

March 2017

Spring 2017 Newsletter



The Commission on Statistics in Volcanology (COSIV) has been busy advocating the use of statistics in volcanology and preparing for 2017's IAVCEI Scientific Assembly in Portland, OR. In this newsletter we have outlined some of our more notable accomplishments, plans for the future and research highlights that have notable statistical applications.

- 1) Recently published in *Statistics in Volcanology*
- 2) COSIV at IAVCEI 2017 (sessions, workshops and meetings)
- 3) Research Highlight A new tool for Tephra Hazard Assessment
- 4) A new working group on Volcanic record completeness

1. Recently published in *Statistics in Volcanology* (Volume 2, 2016)

Statistics in Volcanology (SIV) was launched in 2012 (ISSN 2163-338X) as the open-access, peer-reviewed journal of the COSIV and is supported by the University of South Florida. The journal publishes invited review articles, new research contributions, case studies using existing methods, and short method or how-to articles. In addition to these articles, the submission of supplementary data sets, computer code, and related materials is encouraged. Here are three *hot off the presses* articles available online for free.

Pooling strength amongst limited datasets using hierarchical Bayesian analysis, with application to pyroclastic density current mobility metrics, *S. E. Ogburn, J. Berger, E. S. Calder, D. Lopes, A. Patra, E. B. Pitman, R. Rutarindwa, E. Spiller, and R. L. Wolpert*, Available online for free: <http://scholarcommons.usf.edu/siv/vol2/iss1/1/>

Volcano Statistics Casebook: Tentative evidence from two real-time analyses for an Earth tide influence on volcano-seismic events, *Willy Aspinall*, Available online for free: <http://scholarcommons.usf.edu/siv/vol2/iss1/2/>

Learning volcanology: Modules to facilitate problem solving by undergraduate volcanology students, *C. B. Connor and H. L. Vacher*, Available online for free: <http://scholarcommons.usf.edu/siv/vol2/iss1/3/>

Visit SIV to submit your work or read the latest: <http://scholarcommons.usf.edu/siv/>

2. COSIV at IAVCEI 2017

COSIV will have a large presence at IAVCEI this summer. We have sponsored three sessions, two workshops and at least one commission meeting.

COSIV Sessions

III.3 Statistical approaches and integrated methods for improved forecasting of volcanic eruptions

V.3 Modeling volcanic hazard [Co-sponsored by COSIV and CVHR]

Conveners: Leah Courtland, Mark Bebbington, Laura Sandri, Sylvain Charbonnier, Jorge Bajo

Modeling of volcanic hazards, including (but not limited to) probabilistic, statistical, numerical, theoretical, and analogue models. Emphasis is on (i) underlying volcanological processes and eruption styles, (ii) the probability that a hazardous event occurs, (iii) the probable location and scale of impacts from one or more hazards, and (iv) quantifying hazard and providing information for risk management and land-use planning. The use of field data and/or remote sensing tools to verify or compare different models is especially encouraged, as improved quantification methods, and methodologies that might be applicable to more than one type of hazard.

VIII.1 New approaches using statistical methods in volcanology

Conveners: Leif Karlstrom, Benjamin Black, Jacob Richardson, Gabor Kereszturi

We welcome contributions from any field of volcanology that emphasizes statistical analysis. We particularly seek contributions that use statistics to compare geochemistry, geophysics, physical volcanology, petrology, remote sensing, topography, InSAR, and other observational datasets with predictions from models to investigate the rich magmatic histories that lead to volcanic eruptions.

COSIV Workshops

Pre-Conference Workshop on Volcano Record Completeness

The workshop aims to bring together members of the working group on volcanic record completeness and other interested parties to consider both how to determine when a record is complete, and the downstream consequences for frequency-magnitude and hazard estimates from using complete or incomplete records. The object of the workshop will be to summarize what is known about data completeness of volcanic records, and to discuss and agree on possible research directions in this space.

Participant application process:

Email applications will be solicited by the conveners when meeting registration opens, stay tuned.

For more information, contact the conveners:

Susanna Jenkins: Susanna.Jenkins@gmail.com Mark Bebbington: M.Bebbington@massey.ac.nz
For updates see: http://iavcei2017.org/preB_3.html

Post-Conference Workshop on The Hazards of Lassen Volcano

This workshop will explore probabilistic modelling and statistical best practices for volcanic hazard assessment. The workshop will begin with fieldwork at Lassen Volcano, California; a complex volcano that has produced a range of hazards from small lava flows to large debris avalanches. Lassen's array of hazards, varying vent locations, and eruption timing data will serve as a case study for the classroom portion of the workshop. The workshop will explore different volcanic hazard models; fitting, validation, and evaluation of models; and probabilistic best practices for running these models. Participants will gain a better understanding of volcanic hazard models, and their limitations and uncertainties.



Figure: The May 22, 1915 eruption of Lassen Peak as seen from Red Bluff, California, NPS Photo

8/19: Drive to Lassen Volcano from Portland, OR

8/20-21: Field work, bonus solar eclipse

8/22-23: Workshop on probabilistic hazard modelling

8/24: Drive to local airport (Sacramento, CA)

Participants will need to:

- bring hiking gear for the 2 day field portion of the workshop
- bring laptops for the classroom portion of the workshop
- be prepared for rustic cabins (details to follow, electricity and plumbing will be available, but sleeping bags may be required) or tent camping.
- bring money for food and drink
- ***arrange travel from local airport (Sacramento, CA) back home on August 24***

Because of transportation logistics to Lassen, the workshop will be limited to 20 participants. Student participation is encouraged and students will receive preference for registration. Otherwise, registration will be handled on a first-come, first-served basis.

For details and more information contact the conveners:

Sarah Ogburn: sogburn@usgs.gov Chuck Connor: cbconnor@usf.edu

COSIV Meeting

The commission will hold a business meeting at IAVCEI in Portland. The agenda for the meeting is yet to be finalized, but will include reports from the leader, the SiV editor, and the Working Group on Volcanic Record Completeness. At this meeting COSIV will hold **elections for the posts below**, and any others that the meeting may decide are needed. We will also include discussions about future commission activities.

Posts that need to be filled for the next 4-year cycle are:

- Leader elect, who will take over at the IUGG meeting in 2019, current leader Patrick Whelley remaining on the executive for a further 2 years as ‘past leader’.
- Workshop organizer. The commission aims to hold one meeting in each 4 year cycle, probably in conjunction with one of the major conferences.
- Secretary (formerly: Liaison committee delegate), whom is responsible for liaising with other IAVCEI commissions
- 2 early career representatives.
- SiV Editor Chuck Connor remains on the executive as an ex-officio member.

Any member of COSIV can nominate someone (including themselves!) for a position. Nominations can be via email to Patrick Whelley, or from the floor at the meeting. If you have any questions, please contact the current or past leader:

Patrick Whelley (Leader): patrick.l.whelley@nasa.gov
Mark Bebbington (Past Leader): m.bebbington@massey.ac.nz

3. Research highlight: TephraProb

TephraProb is a set of Matlab functions wrapped around the Tephra2 model developed to provide an integrated environment for scenario-based probabilistic hazard assessments of tephra fallout. Through graphical interfaces, the code assists the user with every step of the modelling procedure from the collection, pre-processing and analysis of input parameters to the post-processing of model results into comprehensive sets of outputs. TephraProb was designed to provide a tool rooted in the understanding of volcanic processes and field observations, on top of which probabilistic strategies are added to account for natural uncertainties.

TephraProb contains three main modules. The first module is designed to generate

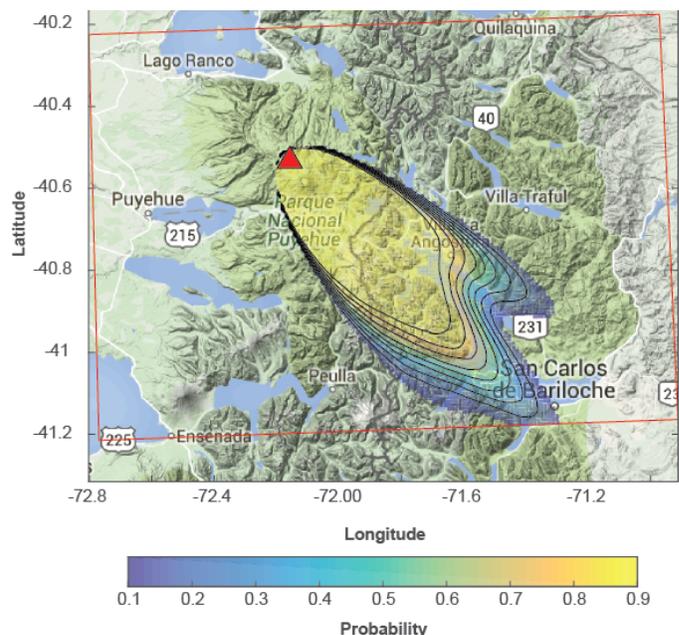


Figure: Illustration of a typical output from TephraProb showing the probability of exceeding an accumulation of 10 kg/m² for a 2011-type eruption of Cordon Caulle (Chile; see the reference paper for more details on the eruption scenario).

input parameters for Tephra2, allowing a direct access to the NOAA Reanalysis and ECMWF Era-Interim atmospheric datasets and the Global Volcanism Program eruption database. Additional tools help the user to critically analyze input conditions and assist the definition of realistic eruption scenarios. The second module offers a range of probabilistic scenarios designed for various eruptive styles and where the user controls the degree of freedom given to the stochastic sampling of eruption source parameters. All simulated eruptions are then sent to Tephra2 and parallelized on multi-core CPUs. Finally, the third module compiles probability maps of tephra accumulation, isomass maps for a given probability of occurrence and hazard curves for selected locations. All outputs are designed for an effortless integration into Bayesian codes for long-term hazard assessment and GIS platforms for further exposure, impact and risk analyses.

In addition to its research applications, TephraProb is designed to serve as an applicable tool in contexts where limited computational resources are available. An updated version of Tephra2 makes the code platform-independent, and various options are offered to decrease the computation time required by probabilistic hazard assessments. A comprehensive user manual and a video tutorial were created to assist the user through the entire process. If you are interested in using the code, please visit the following links and drop us a line at sbiasse@hawaii.edu!

For more information

Original research paper: <https://appliedvolc.springeropen.com/articles/10.1186/s13617-016-0050-5>

Source code: <https://github.com/e5k/TephraProb>

Video tutorial: <https://www.youtube.com/channel/UCP8gCjSeMoPVwgzMwKUnW3w>

4. New Working Group on Volcanic record completeness

COSIV is organizing a working group on "Volcanic Record Completeness":

Forecasting eruptions, including not just the time onset, but the size, location and effects, is vital for the purposes of hazard and risk assessment. However, forecasts are critically dependent on the quality of data available and the statistical methods employed. Going beyond the implausibility of forecasting outcomes that are not present in the data, inhomogeneity of the volcanic record(s) can introduce bias and result in incorrectly calculated forecasts and uncertainties. This inhomogeneity can be present in many forms, but a primary concern is the completeness of the records. In general this varies with eruption size and time (increasing in both dimensions) and, when considering aggregated records from multiple volcanoes, in space. This new working group will aim to tackle quantifying completeness and identifying strategies for improving completeness in the future.

For further information contact:

Susanna Jenkins Susanna.Jenkins@gmail.com Mark Bebbington m.bebbington@massey.ac.nz

5. More information

If you want to keep up to date on the happenings in statistics in volcanology join our email list by contacting Mark Bebbington: m.bebbington@massey.ac.nz or Patrick Whelley: patrick.l.whelley@nasa.gov.

See you in Portland!