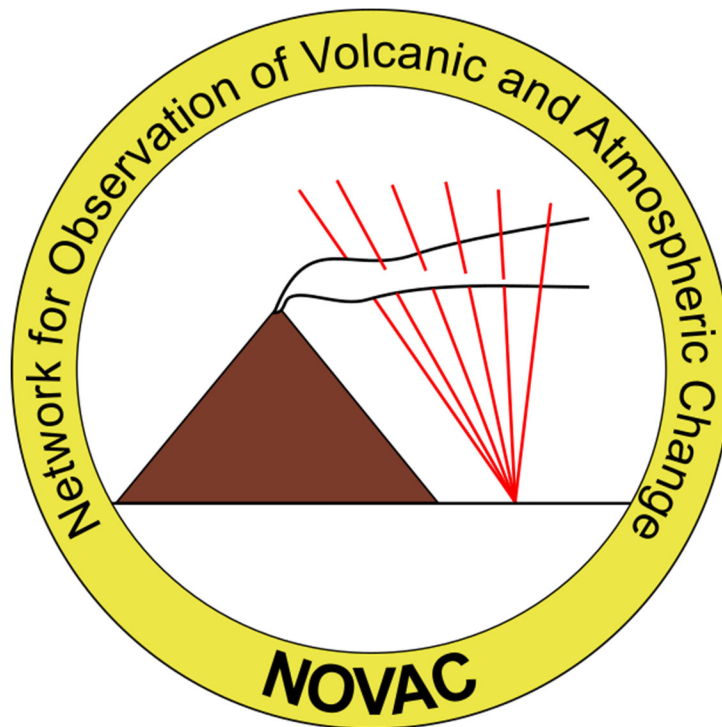


7th NOVAC Workshop

5 – 12 May, 2024

Volcán El Reventador, Ecuador



~ Workshop Program ~

(updated May 2, 2024)



Sunday, May 5, 2024

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| Optional pre-workshop activity | |
| 9:00 – 15:00 | Multi-GAS Demonstration Interested participants meet in the lobby of Hotel Fénix at 9:00. |
| Icebreaker and kickoff dinner | |
| 17:00 | Participants meet in the lobby of Hotel Fénix. Departure by Chiva to Pim's Panecillio for Icebreaker and Dinner |
| 21:00 | Return to Hotel Fénix |

Monday, May 6, 2024

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| 8:30 | Meet in the lobby of Hotel Fénix, walk to auditorium | |
| Official Opening Ceremony at EPN, Hemiciclo Politécnico, Edificio 3 (Administración Central) | | |
| 9:00 | Dr. Mario Ruiz, Director of the Instituto Geofísico, Escuela Politécnica Nacional | |
| 9:10 | Dr. Christoph Kern, USAID USGS Volcano Disaster Assistance Program | |
| 9:20 | Saadia Sánchez Vegas, Representative in Charge, UNESCO Quito | |
| 9:30 | Daniel Sánchez-Bustamante, Mission Director of USAID Ecuador | |
| 9:40 | Dr. Tarquino Sanchez, Rector of the Escuela Politécnica Nacional (EPN) | |
| 9:50 | Equipment donation from USAID | |
| 10:00 | Visit to the IG-EPN Monitoring Room / Return to Hotel Fenix | |
| 11:00 | Bus to El Reventador (Pickup from Hotel Fenix) | |
| 14:00 | Lunch en route (Gina's in Baeza) | |
| Evening at Hostería El Reventador | | |
| 17:00 | Arrive at Hostería El Reventador, check into rooms | |
| 19:00 | Dinner | |
| Evening Talk | | |
| 20:00 | <i>Marco Almeida</i> | El Reventador Volcano |

Tuesday, May 7, 2024

| Session 1 Talks | | |
|-----------------|--------------------------------------|--|
| 8:30 | <i>Silvana Hidalgo</i> | NOVAC monitoring on the active volcanoes of Ecuador |
| 8:55 | <i>Luisa Fernanda Meza Maldonado</i> | Recent activity of the Coconucos volcanic chain - Puracé volcano |
| 9:20 | <i>Alejandro Rodríguez</i> | SO ₂ fluxes at Rincón de La Vieja volcano |
| 9:45 | <i>Allan Lerner</i> | Links between gas emissions and volcanic processes |

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| 10:10 | Coffee Break |
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| Session 2 Talks | | |
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| 10:30 | <i>Zoraida Chacón Ortiz</i> | Analysis of seasonal effects on SO ₂ flux estimates from Nevado del Ruiz volcano |
| 10:55 | <i>Nicole Bobrowski</i> | New possibilities – BrO evaluation with the NOVAC Program, but why should we do it? |
| 11:20 | <i>Hugo Delgado</i> | Degassing patterns at Popocatepetl Volcano |
| 11:45 | <i>Catherine Lit</i> | Degassing of Taal Volcano, Philippines after the January 2020 eruption |

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| 12:30 | Lunch |
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| Hands-on Exercises | |
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| 14:00 – 16:00 | Session 1 |

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| 16:00 | Coffee Break |
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| Hands-on Exercises | |
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| 16:30 – 18:30 | Session 2 |

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| 19:00 | Dinner |
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Wednesday, May 8, 2024

| Session 3 Talks | | |
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| 8:30 | <i>Melissa Pfeffer</i> | DOAS SO ₂ measurements during the 2021-2024 eruptions on the Reykjanes Peninsula, Iceland |
| 8:55 | <i>Rachmad Widyo Laksono</i> | Gas measurements at Merapi Volcano, Indonesia |
| 9:20 | <i>Jorge Luis Mamani Sotomayor</i> | Mini DOAS monitoring network of the Geophysical Institute of Peru, Sabancaya and Ubinas volcanoes. |
| 9:45 | <i>Pyiko Williams</i> | TBD |

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| 10:10 | Coffee Break |
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| Session 4 Talks | | |
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| 10:30 | <i>Agnes Mazot</i> | Two years of SO ₂ flux data from Ruapehu volcano, New Zealand |
| 10:55 | <i>Nick Varley</i> | Gas monitoring at Volcán de Colima, Mexico |
| 11:20 | <i>Yenny Hache</i> | Evaluation of the BrO/SO ₂ molar ratio in the plume of the Galeras volcano during 2007 and 2010 |
| 11:45 | <i>Skye Kushner</i> | Characterizing volcanic SO ₂ emission rates using single-station scanning DOAS instrumentation; measurements from Cleveland, Korovin, and Gareloi Volcanoes, Alaska |

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| 12:30 | Lunch |
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| Hands-on Exercises | |
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| 14:00 – 16:00 | Session 3 |

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| 16:00 | Coffee Break |
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| Hands-on Exercise | |
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| 16:30 - 18:30 | Session 4 |

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| 19:00 | Dinner |
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Thursday, May 9, 2024

| Session 5 Talks | | |
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| 8:30 | <i>Maarten de Moor</i> | Monitoring dynamic hydrothermal-magmatic interactions at Poás volcano |
| 8:55 | <i>Christoph Kern</i> | Forecasting explosions at Sinabung Volcano, Indonesia, based on SO ₂ emission rates |
| 9:20 | <i>Tom Pering</i> | Low-cost UV cameras for permanent monitoring of sulphur dioxide emissions |
| 9:45 | <i>Fredy Vásconez</i> | A multi-camera system for volcano monitoring |

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| 10:10 | Coffee Break |
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| Session 6 Talks | | |
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| 10:30 | <i>Claudia Rivera</i> | Combined direct-sun ultraviolet and infrared spectroscopies at Popocatepetl volcano (Mexico) |
| 10:50 | <i>Jonas Kuhn</i> | Volcanic HF measurement with skylight |
| 11:20 | <i>Charlotte Barrington</i> | Exploiting spatial frequency for analyzing UV spectra of volcanic plumes |
| 11:45 | <i>NOVAC Steering Committee</i> | Report of activities 2018 - 2024 |

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| 12:30 | Lunch |
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| Field Trip | |
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| 14:00 | Pickups to El Reventador Caldera Make Mobile DOAS measurements on the way up? |
| 15:30 | Measurements / Demonstrations Demonstrations by Fredy Vásconez, Tom Pering, Marco Almeida, others |
| 17:00 | Discussion about the future of NOVAC: Hardware, Software, Data Use, Leadership Structure, Workshops... |
| 18:30 | Dinner in the field |
| Overnight Stay at Remote Field Station | |

Friday, May 10, 2024

| Field Trip | |
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| 6:30 | Breakfast in the field |
| 7:30 | Measurements / Demonstrations |
| 10:30 | Pickups to Hostería El Reventador |

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| 12:00 | Lunch at Hostería El Reventador |
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| Hands-On Exercises | |
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| 14:00 – 16:00 | Session 5 |

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| 16:00 | Coffee Break |
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| Hands-On Exercises | |
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| 16:30 – 18:30 | Session 6 |

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| 19:00 | Dinner |
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Saturday, May 11, 2024

| Hands-On Exercises | |
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| 8:30 – 10:00 | Session 7 |

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| 10:00 | Coffee Break |
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| Session 7 Talks | | |
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| 10:30 | <i>Fredy Apaza</i> | Gas emissions during the eruptive process of the Ubinas volcano 2023 |
| 10:55 | <i>Julián Ramírez Valencia</i> | Volcanic gas monitoring at Nevado del Ruiz |
| 11:20 | <i>Francisco Montalvo</i> | The actualization of the NOVAC at El Salvador active volcanoes |
| 11:45 | <i>Mario Díaz</i> | Installation and maintenance of the DOAS network at Popocatepetl volcano |

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| 12:30 | Lunch |
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| Session 8 Talks | | |
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| 14:00 | <i>Santiago Arellano</i> | Plumes in 3+1-D: tomographic inversion of NOVAC data |
| 14:25 | <i>Wendel Alexander Gutiérrez Paxtor</i> | Experiences and Challenges with gas monitoring at INSIVUMEH |
| 14:50 | <i>Fabrizio Carbajal</i> | SO ₂ FC (SO ₂ Flux Calculator): Preliminary code for measuring SO ₂ flux with TROPOMI |
| 15:15 | <i>Carlos Laverde</i> | Processing and analysis of SO ₂ satellite imagery using free & open software tools to complement data from NOVAC networks |

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| 15:30 | Coffee Break |
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| Session 9 Talks | | |
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| 16:00 | <i>Christoph Kern</i> | A synoptic view of volcanic gas remote sensing from the ground, air, and space |
| 16:25 | <i>Elvis Mendoza</i> | TBD |

| Final Discussion and Wrap Up | |
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| 16:50 – 18:30 | Future Directions for NOVAC, Elections (if needed), Workshop Evaluation |
| 19:00 | Final Dinner |
| 20:00 | Farewell Party |

Sunday, May 12, 2024

| Transfer back to Quito | |
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| 9:00 | Bus departs from Reventador |
| 11:30 | Termas de Papallacta |
| 14:00 | Lunch by the lake |
| 17:00 | Arrive in Quito. Participants can be dropped at the airport, or a hotel as needed. |

Description of Technical Sessions and Hands-On Exercises

Technical design and configuration of the NOVAC Scanning DOAS

- Disassemble / reassemble scanner.
- Identify the motor switch, identify the UV-filter, change conical-flat.
- Identify all components inside NOVAC instrument box.
- Disconnect / reconnect all connections inside NOVAC instrument box.
- Connect to Axiomtek with WinSCP – edit cfg.txt and network interfaces file.

Configuration of a new NOVAC Scanning DOAS in the NOVAC Program

- Do the global configuration of the NOVAC Program, including wind downloads and sftp connection.
- Configure a new scanner in NOVAC Program.
- Make default reference files for the new scanner (using new Fraunhofer functionality?)
- Let scanner run outside and collect scans; hold SO₂ cells in front of instrument at times.
- View real time data in NOVAC Program; interpret the information.
- Connect to Axiomtek with PuTTY and do “showlog” for troubleshooting.
- Chris Lockett to update the group on new pak file handling capabilities.

Performing data analysis in the NOVAC Program

- Using data from an appropriate volcano, perform a flux re-analysis with the NOVAC Program
- Using data from an appropriate volcano, perform a BrO/SO₂ analysis with the NOVAC Program
- NOVAC PPP (discussion about how this could be used in the future)
- Possible volcanoes: Cotopaxi, Ruiz, Sabancaya, Turrialba

The NOVAC Explorer: A new tool for NOVAC data visualization

- Using NOVAC Explorer, display SO₂ emission rates from the NOVAC sftp server
- Using NOVAC Explorer, display SO₂ emission rates from a local PostFluxLog file

Mobile DOAS measurements and data analysis

- Configure the Mobile DOAS software (possibly using pre-built reference files?)
- Perform a brief test measurement, either driving a short distance or walking around the hotel, holding a cell in front of the telescope at times.
- Perform Flux analysis of selected traverse with the Mobile DOAS software. Possible: Reykjanes
- Bonus: perform flux analysis with the mDOAS software.

Software required for the Technical Sessions and Hands-On Exercises

The following software will be used during the technical sessions and hands-on exercises. All software will be run on the Windows operating system. Software will be provided on USB drives during the workshop, but participants are encouraged to install these programs before traveling to Ecuador to save time at the workshop. All software is freely available on the internet and does not require a paid license.

Software can be downloaded from the original links below, or from the following Google Drive:

<https://drive.google.com/drive/folders/1bpGgdvPbyostdMZbWgsGr2euZG1dEqwu>

Original links to the individual software packages:

- PuTTY
<https://the.earth.li/~sgtatham/putty/latest/w64/putty-64bit-0.81-installer.msi>
- WinSCP
<https://winscp.net/download/WinSCP-6.3.3-Setup.exe/download>
- NOVAC Program
Link to new release coming soon, check <https://novac-community.org/software>
- Mobile DOAS (Ocean Optics or Avantes version, depending on which spectrometer is used)
https://novac-community.org/wp-content/uploads/2024/05/MobileDOAS_v6.5_Avantes.zip
https://novac-community.org/wp-content/uploads/2024/05/MobileDOAS_v6.5_OceanOptics.zip
- MATLAB Runtime (version 9.8, no other versions are supported)
https://ssd.mathworks.com/supportfiles/downloads/R2020a/Release/8/deployment_files/installer/complete/win64/MATLAB_Runtime_R2020a_Update_8_win64.zip
- DOASIS
https://novac-community.org/wp-content/uploads/2023/06/InstallerDOASIS3.2.3505_x86.zip
- NOVAC Explorer
https://novac-community.org/wp-content/uploads/2023/11/NOVACExplorer_v1.07.zip
- mDOAS
https://novac-community.org/wp-content/uploads/2023/10/mDOAS_v3.19.zip
- GhostScript
<https://github.com/ArtifexSoftware/ghostpdl-downloads/releases/download/gs10030/gs10030w64.exe>
- Notepad++ (optional, but nice to have)
<https://github.com/notepad-plus-plus/notepad-plus-plus/releases/download/v8.6.5/npp.8.6.5.Installer.x64.exe>

List of Participants

| | | |
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Workshop locations

Fénix Hotel

Queseras del Medio E11-205
Quito, Ecuador
Tel: +593 2 254 0629
WhatsApp: +593 99 983 0400
www.fenixhotel.ec

Hostería El Reventador

Km 159 Vía Quito – Lago Agrio
Ecuador
Tel: +593 99 357 7143
www.hosteriaelreventador.com

Las Mercedes Airport Hotel

Tulio N2-13 y Thomas Baquero
Calle Carlos Garzón
Quito 170907, Ecuador
+593 96 303 6915