Introduction
The LIGO and Virgo interferometers are susceptible to a variety of instrumental and environmental noise sources that limit their detection sensitivity [1]. Environmental-noise transients can occur due to mechanical vibrations, electromagnetic disturbances and other phenomena. Common sources of transients are seismic activity, weather conditions and human activity. Identifying these environmental effects is important to improve detector performance and to flag the noise transients for gravitational wave (GW) searches. The “STAMP Pipeline [2]:”

- Calculate cross power SNR between GW channel and auxiliary channels at the detectors and generate ft-maps.
- Use pattern recognition algorithms to find noise sources.
- Define times when the GW data is affected.

Airplane Identification
One source of environmental noise entering the interferometer is vibrations from airplanes. Airplanes are identified as follows:

- During S6, a number of airplanes have been found coincident with hardware injections
- Some of the flybys have been close enough to Virgo to cause the detector to no longer take data.
- Because the STAMP method isolates the noise in frequency as well as time, it is possible to show that the airplane’s effect is limited to a small frequency band that does not contain the injection

Airplanes and HW Injections
- In S6, a number of airplanes have been found coincident with hardware injections
- Due to the way vetoes are currently used, these “GW” events would have been marked as noise due to the presence of an airplane.
- Because the STAMP method isolates the noise in frequency as well as time, it is possible to show that the airplane’s effect is limited to a small frequency band that does not contain the injection

Helicopters
- During VSR3, helicopters were a noise source with tracks similar to those of airplanes.
- Some of the flybys have been close enough to Virgo to cause the detector to no longer take data.
- Because the STAMP method isolates the noise in frequency as well as time, it is possible to show that the airplane’s effect is limited to a small frequency band that does not contain the injection

Thunderstorms
One source of magnetic and acoustic environmental noise entering the interferometer is from thunderstorms, which can prevent the detectors from running stably. To find times at which thunderstorms are affecting the detectors, we:

- Search for broadband events of high SNR in GW-microphone and GW-magnetometer ft-maps
- Find events coincident in both the microphones and magnetometers within a 10s window

Conclusions
- There are many noise hunting applications for STAMP, already realized and still in development.
- Data quality flags are being generated for use by LIGO and Virgo CBC and burst searches.
- STAMP will be an important tool for identifying noise during Advanced LIGO and Virgo

Threshold Calculation
- Record the maximum $SNR_t$ of each Radon map
- Create a histogram of $SNR_t$ for each site and determine airplane threshold.

Veto Results

<table>
<thead>
<tr>
<th>Detector</th>
<th>Time Analyzed</th>
<th># of Mics</th>
<th>Vetoed Injections</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIGO</td>
<td>S6D (June 26, 2010 to August 20, 2010)</td>
<td>13</td>
<td>4/97/52</td>
</tr>
<tr>
<td>LLO</td>
<td>S6D (June 26, 2010 to August 20, 2010)</td>
<td>9</td>
<td>2/84/64</td>
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<tr>
<td>Virgo</td>
<td>VSR3 (August 11, 2010 to October 18, 2010)</td>
<td>4</td>
<td>0/30/83</td>
</tr>
</tbody>
</table>

References

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