I. Methodology:

SSA-VSR system

1. Station-independent VSR under Manual VSR + hazard

Parallel (PSA) vs. serial (SSA) VSR @ Deception Island

i. Robust & station-independent VSR at Deception Island

Standardisation (STAND) + Efficient feature selection (DFS)

Train DB = Dec. 1995

288 / 3 @ 1,8 [h]

2. VI.VSR: recognising Arenal events by Colima and Popocatépetl

✔ Automatic SSA-VSR models built by a joint DB

Continuous VI.VSR @ Popocatépetl by Colima

814 / 6 @ 37 [h]

An enhancement of 10% via system Auto-configuration

3. VI.VSR: recognising Arenal events using Colima models

✔ Continuous VI.VSR @ Popocatépetl by Colima: waveform standardisation (STAND) + efficient feature selection (DFS) + system auto-configuration (AUTO) empowers volcano-independent VSR:

Train DB = Dec. 1995

288 / 3 @ 1.8 [h]

(VS) activity

(cPrec%)

707 / 3 @ 12.2 [h]

46 / 20.9 [h]

70 [1.1]

2. VI.VSR: system setup & recognition of unknown data

(6) Volcano-independent labelling

(3) Decoding

(0) DBs

Events / classes @ duration

(1) Aims: automatic Volcano-Independent Volcano-Seismic Recognition (VI.VSR)

Aims: station-independent VSR under Manual VSR + hazard

(1.1) Station-independent VSR under noisy conditions VSR @ Deception Island

(1.2) Parameterisation (param. # feats) of overlapped waveform segments as feature vectors

(1.3) Feature selection (DFS) in the given (param. # feats) parameterisation scheme

(1) Proposal: portable & universal VSR systems

i. portable VSR solutions, relying on:

Easy-to-use (Python-based) user interfaces to facilitate the VSR integration at VOs

Structured Hidden Markov models (HMMs) to perform real-time, continuous VI.VSR

ii. universal VSR, based on VULCAN.ears project® approaches:

Universal DBs collected from more than 15 volcanoes to build universal VSR models

Efficient waveform description will enhance the volcano-independent models of VI.VSR

Parallel VSR channels focused on each VS class, increasing reliability and precision

2. Universal-VI.VSR system setup & recognition of unknown data

(6) DBs: a universal joint DB is used to build universal VSR models

1. Feature Extraction (FE): efficient waveform description by a stream of feature vectors®

2. Model building: each VS class in the joint DB using its labels

3. Decoding: automatic detection & classification of real DB events

4. Evaluation of results comparing recog labels vs. real DB labels via VSR precision (cPrec)

5. AUTO-configuration by (re)evaluation of the (1-4) stages

6. Volcano-independent labelling of VS events of an unk DB acquired at another volcano

(1) References & Acknowledgments

(1) Brain et al., 2016, “Predicting the Volcanic Eruption Forecasting Framework in real-time situations: A Bayesian approach applied on explosive and effusive eruptions”, JVDR, 327(0).


(6) pyVSR command-line interface as a Python wrapper for the VSR system:

− Ready-to-use scripts to build VSR models given a labelled DB

− Tools to run, define and evaluate whole VSR-tests

− Online VSR of data received from VO data servers


(2) Framework Programme 2.
