote sensing images, the heights at the base of their fronts were determined; they were grouped by altitudinal ranges and correlated with other glaciated regions in Colombia and Ecuador, based on compiled information from several authors work.

Thus, four glacial stages were established: Galeras I (3000-3200) includes five moraine fronts with altitudes between 3011-3183 m asl, ages between 34 000-40 000 years BP or even >50 000 years BP, corresponding to Colombia´s Periglacial. Galeras II (3200-3400) with 11 moraine and altitudes between 3266-3387 m a.s.l. and ages between 15 000 -28 000 years BP. Galeras III (3400-3500) groups nine moraines between 3400-3508 m a.s.l. and age ~13 500 years BP. Galeras IV (3500-3650) with eight moraines between 3527-3627 m a.s.l., and age ~12 500 years BP. This study constitutes an effective tool to determine milestones in the GVC evolution, especially in very young volcanic deposits.

**ID:** 719

**Surface morphology reveals the dynamics of the emplacement mechanism of Piedras Negras and Middle Mezquital lava domes**

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The morphology of dacitic exogenous domes provides information on the flow dynamic. Detailed analysis of the surface features of exogenous domes devoid of vegetation allows understand the emplacement mechanism. We decided to elaborate the geomorphological mapping of two exogenous domes of smaller volumes (5.1- 6.3 x $10^6$ $m^3$). For this purpose, we used unoccupied aerial vehicles (UAVs) and Structure-from-Motion photogrammetry techniques to obtain surface images and centimeter-resolution digital elevation models. The domes selected were the Middle Mezquital dacitic dome (Pleistocene age) located on the southern slope of the Tres Vírgenes volcano in Baja California Sur, and Piedras Negras lava dome (AD) emplaced on the eastern slope of Las Derrumbadas rhyolitic domes. The morphological features founded was compressional ridges, inflation clefts, ogives, levees, elongated sinks, oblique cracks, block-rubble surface, and conical and irregular hummocks. Subsequently, volume, length, width, thickness, paleo-slope, ridge spacing, vergence of the ogives and aspect data were measured. The lava domes show thickness of 65 to 45 m, widths of 586 to 564 m and length of ~500 m. The clefts spacing is 18 to 3 m proximal to the source, both domes show changes in crevasses orientation, from parallel to each other to perpendicular to the lava front. With these data we calculated the crustal yield strength, velocity, effusive rate, and reconstructed the emplacement mechanism. Understanding how these structures are emplaced is one of the key aspects that will allow investigating the ascent and stagnation mechanism, as well as the potential hazards of low-volume magma batches.

**ID:** 760

**La historia eruptiva de Isla Clarión y escenarios de riesgos**

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Isla Clarión es una isla volcánica localizada al este del pacifico tropical frente a la costa de México. Pertenece al Archipiélago de Revillagigedo, el cual es un parque nacional y Reserva de la biosfera, además ha sido declarado como patrimonio natural de la humanidad por la UNESCO. Se sitúa aproximadamente a 700 km de Cabo San Lucas, Baja California Sur. La tectónica regional del archipiélago consiste en la Dorsal del Matemático y la Zona de Fractura de Clarión, además existen dudas en la comunidad científica acerca del porqué son edificios volcánicos tan prominentes.

En Isla Clarión las rocas volcánicas encontradas son todas miembros de la asociación típica de islas volcánicas Basalto-traquita-Alcalino, sin embargo, el presente estudio encontró evidencias de una mayor diversidad de rocas. También se obtuvo un mayor detalle de las formaciones geológicas y su distribución espacio-temporal, lo cual expone de una mejor manera el geopatrimonio del archipiélago, algo que falta reconocimiento.

Existe incertidumbre sobre su estado de actividad. Si ocurre una reactivación volcánica, los escenarios de riesgos más relevantes debido a su aislamiento con respecto a centros grandes de población, serían la generación de cenizas a niveles estratosféricos y generación de tsunamis volcánicos. El presente trabajo generó un mapa geológico en el cual se ha mejorado la comprensión de la historia eruptiva de la isla así como escenarios de riesgos asociados.