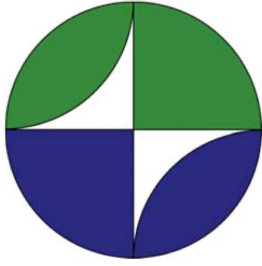


**INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS**  
**UNION GEODESIQUE ET GEOPHYSIQUE INTERNATIONALE**

**DISCOVERING PATASCOY, AN UNKNOWN HOLOCENE VOLCANO**  
Final Report

March 2023



**INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS**  
**UNION GEODESIQUE ET GEOPHYSIQUE INTERNATIONALE**

## WORKSHOP-EXPEDITION SUMMARY

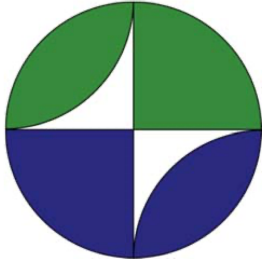
The meeting was held in the slopes of the Patascoy mountain, located  $0.9442^{\circ}$  N,  $77.0725^{\circ}$  W, at the South of Colombia, South America (see Map). In order to reach such a place, it was necessary to travel by boat almost 5 hours. The meeting was split in two parts, one devoted to talks and discussions before traveling to Patascoy and a second part held in the slopes of it, where it was necessary to condition the place and build an auditorium in the middle of the jungle (see attached photos 1 and 2). The 29 participants attended the meeting from Italy, Peru, Ecuador and Colombia, both scientists, students and community members.

The first part of the meeting was held on the shore of La Cocha lake on 20 January, where several talks were given by some of the participants of the workshop, followed by discussions. The discussions allowed the introduction of the participants into the understanding of the physical environment to face and the little scientific knowledge that we have about Cerro Patascoy.

Next day, along the boat trip toward Patascoy, a massive white pyroclastic fall deposit, identified previously the year before during a preliminary exploratory trip, on walls eroded by the river, was reached. We stopped near to one of them (see attached Photo 3) in order to collect samples which will be later used for chemical analysis and dating. On 22 January, we split between a group who attempted to reach the top of the Cerro Patascoy, and a group who visit the El Silencio o El Trueno lake. The first group departed at early morning with the aim to reach the top of the mountain in about 5 hours walk. During the journey they collected samples and confirm that most of little exposed deposits are actually granite. Unfortunately, a landslide affected the already difficult trial making it impossible the climb the mountain. So, they were forced to return to the base camp. The second group departed at morning reaching the El Trueno lake (see attached Photo 4), examining the morphology and landscape of the surroundings of the lake, identifying possible domes, observing if the lake could be the result of a phreatic explosion.

On 23 January the team split in groups to explore eroded scars leave by La Joya River and along the road built to connect the landing stage on the Guamuez river with the base camp, in order to collect samples (see Map) and to do a first visual analysis of them.

Late in the afternoon the whole group of participants meet in the cabin built for meetings (see attached Photo 2b) in order to discuss the outcomes of the expedition based on the visual analysis of the samples, the landscape and satellite images (see attached Photo 5). The undergrad students joined both the trip towards the top of the mountain and the lake, as well as the discussions openly questioning the science behind the preliminary conclusions. At the end of the discussions, we share the preliminary conclusions to the community of peasants and indigenous



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people in a non-technical language, more accessible for them. The last day was devoted to the return trip by boat.

The preliminary conclusions suggest that Patascoy is not an ancient, eroded caldera as most of the outcrop rocks are granites and there is no evidence of ignimbrite deposits in the region, at least for the last 20 ky, and the structures are the likely result of tectonic stresses. The volcanic deposits found in the area are both pyroclastic fallout and flows deposits. In particular fallout deposit outcrops were found in two locations along the river (~5-6 m) and along the trail to the base camp coming from the river (~9 m; see map). In the latter location, on the top of the fallout deposits, there are also deposits of a volcanoclastic flow (~2 m). Several potential sources of these deposits were discussed during the workshop, including distal volcanoes like Soche at the border with Ecuador or El Estero volcano, but on the basis of the distance and variation of thickness among the outcrops and because the presence of a flow deposit on the most proximal found deposit, the conclusion was that the source has to be near the Patascoy slopes. This can be the Cocha del Trueno or the nearby El Alcalde hill, which look like a potential dome. A better idea may be obtained after the analysis of the field data and the ongoing laboratory analyses.

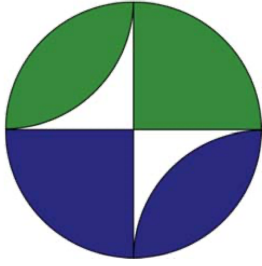
The expedition resulted in a challenge for the visiting vulcanologist who decided to continue studying the geology of those areas and volcanoes non previously studied by promoting the international collaboration among the participants.

#### **Accomplishment of the goals**

Five of the six objectives of the expedition stated on the proposal were totally accomplished, remaining the study of the impact of the eruptions on environmental services on the surrounding tropical rainy amazon forest.

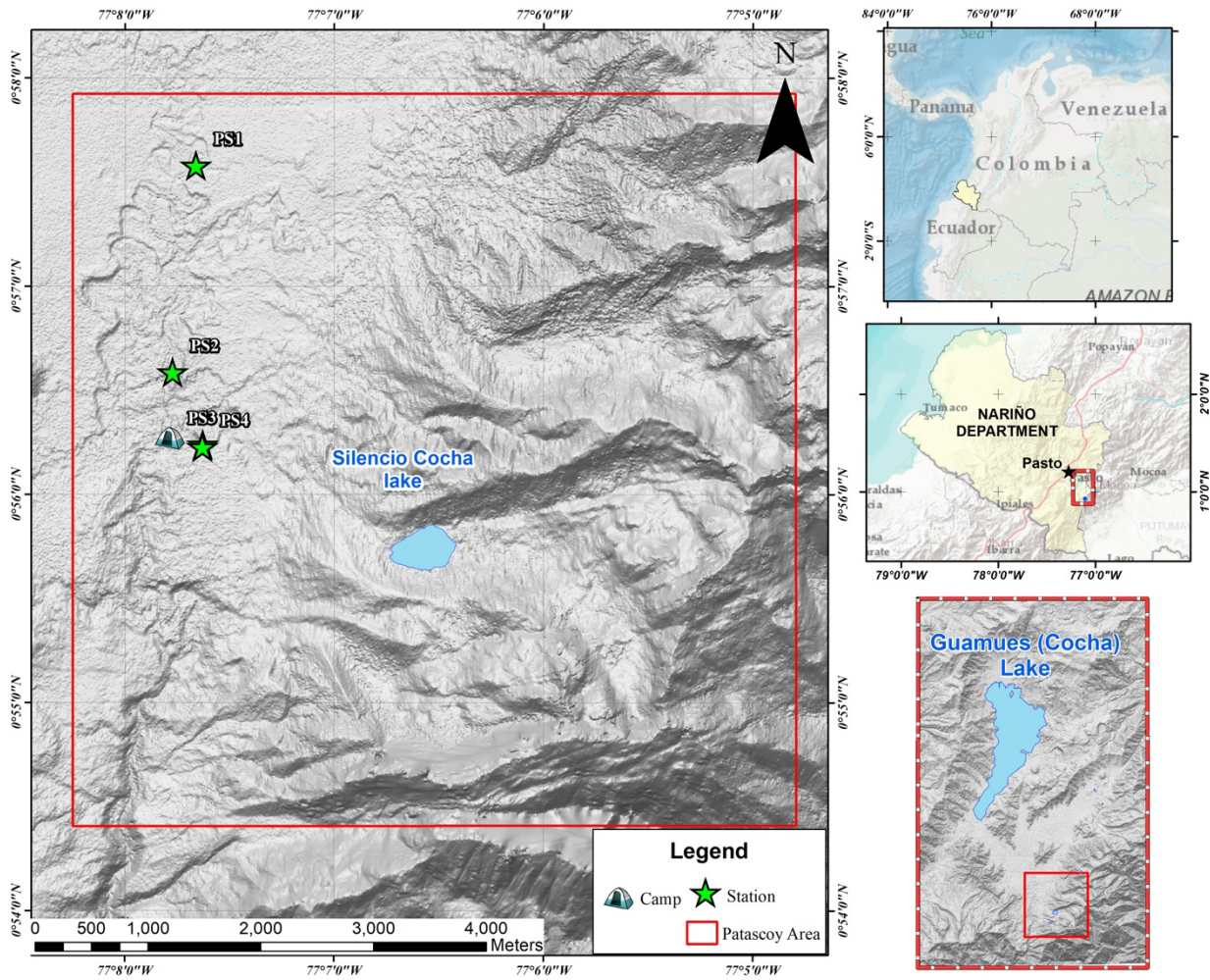
#### **Accomplishment of the expected results**

Two of the expected results stated in the proposal remain in progress, which are improvement of the understanding the impact of the volcanic eruptions on the ecological services, and to work on a paper to spread the learned. We learn that Patascoy could not have caldera-forming eruptions, but a granite-based formation. However, anecdotal references did by the participants stakeholders and drawings from Alphose Stübel in 1869 show volcanic activity from a volcano in the sector. It is likely that the complex fault system close and underneath of Patascoy are the responsible of the Patascoy formation. The caldera hypothesis is unlikely, thus there was no need to characterize it. During the session devoted to show the preliminary results to the stakeholders, they show to be happy with it, pointing out that “if Tayta Patascoy is not the responsible of the volcanic deposits, it was his relatives”.

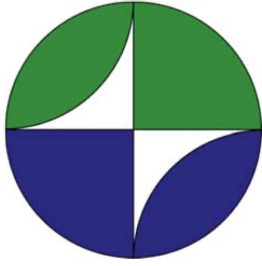


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Map of the investigated area showing the locations of the outcrops (stars), the camping base and the Cocha del Silencio lake (Courtesy by D. Llano).





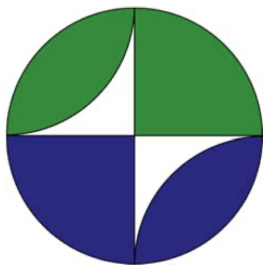


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SCIENTIFIC PROGRAM

*Expedición Patascoy*  
PROGRAMACIÓN

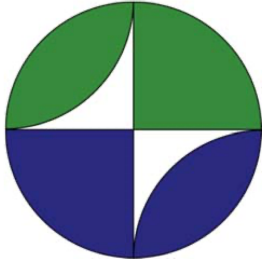
	ACTIVIDAD	HORA
<b>VIERNES</b> 20.01.23	Salida a la Cocha	2:00 pm
	Llegada Vereda El Motilón	4:00 pm
	Discusiones previas	5:00 - 8:00 pm
	Actividad cultural	8:00 pm
<b>SÁBADO</b> 21.01.23	Salida a Patascoy	8:00 am
	Almuerzo en Santa Isabel	12:30 pm
	Llegada Reserva AIRU-MIMI	4:00 pm
	Ceremonia de apertura - Apu Patascoy	4:30 pm
	Llegada a campamento	5:30 pm
	Cena y diálogo de saberes	7:00 pm
<b>DOMINGO</b> 22.01.23	Salida a borde caldérico - Opción 1	4:00 am
	Salida a Laguna del Patascoy - Opción 2	8:00 am
	Almuerzo	2:00 pm
	Identificación de depósitos	3:00 - 6:00 pm
	Acercamiento a la medicina tradicional	7:00 pm
<b>LUNES</b> 23.01.23	Toma de muestras geológicas	10:00 - 12:00 am
	Almuerzo	12:30 pm
	Toma de muestras geológicas	2:00 - 6:00 pm
	Cena y compartir de saberes	7:00 pm
<b>MARTES</b> 24.01.23	Retorno a La Cocha	9:00 am
	Almuerzo en Santa Isabel	12:30 pm
	Llegada a Pasto	4:00 pm
<b>MIÉRCOLES</b> 25.01.23	Discusiones post expedición - Udenar	9:00 am
	Cata de café colombiano	2:00 pm
	Retorno a lugares de origen	



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**LIST OF PARTICIPANTS**

<b>Name</b>	<b>Gender</b>	<b>Country</b>
Hugo Murcia	M	Colombia
Natalia Pardo	F	Colombia
Roberto Torres	M	Colombia
Evelyn Arapa	F	Perú
Antonio Costa	M	Italia
Carlos Germán Jurado	M	Colombia
Karen Maigual Parpuezan	F	Colombia
Paulo Alejandro Hernández	M	Colombia
Fabian Ricardo Castro	M	Colombia
Jorge Andres Guzman Mesias	M	Colombia
Maria Fernanda Jacanamijoy	F	Colombia
Manuel Andrés Alava	M	Colombia
David Llano	M	Colombia
Gina Lizeth Bolaños	F	Colombia
Liliana Troncoso	F	Ecuador
Stalin Paul Solano Yopez	M	Ecuador
Ricardo Ceballos	M	Colombia
Marlon Jesus Cuasapud Obando	M	Colombia
Jhon Steven Burgos Caicedo	M	Colombia
Javier Andrés Rodríguez Santiusty	M	Colombia
María del Mar Ojeda Gomez	F	Colombia
Alejandra Rodríguez Ojeda	F	Colombia
Hildemar Rodríguez Flórez	M	Colombia
Juan Carlos Mora Hidalgo	M	Colombia
Nathalia Esther Segura Hernández	F	Colombia
Gorki Ruiz	M	Ecuador
Elizabeth Ojeda	F	Colombia
Ruby Criollo	F	Colombia
Diana Rodriguez	F	Colombia
Gustavo Córdoba	M	Colombia
Roberto Sulpizio	M	Italia
Aquiles Gutierrez	M	Colombia



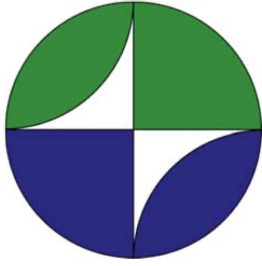
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LIST OF RECIPIENTS

<b>Recipient</b>	<b>Amount</b>	<b>Country</b>	<b>Age</b>	<b>Gender</b>
Diana Rodriguez	US\$ 283	Colombia	30	F
Juan Carlos Mora	US\$ 102	Colombia	38	M
Reserva Natural Airu-Mimi	US\$4.564	Colombia	N/A	N/A
Luis Guerrero	US\$ 51	Colombia	29	M
Total	US 5.000			

See attached receipts for details.





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ANNEXES

**Attached Photos**

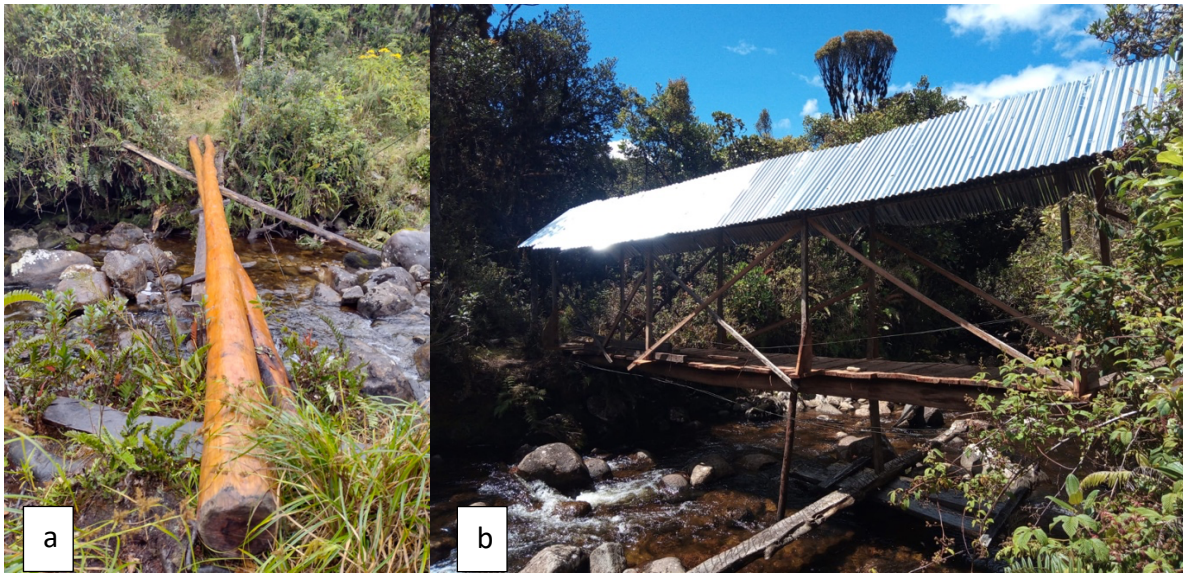
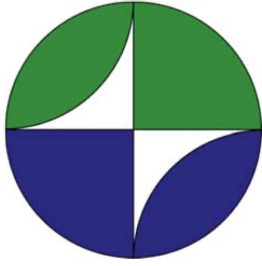


Photo 1. Bridge construction. a) Bridge beams. b) Finished bridge



Photo 2. Meetings room. A) Basement of the building. B) Finished meeting room and the participants of the workshop





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Photo 3. White pyroclastic fall ~5 meters wide deposit. The participants of the workshop climbing the wall for sampling.



Photo 4. The group who visited the El Trueno lake. A dome like formation can be seen behind.

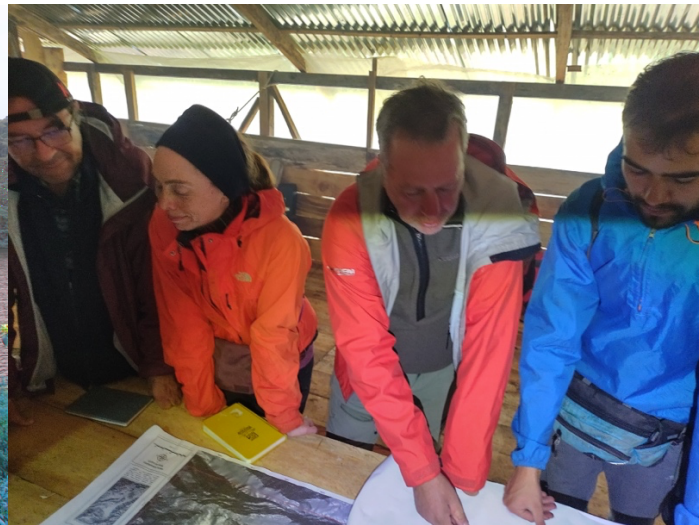
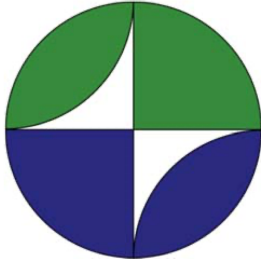


Photo 5. Part of the group during the discussions in the built meeting room.



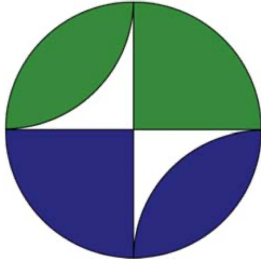


**INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS**  
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**Signed list of participants.**

Expedición científica "Discovering the great Patascoy, an unknown volcano"						
Pasto, Colombia del 20 al 24 de enero de 2023						
LISTA DE ASISTENCIA						
Fecha:	Nombre y apellidos	Ocupación	Institución	Correo electrónico	Teléfono	Firma
1	MIGUEL SUAREZ	INGENIERO	U DE CALDAS	ingusuar@uocaldas.edu.co	304132244	[Firma]
2	MATILDA PIETO	INGENIERA	UNIVERSIDAD DE CALDAS	matpieto@uocaldas.edu.co	317801288	[Firma]
3	ROBERTO A TORRES C	INGENIERO	UNIVERSIDAD DE CALDAS	rtorres@uocaldas.edu.co	310000000	[Firma]
4	EVILYN HERRERA	INGENIERA	UNIVERSIDAD DE CALDAS	eherrera@uocaldas.edu.co	310000000	[Firma]
5	ANTONIO C OSTA	INGENIERO	UNIVERSIDAD DE CALDAS	antosta@uocaldas.edu.co	310000000	[Firma]
6	ENRIQUE VERGARA VARGAS	INGENIERO	UNIVERSIDAD DE CALDAS	enverga@uocaldas.edu.co	310000000	[Firma]
7	PAULO HERNANDEZ	INGENIERO	UNIVERSIDAD DE CALDAS	phernan@uocaldas.edu.co	310000000	[Firma]
8	PAULO HERNANDEZ	INGENIERO	UNIVERSIDAD DE CALDAS	phernan@uocaldas.edu.co	310000000	[Firma]
9	FABIAN FERRER	INGENIERO	UNIVERSIDAD DE CALDAS	fferrer@uocaldas.edu.co	310000000	[Firma]
10	FRANCISCO GUERRA	INGENIERO	UNIVERSIDAD DE CALDAS	fguerra@uocaldas.edu.co	310000000	[Firma]
11	FRANCISCO GUERRA	INGENIERO	UNIVERSIDAD DE CALDAS	fguerra@uocaldas.edu.co	310000000	[Firma]
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13	FRANCISCO GUERRA	INGENIERO	UNIVERSIDAD DE CALDAS	fguerra@uocaldas.edu.co	310000000	[Firma]
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15	FRANCISCO GUERRA	INGENIERO	UNIVERSIDAD DE CALDAS	fguerra@uocaldas.edu.co	310000000	[Firma]
16	FRANCISCO GUERRA	INGENIERO	UNIVERSIDAD DE CALDAS	fguerra@uocaldas.edu.co	310000000	[Firma]
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Expedición científica "Discovering the great Patascoy, an unknown volcano"						
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Fecha:	Nombre y apellidos	Ocupación	Institución	Correo electrónico	Teléfono	Firma
1	GEORGE ZUZE	INGENIERO	UNIVERSIDAD DE CALDAS	gzuze@uocaldas.edu.co	310000000	[Firma]
2	ELIZABETH CHAVEZ	INGENIERA	UNIVERSIDAD DE CALDAS	echavez@uocaldas.edu.co	310000000	[Firma]
3	ROBERTO GONZALEZ	INGENIERO	UNIVERSIDAD DE CALDAS	rgonzale@uocaldas.edu.co	310000000	[Firma]
4	DAVID RODRIGUEZ	INGENIERO	UNIVERSIDAD DE CALDAS	drodriguez@uocaldas.edu.co	310000000	[Firma]
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**Receipts**



**RESERVA NATURAL PARA LAS AVES**  
**AURU MIMI - COLIBRÍ DE MONTE**

EL SUSCRITO COORDINADOR CIENTÍFICO DE LA RESERVA AURU MIMI

HACE CONSTAR

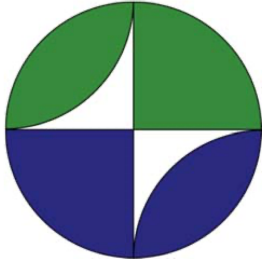
Que recibí de Gustavo Córdoba Guerrero la suma de Tres Millones Setecientos mil pesos colombianos (col \$2.440.000) , que han sido invertidos dentro del rubro de Logística de Campo (adecuación de caminos, reconstrucción de puente, etc) y la suma de Un Millón Doscientos Sesenta mil pesos colombianos (col \$1.260.000) cargados a al rubro Expedición los cuales se invirtieron para asegurar condiciones adecuadas para transporte y acomodamiento de los 20 visitantes que se invitan al evento Discovering Patascoy, an unknown Holocene Volcano

Total recibido: \$ 3.700.000 pesos colombianos  
Dado en Pasto, a los 13 días de diciembre de 2022.

Atentamente,

MsC. Aquiles Gutierrez Zamora


RECIBO DE CAJA MENOR					
Ciudad	PASTO	13 DIA	12 MES	2022 AÑO	No.
Pagado a	Diana Marcela Rodríguez			\$	530,000
<b>Concepto</b>					
Apoyo en gestión y logística - Expedición Patascoy					
<b>Valor (En Letras)</b>					
Quinientos treinta mil pesos, moneda corriente					
Código	Firma de Recibido				
Aprobado	<i>Diana Rodríguez</i>				
c.c.	x	Nit		No.	1.085.306.213



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UNION GEODESIQUE ET GEOPHYSIQUE INTERNATIONALE

## Receipts

**RECIBO DE CAJA MENOR**  
FORMA 04 - 2002

FECHA	06 / 12 / 2022	No.	
PAGADO A	Juan Carlos Mora	\$	650.000
POR CONCEPTO DE			
Diseño y elaboración			
clip de video promocional			
Expedición Patascay			
VALOR (en letras)	seiscientos cincuenta mil		
	pesos colombianos		
CÓDIGO	FIRMA DE RECIBIDO		
APROBADO			
	C.C./NIT: 5.778.344 la Florida		

**EXPLORA**  
SIN FRONTERAS

**BRIGADA**

No. 0059 | ENERO 18 2023

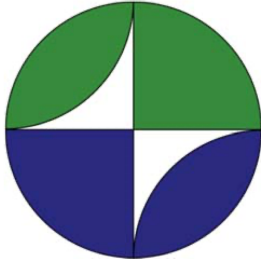
CANTIDAD	SERVICIO	COSTO	Total
1	PRIMEROS AUXILIOS	\$250.000	\$250.000

Total \$250.000

Pasto-Nariño

Luis Guerrero

Contact  
+57 3162270717  
xplorasinfronteras@gmail.com



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**UNION GEODESIQUE ET GEOPHYSIQUE INTERNATIONALE**

**Receipts**



**RESERVA NATURAL PARA LAS AVES**  
**AURU MIMI - COLIBRÍ DE MONTE**

EL SUSCRITO COORDINADOR CIENTÍFICO DE LA RESERVA AURU MIMI

HACE CONSTAR

Que recibí de Gustavo Córdoba Guerrero la suma de Nueve Millones de pesos Colombianos (col \$ 9.000.00), por concepto de transporte, acomodación y comidas de 20 participantes del evento Discovering Patascoy, an unknown Holocene Volcano durante los días 20, 21, 22, 23 y 24 de Enero de 2023 y la suma de Nueve Millones Quinientos Setenta mil pesos Colombianos ( col \$9.570.000) para adecuación del camino de acceso, finalización puente sobre el río Joyas y campamento.

Total recibido: \$ 18.570.000 pesos colombianos  
Dado en Pasto, a los 20 días de enero de 2023.

Atentamente,

MsC. Aquiles Gutierrez Zamora

**RECIBO DE CAJA**  
**MENOR**

Ciudad	PASTO	20	1	2023	No.
		DIA	MES	AÑO	
Pagado a	Diana Marcela Rodríguez				\$ 850,000.00
Concepto	* Apoyo en gestión y organización general				
	* Compra de botiquín de primeros auxilios para el evento: "Discovering the great Patascoy , an unknown volcano"				
Valor (En Letras)	Ochocientos cincuenta mil pesos colombianos				
Código	Firma de Recibido <i>Diana Rodríguez</i>				
Aprobado	c.c.	x	Nit	No.	1.085.306.213