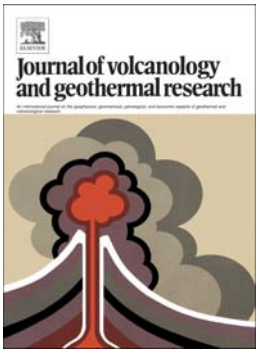
Accepted Manuscript



Automatic detection of volcano-seismic events by modelling state and event duration in hidden Markov models

Sohail Masood Bhatti, Muhammad Salman Khan, Jorge Wuth, Fernando Huenupan, Millaray Curilem, Luis Franco, Nestor Becerra Yoma

PII: S0377-0273(16)30120-2
DOI: doi: 10.1016/j.jvolgeores.2016.05.015
Reference: VOLGEO 5859

To appear in: *Journal of Volcanology and Geothermal Research*

Received date: 26 November 2015
Revised date: 1 April 2016
Accepted date: 23 May 2016

Please cite this article as: Bhatti, Sohail Masood, Khan, Muhammad Salman, Wuth, Jorge, Huenupan, Fernando, Curilem, Millaray, Franco, Luis, Yoma, Nestor Becerra, Automatic detection of volcano-seismic events by modelling state and event duration in hidden Markov models, *Journal of Volcanology and Geothermal Research* (2016), doi: 10.1016/j.jvolgeores.2016.05.015

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Automatic detection of volcano-seismic events by modelling state and event duration in hidden Markov models

Sohail Masood Bhatti[(a)], Muhammad Salman Khan [(a)1], Jorge Wuth[(a)], Fernando Huenupan [(b)], Millaray Curilem [(b)], Luis Franco[(c)], Nestor Becerra Yoma [(a)*]

[(a)] Department of Electrical Engineering, Universidad de Chile, Santiago, Chile

{smasood@ing.uchile.cl; jwuths@gmail.com, nbecerra@ing.uchile.cl}

[(b)] Department of Electrical Engineering, Universidad de La Frontera, Temuco, Chile

{fernando.huenupan@ufrontera.cl; millaray.curilem@ufrontera.cl}

[(c)] Observatorio Vulcanológico de los Andes Sur, Chile{luis.franco@sernageomin.cl}

ACCEPTED MANUSCRIPT

ABSTRACT

In this paper we propose an automatic volcano event detection system based on Hidden Markov Model (HMM) with state and event duration models. Since different volcanic events have different durations, therefore the state and whole event durations learnt from the training data are enforced on the corresponding state and event duration models within the HMM. Seismic signals from the Llaima volcano are used to train the system. Two types of events are employed in this study, Long Period (LP) and Volcano Tectonic (VT). Experiments show that the standard HMMs can detect the volcano events with high accuracy but generates false positives. The results presented in this paper show that the incorporation of duration modeling can lead to reductions in false positive rate in event detection as high as 31% with a true positive accuracy equal to 94%. Further evaluation of the false positives indicate that the false alarms generated by the system were mostly potential events based on the signal-to-noise ratio criteria recommended by a volcano expert.

Keywords: Volcano monitoring, duration model, hidden Markov models, signal processing, pattern recognition

[1] Salman Khan is now with the Department of Electrical Engineering, University of Engineering and Technology Peshawar, Pakistan {salmankhan@uetpeshawar.edu.pk}.

* Corresponding Author

Download English Version:

https://daneshyari.com/en/article/6439919

Download Persian Version:

https://daneshyari.com/article/6439919

Daneshyari.com