EVALUATION OF THE ASHE PROJECT (ECUADOR)

(Presented by the United States)

SUMMARY
This paper presents an evaluation of the results of the ASHE Infrasound Project in Ecuador.

1. INTRODUCTION

1.1 The Acoustic Surveillance for Hazardous Eruptions (ASHE) project is a prototype for a near real time volcanic eruption detection system. Its primary purpose is to demonstrate the possibility of using low frequency acoustic (infrasound) observations over the region of Ecuador and southern Colombia for automatic volcanic eruption notification to the Washington DC Volcanic Ash Advisory Center (VAAC). ASHE has been operating in Ecuador since late 2005, collecting and analyzing data with the aim to identify and characterise volcanic eruptions.

1.2 At the IAVWOPSG/3 Meeting, an information paper reported on the initial work and set-up of the ASHE project (IAVWOPSG/3-IP/5) and at IAVWOPSG/4 both a working paper (IAVWOPSG/4-WP33) and in information paper (IAVWOPSG/4-IP6) followed with initial evaluations of the project by the Canadian team.

1.3 This paper is an evaluation of the project as a tool at the Washington Volcanic Ash Advisory Center (VAAC).
2. DISCUSSION

2.1 The first messages sent to the VAAC in March of 2007 were in the form of a daily summary of activity. While these messages proved the concept that detections and notification was possible, knowing an eruption had occurred hours ago was of little value to the VAAC mission.

2.2 In December 2007 and February 2008 some refinements to email notification program were made. First for when the acoustic energy recorded from Tungurahua for the previous hour exceeded a moderately high level a notification was sent. Second when the acoustic energy fell below a moderately high level or if the energy level doubled from the current level a notification message was sent. This was an improvement for more timely notification for high tremor and/or explosions at the volcano without over notifying for every moderately high acoustic signal. Operationally this was an improvement that had promise over just the daily notification.

2.3 It was found, however, that there was not always a correlation between explosions and ash producing events. In review of satellite imagery, many times it was not possible to detect ash post notification of significant acoustic events. From the Geophysical Institutes reports the volcano produced sounds of “canon shots” or a sound like a jet engine. These sounds were found to be noises associated with degassing or ash poor emissions.

2.4 Also during the use of the data a limitation to notifications or use of the website were seen for several hours during the day due to high noise. During those hours the infrasonic signal noise levels are saturated with winds noise (maybe also ocean noise? per conversation with investigator) and all but the very high signals were masked.

2.5 As noted in the previous evaluation, working paper written by Canada, there were 120 events for the period of March 2007 to March 2008 where it was recorded that the Washington VAAC cited in their advisories that infrasound was used as a source of information. In reflection or re-evaluation of the issuance of the VAA it should be noted that infrasound information was used primarily as a reason to continue an ongoing eruption during times that ash was not identifiable due to cloud cover and/or darkness and also in association with high seismic activity. It is likely that the event would have been continued based just on the seismic signal alone. There was never a time that infrasound detection occurred to initiate a new ash producing event after a period of non ash activity.

3. CONCLUSION

3.1 The primary objective of the project was met. The system was able to provide near real time notification to the Washington VAAC of acoustic signals associated with volcanic activity.

3.2 We were not able to correlate with a high level of confidence that there was ash associated with the acoustic signal. There may be some potential in the use of this technology, with very high acoustic signals that may correlate to stratospheric injections of ash. But this would require a more in-depth study which is beyond this assessment. In that the resources at the Washington VAAC are limited we were not able to conduct any further in-depth assessment of the acoustic signal strength to ash height assignment.
3.3 The meeting may wish to formulate the following conclusion:

**Conclusion 5/xx — Evaluation of the results of the ASHE product (Equador)**

That, IAVWOPSG

a) express appreciation to the members of the demonstration project for their efforts; and

b) agree that the work on this task be considered complete and that no further assessment is required by the Washington VAAC.

4. **ACTION BY THE IAVWOPSG**

4.1 The IAVWOPSG is invited to:

a) note the information in this paper; and

b) decide on the draft conclusion proposed for the groups consideration.

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