

STREVA PROJECT BULLETIN



Number 5

STREVA

A collaborative project that aims to reduce the negative consequences of volcanic activity on communities and their assets. Funded by the UK Natural Environment and Economic and Social Research Councils.

Keep up to date with our progress at: www.streva.ac.uk or Follow us on Twitter @StrevaProject. If you want any more information about any of our research feel free to contact Jenni Barclay (J.Barclay@uea.ac.uk)



Participants at the 4th STREVA Forensic Workshop held in Manizales, Armero-Guayabal and Cerro Machín, Colombia

FINAL 'FORENSIC' WORKSHOP IN COLOMBIA

After several months of preparation by a core organizing committee (*Servicio Geológico Colombiano* (SGC) especially *Manizales Volcano Observatory* (OVSM), *Unidad Nacional para la Gestión del Riesgo de Desastres* (UNGRD) and UK STREVA representatives led by the *British Geological Survey* and *STREVA's KE Fellow*): the workshop took place from the 1st-11th of October 2014. This came after several preliminary visits from the UK Team.

Learning from past eruptions at Nevado del Ruiz to build a more resilient future:

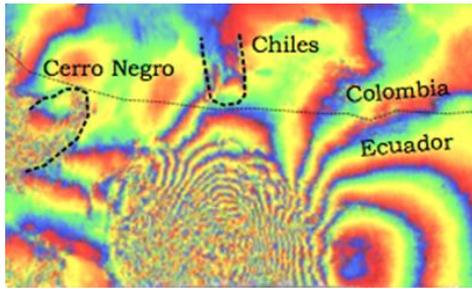
The workshop had the following themes:

To catalyse collaborative research and activities that would most effectively add value to existing efforts to enhance resilience to volcanic activity in Colombia

To develop learning about the last 30 years around Nevado del Ruiz and future eruption scenarios.

To initiate community-based engagement and catalyse and support cross-disciplinary learning for (1) and (2).

The workshop report can be found here: <http://streva.ac.uk/what-we-do/forensic-workshops/colombia>



[Interferogram from a 5.6Mw Earthquake and the locations of the two volcanoes. Image courtesy S. Ebmeier.]

Recent Outputs

A list of our current paper outputs can be found here:

<http://streva.ac.uk/our-outputs/researchers>

Many of them are 'open access' #OA

Coming soon (all #OA in Journal Applied Volcanology):

Mothes et al., *The scientific-community interface over the 15 year eruptive activity of Tungurahua, Ecuador. (IGEPN output)*

Wilkinson, E. *Beyond the volcanic crisis: the co-governance of risk on Montserrat*

Hicks, A. Few, R. *Trajectories of vulnerability during the Soufriere Hills Volcanic crisis*

We wish to thank the *University of Manizales, Red Cross Caldas Branch, Manizales Volcano Observatory (SGC-OVSM) and Cerro Machin Community (Primary School)* for hosting activities during the workshop.

Research paper outputs from earlier 'forensic' analyses: several are now in press with Journal of Applied Volcanology: watch this space!

HEIGHTENED ACTIVITY AT CHILES-CERRO NEGRO

Our Project Partners (*Servicio Geologico Colombiano and Instituto Geofisico Y Escuela Politecnica Nacional*) have been responding to an episode of heightened seismic activity and unrest at the Chile-Cerro Negro. Episodes of unrest over the past months have sometimes involved thousands of seismic events per day.

Several STREVA UK researchers have provided some additional support, at the request of SGC and IG-EPN.

Susi Ebmeier (University of Bristol) visited Quito, in November-December 2014 to collaborate with colleagues from the *Instituto Geofisico* on satellite measurements of deformation at Ecuadorian volcanoes. Most importantly, this included making measurements of deformation between Chiles and Cerro Negro volcanoes on the Ecuador-Colombian border, where. Before the start of recent unrest, no historical activity had been recorded at either volcano, so a ground based network of instruments is still in development. This makes satellite imagery particularly important for monitoring the development of the volcanic crisis at Chiles-Cerro Negro.

Mel Rodgers (University of Oxford) is also working closely with Colombian scientists at *Servicio Geological Colombiano*, monitoring the unrest at Chiles. They are exploring new applications for Mel's 'peakmatch' algorithm for rapid data processing. Mel has just arrived in Colombia to work with researchers at the Manizales and Pasto Observatories.

Following a January visit (see more below) to *Instituto Geofisico*, *Juergen Neuberg ('Locko'; University of Leeds)* is testing software developed through STREVA by Leeds PhD student Becky Salvage. This is an important step to characterise locations of possible LP swarm activity, indicating the movement of magma. In the next few weeks the team will compare results regarding the processing of VLPs and overall seismicity with different types of software, developed at Leeds and *Instituto Geofisico*.

By collaborating closely with both Observatories we hope this will be a useful benefit to all.

STREVA-UK RESEARCH VISITS TO OUR COUNTRY PARTNERS.

In December 2014, *Jon Stone* and *Teresa Armijos Burneo* (*University of East Anglia*) visited the Strevans of Ecuador. They fed back some of the research carried out between IGEPN and STREVA, with members of the community, municipality, the vigias network and the national risk management secretariat. Jon took IGEPN the first 'strevacopter' UAV (funded by a NERC public engagement grant), which they will use for the next two years to map deposits, model valleys and engage with communities. The 'strevacopter' in action can be found here: <https://www.youtube.com/watch?v=SaVvWN91ejU> (courtesy *Instituto Geofisico*) and here: <https://www.youtube.com/watch?v=wPbYjS1QVWk> (courtesy *Jon Stone*).

Teresa visited with *Instituto Geofisico* again in January to discuss the findings from her fieldwork working with communities around Tungurahua. She also completed fieldwork working with communities around Soufriere St. Vincent in collaboration with *Barbara Carby* from the *University of the West Indies, Disaster Risk Reduction Center and the ODI*

In January, *Locko*, visited *Instituto Geofisico* to discuss several aspects of broadband seismology, largely dedicated to identifying a) different types of tremor (and their specific meaning), b) to very-long period seismic signals, how to identify them and process them properly as well as the work on Chile.

UK STREVA MEETINGS

The 'integrated analysis of volcanic risk' that we are trying to develop in response to the findings from the forensic processes is both stimulating and challenging. In January 2014 UEA volcanologists hosted the Annual UK Volcanic and Magmatic Studies Group meeting, we used this opportunity to host a two-day workshop on 'Understanding Volcanic Risk' afterwards with other UK-based volcanologists to discuss problems and common issues. The outputs can be found here:

<http://streva.ac.uk/our-blog>

Mel Rodgers convened a small working group in August 2014 to identify future challenges in volcano seismology, focussing primarily on how best to integrate multiple datasets, and to use and share data and processing tools between and across academia and observatories. The short report from this meeting is now freely available here:

http://figshare.com/articles/2014_Oxford_volcano_seismology_discussion_workshop_report/1291179

Discussions around this topic will continue at international meetings and workshops over the next year.

CONGRATULATIONS AND NEW STREVA FACES!

Congratulations to *Chris Johnson* who took up a lectureship in the Centre for Nonlinear Dynamics at the University of Manchester. Chris had been the postdoc working on the development of a dynamic model for lahars to be made freely-available as one of the STREVA project outcomes. Chris' mathematical modelling has resulted in a new formulation for the

transport of large boulders within lahar flows that enables new predictions of building damage and feeds into assessment of vulnerability. He has also developed a model for lahar flow that incorporates erosion and deposition by the flow, which is implemented on freely-available global digital elevation mapping. We have been lucky to be able to recruit *Mark Woodhouse (University of Bristol)* to replace Chris. Mark is a mathematical modeller who has most recently worked on the VANAHEIM and FUTUREVOLC projects on dispersion of volcanic ash, and he developed the freely-available plumerise tool (www.plumerise.bristol.ac.uk). Mark started on the 1st of February and has already been working with STREVA (see below).

Congratulations to *Susi Ebmeier (University of Bristol)* who has been awarded a 2 - year European Space Agency Living Planet Fellowship to work on 'Interconnectivity of magma reservoirs'. *Juliet Biggs* is currently recruiting a replacement PDRA for Susi's position on the STREVA Project. More news of that soon.

Amy Collinson (University of Leeds) joins STREVA as Locko's new post-doc. She successfully defended her thesis on "Determination of Degassing Patterns in Volcanic Systems" last summer. For her post-doc, she will be working on modelling observables, e.g. gas, seismology and magma movement, and the corresponding deformation and degassing.

We wish *Victoria Sword-Daniels (University College London)* STREVA Researcher and KE-Fellow an exciting and fulfilling Maternity Leave and look forward to your return sometime in 2016. Good luck!

Congratulations Award Winners!

Steve Sparks for winning the Geological Equivalent of the Nobel Prize (Vetlesen Prize). Well done, Steve! *Geoff Wadge* is the recipient of the Geological Society of London Murchison Medal for 2015, this is one of the major awards given by the Geological Society of London. The Murchison Medal is normally given to people who have made a significant contribution to the science by means of a substantial body of research and for contributions to 'hard' rock studies. *Juliet Biggs and co-authors* on the STREVA paper 'Global Link between deformation and volcanic eruption quantified by satellite imagery' published in Nature Communications won the Lloyds Science of Risk Prize for Natural Hazards 2014. *Jenni Barclay* won the Annual UK VMSG Award. Well done, all!

FUTURE AND ONGOING ACTIVITIES

Volcanic Ash in the Caribbean

One of the emerging findings across our forensic settings has been the disruptive influence of volcanic ash on community livelihoods during long-term volcanic activity. We have been fortunate enough to secure more NERC Funding (via their International Opportunities Fund) to convene a workshop of International Experts to discuss the state of the art in modelling the distribution of ash and understanding its long and short-term impacts. This is being co-organised with *Richie Robertson* from the *University of the West Indies, Seismic Research Centre* and will be held from 8th-12th March on St. Vincent to coincide with their Country Conference as they review their disaster management plan. However the outcome of these discussions will be shared freely and we hope to use this as a platform to catalyse further learning and research across the STREVA study regions. A team from STREVA UK will travel to this workshop.

Plumerise model and Nevado del ruiz

As one of the outcomes of the STREVA Colombia workshop, *Mark Woodhouse* has set up an automated daily plume forecast for Nevado del Ruiz that is used by our partners SGC at the Manizales Observatory. Meteorological data for the region is uploaded and a simulation is run using the PLUMERISE model to make a prediction for the relationship between plume height and volcanic mass eruption rate if an eruption were to occur. The Manizales Observatory download the forecast and use this as part of their eruption preparedness planning.

This work arose directly from discussions during the Colombia Workshop, and is one example of how STREVA hazard assessment research is feeding back to operation practice with our project partners. Additional motivation for the work was provided by the small eruption and ash plume that occurred at the end of our field day on Nevado del Ruiz . The link to the PLUMERISE model can be found here: www.plumerise.bristol.ac.uk. For more information contact Jerry Phillips or Mark Woodhouse.

Visits to Partners and plans for the ‘trial volcanoes’

Teresa Armijos is just about to start a new season of fieldwork in Colombia, working with communities near Nevado del Ruiz in consultation with *Servicio Geologico Colombiano (SGC)*. *Roger Few* will join her for a couple of weeks in March. Similarly *Emily Wilkinson and Nella Canales (UK Overseas Development Institute, ODI)* will be working in Colombia from April, working with those responsible for managing risk in consultation with *Servicio Geologico Colombiano (SGC)* and *Unidad Nacional para la Gestión del Riesgo de Desastres (UNGRD)*. Emily has also been working with risk managers and decision-makers on St. Vincent in collaboration with *Barbara Carby*.

Mel Rodgers is currently in Colombia working with partners on seismic data from Nevado del Ruiz, Galeras and Chiles-Cerro Negro.

Anna Hicks (University of East Anglia) is currently working on the analysis of the activities thus far in St. Vincent (one of our original trial volcanoes, now something of a hybrid setting), these will be used to develop a strategy for working on personal preparedness plans through scenario planning in response to these findings. She will re-visit St. Vincent in the autumn in collaboration with *UWI* researchers and the local *National Emergency Management Organisation*. Plans for other ‘trial’ volcanoes will be developed with our country partners as findings from the initial phases are consolidated through the early part of 2015.

AND FINALLY... VOLCANOES TOP TRUMPS FUND.. WATCH THIS SPACE

We are lucky enough to have many engagement projects in STREVA and we are always looking for ways to fund and collaborate on more! The Volcanoes Top Trumps cards have been a great success and many STREVA researchers generously contributed images for the cards. They feature Soufriere Hills Volcano, Tungurahua and Nevado del Ruiz. Soon, we will be in a position to use the proceeds from the sales of these cards to fund small (£500 or so) collaborative projects that help to reduce risk in communities impacted by volcanic risk. We're very keen this includes our STREVA volcano sites– so – please get your thinking caps and watch this space for news of how to obtain funding... or follow @VolcTopTrumps on Twitter.