

Monitoring the LIGO Environment

- new monitor class created for DMT
- operates on-line
- detects transient events in the environmental monitors and saves trigger information

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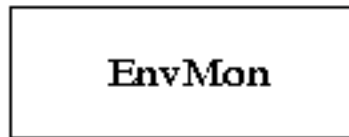
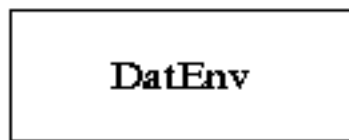
University of Oregon

EnvMon [-infile < *filename* >]
[-outfile < *filename* >]
[-< *instrument* >]

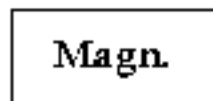
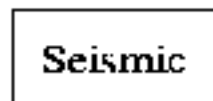
Compares signals from multiple channels in the current frame to their previous histories.

If a pre-defined number of channels have samples above threshold in the frame, a trigger is produced. Conforms to last-known standards for input to metadata base.

Analysis Routine



Instrument Class



... etc

Each instrument is a class unto itself:

```
#include <iostream.h>
#include "baseMon.hh"
#include "seisMon.hh"

seisMon::seisMon() : baseMon() {
    n_chan = 5;

    // specify the channels and add them to the list
    chans[0] = "BO:PEM-MX_SEISZ";
    chans[1] = "BO:PEM-MX_SEISY";
    chans[2] = "BO:PEM-LVEA_SEISY";
    chans[3] = "BO:PEM-LVEA_SEISZ";
    chans[4] = "BO:PEM-MX_SEISM";

    // calibration (adc counts -> um/sec for seismometers)
    cal_fac = 0.072;

    // sampling rate
    s_rate = 256.0;

    // number of channels that need to be above threshold to produce
    // a trigger
    n_above = 4;
} // end of the constructor

// the destructor!
seisMon::~seisMon()
{
}
```

Trigger

- threshold test applied to each channel

$$|x - \langle x \rangle| > k\sigma_x$$

- if enough channels exceed threshold, produce a trigger

Trigger info:

- start/stop times for a disturbance
- channel amplitude in appropriate unit
- current evaluation of channel statistics

Stats

- calculated separately for each channel
- no triggers allowed
- calculate $\langle x \rangle, \sigma_x$ from 30 s of data
- average last 10 measures to calculate the threshold

Seismic Test Run

- July 31 - Aug. 5 (framebuilder dies 8/5 ~18 hr PDT)
- 3 earthquakes detected

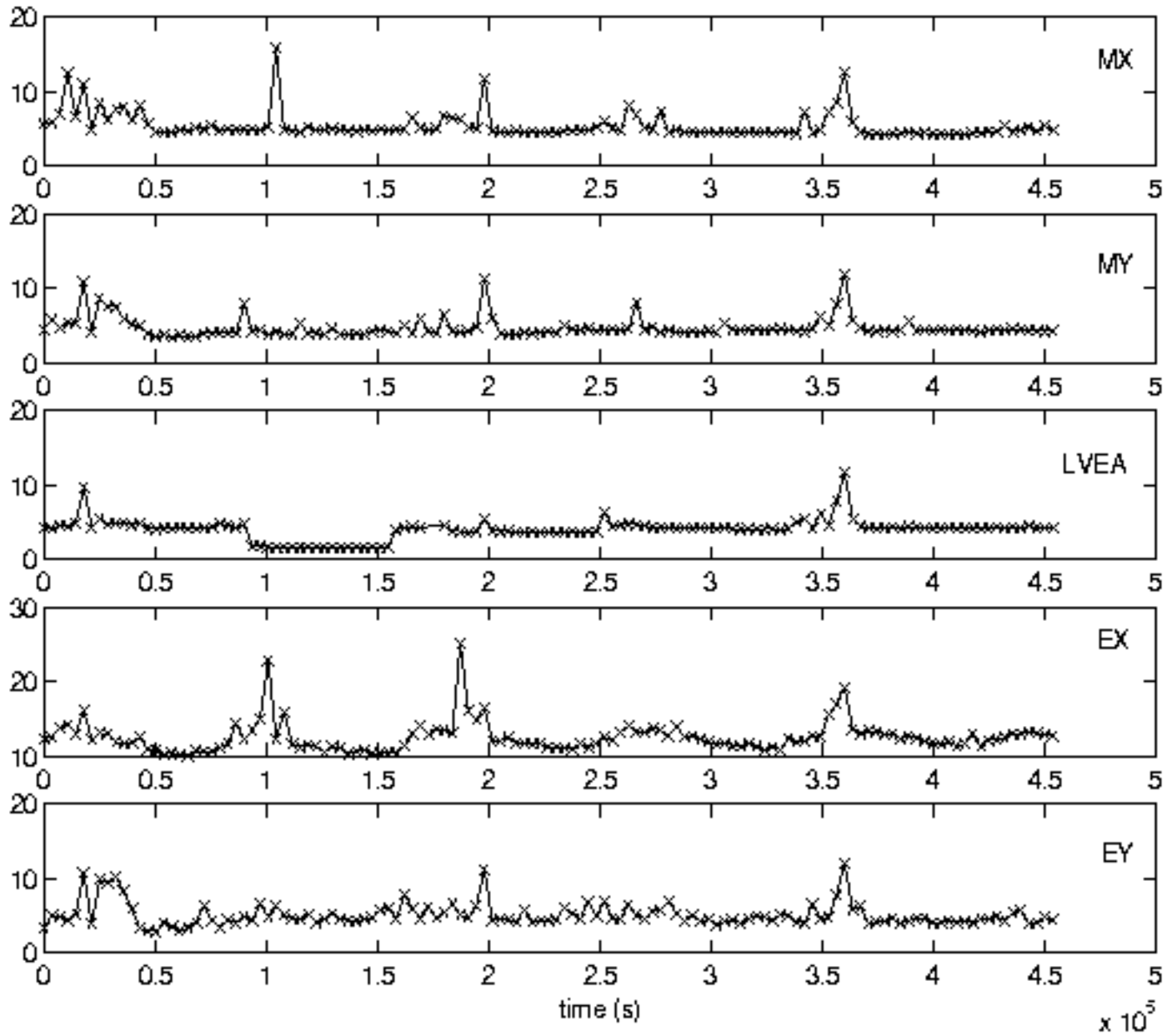
time (UTC)	magn.	location	duration (secs)	no. triggers
08/01 21:33	4.8	Vancouver Isl.	135	13
08/03 01:09	6.8	Santa Cruz Isl.	1990	45
08/04 21:13	7.0	Sakhalin Isl.	5034	217

No other EQ's listed on the USGS Near Real Time Earthquake list for these days show up in the PNSN network (Mt. Rainier, Mt. Fremont)

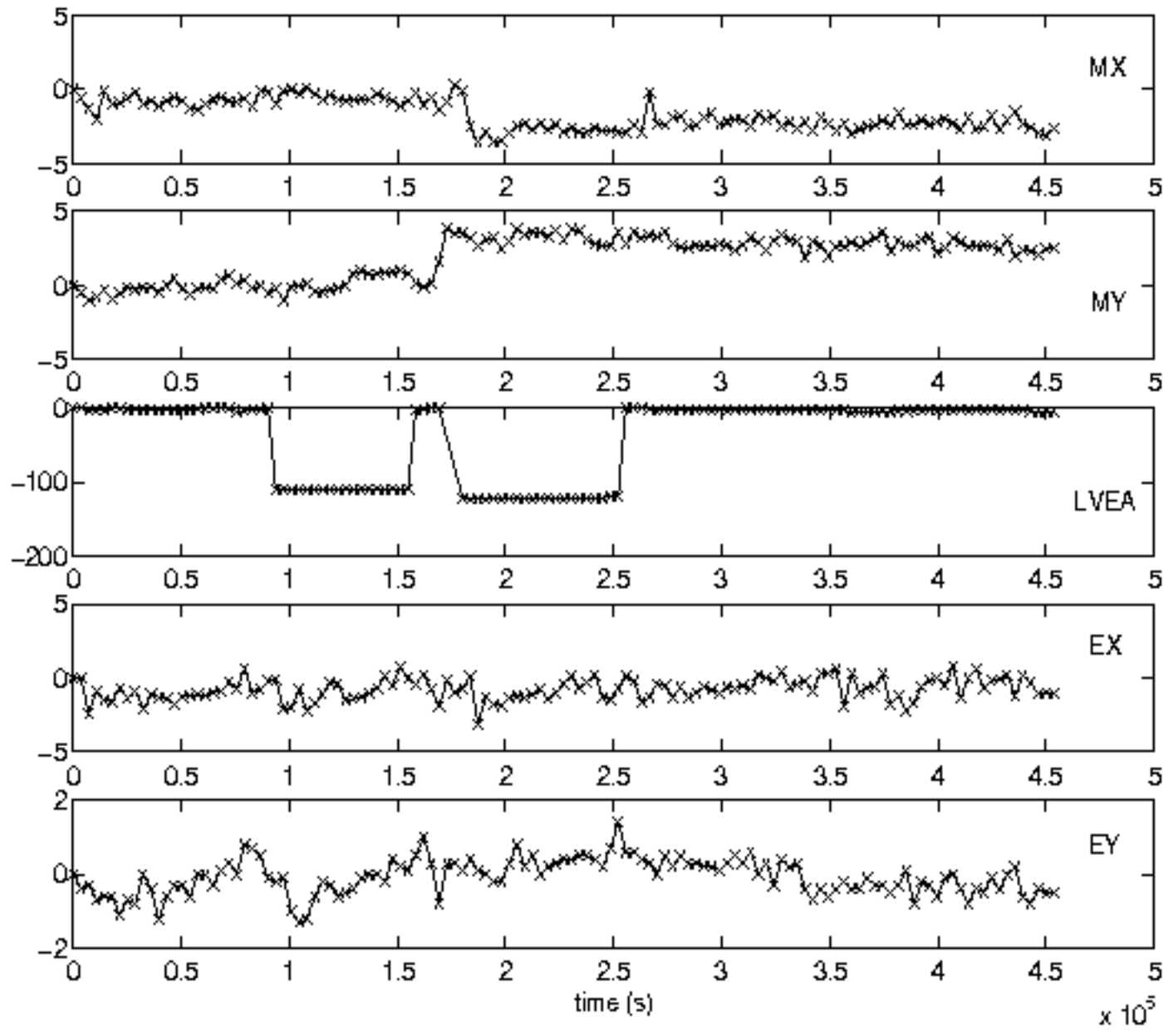
- unidentified triggers

time (UTC)	duration (secs)	no. triggers
07/31 21:11	1	1
07/31 23:49	222	10
08/03 21:15	23	4

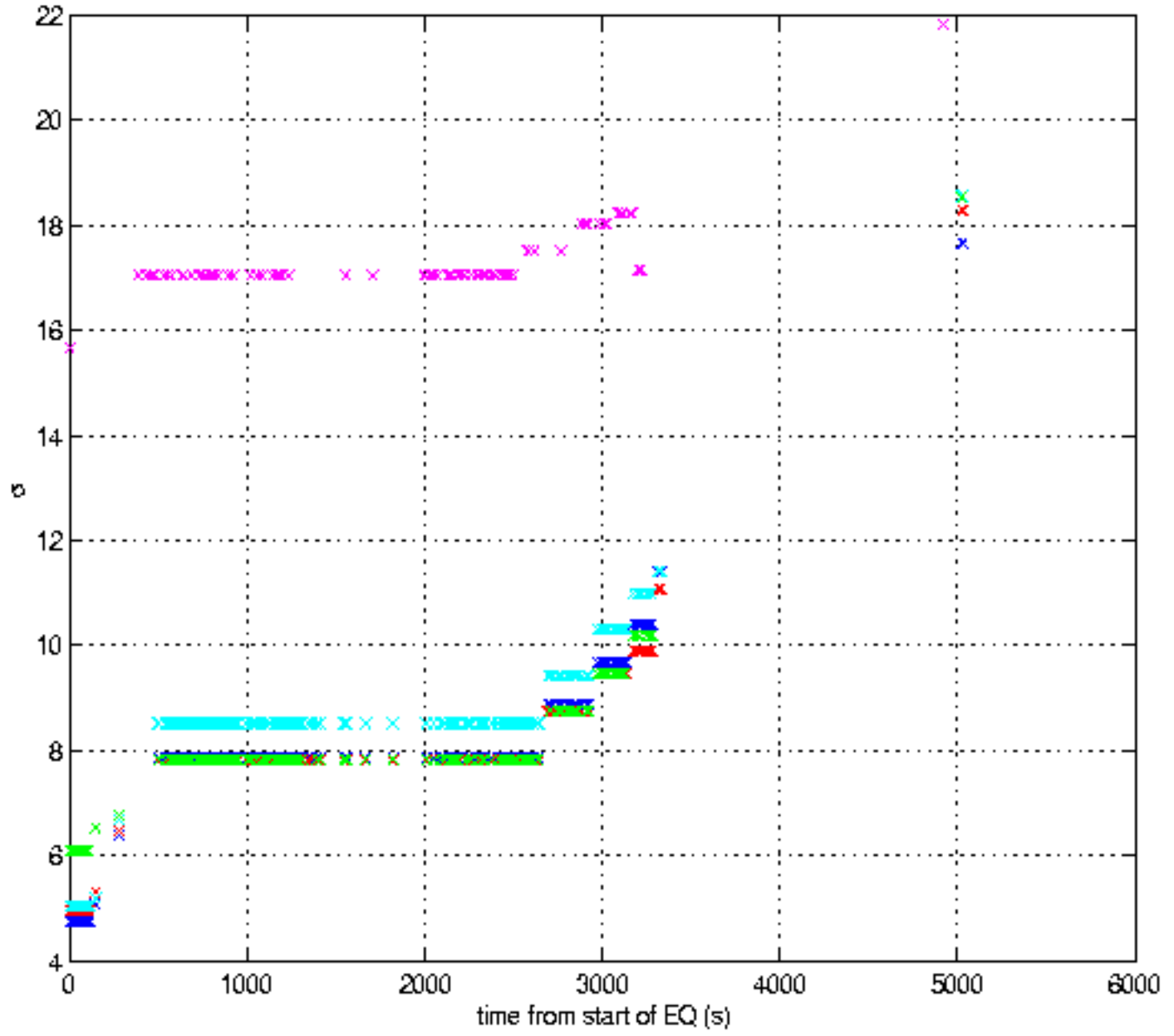
Time History of σ_x



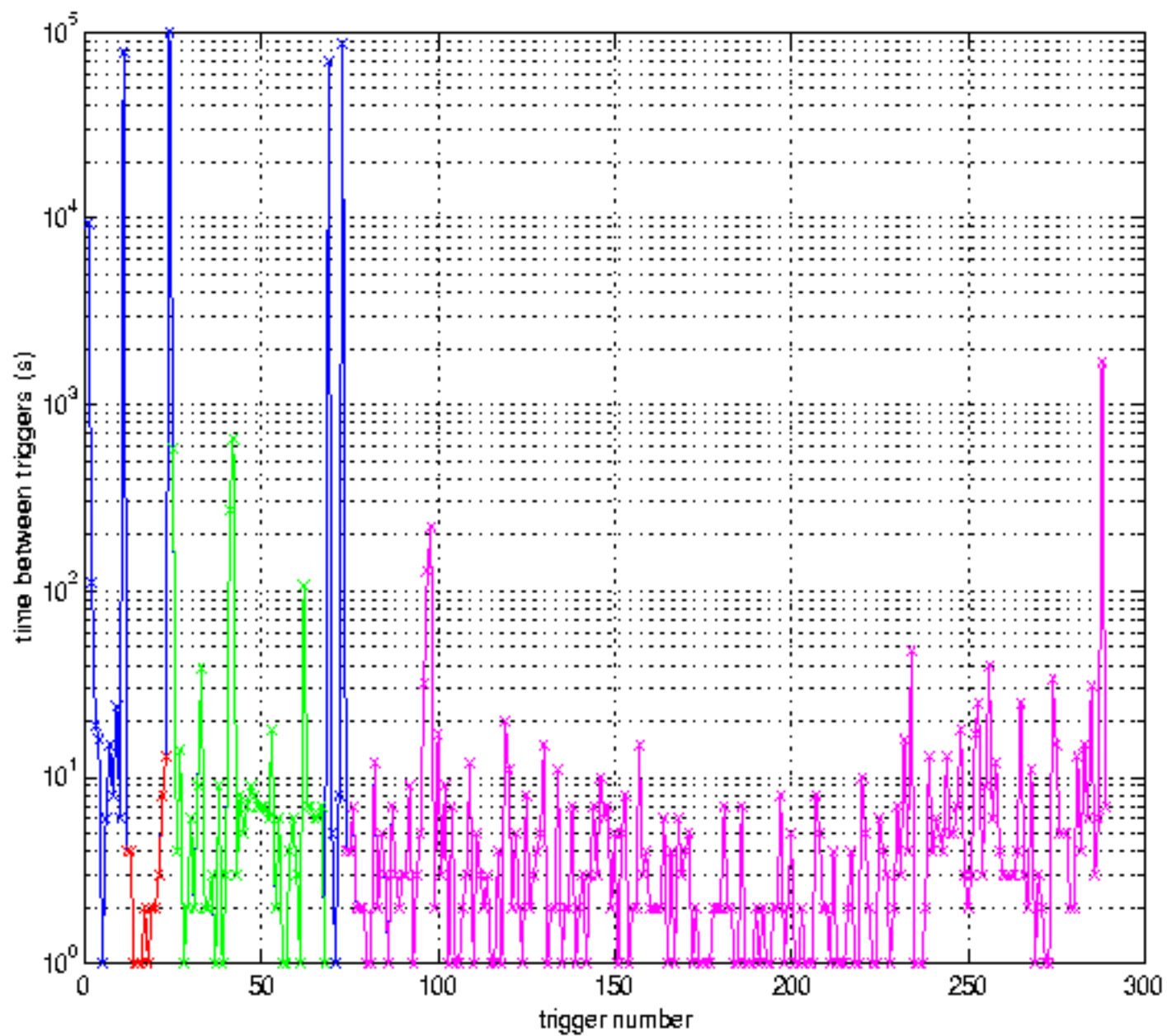
Time History of (x)



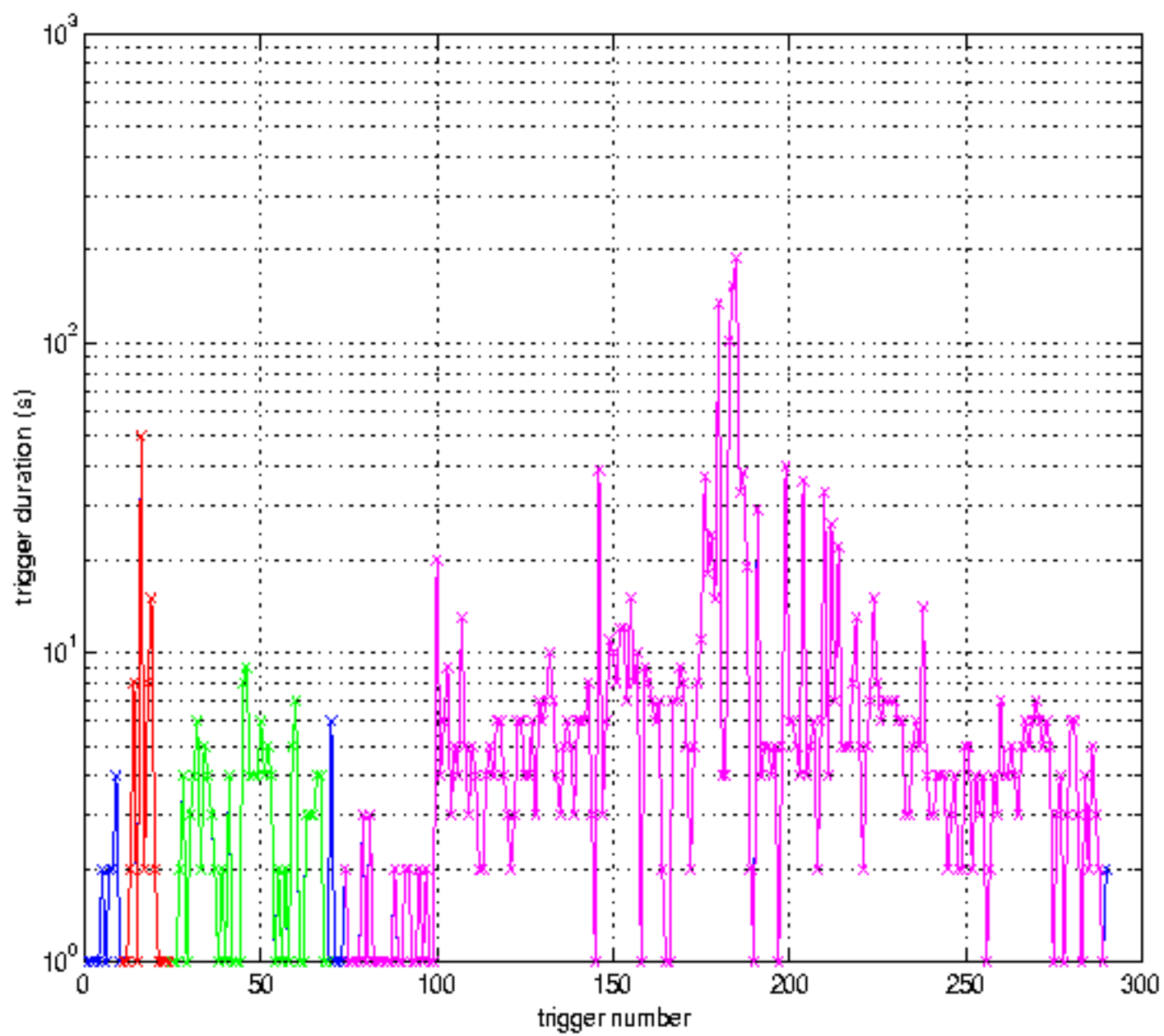
Russian Earthquake (σ_x)



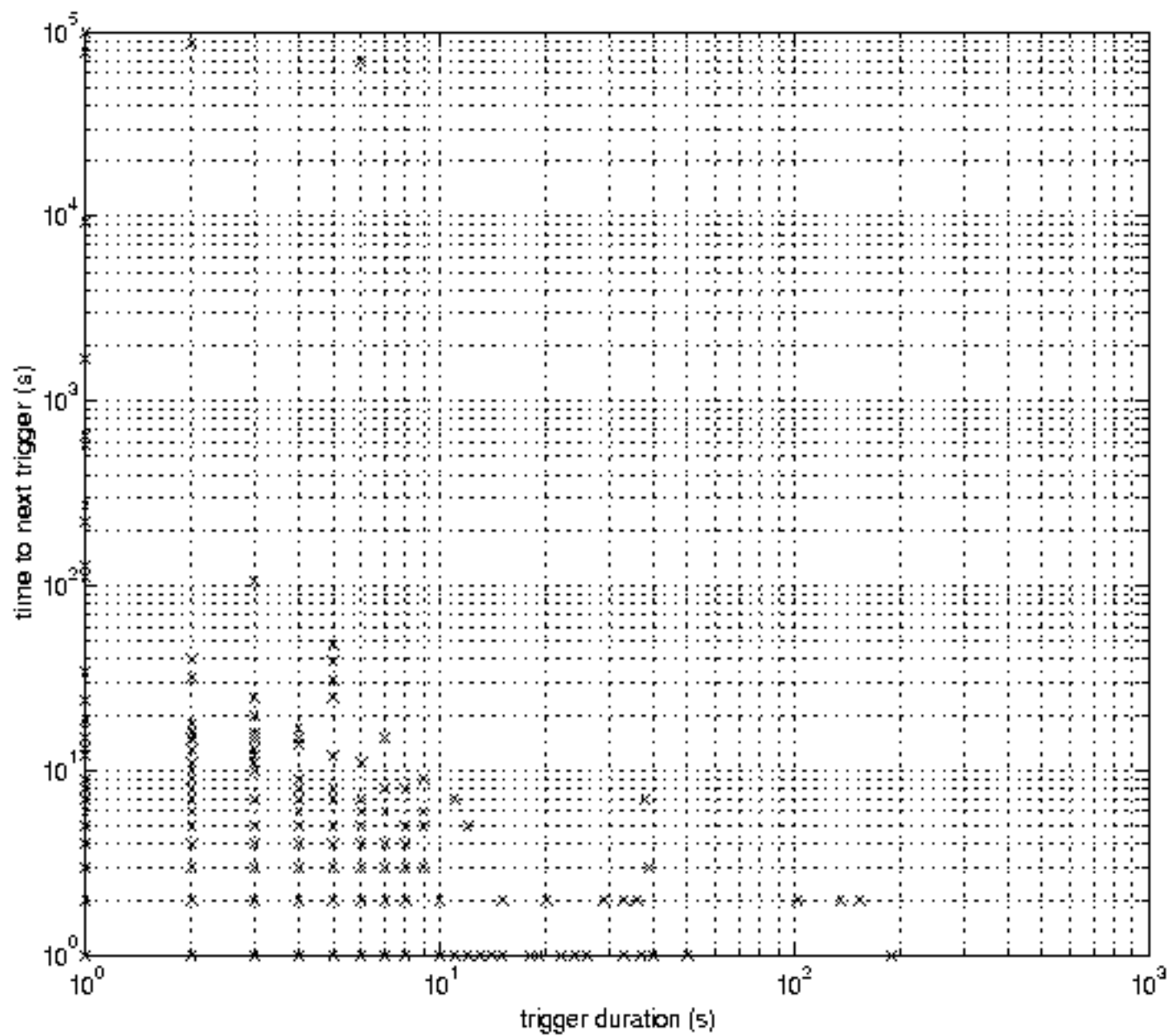
Time between triggers



Trigger Duration



Trigger Correlation



Extensions

- lower threshold when triggers start
- send triggers to web page
- add band-limiting