Neural classification of infrasonic signals from hazardous volcanic eruptions

Garces, M.¹, F. Ham², A. Iyer², D. Fee³, A. Le Pichon⁴, R. Matoza⁴, T. Murayama⁵, D. Brown⁶, P. Mialle⁶, and R. Servranckx⁷

¹Infrasound Laboratory, HIGP, SOEST, University of Hawaii at Manoa, milton@isla.hawaii.edu
²Information Processing Laboratory, Department of Electrical and Computer Engineering, Florida Institute of Technology
³Geophysical Institute, University of Alaska, Fairbanks
⁴Commissariat à l'Energie Atomique, CEA/DASE, France
⁵Japan National Data Center and Weather Association
⁶Comprehensive Test Ban Treaty Organization, Vienna, Austria
⁷Montréal Volcanic Ash Advisory Centre, Canada

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IAVWOPSG 5 Conclusion 5/14
Use of infrasound data in support of the VAACs

The International Civil Aviation Organization (ICAO) and World Meteorological Organization (WMO) gave a positive evaluation of the ASHE project during the 2010 International Airways Volcano Watch Operations Group (IAVWOPSG 5) coordination meeting, and recommended:

That an ad hoc working group consisting of the IAVWOPSG Members of Australia, Canada (Rapporteur), France, Japan and New Zealand:

a) examine the development and testing of a prototype, real-time "significant" eruption notification system for the VAACs;

b) pursue the collaborative work between VAACs and CTBTO;

c) report back to the IAVWOPSG/6 Meeting (Senegal, Fall 2011).

ASHE Global

• Small explosions do not present an ash hazard to aviation at cruising heights.
• Sustained volcanic jetting signal reliably signifies the eruption of ash that poses a risk to aviation.
• Coherent energy, bandpass, and backazimuth are the primary signal discriminants.
• Develop neurocomputing algorithms to supplement these methods and reduce false alarms.
• Extend eruption signal classification work to other regions of interest.
• Invite collaborations to pursue the ICAO objectives.
Acoustic Surveillance for Hazardous Eruptions (ASHE)
Identified Infrasonic Fingerprint of a Plinian Eruption at Tungurahua Volcano, Ecuador

23 March 2010, FIFTH INTERNATIONAL WORKSHOP ON VOLCANIC ASH
Performed pilot neural net classification of volcanic eruptions signals from Mount St. Helens, Tungurahua, and Kasatochi volcanoes

- ID hazardous eruptions
- Train neural net
- Extend to IRED
- Extend to IMS
- Implement in real time

Cepstral Neural Net Classifier Bank with Radial Basis Functions

PNNCB (Parallel Neural Network Classifier Bank) architecture.
Extend study to Infrasound Reference Event Database (IRED)

This database is rapidly growing: IMS infrasound network is shown in yellow squares, volcanoes in orange