NOVAC

Network for Observation of Volcanic and Atmospheric Change

Specific Targeted Research Project:

Sub-Priority 1.1.6.3 Global Change and Eco-systems
IV.1 Natural Disasters
IV.1.2 Volcanic risk assessment

Project No: 18354

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PM for the first annual meeting

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NOVAC First Annual Meeting

27 November – 2 December 2006, Granada, Nicaragua

The First NOVAC Annual Meeting took place in Granada Nicaragua during 27 November – 2 December 2006. The participants of the meeting were:

Name	Institution
Armando Saballos	INETER
Bo Galle	CHALMERS
Carlos Pullinger	SNET
Caroline Fayt	BIRA
Christoph Kern	UHEI
Claudia Rivera	CHALMERS
Deliang Chen	UGOT
Eduardo Mayorga	INETER
Eliecer Duarte	OVSICORI
Erick Fernandez	OVSICORI
Ernesto Gutiérrez	INETER
Evgenia Ilyanskaya	UCAM
Francisco Montalvo	SNET
Giuseppe Salerno	INGV-CT
Gustavo Garzon	INGEOMINAS
Hugo Delgado	UNAM
Jose Manuel Alvarez Nieves	UNAM
Marie Boichu	UCAM
Martha Herrera	INETER
Mattias Johansson	CHALMERS
Nicole Bobrowski	INGV-PA
Otoniel Matias	INSIVUMEH
Pedro Pérez	INETER
Santiago Arellano	IGEPN
Severine Moune	UCAM
Thomas Staudacher	IPGP
Ulrich Platt	UHEI
Wilfried Strauch	INETER
Yalire Mapendano	OVG
Yan Zhang	CHALMERS

The agenda for the meeting is shown in Table 1. All specific administrative issues for each partner were handled by Bo Balle in parallel to the sessions.

Table 1: NOVAC First Annual Meeting Agenda.

Date	Time	Activity	Responsible	Remarks
27 Nov	10:00–11:00	Inauguration, Invited speakers	Wilfried	Invited officials All participants
	11:00-13:00	Press meeting, Lunch	Wilfried	
	13:00-14:00	Administrative issues	Bo Galle	All
	NOVAC FIRST YEAR ACTIVITIES			
	14:00-14:15	Chalmers	Bo Galle	
	14:15-14:30	Heidelberg	Christoph Kern	
	14:30-14:45	UCAM		
	14:45-15:00	IPGP	Thomas Staudacher	

	15:00-15:15	INGV-CA: Challenges with using UV network in the real world	Giuseppe Salerno	
	15:15-15:30	UNAM	Hugo Delgado	
	15:30-16:00	Coffee Break		
	16:00-16:15	INETER	Wilfried Strauch	
	16:15-16:30	OVSICORI	Eliecer Duarte	
	16:30-16:45	INGEOMINAS: Activities carried out this year, with mobile and scanning miniDOAS systems at Galeras volcano	Gustavo Garzon	
	16:45-17:00	SNET	Carlos Pullinger	
	17:00-17:15	OVG	Yalire Mapendano	
	17:15-17:30	IGEPN	Santiago Arellano	
	17:30-17:45	INSIVUMEH	Otoniel Matias	
	17:45-17:50	INGV-PA	Nicole Bobrowski	
	17:50-17:55	UGOT	Deliang Chen	
	17:55-18:00	UES	Rodolfo Olmos	
28 Nov	8:00-9:00	Measurement strategy, installation considerations	Bo Galle	
	9:00-9:30	Instrument hardware, ver I	Bo Galle	
	9:30-10:00	Coffee Break		
	10:00-11:00	Acquisition electronics	Mattias	
	11:00-12:00	Instrument hardware, ver II	Christoph	
	12:00-13:00	Lunch Break		
	13:00-14:00	Demonstrations of Instruments	Christoph, Bo	
	14:00-15:00	Basic meteorology, part 1	Deliang Chen	
	15:00-15:30	Coffee Break		
	15:30-16:30	Basic meteorology, part 2	Deliang Chen	
	16:30-17:30	Basic calibration procedures	Mattias	
	17:30-18:30	Development of a digital system for the improvement of the COSPEC measurements	Jose Manuel Alvarez Nieves	
	18:30-18:45	SCIENTI	Gustavo Garzon	
29 Nov	8:00-9:00	Data communication	Yan	
	9:00-9:30	Archive	Christoph	
	9:30-10:00	Coffee Break		
	10:00-12:00	Instrument software	Mattias	
	12:00-13:00	Lunch Break		
	13:00-14:00	Post processing and validation	Mattias	
	14:00-14:30	Coffee Break		
30 Nov	8:00-10:00	Atmospheric spectroscopy, atmospheric chemistry	Ulrich Platt	
	10:00-10:30	Coffee Break		
	10:30-12:00	The DOAS principle	Ulrich Platt	
	12:00-13:00	Lunch Break		
	13:00-15:00	DOAS software Advanced calibration	Christoph, Caroline	
	15:00-15:30	Coffee Break		
	15:30-18:00	DOAS software hands-on experience	Christoph, Caroline	
1 Dec	8:00-9:20	Basic Volcanology, Gas surveillance at Popocatépetl volcano	Hugo Delgado	
	9:20-10:20	Basic Seismology	Thomas Staudacher	
	10:20-10:40	Coffee Break		
	10:40-11:00	Model for the episodic degassing of an andesitic magma intrusion and application to La Soufrière of Guadeloupe volcano (Lesser Antilles)	Marie Boichu	
	11:00-11:20	Galeras activity from 2004 to 2006, including information of fumarolic gases,	Gustavo Garzon	

		seismic signals and deformation		
	11:20-11:40	Experience with last years eruption at Santa Ana.	Francisco Montalvo	
	11:40-12:00	Coupling SO_2 emission and seismicity data at Popocatépetl volcano	Claudia Rivera	
	12:00-13:00	Lunch Break		
	13:00-13:20	Minor volatiles and trace elements in pre-eruptive magma and gas Emission	Severine Moune	
	13:20-13:40	Some recent developments in remote sensing methods for gas monitoring at Ecuadorian volcanoes	Santiago Arellano	
	13:40-13:55	Experiencias de monitoreo de SO_2 en El Salvador utilizando MobileDOAS	Rodolfo Olmos	
	13 :55-14 :10	New ideas; Webcams in connection with NOVAC	Eliecer Duarte	
	14 :10-15 :00	End of meeting, Summary	Bo	
	15 :00-	Trip to Islands / Dinner	Wilfried	
2 Dec	8:00-16:00	Fieldwork with scanning DOAS instruments	Mattias, Yan, Claudia, Christoph	All welcome at Masaya
	16:00	Steering Committee Meeting	Wilfried, Bo, Ulrich, Thomas	

27 November 2006

The meeting started with an inauguration with some invited speakers from the Nicaraguan Government. Bo Galle gave a talk about how the project started and showed the evolution of measurements starting with the first Mobile mini-DOAS measurements at Masaya during May 2001 and continuing with some other volcanoes in Central America during the following years. The DORSIVA project was also introduced as a first step of the NOVAC project. Next the NOVAC project was fully explained and the first official installations in San Cristobal volcano were shown. Next each partner gave a presentation about their first year activities as part of the NOVAC project.

Bo Galle presented the main activities Chalmers has had during the first year of the NOVAC project. The main activities Chalmers has had were: the addition of 2 new partners, setup of a web page and the development of measurement strategies, instrument version I, acquisition electronics, data communication and software; as well as field tests and installations.

Christoph Kern continued presenting the Activity Report of UHEI during the first year of the NOVAC project. The main activities UHEI had during the first year were: instrument integration, instrument compilation (instrument was successfully tested at Mount Etna Sep. 2006 with INGV Palermo & INGV Catania and San Cristobal/Massaya Nov. 2006 with INETER), instrument installation, data retrievals and data archiving (NOVAC database).

Marie, Severine and Evgenia from UCAM presented themselves and the work they are performing.

Thomas Staudacher from IPGP presented the monitoring performed at Piton de la Fournaise as well as information and pictures about the last activity of the volcano.

Giuseppe Salerno from INGV-CA gave a presentation about the challenges of using an UV network in Mount Etna, focusing on the description, performance, advantages and limits of the automatic UV-Scanner array installed at Mount Etna.

Hugo Delgado presented the activities of UNAM. It started with an explanation of the location and background of the volcanoes, the monitoring system (seismicity, volcanic gas monitoring, deformation and visual) and the people part of the monitoring team. Another main activity during the past year has been setting up of a prototype system at Popocatépetl volcano, taking care of the prototype instrument, data acquisition and data processing from the prototype. Additionally a first scientific report was written using the data from the prototype instrument installed at Popocatépetl volcano. Finally, the future location of mini-DOAS systems at Popocatepetl was presented.

Eliecer Duarte gave a presentation about monitoring activities and research performed by OVSICORI and the volcanoes in Costa Rica.

Gustavo Garzon from INGEOMINAS presented the activities carried out the past year, with mobile and scanning miniDOAS systems at Galeras volcano. An explanation of different volcanoes in Colombia was made and then some examples of measurements performed with a mobile mini-DOAS system. Also different setups of the scanning system were presented.

Carlos Pullinger from SNET presented their activities during the first year which consisted of the installation of a preliminary DOAS at Santa Ana volcano, to support the continuous operation of the DOAS and to search for suitable permanent sites at Santa Ana and San Miguel volcanoes.

Yalire Mapendano from OVG gave then a presentation about basic information of Nyamulagira and Nyiragongo volcanoes.

Santiago Arellano presented an Overview of the IGEPN prior activities relevant to the goals of the NOVAC project. It expained the activities of the Instituto Geofísico de la Escuela Politécnica Nacional (IGEPN), their goals for monitoring volcanic gases, an overview of the equatorial volcanoes and a detailed description of the volcanoes forming part of the NOVAC network.

Otoniel Matias gave a short explanation about INSIVUMEH.

Nicole Bobrowski from INGV-PA gave a short presentation about Vulcano and the colleagues working at INGV Palermo.

Finally Rodolfo Olmos from UES gave a presentation about the activities of the Volcanological Research Group of the University of El Salvador and explained in detail the geochemical monitoring performed by the group.

28 November 2006

This day started with a talk by Bo Galle about measurement strategies and installation considerations. Different issues were addressed including: local meteorology, free horizons, height/distance ratio, scattering effects, meteorological wake effect, plume height/tomography, gases, ash and acid rain, data transmission, accessibility and security. The new conical scanning concept was also explained, as well as the advantages of using it instead of the plane approach. A description of the installations at San Cristobal and planned installations at Masaya was also presented as well as some examples of installations at other volcanoes.

An explanation of the instrument hardware version I was also given by Bo Galle. A detailed description of the instrument was done. The instrument consists of a well proven scanner design (can be mounted separately), it can perform as dual-beam for plume speed, and adjust to ”Cone” or ”flat” scan concept. The instrument has an on-board PC for independent data acquisition (1 Gb), ftp-server, it can communicate via serial, WLAN or internet. It additionally has a timer and passive temperature stabilisation.

Mattias Johansson explained in more detail the acquisition electronics which consist of new controlling electronics for the scanning instrument developed in NOVAC, resulting in a more “intelligent” and autonomous instrument. The tasks the new electronics perform are to acquire data from the spectrometer, to acquire GPS-data, to control the motor in scanning unit and to save the acquired data. The acquisition software (kongo.exe) and the configuration file needed to run it was also explained.

Christoph Kern continued with the explanation of the instrument hardware, version II. The schematics of the instruments were explained as well as the mechanics technical specifications and scanning scheme. The optics technical specifications of the instrument were additionally addressed as well as the electronics. The special characteristics of the instruments were further discussed.

After lunch a demonstration of the instruments version I and II was done.

Deliang Chen continued with a lecture of basic meteorology. A description of the working group was first made. The lecture continued with an explanation of wind and its influencing factors. The vertical wind profile was then explained as well as the factors influencing the wind distribution in the boundary layer. Next an explanation of the winds in a mountain was made. Different ways to perform wind

measurements were next explained. A basic description of wind modelling was then addressed as well as a more detailed explanation and examples of the MM5 model.

Mattias Johansson described the basic calibration procedures for the spectrometers used. Some important properties of the spectrometer were addressed: wavelength, slit function and cross section.

Jose Manuel Alvarez presented a System for digital acquisition and processing of SO_2 measurements performed by COSPEC.

The day ended with a presentation by Gustavo Garzon about SCIENTI (International network of information and knowledge sources for scientific management).

29 November 2006

The day started with a presentation of Data communication by Yan Zhang. The structure of the network was explained as well as the considerations and instruments used for communication. A detailed description and inter-comparison was then made between several possible communication instruments and network possibilities. An example of a network was then made using San Cristobal volcano as basis. Finally some considerations before and during installations of communication systems were explained.

Christoph Kern continued with an explanation about the development of the NOVAC database, which allows users to search for, view and download data.

The last session of the day was taken by Mattias Johansson, who explained about the activites the NOVAC Program performs: monitor the instruments, retrieve data from the instruments, evaluate spectra for SO_2, calculate flux (cone/flat), calculate wind-speed (dual-beam), present results to the user, save images for web-publishing, organize spectra, evaluation results and fluxes on observatory's computer and finally upload to FTP-server: spectra, evaluation results and fluxes. Then the different components of the program were described and then the communication, evaluation and data uploading parts were explained in detail. A description of how to use the program was then made, including the configuration, running and data processing parts.

30 November 2006

This day was devoted to atmospheric chemistry and spectroscopy lectures. Ulrich Platt started with a lecture about Atmospheric spectroscopy and chemistry. A basic explanation about the atmosphere was made, including mixing ratios of atmospheric trace gases and the interaction of volcanoes and the atmosphere. Some important topics in atmospheric chemistry were then addressed and a detailed explanation of them was made: ozone problems, reaction kinetics, free radicals and change of the global distribution of some gases from preindustrial time to today. The NOx cycle was also explained as well as sulphur species in the atmosphere.

A lecture about history, basics and details of DOAS was also given by Ulrich Platt. Some advantages of using spectroscopic techniques were discussed as well as some history and different types of spectroscopic measurements in the atmosphere. The Dobson spectrometer and COSPEC instrument were then introduced and the principle of Differential Optical Absorption Spectroscopy. Some examples of absorption cross sections and DOAS spectrum of SO_2 were shown, followed by some gases detection after DOAS was started to be used. Some applications of DOAS were further approached. A more detailed explanation of the principle of DOAS, the (many) variants of DOAS and some examples were next discussed. Additionally the correction for instrumental effects, evaluation principles and procedures were addressed.

Caroline Fayt continued with a lecture about calibration and fitting algorithms. The main topics, linear and non linear least-squares fitting algorithms, convolution and advanced calibration procedures, where discussed in detail.

Next Christoph Kern continued with a DOAS retrieval exercise. A measurement at Mount Etna was used for the retrieval exercise. An overview of the DOAS retrieval was explained and then the procedure was explained using DOASIS, focusing extensively on the calibration of the spectrometer, convolution of the cross sections, offset and dark current correction, calculation of the ring spectrum, calculation of optical density and finally DOAS fit. Additional comments about shift and squeeze, order of the DOAS polynomial, choosing a wavelength range for the fit, ozone absorption and non-linearity were made.

1 December 2006

This day was devoted to volcanology topics. Hugo Delgado started with a talk about Basic volcanology, gas surveillance at Popocatépetl volcano. The following topics were extensively covered: volcanism origin, volcanic eruptions, and different types of eruptions, volcanoes classification, volcanic processes and observations at Popocatépetl volcano.

Next Thomas Staudacher gave an explanation about Basic Seismology. The types of seismic waves were then explained as well as the way to record earthquakes and a description of the intensities of them. A seismic network was then explained as well as the procedure to locate earthquakes in volcanology. The installed seismic network at Reunion Island was then explained as well as the types of events the network is able to record.

Marie Boichu presented a Model for the episodic degassing of an andesitic magma intrusion and application to La Soufrière of Guadeloupe volcano (Lesser Antilles). Some of the objectives of modelling are to reproduce a long-term episodic degassing and to gather information on the subsurface magmatic system.

Gustavo Garzon gave a presentation about Galeras activity from 2004 to 2006, including information of fumarolic gases, seismic signals and deformation. An extensive explanation about the monitoring network of the volcano and the volcanic crisis was made.

Francisco Montalvo explained about the Experience with last year's eruption at Santa Ana volcano. A detailed explanation about the most recent activity at Santa Ana volcano culminating on the eruption of October 2005 (seismicity and SO_2 data) was made. Also the use of a Scanning DOAS at Santa Ana volcano including data gathering and limitations, problems and positive outcomes was explained. Also background information of San Miguel volcano was given.

Hugo Delgado presented work related to coupling SO_2 emission and seismicity data at Popocatépetl volcano. The main objective of the work was to study SO_2 emissions and RSAM accumulated between explosions at the volcano (released gas vs released energy). In conclusion the research shows that the correlation coefficient between RSAM and SO_2 can be used as a tool to understand the volcanic activity of Popocatépetl and possibly forecasting explosive eruptions.

Severine Moune continued with a presentation about Minor volatiles and trace elements in pre-eruptive magma and gas emission. A detailed research study on volatile evolution in Hekla´s magmatic system during the 2000 eruption was presented.

Next, Santiago Arellano presented some recent developments in remote sensing methods for gas monitoring at Ecuadorian volcanoes. An explanation of different types of gas measurements was given as well as the evolution of spectroscopy. The COSPEC instrument was described as well as DOAS instruments. Next some SO_2 results obtained using different instruments for monitoring Ecuadorian volcanoes were presented.

Rodolfo Olmos gave then a presentation about experiences of SO_2 monitoring in El Salvador using MobileDOAS. The geochemical station network in El Salvador maintained by UES was described. Thermal monitoring was also explained. Coupled SO_2 emissions and seismic activity during and after the volcanic crisis was then presented. Additionally temporal variation of CO_2 degassing of San Miguel volcano was described.

Dinner at an island close to Granada was arranged.

2 December 2006

This day was devoted to fieldwork with scanning DOAS instruments at Masaya volcano.