

ASHE V4R4

Acoustic Surveillance of Hazardous Volcanic Eruptions (ASHE) in Asia

M. Garces¹, B. Taisne², T. Murayama³, E. Blanc⁴, J. Vergoz⁴,
A. Tupper⁵, P. Mialle⁶, M. Ngemaes⁷, and F. Shaw⁸

1. Palau National Data Center and University of Hawaii Infrasound Laboratory
2. Earth Observatory of Singapore, Nanyang Technical University
3. Japan National Data Center and Weather Association
4. ARISE and Commissariat à l'Énergie Atomique et aux Énergies Alternatives
5. Darwin VAAC, Bureau of Meteorology, Australian Government
6. Comprehensive Nuclear-Test-Ban-Treaty Organization
7. Palau National Data Center and National Weather Service
8. Meteorological Service of Singapore

ASHE ASIA V4R4

- The ASHE Asia project is an international collaboration to improve coverage, reduce detection latency, and increase confidence in volcanic eruption identification in the Asia-Pacific region.
- The capability for volcanic eruption monitoring with infrasound has been demonstrated. ASHE Asia aims to optimize eruption identification for specific design criteria.
- We plan to design the ASHE Asia event detection criteria to Volcano Explosivity Index 4 eruptions (and above) recorded with sensor systems within 4 megameters. We refer to this scalable design specification as V4R4.
- ASHE Asia will use a hybrid sensor system of traditional and smartphone sensors.
- New methods will be developed to integrate and process these data.

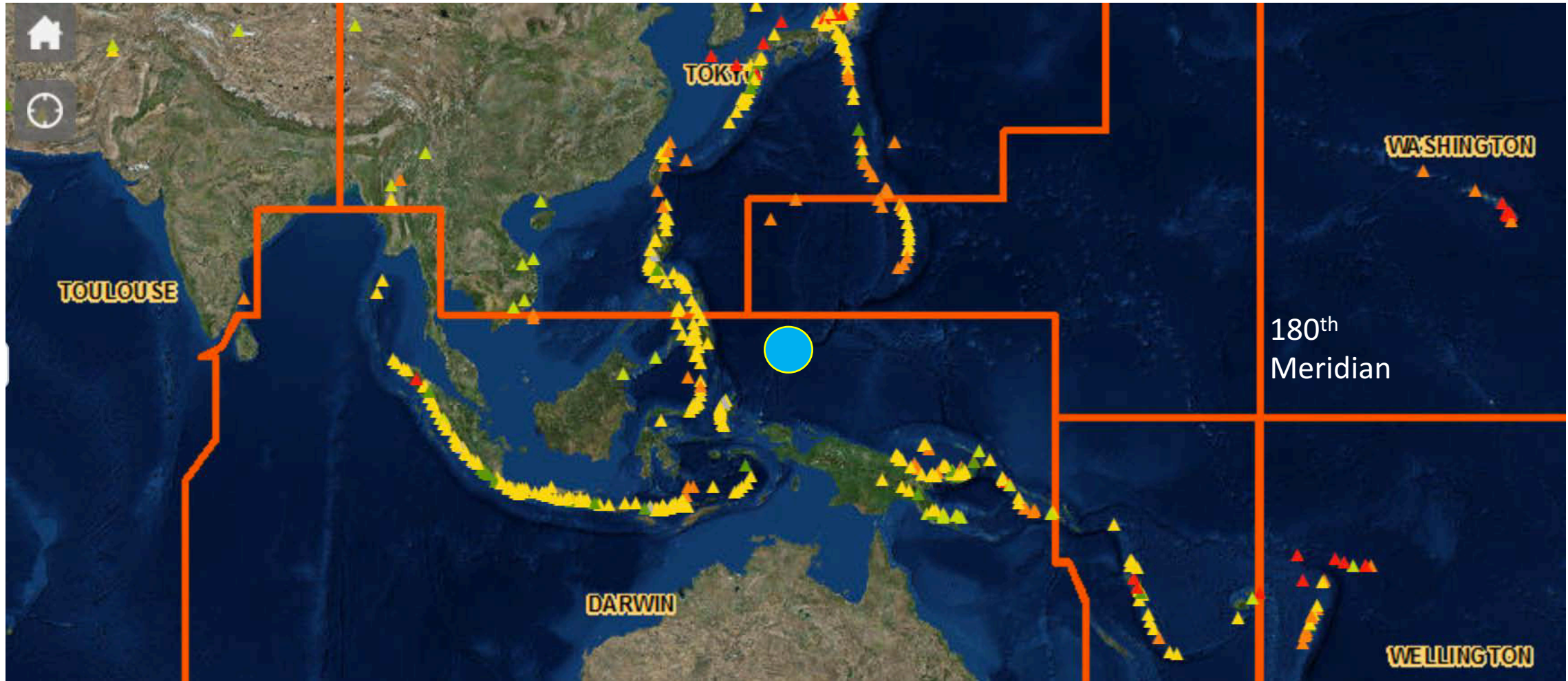
VEI Scale

“The Volcanic Explosivity Index (VEI) is a relative measure of the explosiveness of volcanic eruptions. It was devised by Chris Newhall of the United States Geological Survey and Stephen Self at the University of Hawaii in 1982 (Newhall and Self, 1982).”

From: USGS Volcano Hazards Program Glossary
<https://volcanoes.usgs.gov/vsc/glossary/vei.html>

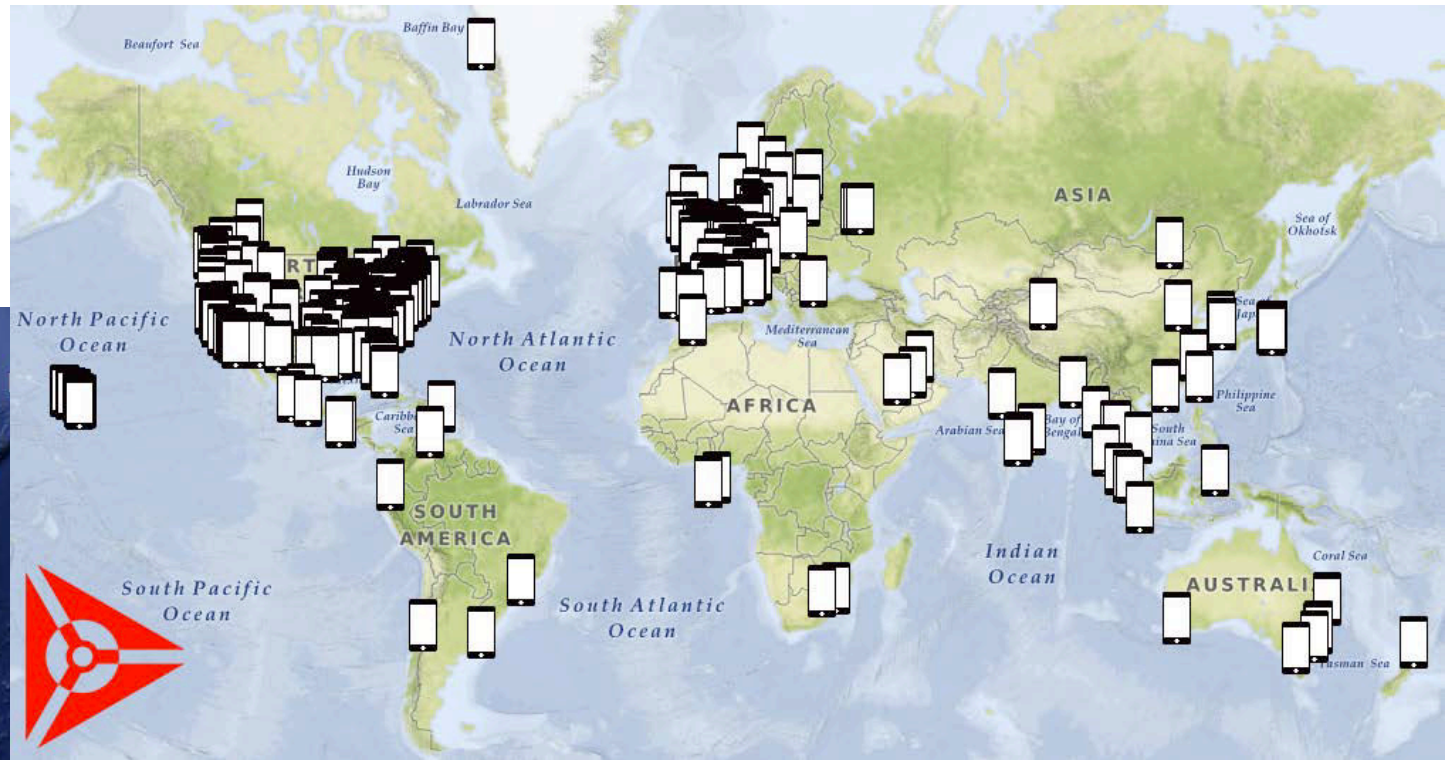
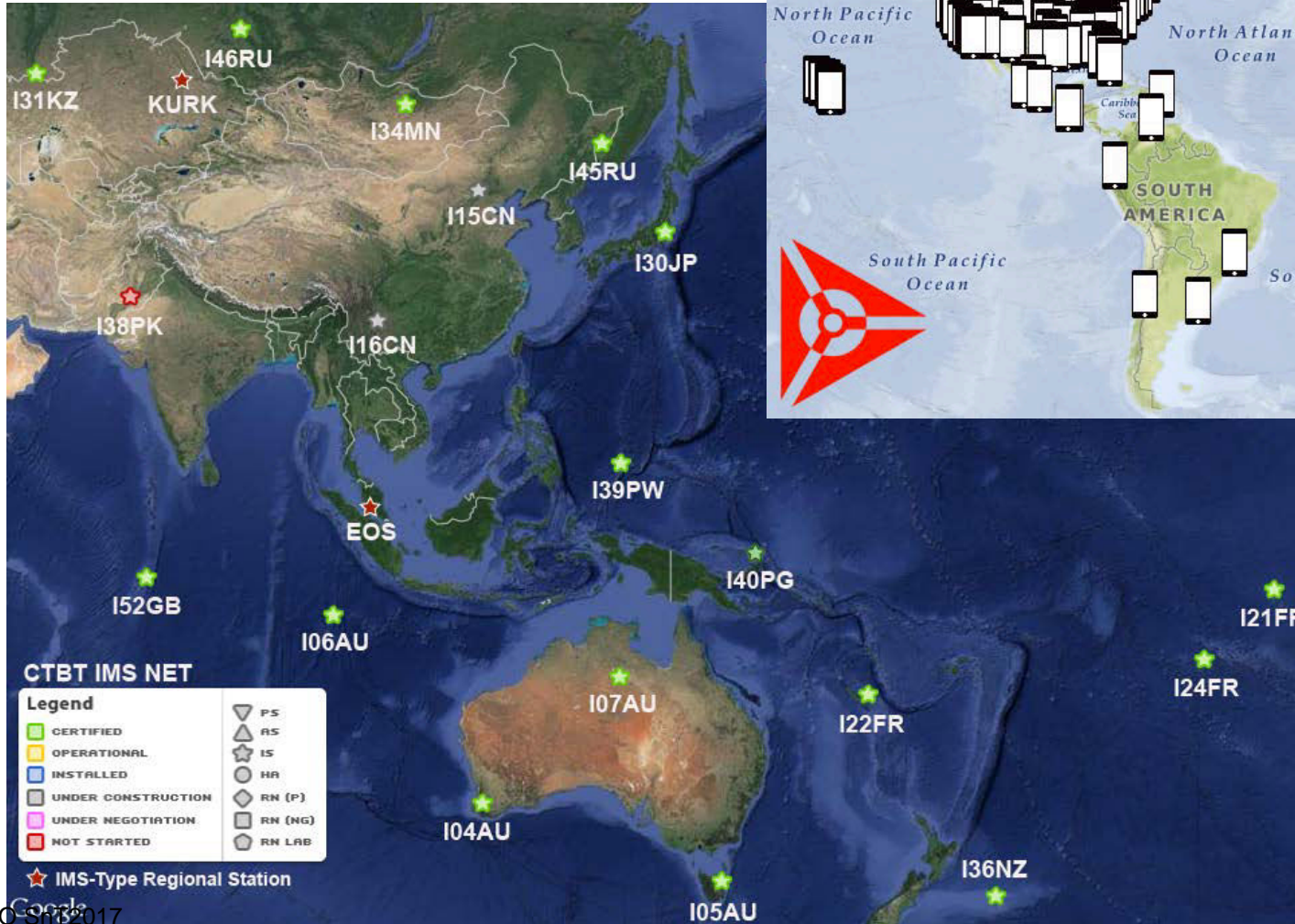


Palau is near the intersection Tokyo, Darwin, and Washington Volcanic Ash Advisory Centers (VAACs)



From: International Civil Aviation Organization (ICAO)
GIBTO 8-T2017
<http://icao.maps.arcgis.com/home/index.html>

ASHE ASIA V4R4 Networks



Infrasound Recorder App
in Apple and Play Stores
(search for *infrasound*).
APK at redvox.io



Apple iOS 8
and above



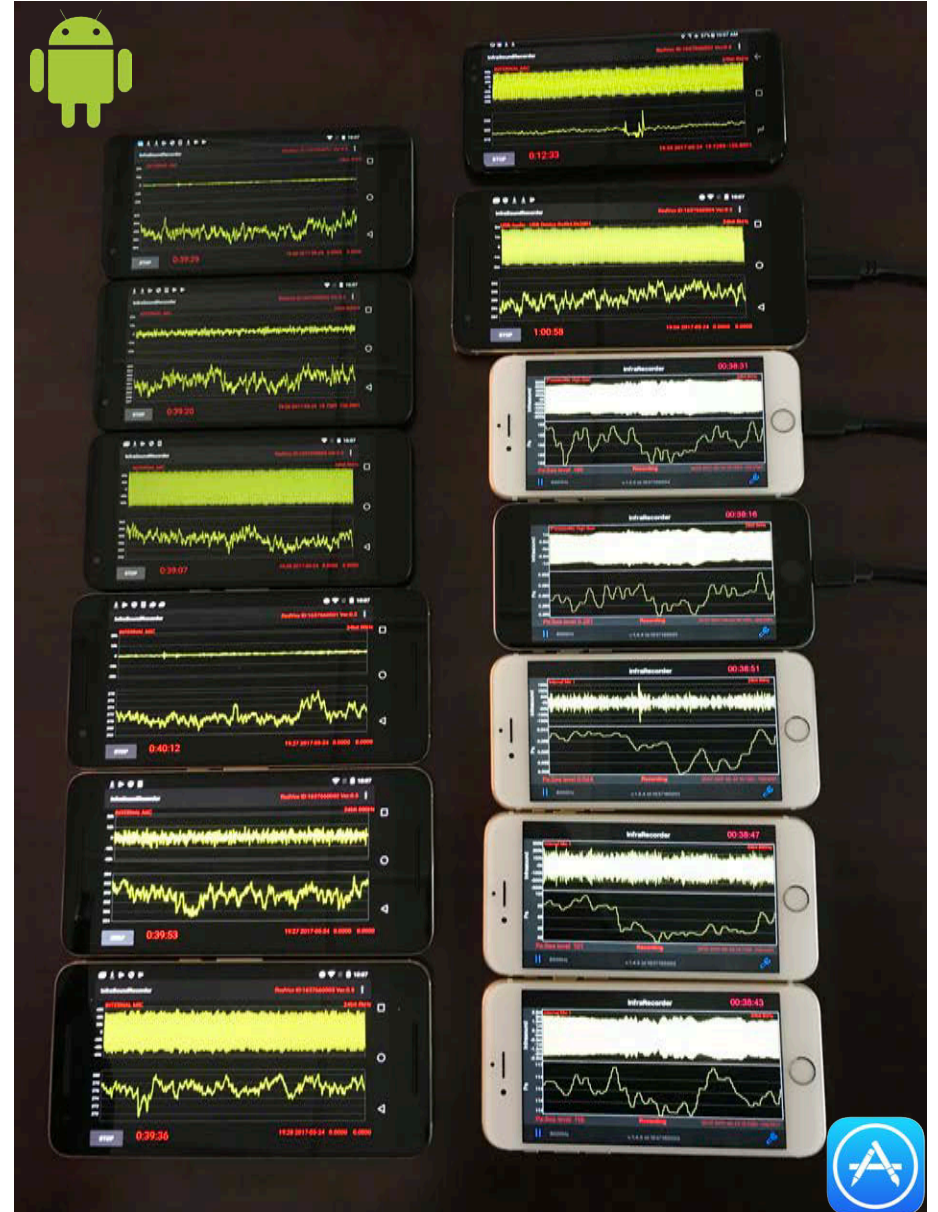
Android OS7
and above



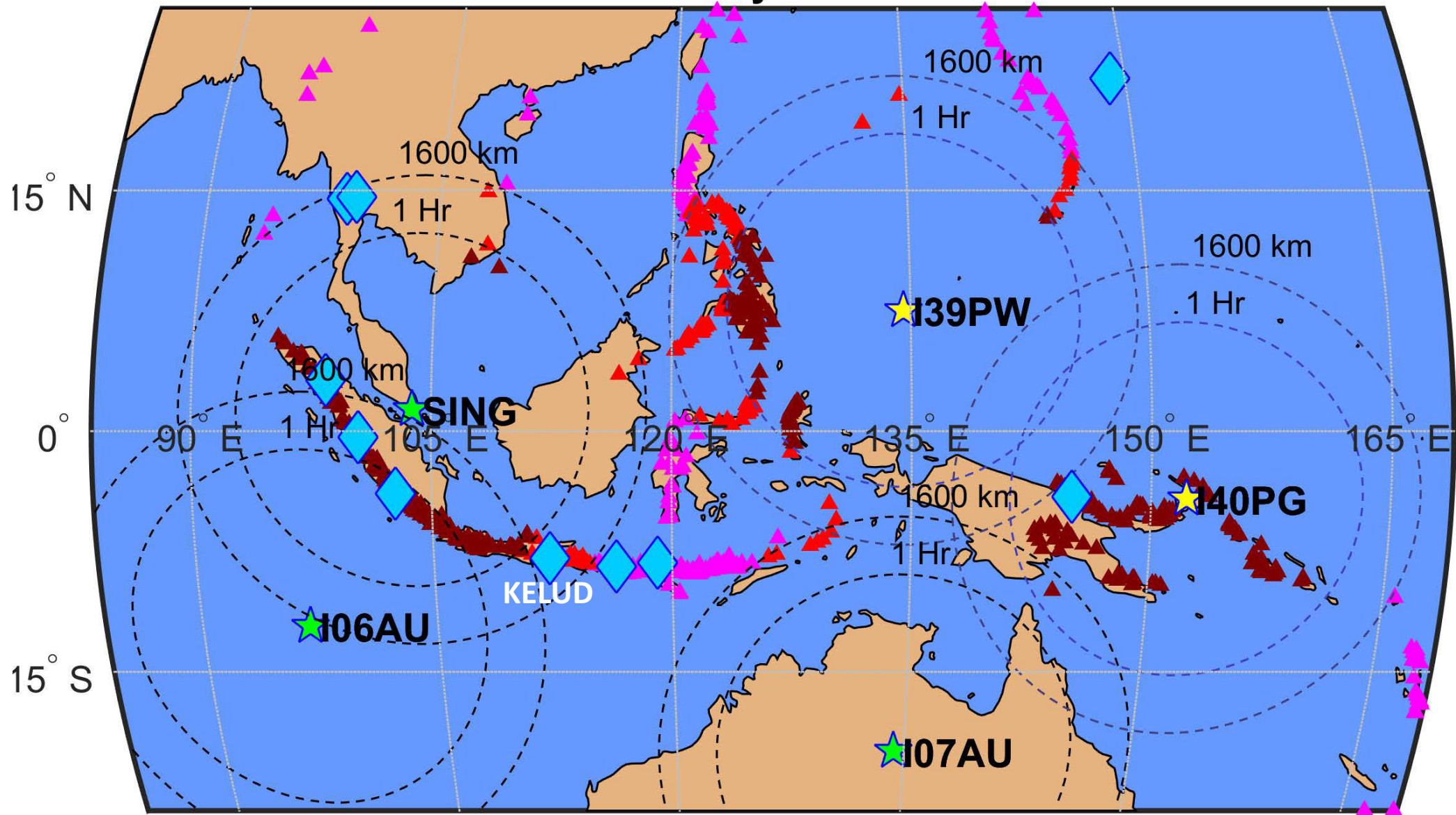
PALAU NDC WALL OF SOUND (IMS)

104H1 BDF IM 01
104H2 BDF IM 01
104H3 BDF IM 01
104H4 BDF IM 01
104H5 BDF IM 01
104H6 BDF IM 01
104H7 BDF IM 01
104H8 BDF IM 01
106H1 BDF IM 01
106H2 BDF IM 01
106H3 BDF IM 01
106H4 BDF IM 01
106H5 BDF IM 01
106H6 BDF IM 01
106H7 BDF IM 01
106H8 BDF IM 01
107H1 BDF IM 01
107H2 BDF IM 01
107H3 BDF IM 01
107H4 BDF IM 01
107H5 BDF IM 01
107H6 BDF IM 01
107H7 BDF IM 01
130H1 BDF IM 01
130H2 BDF IM 01
130H4 BDF IM 01
130H5 BDF IM 01
130H6 BDF IM 01
139H1 BDF IM 01
139H2 BDF IM 01
139H3 BDF IM 01
139H4 BDF IM 01
139H5 BDF IM 01
139H6 BDF IM 01
139H7 BDF IM 01
140H1 BDF IM 01
140H2 BDF IM 01
140H3 BDF IM 01
140H4 BDF IM 01
140H6 BDF IM 01
140H7 BDF IM 01
140H8 BDF IM 01
152H1 BDF IM 01
152H2 BDF IM 01
152H3 BDF IM 01
152H4 BDF IM 01
152H5 BDF IM 01
152H6 BDF IM 01
152H7 BDF IM 01

Smartphone net: limited iOS coverage in Asia-Pacific Region



Volcanoes Covered by IMS+SING and Events



◆ Eruption detected by EOS SING, July 2015 – December 2016

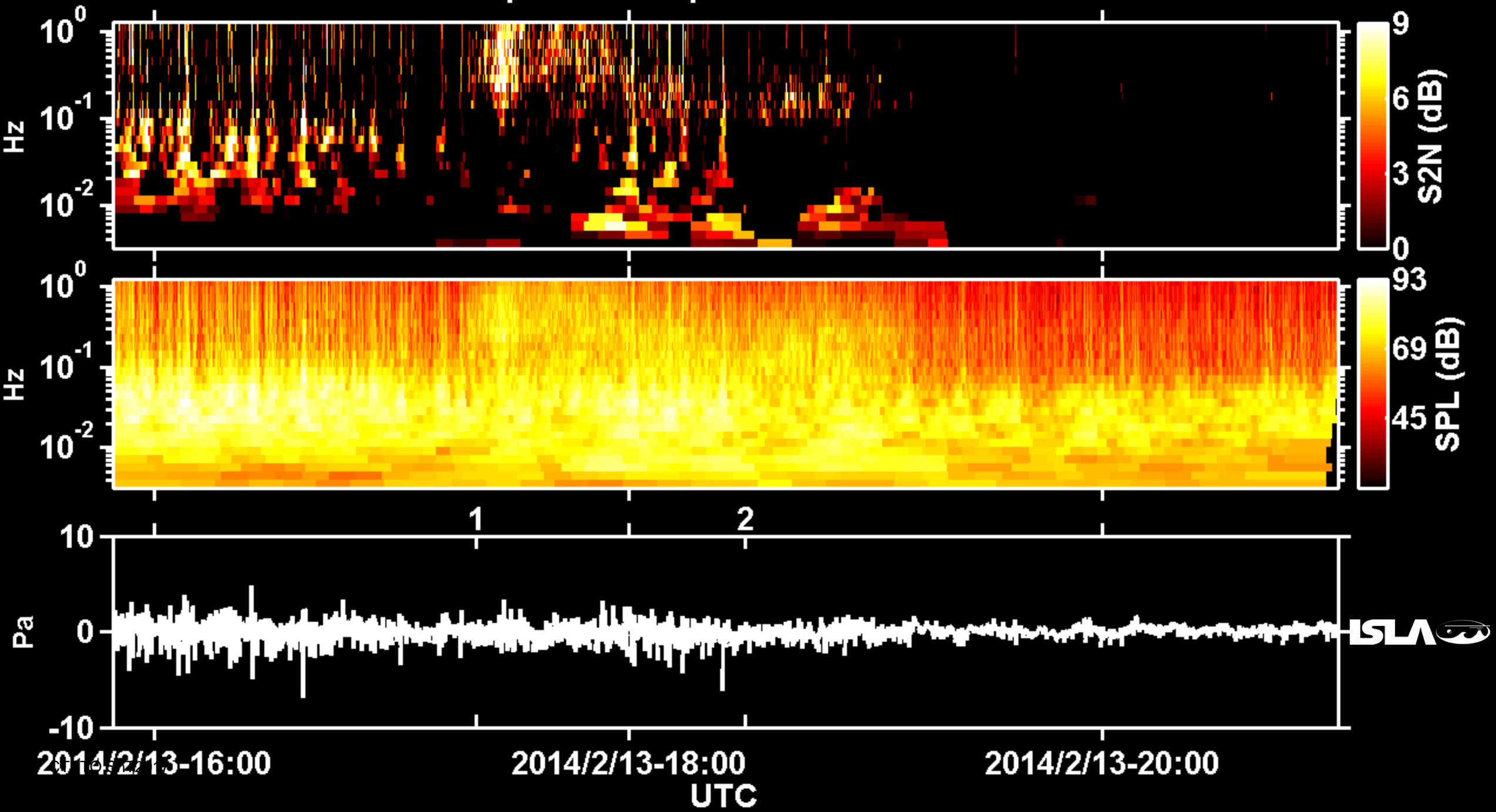
Most Recent VEI 4 in Asia-Pacific: Kelud Volcano



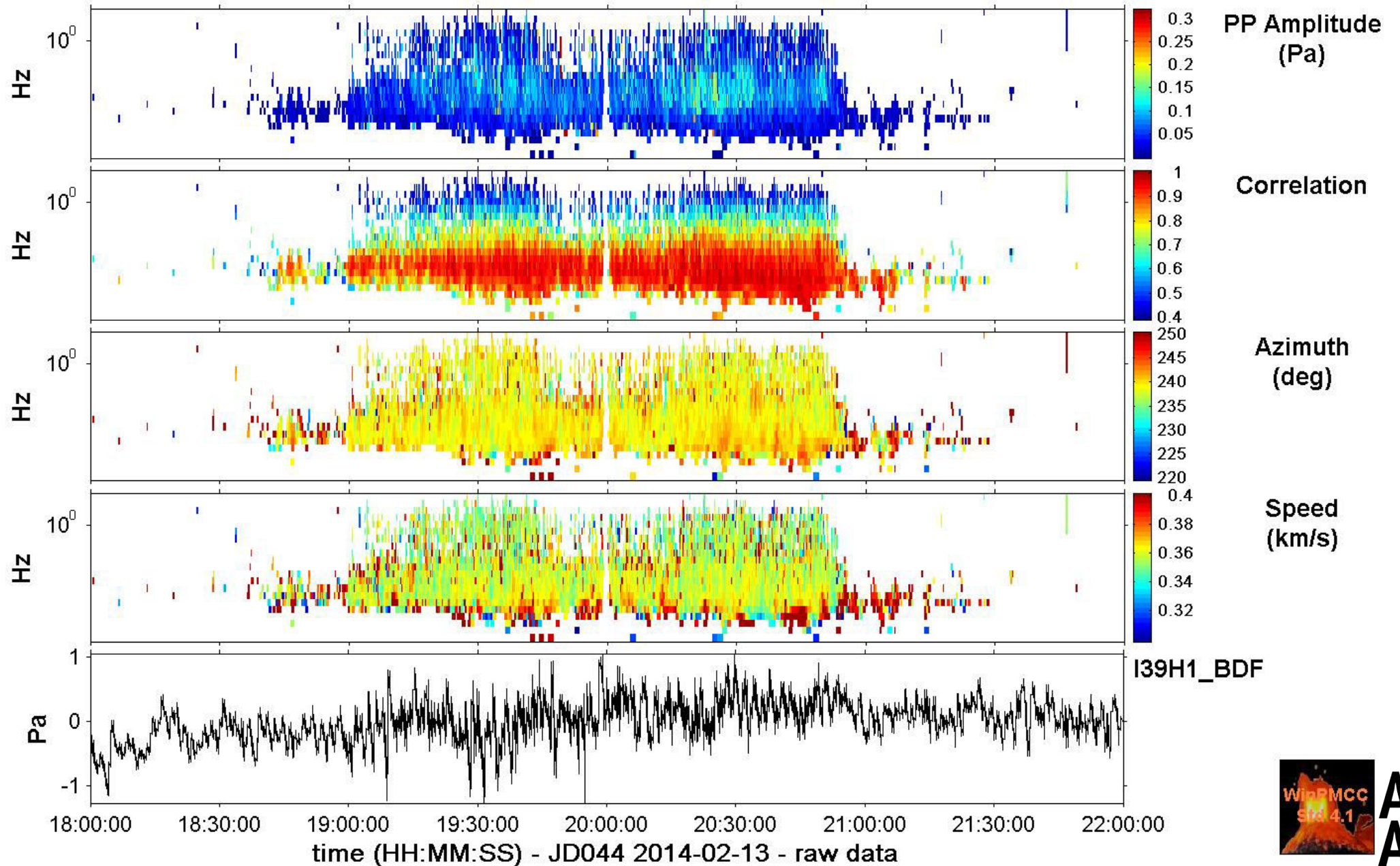
- Kelud Volcano, Indonesia, 13 Feb 2014
- CTBTO reported detections by 14 IMS IS stations
- Observed by IS sensors in Singapore

Caudron, C., B. Taisne, M. A. Garcés, A. Le Pichon (2015). On the use of remote infrasound and seismic stations to constrain eruptive sequence and intensity during the 2014 Kelud eruption, *Geophysical Research Letters*, DOI 10.1002/2015GL064885.

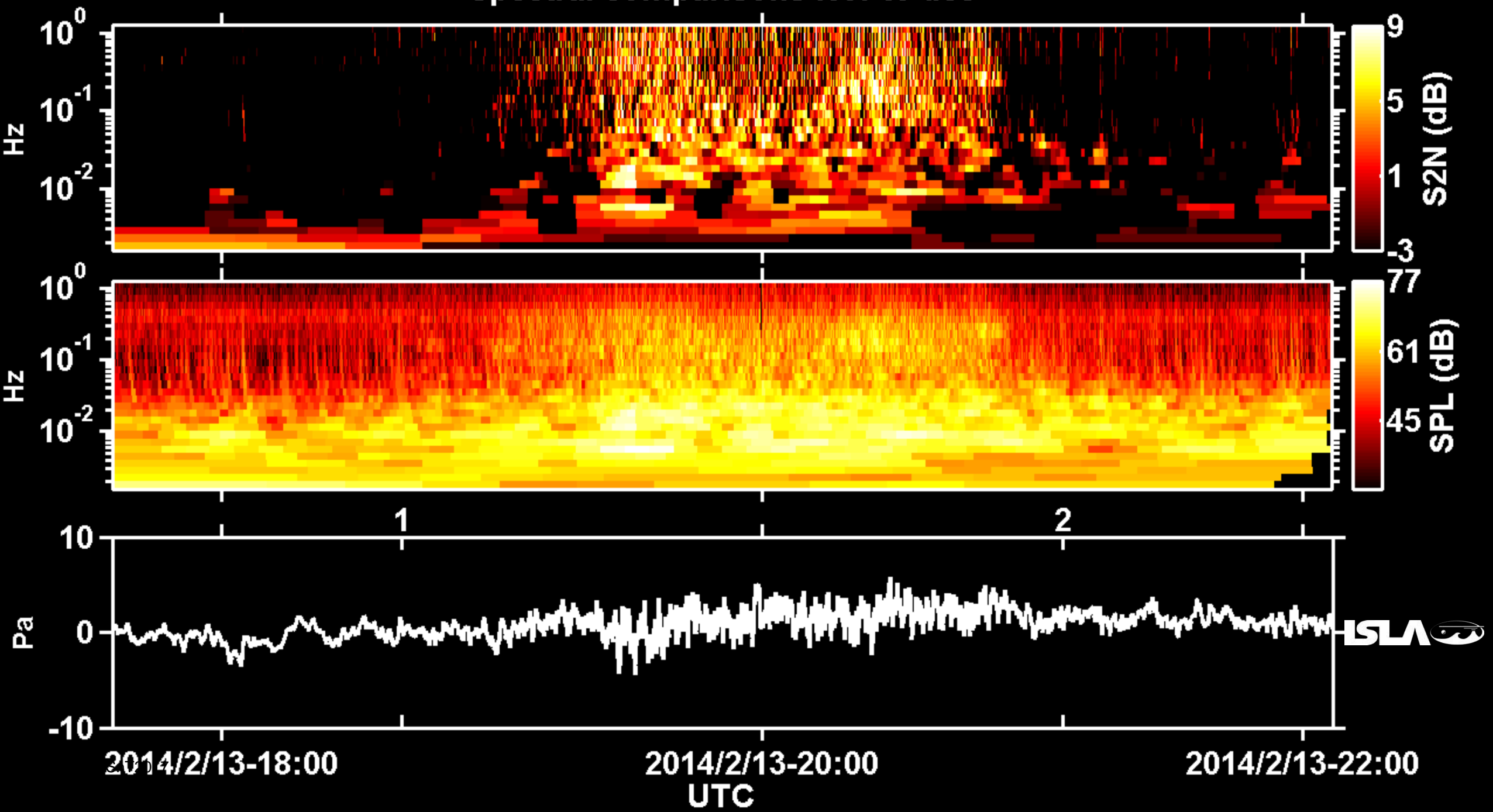
Spectral comparisons EOS-dec



PMCC Inferno: Kelud Eruption Signature in I39PW, Palau



Spectral comparisons I39PW-dec



Closing Remarks

- The ASHE ASIA project is an international collaboration to improve coverage, reduce detection latency, and increase confidence in volcanic eruption identification in the Asia-Pacific region.
- We plan to design the ASHE Asia event detection criteria to Volcano Explosivity Index 4 eruptions (and above) recorded with sensor systems within 4 megameters. We refer to this scalable design specification as V4R4.
- Smartphone data will supplement IMS coverage in sparsely monitored regions. Android and iOS infrasound recording apps are available in the Play and Apple Stores (search term: redvox infrasound).
- The UH Infrasound Laboratory intends to integrate the Palau National Data Center with cloud servers to reduce infrastructure, bandwidth, and maintenance costs and vulnerabilities.