Seismic Monitoring with DMT

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Purpose of the online monitor

Provide a continuous monitor of local seismic activity with an emphasis on earthquake detection.

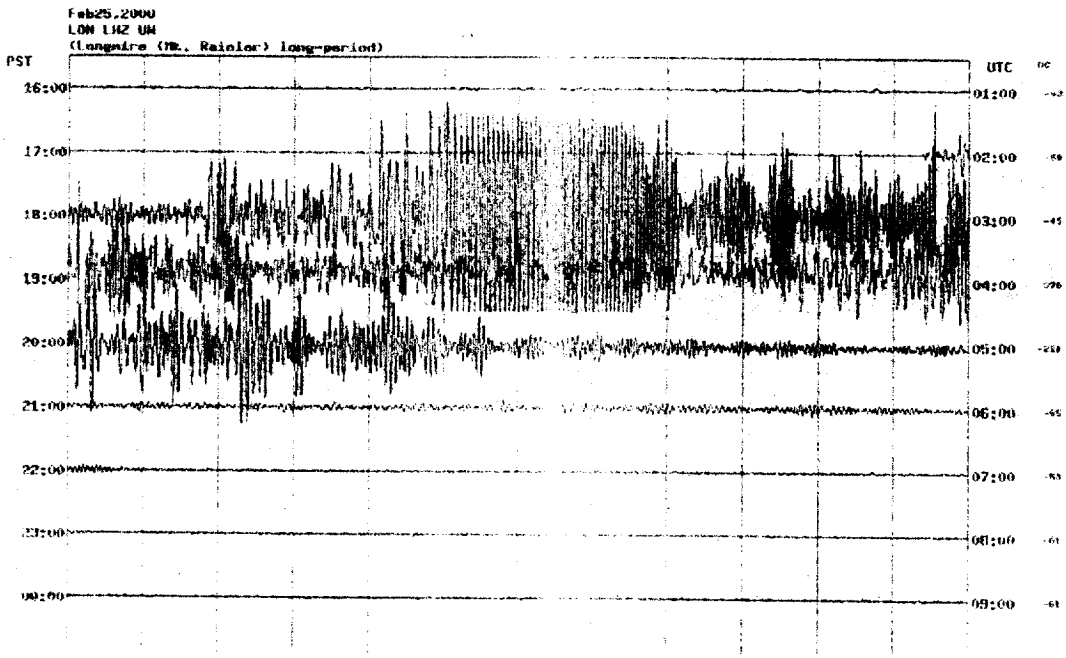
Record time of earthquake and amount of ground motion and make that information easily available to interested parties.

Concentrate on low frequencies

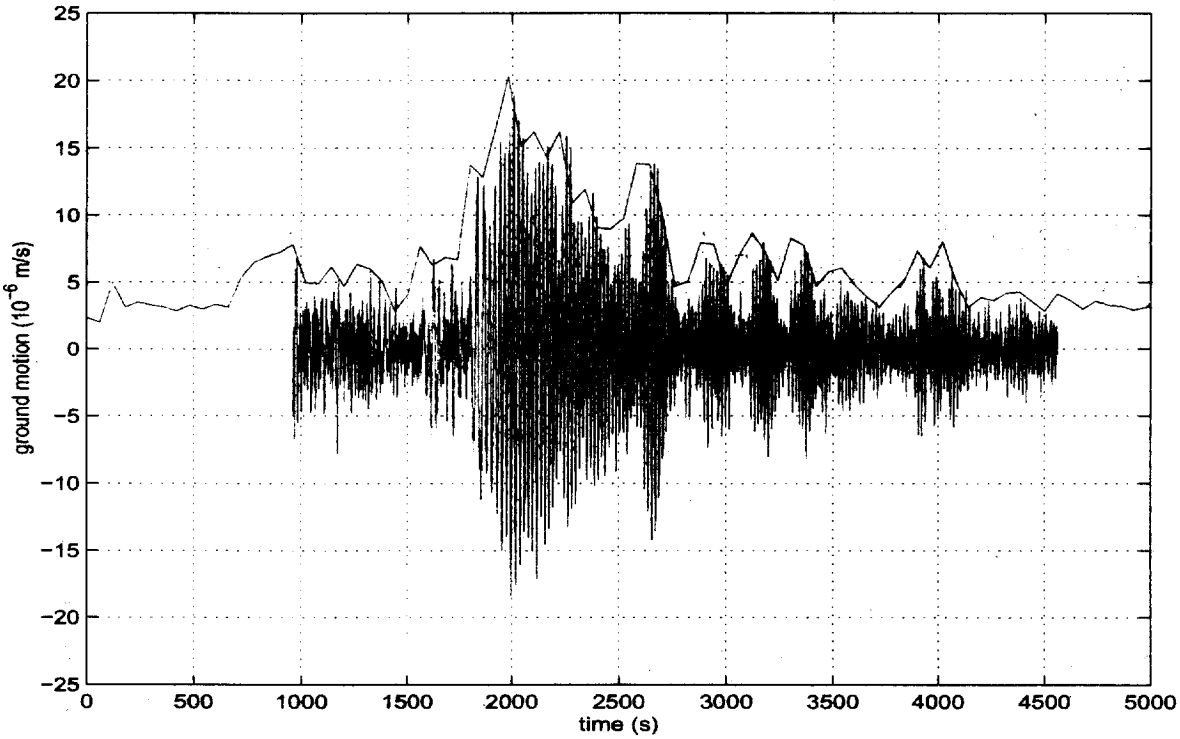
- < 0.5 Hz
- microseismic peak
- 20 sec period surface waves from far earthquakes

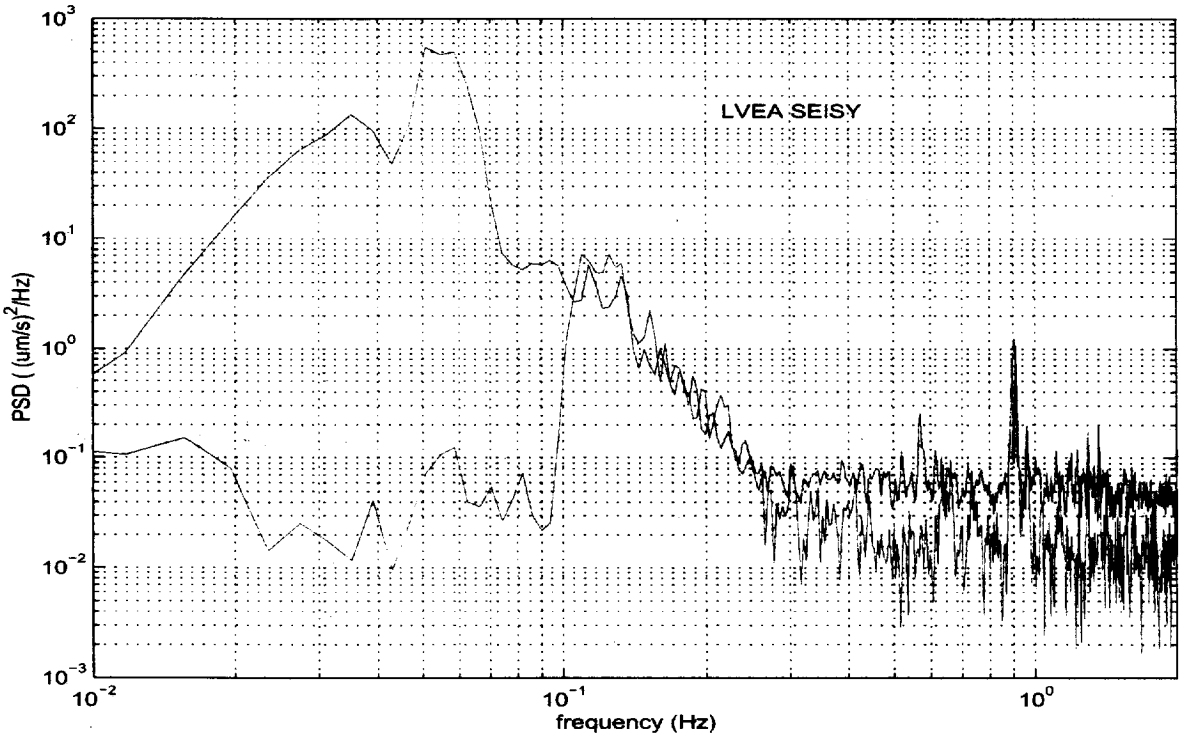
Vanuatu Islands Earthquake

00/02/25 01:43:59 UTC, 7.1 Ms

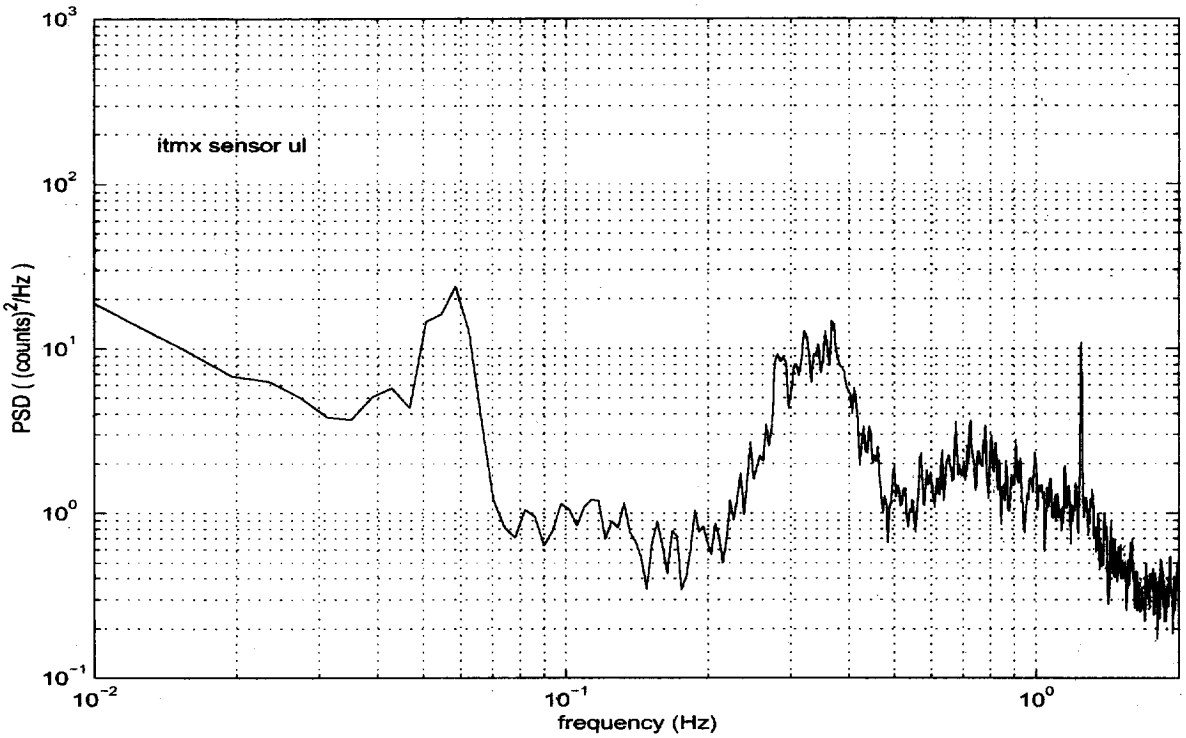


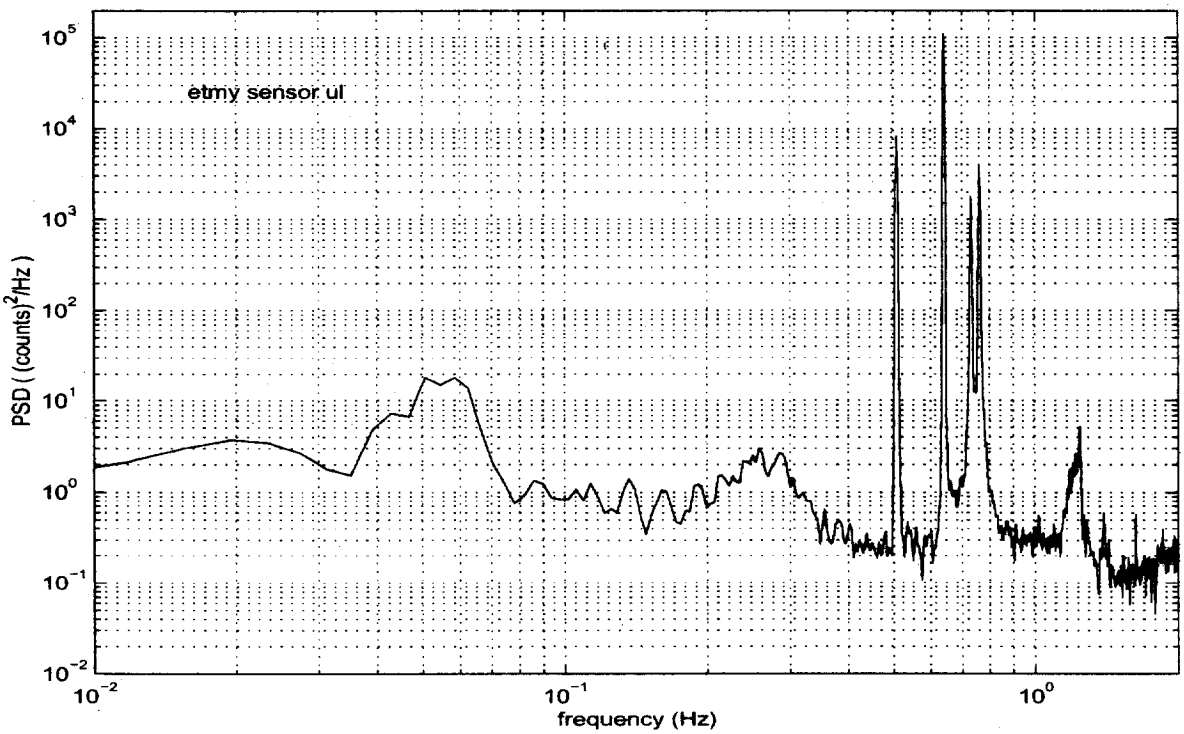
Local Ground Motion (LHO)





Local Ground Motion (LHO) - shadow sensors





Algorithm

- written, developed, tested and running under DMT
- single frames
- 10 channels : LVEA, Y-mid, X-mid, Y-end, X-end ($\hat{Y}$, $\hat{Z}$ for each)
- sub-sample each channel to 1 Hz
- threshold test applied to each channel $|x - \langle x \rangle| > 3\sigma_x$
- if 6 of 10 channels exceed threshold, produce a trigger

Thresholds

- calculated separately for each channel
- $\langle x \rangle$, σ_x calculated from previous 1 hour of data
- recalculated every hour

Output

Triggers :

XML file (+text file)

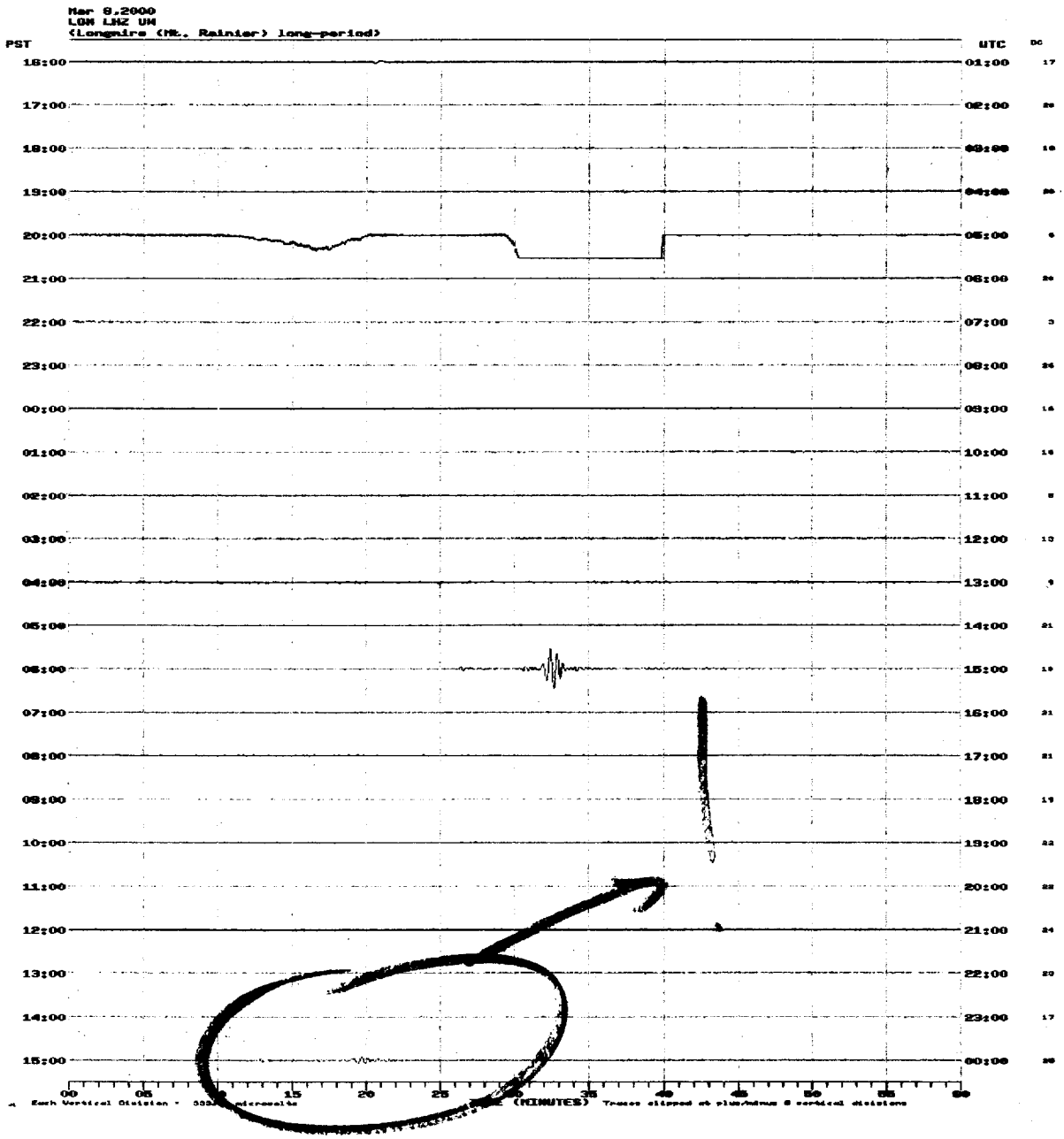
- GPS time
- channels above threshold and the seismometer reading (μm/s)

Statistics :

GPS time, $\langle x \rangle$, σ_x for each channel, every hour as the thresholds are updated

Central Alaska Earthquake

00/03/08 23:07:12 UTC, 5.3 Mb



Output

636592929

```
H0:PEM-MY_SEISZ  -676
H0:PEM-MX_SEISY  -70
H0:PEM-MX_SEISZ  -147
H0:PEM-LVEA_SEISY  -803
H0:PEM-LVEA_SEISZ  -721
H0:PEM-EX_SEISY  -211
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636747230

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H0:PEM-MX_SEISZ  -120
H0:PEM-LVEA_SEISZ  -696
H0:PEM-EY_SEISY  -194
H0:PEM-EY_SEISZ  -330
H0:PEM-EX_SEISY  -178
H0:PEM-EX_SEISZ  72
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Extensions

- $\hat{X}, \hat{Y}, \hat{Z}$ in quadrature
- multiple frequency bands
- other types of transients (i.e. magnetic fields)

Note 1, Linda Turner, 05/09/00 10:08:21 AM
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