



Seismic Glitches in LIGO S5 Data

Preliminary results from the offline analysis of NoiseFloorMon

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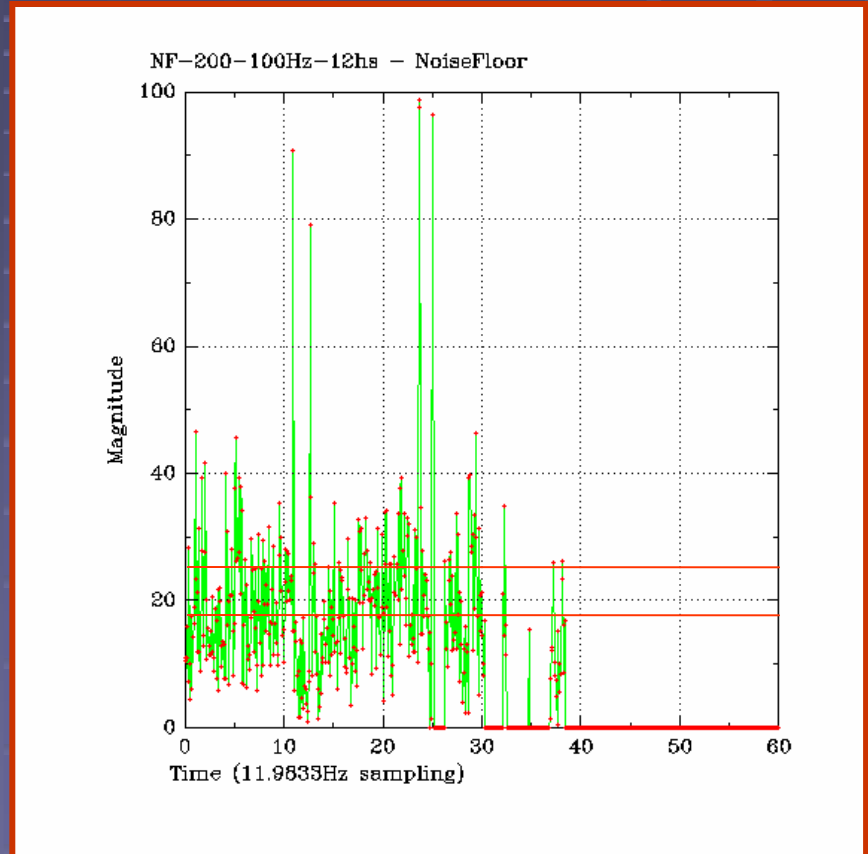
The University of Texas at Brownsville

LSC-Virgo Meeting
Pasadena, CA
March 17-20, 2008



NoiseFloorMon DMT

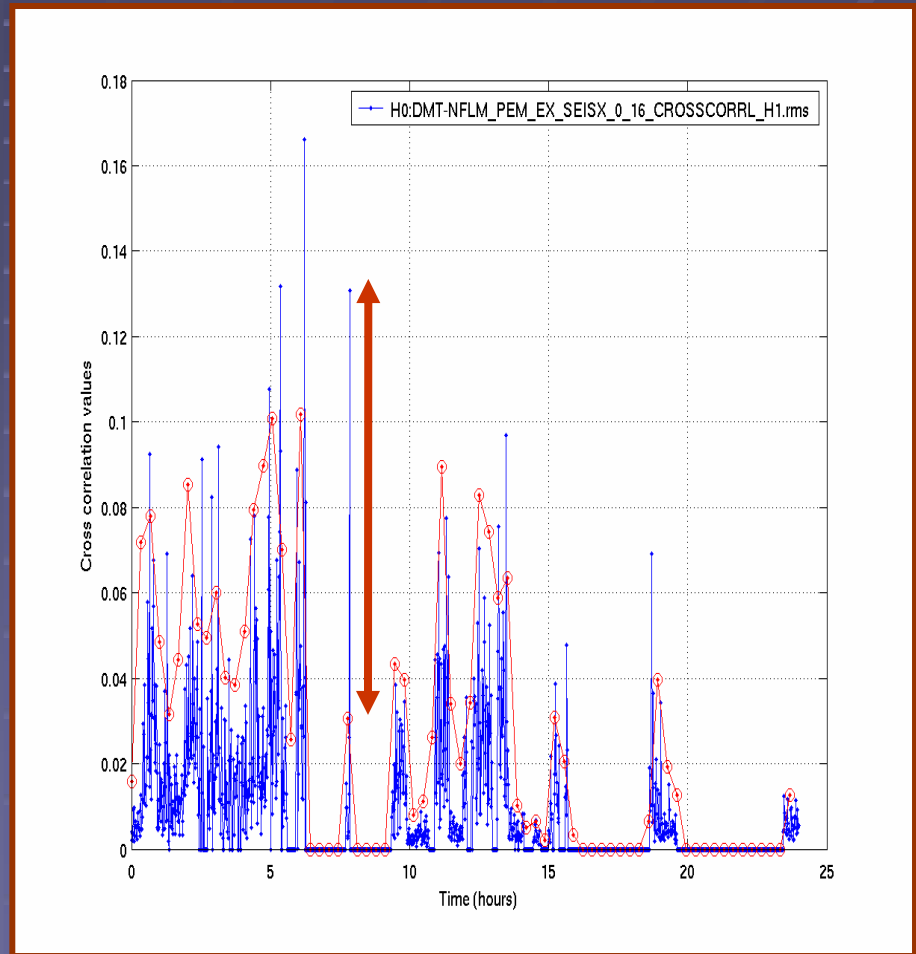
- NoiseFloorMon is a data monitoring tool that tracks the gw and seismic channels
- The cross-correlation between the gw and seismic channels is monitored in 0-16 Hz, 16-32 Hz, 32-64 Hz, and 64-128 Hz bands
- A threshold to indicate nonstationarity is set. The largest threshold crossings are stored each minute.



Online output of the NoiseFloorMon DMT

Offline Analysis

- A median-based algorithm is used to set the threshold for offline analysis.
- The top 10 threshold crossings across all seismic channels are identified daily. The criterion used is the distance from the threshold.



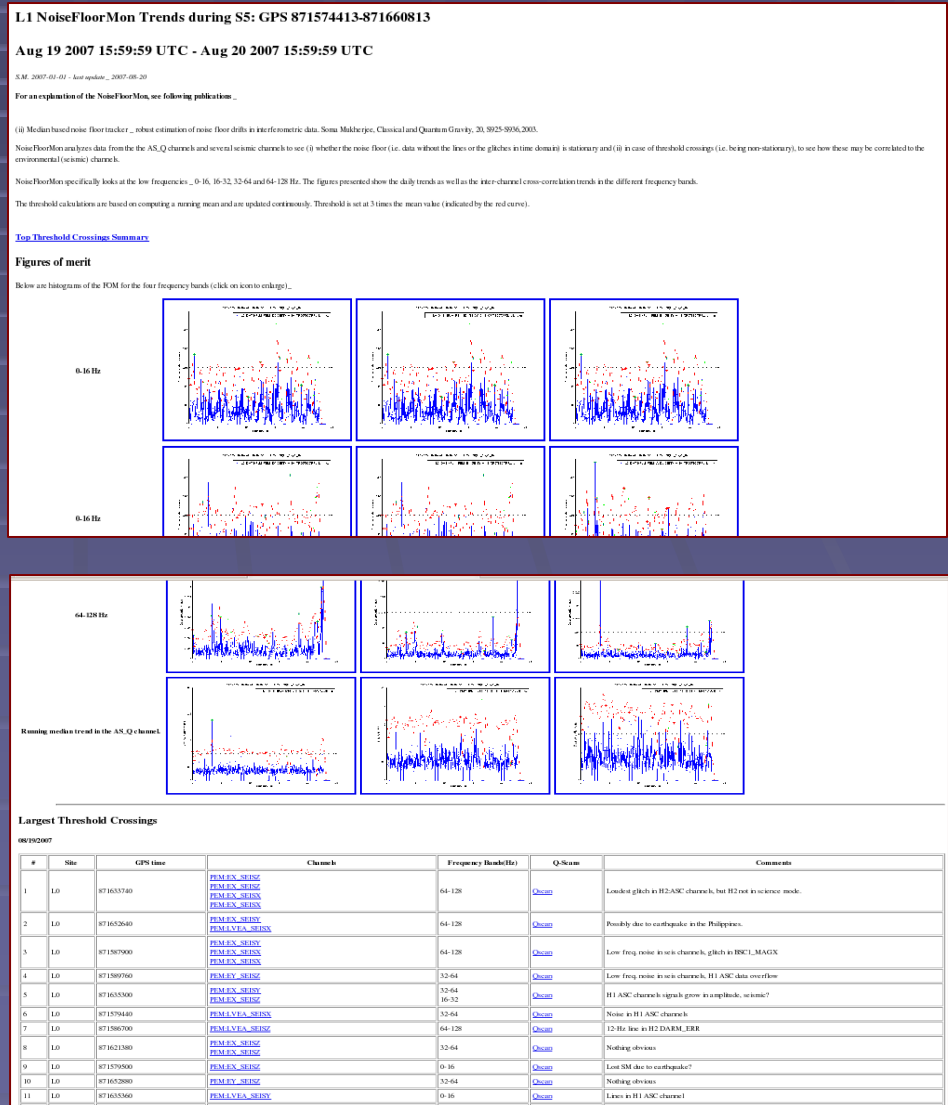
Typical output of NoiseFloorMon offline analysis, January 2007.

Offline Analysis Results

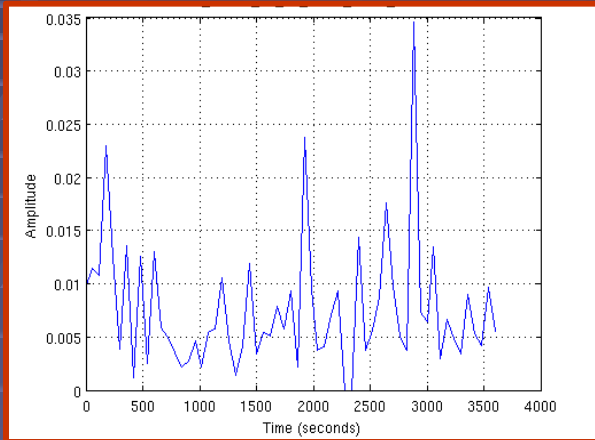
The offline analysis includes the cross-correlation values between the gw channel and several PEM channels. A median-based threshold is applied. Results can be found at



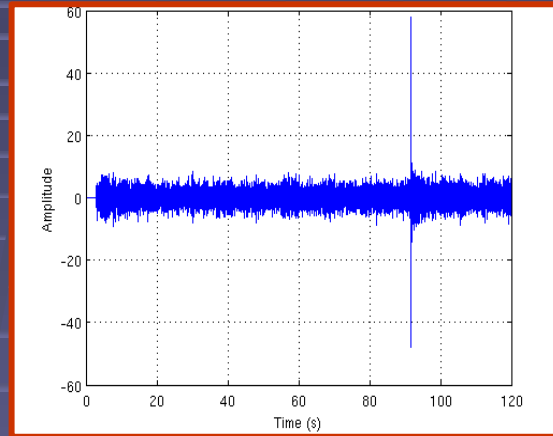
http://www.phys.utb.edu/~soma/MNFTresults/NoiseFloorMon_daily.html



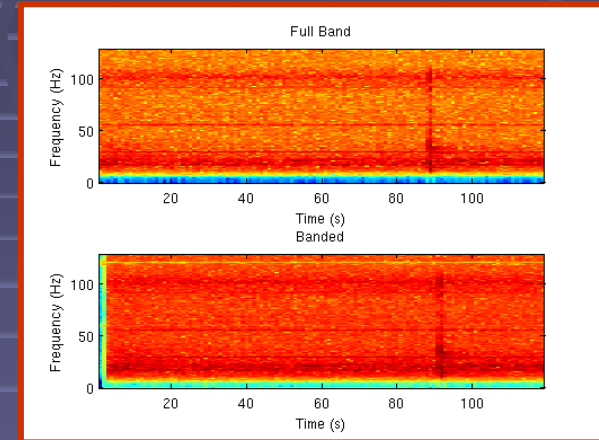
Offline Analysis



NoiseFloorMon output



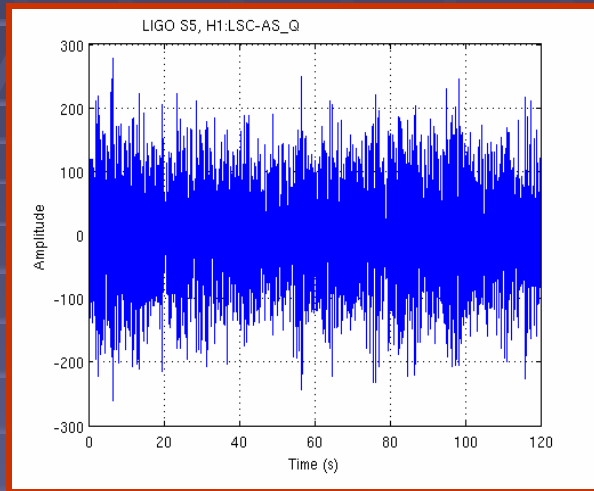
whitened time series



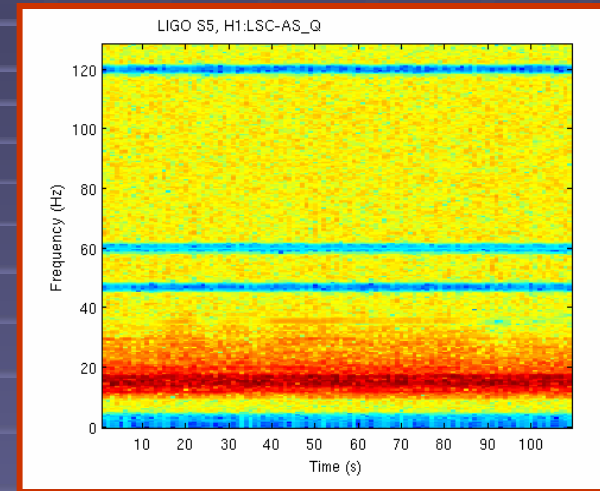
time-frequency

- A more thorough analysis of threshold crossings has been initiated in order to determine the coupling between seismic background and nonstationarity in the gw channel.
- The analysis includes visual examinations of data around the threshold crossing, including the NoiseFloorMon output, the seismic channel time series, and the full-band and banded time-frequency plots.

Offline Analysis



low-passed gw time series

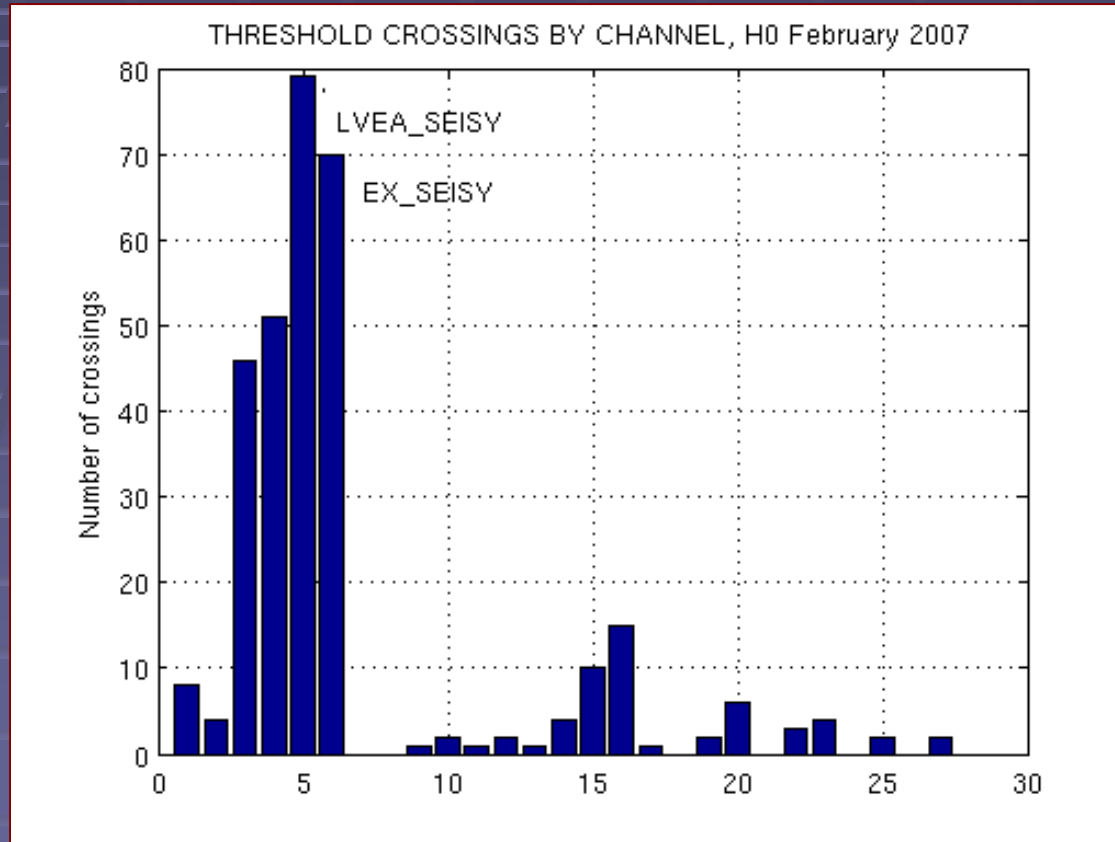


whitened time-frequency

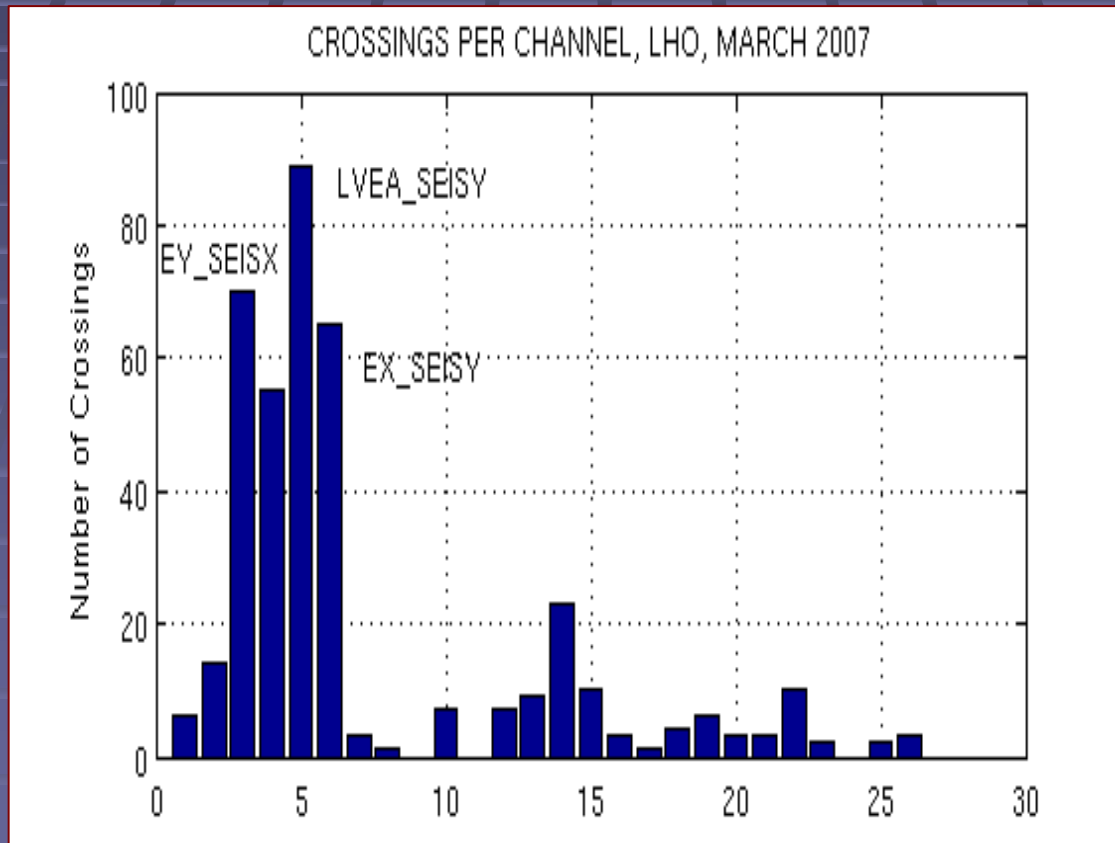
Data Quality Flags (?)

The goal of this work is to determine if a data quality flag indicating noise floor nonstationarity is warranted.

Threshold Crossing Per Channel

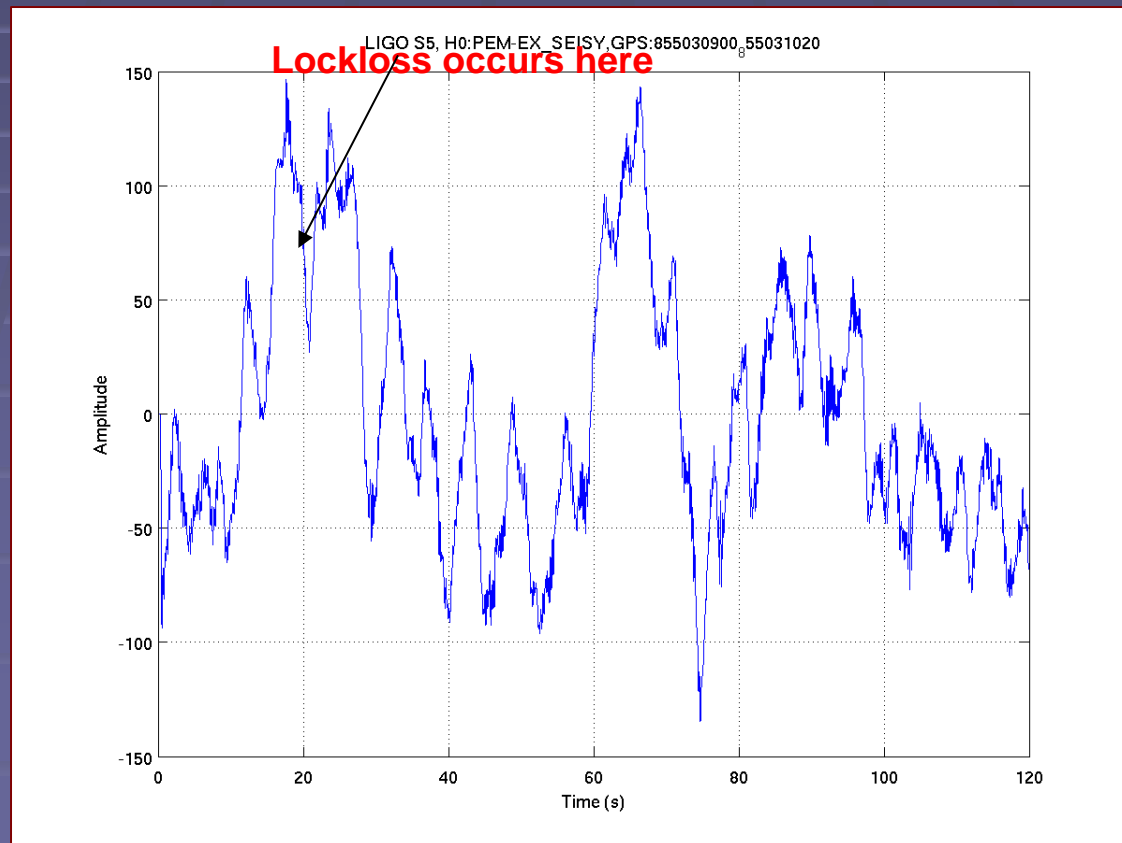


Threshold Crossing Per Channel

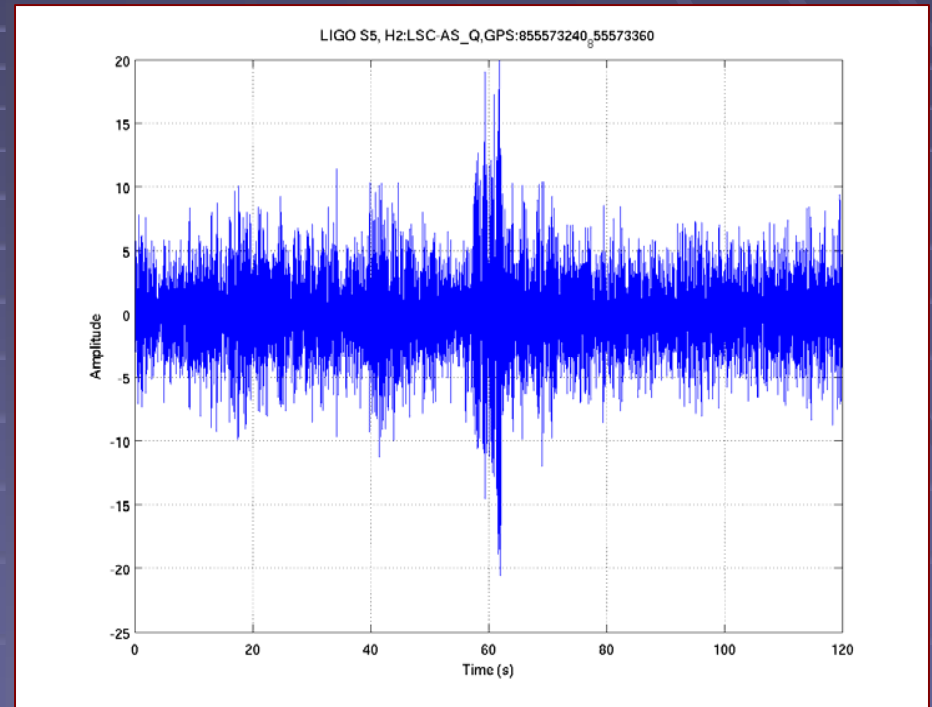
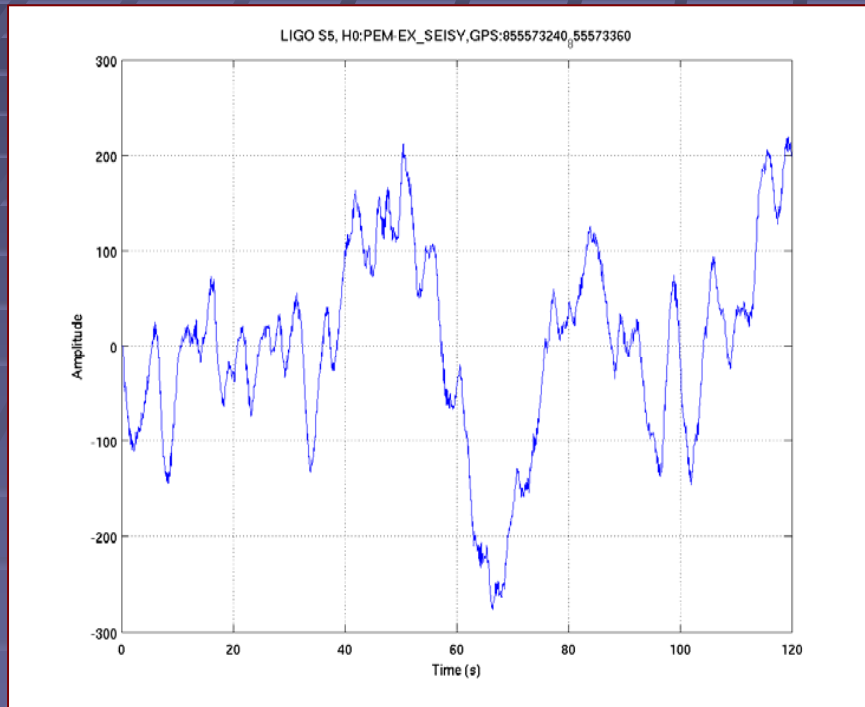


Threshold Crossings and Lockloss

- Roughly half of the threshold crossings are associated with a drop from lock



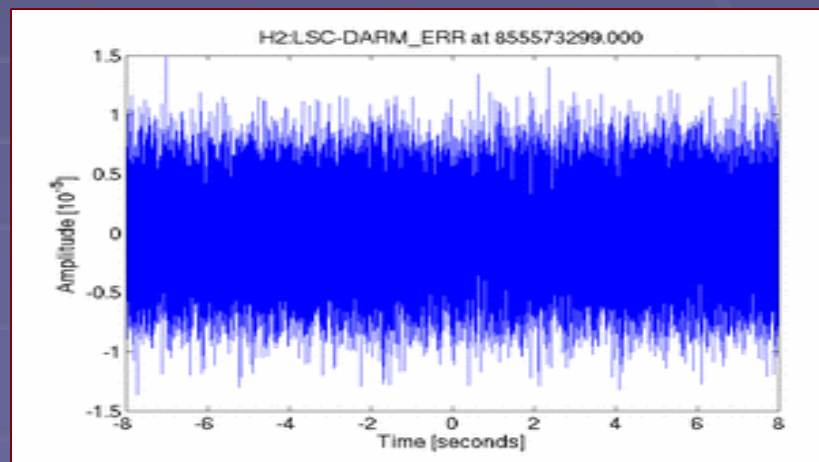
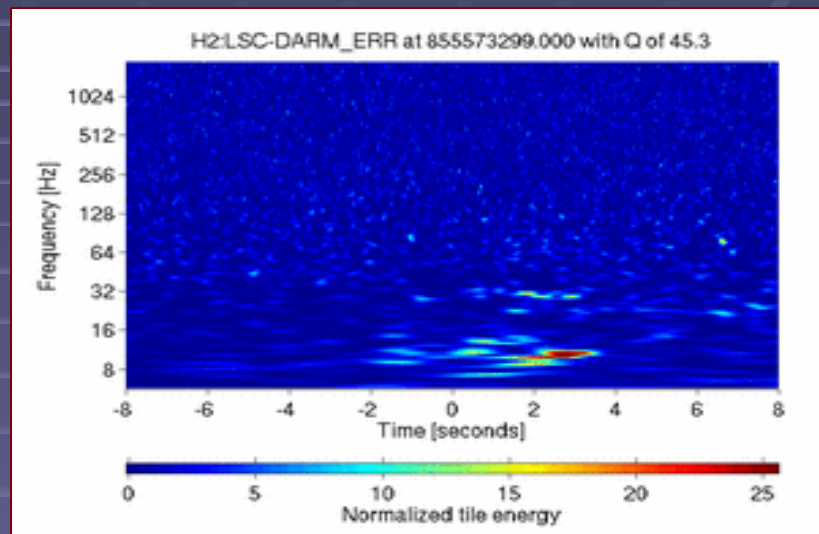
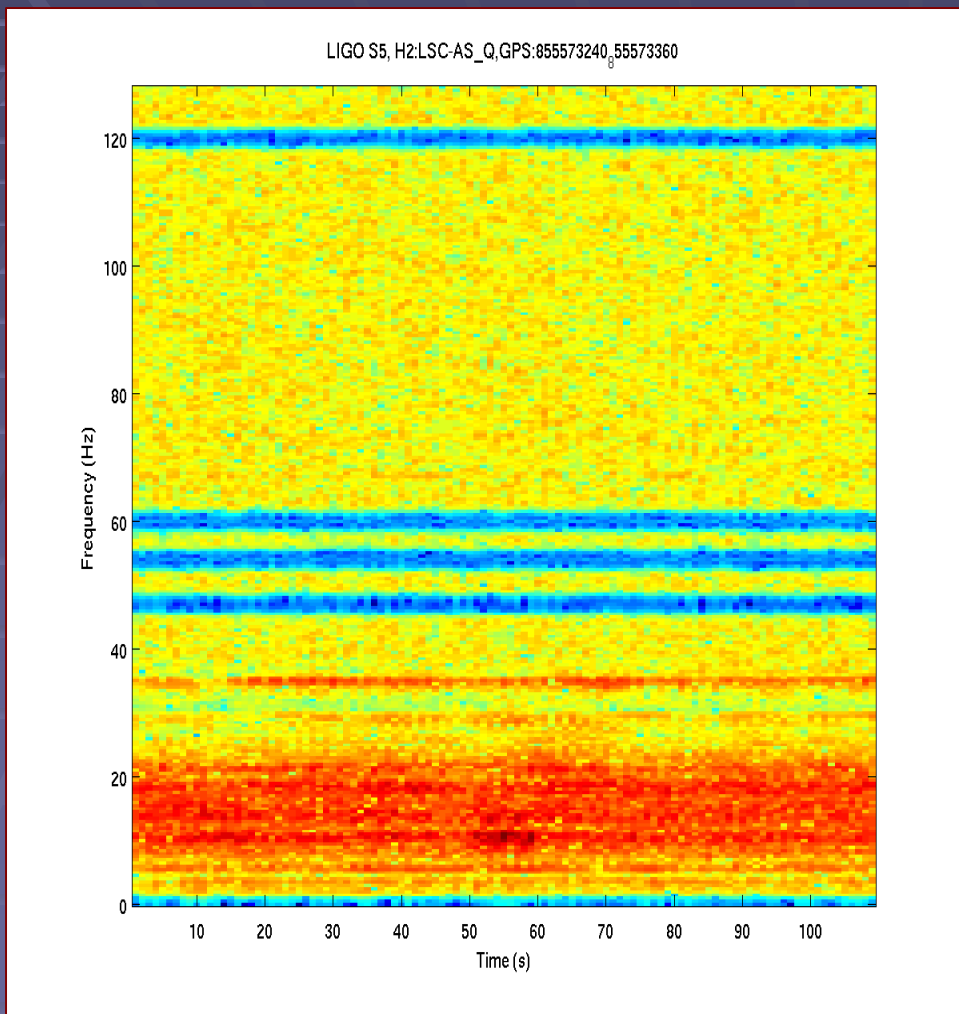
Seismic Noise in the GW Channel



I/O stayed in lock, but noise apparent in gw channel

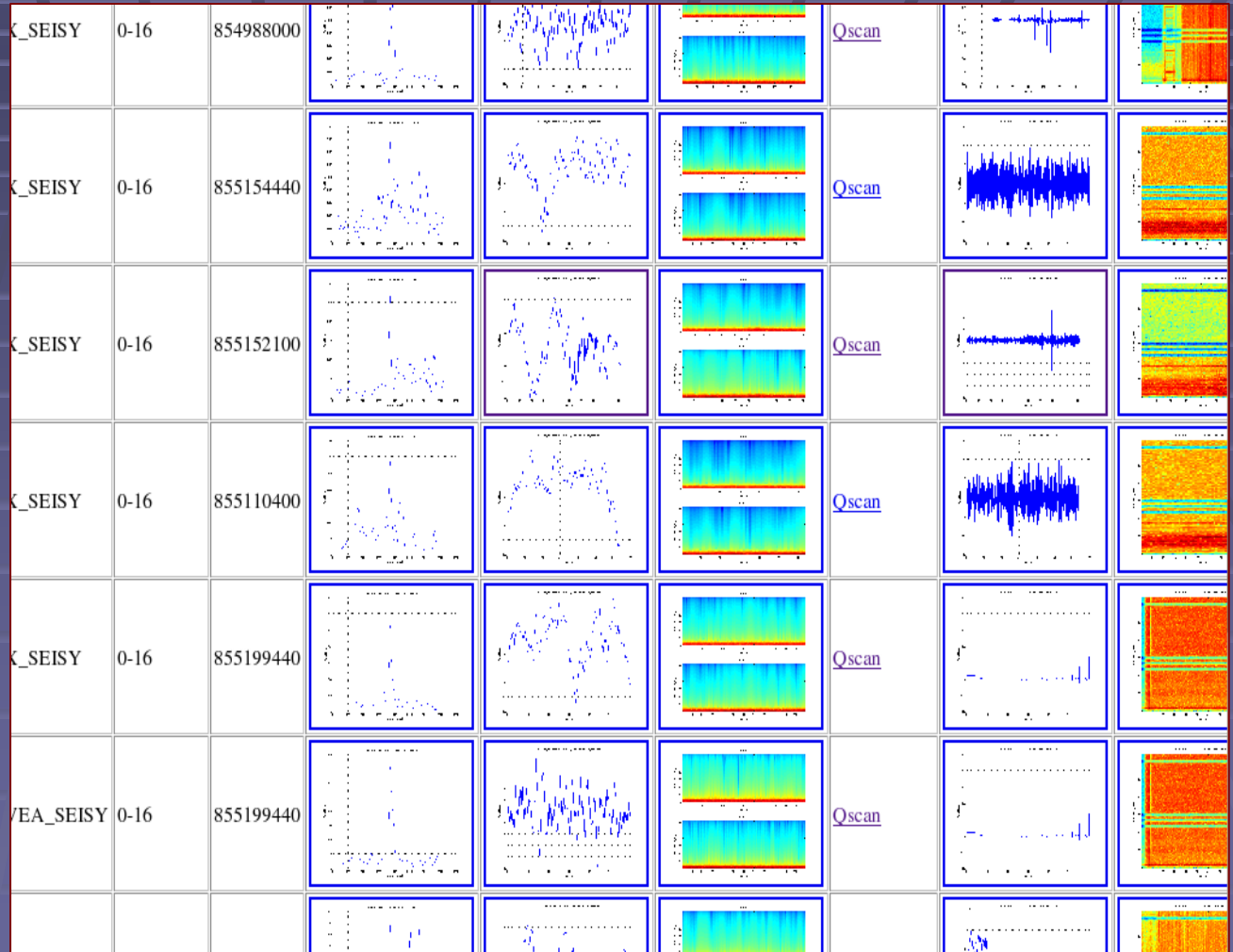
Seismic Noise in the GW Channel

Qscans

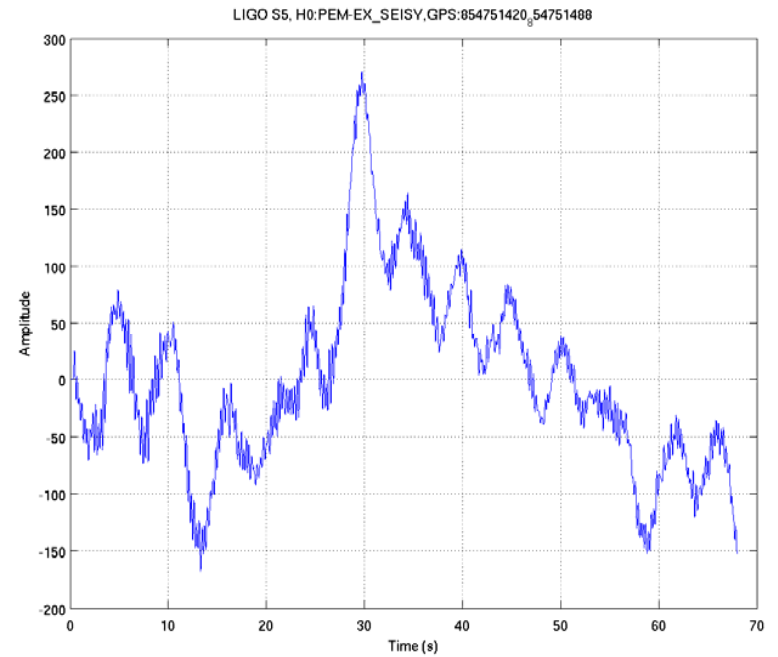
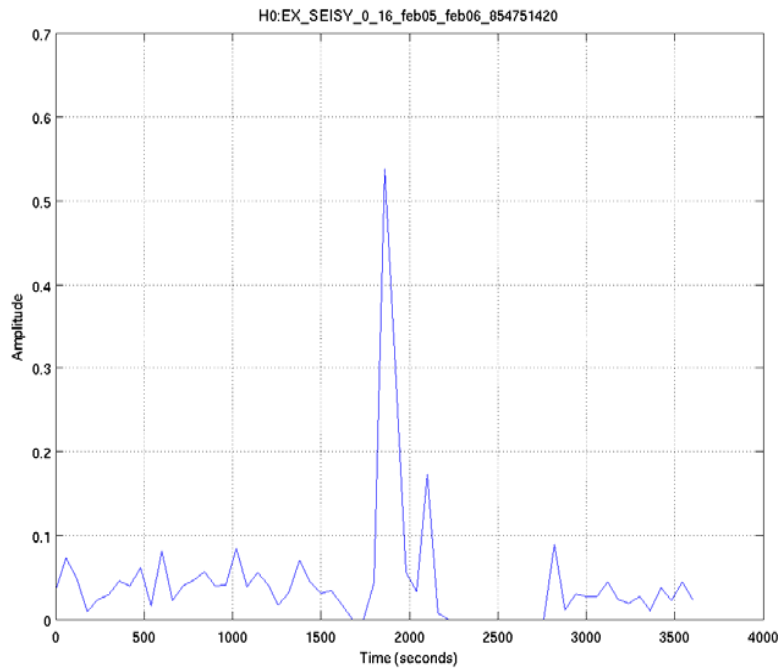


Current Status

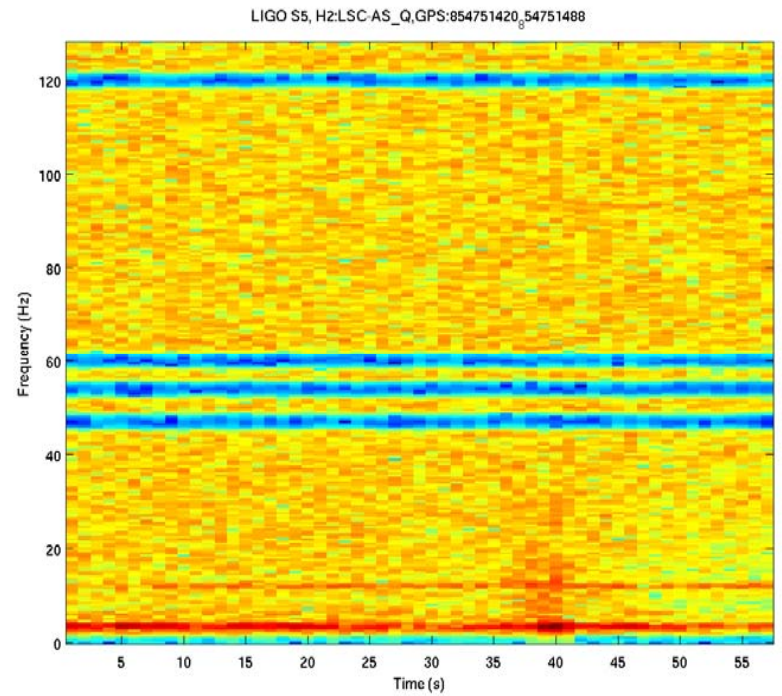
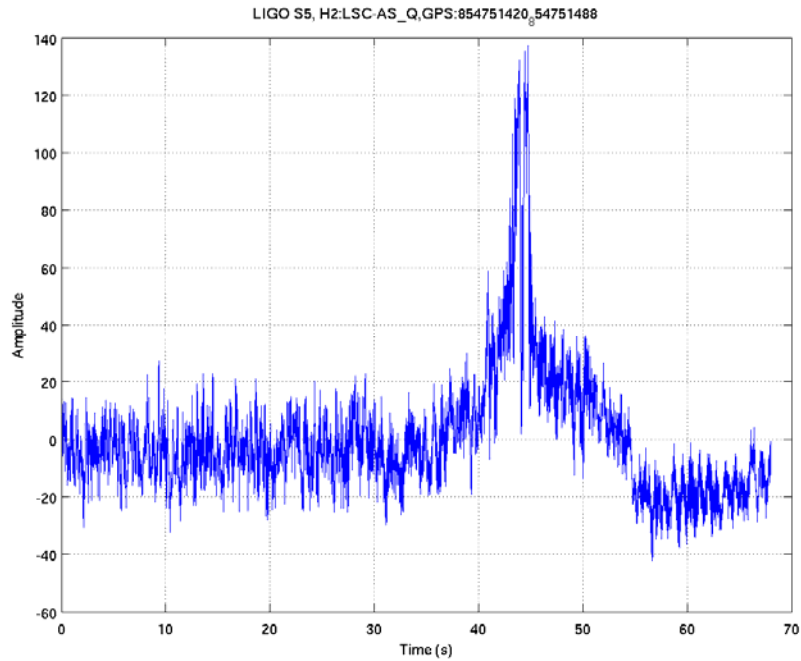
Analysis of S5
is
ongoing. The
analysis began
with February
2007.



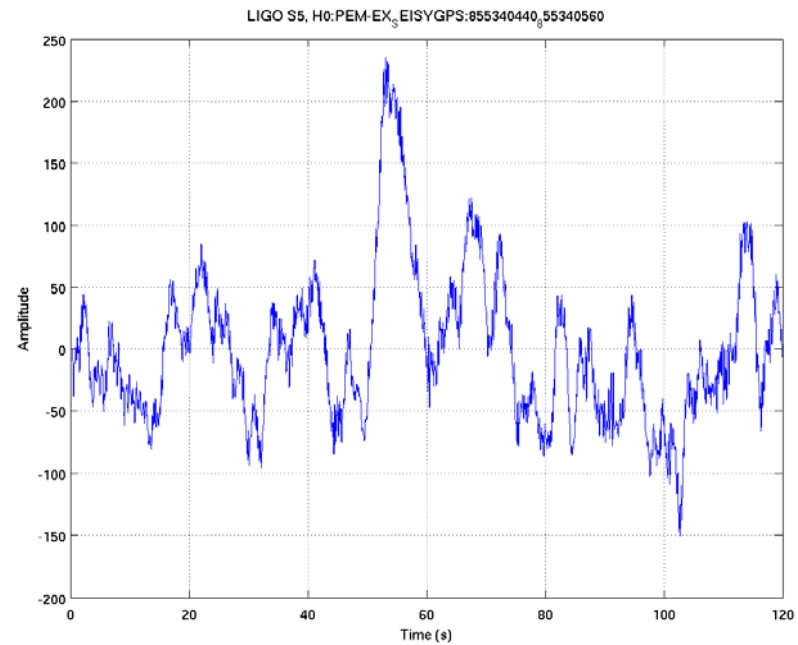
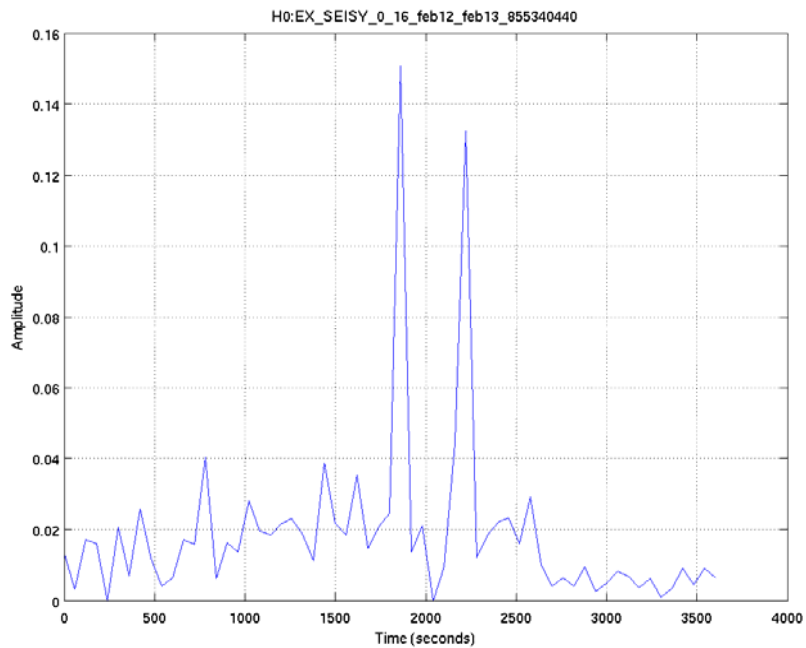
Points of Interest



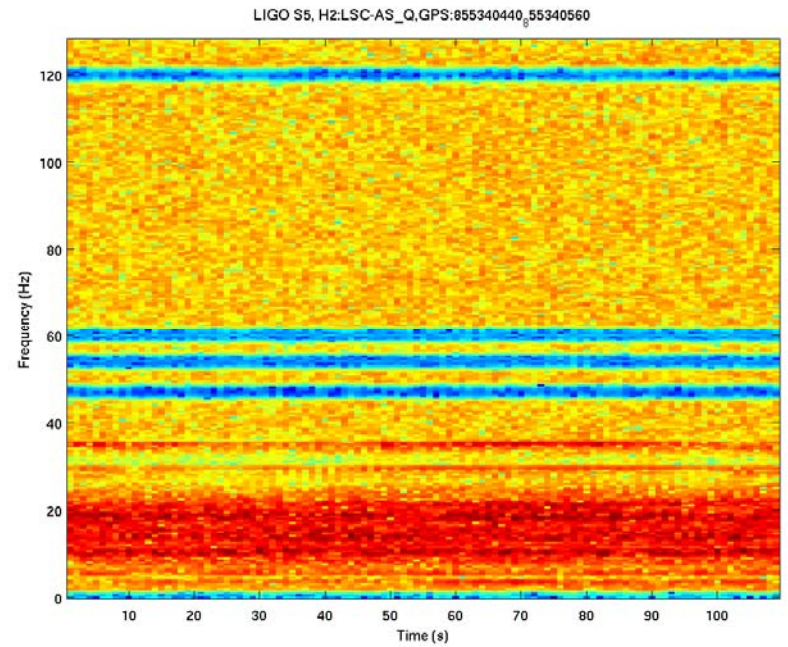
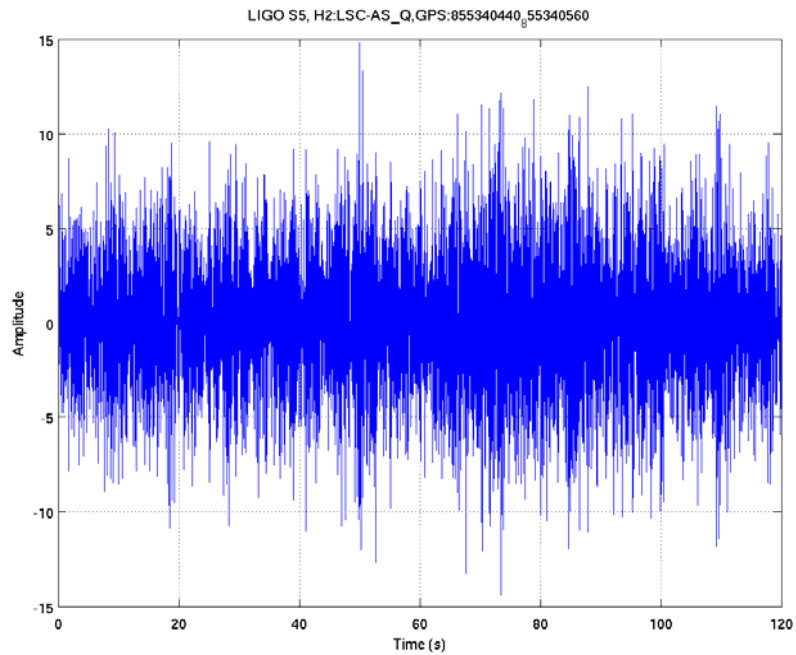
Points of Interest



Points of Interest



Points of Interest



Conclusions

- The threshold crossings generally indicate seismic activity. We are looking for segments that might need to be flagged in S5.
- There could be a correlation between the crossings and lockloss. Further study is warranted.
- Analysis results will be made available in the near future.