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Session: Rabaul 2

Advancing the Multi-Hazard Early Warning Systems for Emergency Preparedness and Disaster Risk Management

Submitted by: Papua New Guinea

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PAPUA NEW
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12th Senior Disaster Management Officials Forum
Kokopo, Papua New Guinea
25-26 September 2018

The 1994 Rabaul twin volcanic eruptions and developments in volcano monitoring and early warning systems in PNG.

A presentation at the 12th Senior Disaster Management Officials Forum

on

Advancing the multi-hazard Early Warning Systems for Emergency Preparedness and Disaster Risk Management.

25th – 26th September 2018.

by

Rabaul Volcanological Observatory, PNG.

2. Developments in volcano monitoring and early warning systems in PNG.

Volcano monitoring systems.

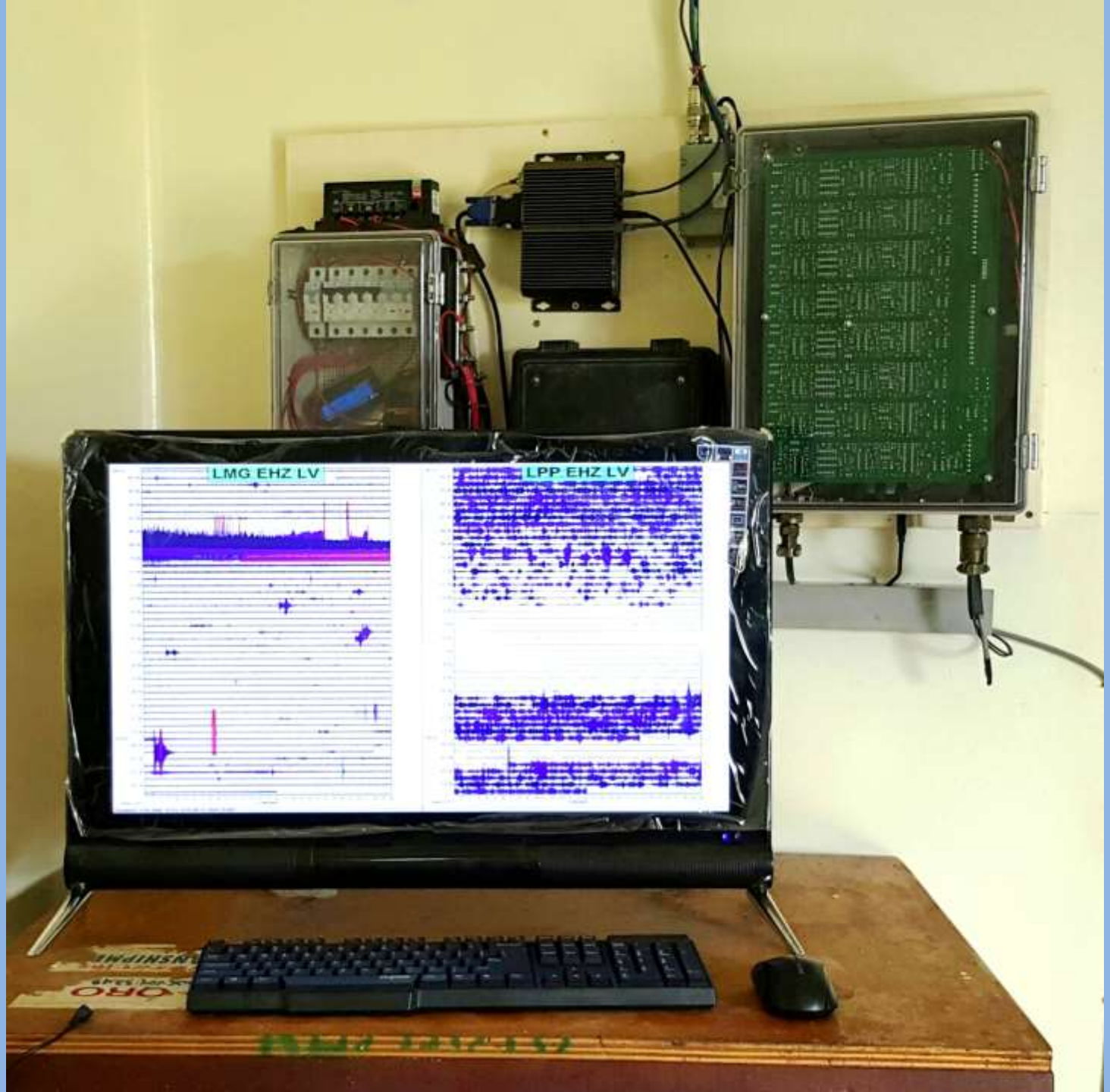
Pre-1994 eruption volcano monitoring at Rabaul:

1. Analogue seismic recording on helicorder papers and develocorder film.
2. Read data from develocorder film after 24 hrs.
3. Earthquake locations;
   - Graphical method.
   - Computer-based in 1983/1984
   - Further improvements in 1985 with introduction of PC's.
4. Traditional leveling techniques and manual data processing for surface deformation.
5. Others;
   - Gravity

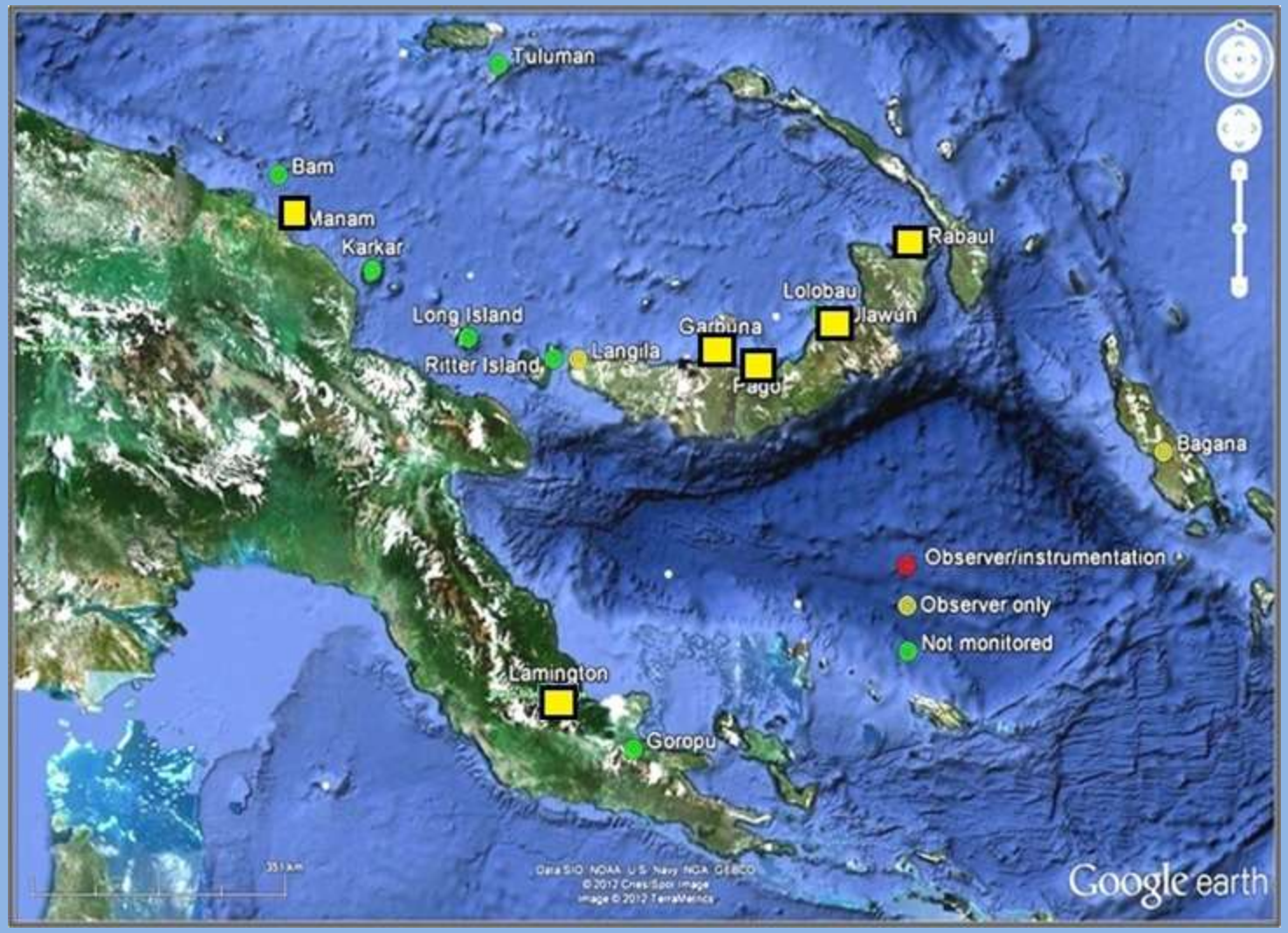
Improvements in monitoring technologies:

1. Introduction of computer-based data acquisition systems for
   - Seismicity since early 1990's
     - 12-volts data acquisition system
     - another currently tetsted
   - surface deformation since 1997
   - gas since 2016
2. Allowed rapid turn-around data processing and results.

Note: The above were made possible through aid-funded programs.


LMG EHZ LV
LPP EHZ LV

Active volcanoes of PNG.



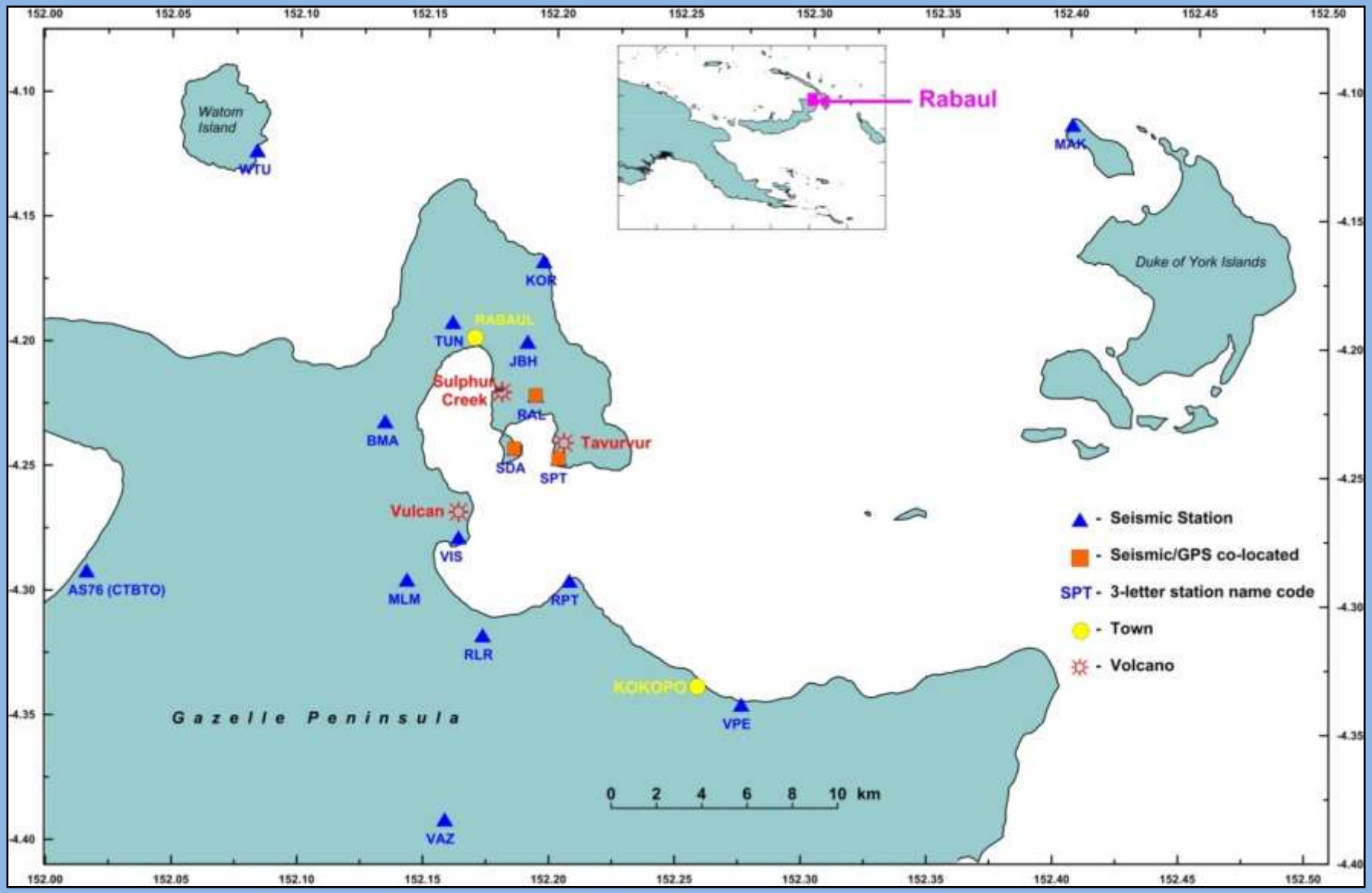
Status of monitoring:

- **15 active volcanoes.**
- **Only 5 are monitored.**

Plans:

- **Increase to 7 by end of 2017.**

Rabaul Harbour Seismic Network



RVO Operations Room.

Before 2015

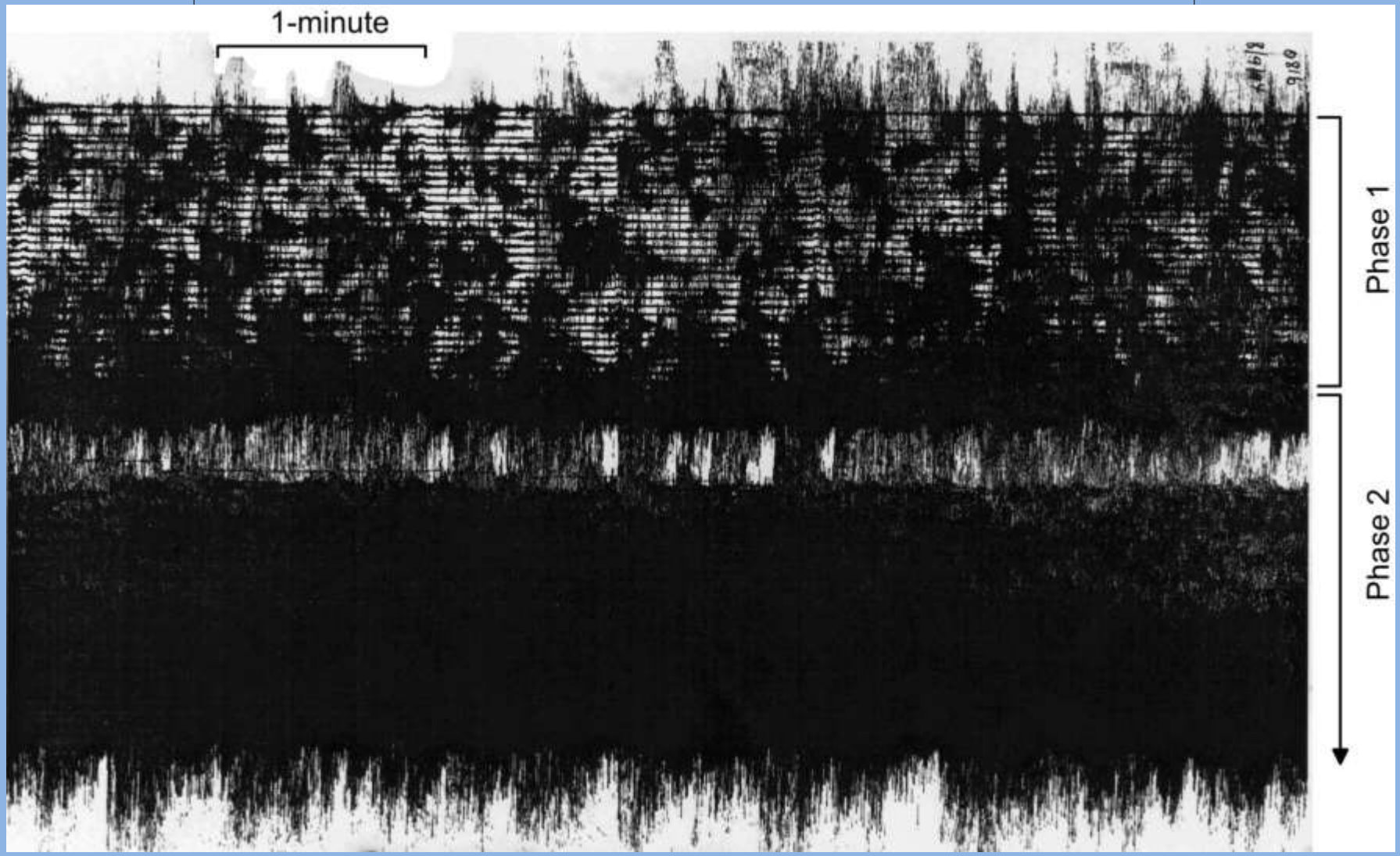
After 2015

2.2. Early warning systems.

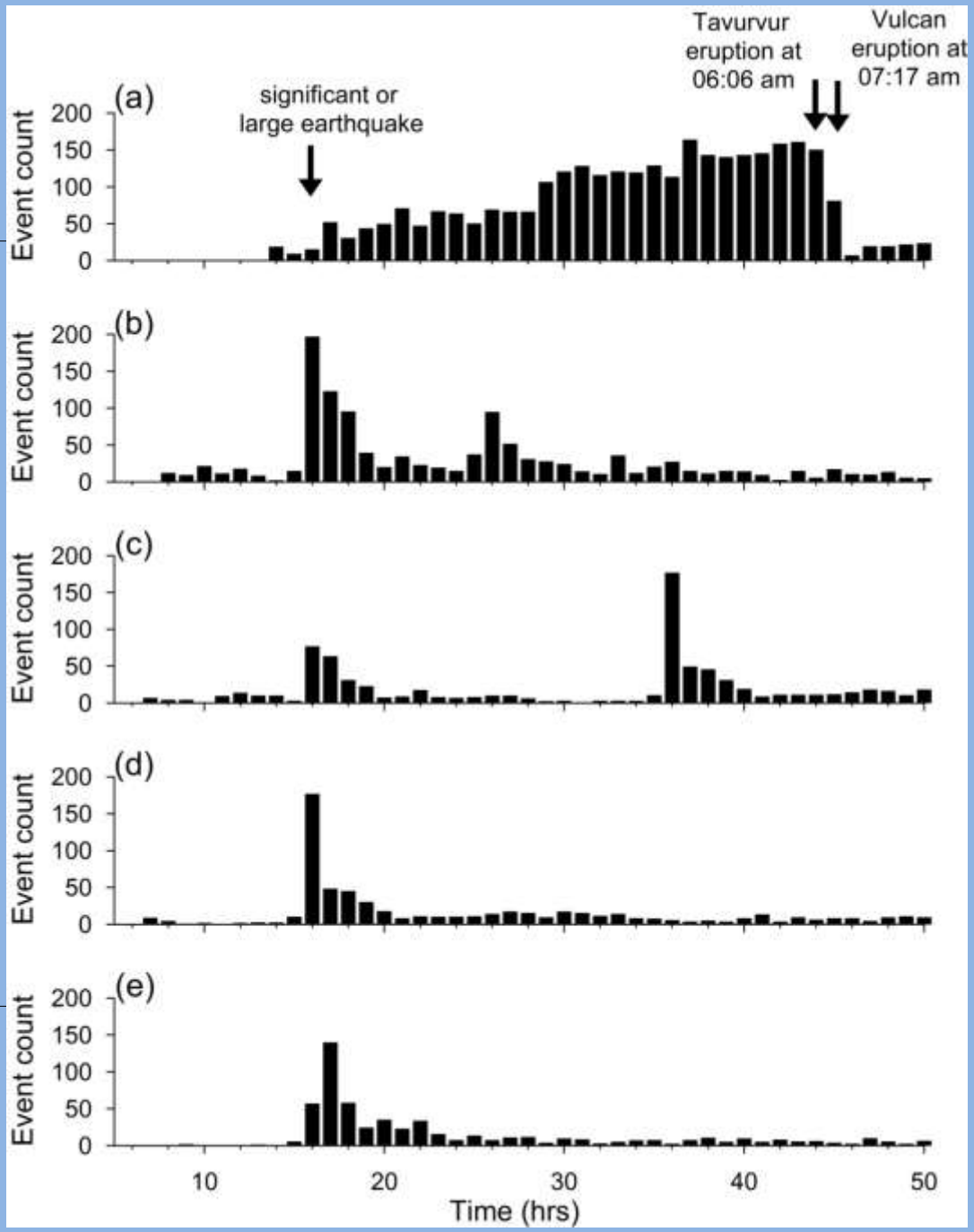
Early warnings on volcanic eruptions depend on number of factors, including;

1. Monitored parameters (seismicity, surface deformation, gas, visual observations, etc.).
2. Mode of recording (analogue vs digital).
3. How soon data are processed and evaluated/assessed;
   - Non-realtime vs realtime
   - Manual vs automated.
4. Mode of early warning information dissemination to stakeholders.

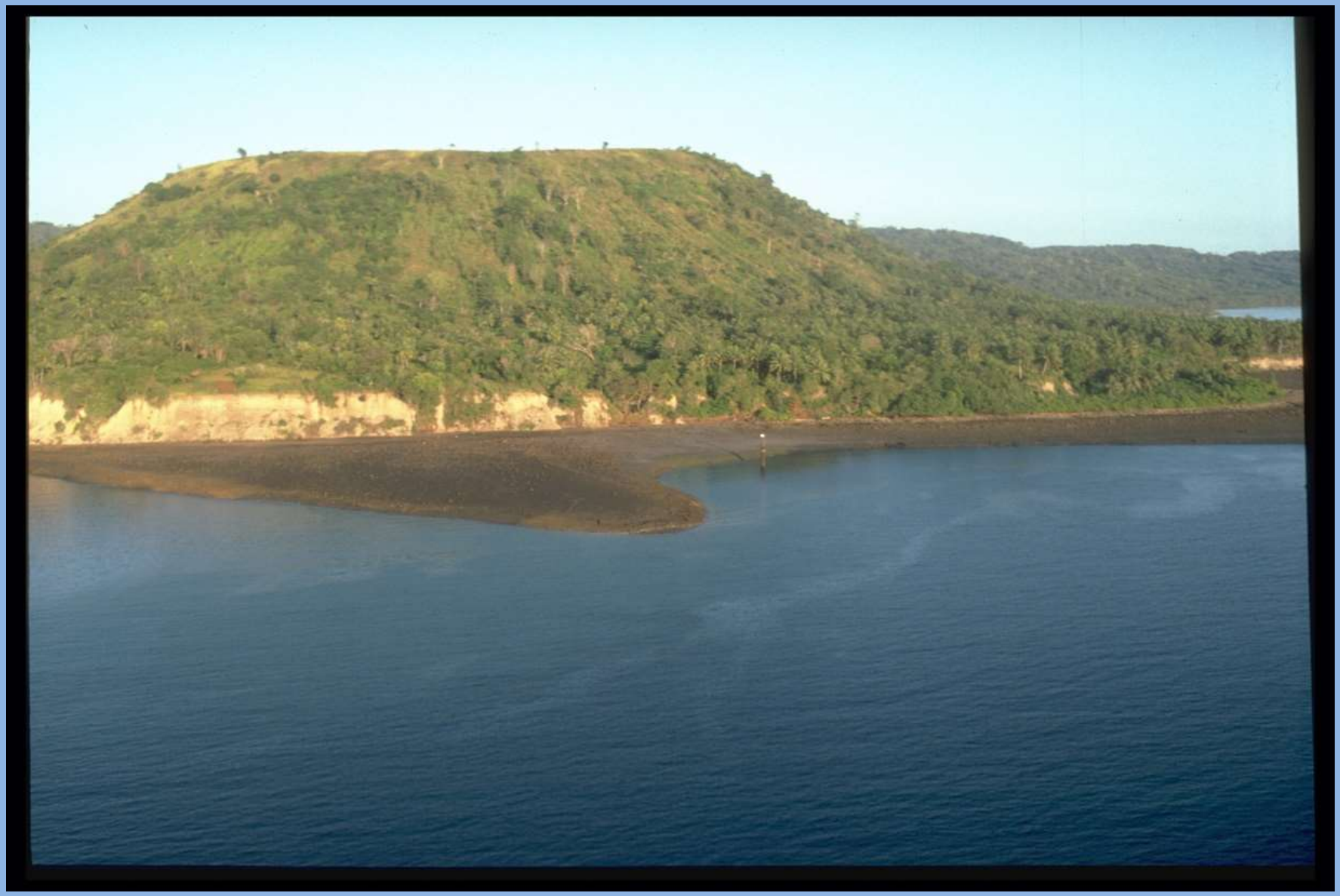
Pre-1994 eruption VIS seismogram for the 27hrs intense seismicity;



Patterns of earthquake activity after a big (M_L>5.0) earthquake in Rabaul.



12hrs overnight uplift at Vulcan.



Early warnings from animal behaviour.

1. The megapode – The birds fly away from their near-volcano habitat when they detect unusual volcanic activity.
2. This observed behaviour led people from Matupit to move out of the island during the 27 hours of very intense seismicity prior to onset of the eruption.

Time windows for early warnings;

1. Hours.
2. Days.
3. Weeks.
4. Months.

Target Recipients for early warnings;

1. Decision making authorities only.
2. Selected group including (1), business houses, NGO's, media.
3. Open to (1) and (2) and people in vulnerable communities.

Responding to early warnings;

1. Are mechanisms in place at stakeholder SOP level to respond to early warnings?
2. Strengthening the SOP systems.

RSAM Alert Notification System.

The system:

1. is based on RSAM or **R**eal-time **S**eismic **A**mplitude **M**easurements.
2. uses real-time digitized seismic data.
3. runs a semi-automated detection algorithm.
4. triggers when RSAM values reach some set of preset threshold values.
5. creates files and disseminates them automatically by email to selected recipients after trigger.
6. disseminates alerts within 5 minutes from time of initial detection.
7. makes use of ICT by way of mobile communications infrastructure and technology.
8. triggered during the recent 25/08/2018 Manam eruption but the alerts failed to send due to issues associated with mobile service provider.
9. Alert detections and triggers commenced 2-3 hours before main eruption.

Case study on recent Manam eruption.

The system:

1. triggered during the recent 25/08/2018 Manam eruption but the alerts failed to be sent out due to issues associated with mobile service provider.
2. The Alert began logging 2-3 hours before the main eruption.

Message for trigger alert for 25/08/2018 Manam eruption.

THIS IS AN AUTOMATICALLY GENERATED RSAM ALERT.
VERIFY ALERT WITH RABAUL VOLCANO OBSERVATORY.

VOLCANO: MANAM (4.109 deg S, 145.004 deg E).

SEISMIC STATION: MAN - 4.9 km FROM CRATER.

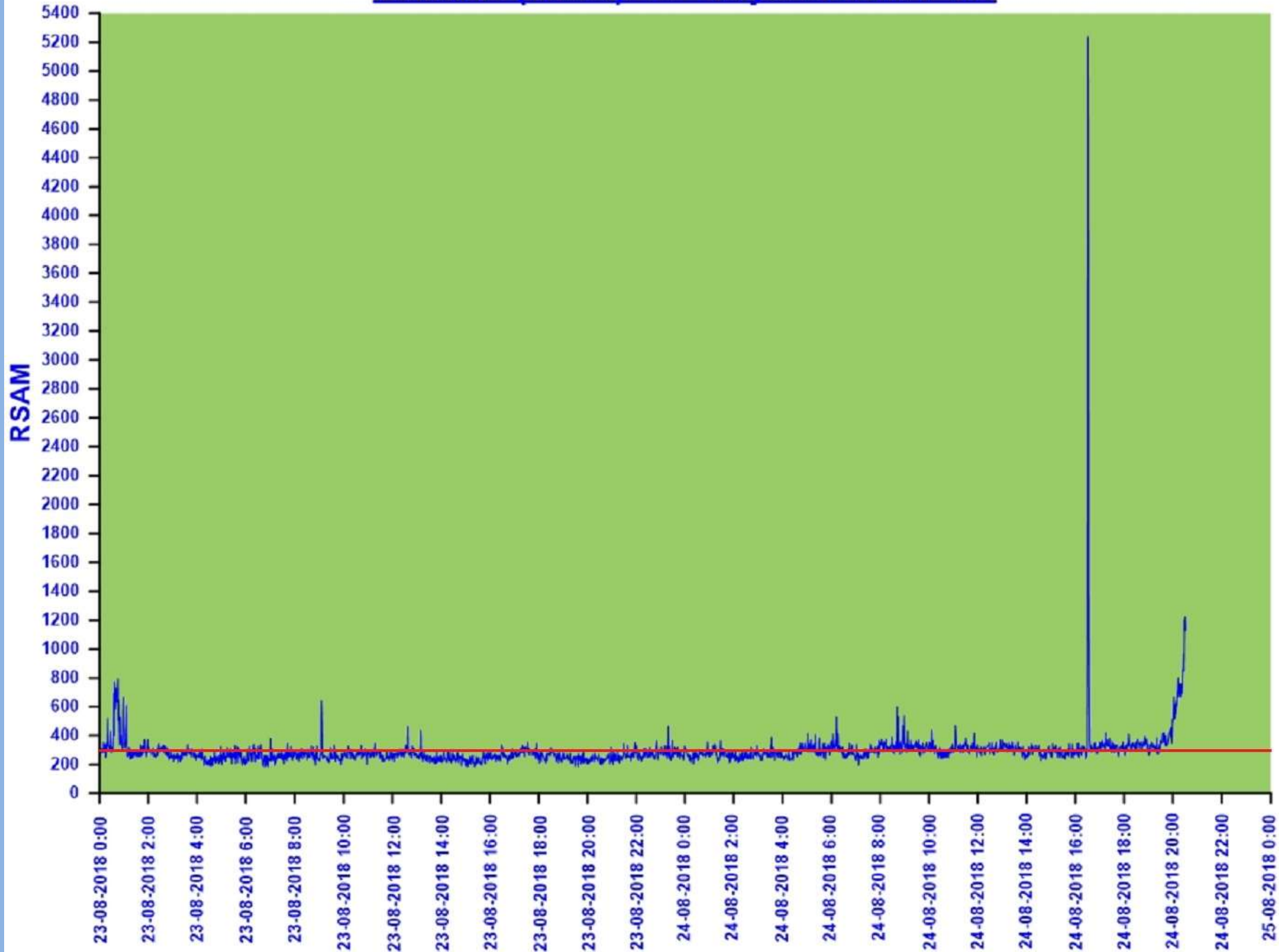
RSAM Trigger: 300.
Threshold: 75%.
Calculated: 100%.

100% OF LAST 20 1-MIN RSAM VALUES ARE ABOVE RSAM TRIGGER.

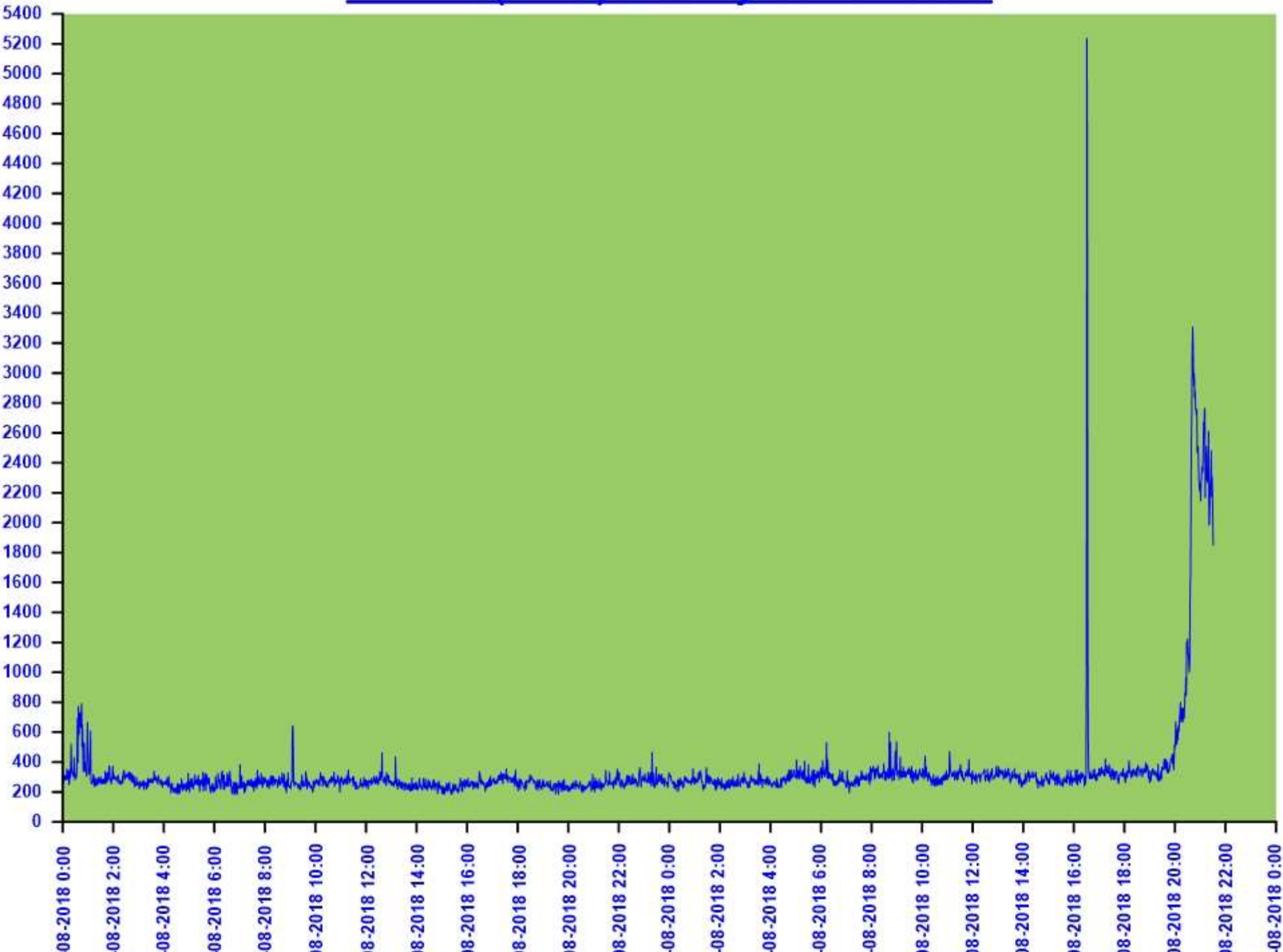
AVERAGE IS: 846.
RSAM ALERT TRIGGERED!!!

RSAM ALERT LEVEL: HIGH.

Manam (MAN): 2 - days RSAM Plot



Manam (MAN): 2 -days RSAM Plot



Other sources of early warning information.

Remote Sensing products from international agencies:

- **Sulphur dioxide gas**
- **Volcano hotspots**
- **Ash plume**

Outreach programs for Disaster Preparedness:

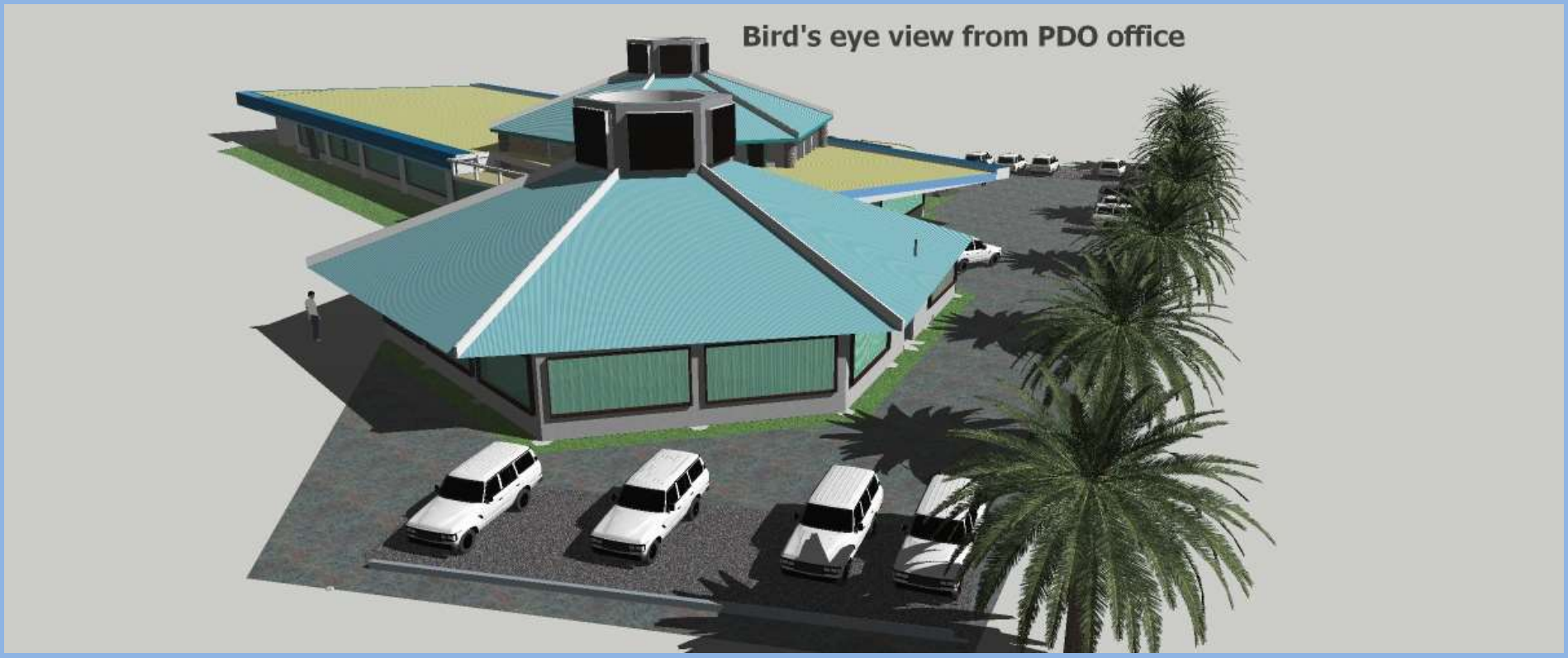
- Community awareness
- School visitations
- encouragement of groups to visit the Observatory

3. Plans for moving forward.

3. Plans for moving forward

1. Guided by DMPGM 5-year Strategic Plan.
2. The Plan includes construction of a modernised Observatory building.

An artists impression of the finished new proposed RVO Office building.



An artists impression of the finished new proposed RVO Office building.

- The building will have a wing for the ENB Provincial Disaster Office

4. Plans for moving forward

1. Guided by DMPGM 5-year Strategic Plan.
2. Includes construction of a modernised Observatory building.
3. Continue, beside other activities, to:
   - Improve volcano monitoring
   - Improve early warning systems
   - All efforts geared towards improving DRM/DRR.


THANK YOU.