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# A First Look at Burst ETG False Triggers: BlockNormal and SLOPE

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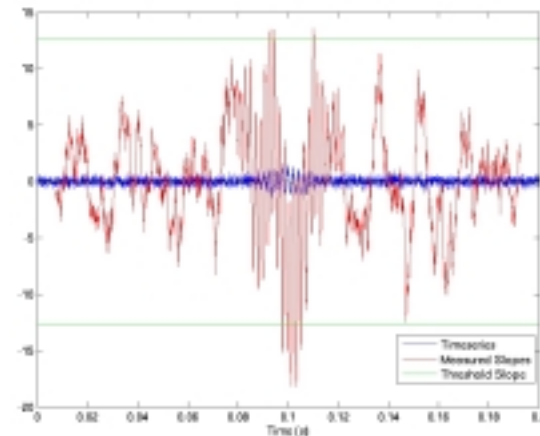
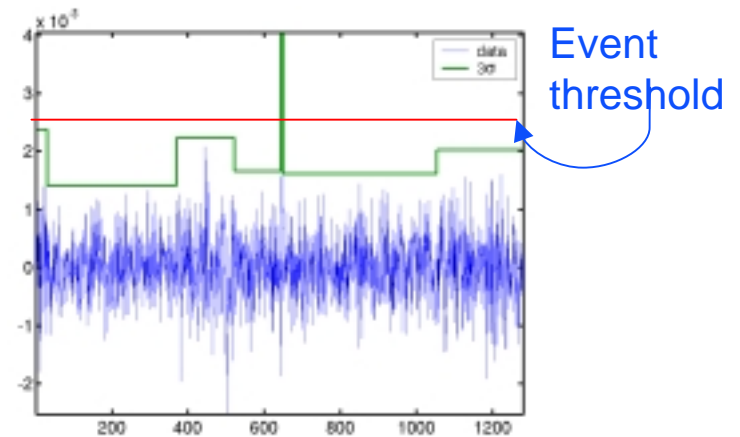
# Motivation

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- Much time and effort have gone into developing individual ETGs.
- The characteristics of the candidate events generated by each ETG have not been investigated.
- To initiate an investigation of the different strengths of different ETG's, I pose the following question:
  - » Are the "strongest" events identified by each ETG the same or different?
- The answer to this question will tell us if the ETGs are roughly equivalent to each other or if they look at different things.

# BlockNormal and SLOPE

- BlockNormal divides the data into block with consistent mean and variance.
- SLOPE identifies intervals of time where the linear trend of the data is improbable.



# Strongest Triggers

- There are several ways to define a “strong” event.
- I have investigated two measures: relative excess power and energy.
- Relative excess power:

$$\text{Power} = \frac{(\mu - \mu_0)^2 + (\sigma^2 - \sigma_0^2)}{\sigma_0^2}$$

- Excess energy:

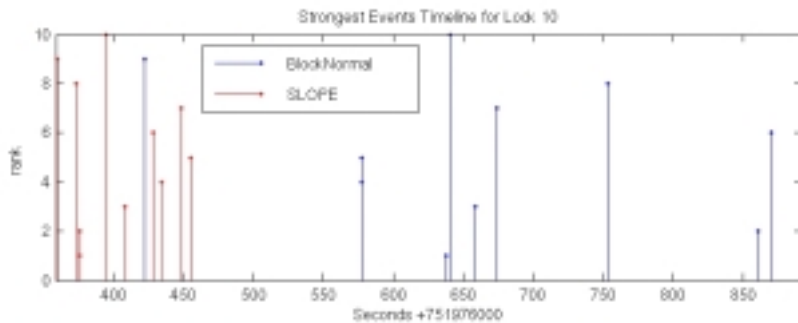
$$\text{Energy} = \left( (\mu - \mu_0)^2 + (\sigma^2 - \sigma_0^2) \right) \Delta t$$

where  $\Delta t$  is the event duration

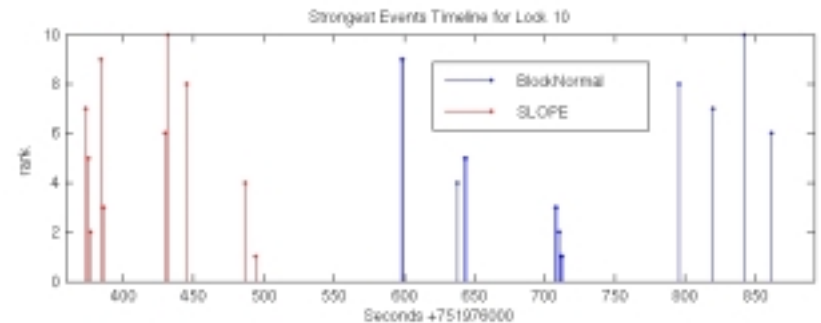
# Locations of Strongest Events in a Lock

- The strongest events from a single lock are not the same between ETG's (*top 10 events from S3 playground, 512 – 640 Hz band, H1*):

Power:



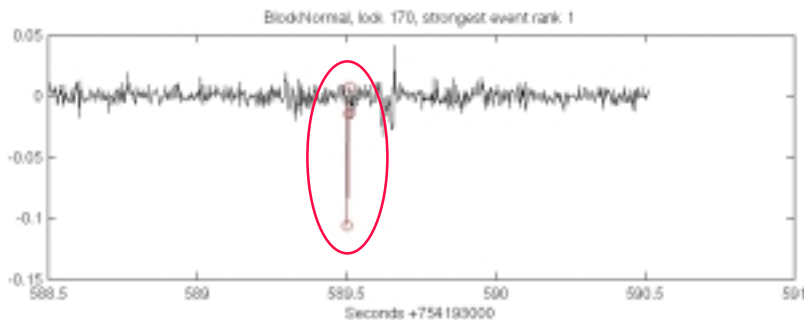
Energy:



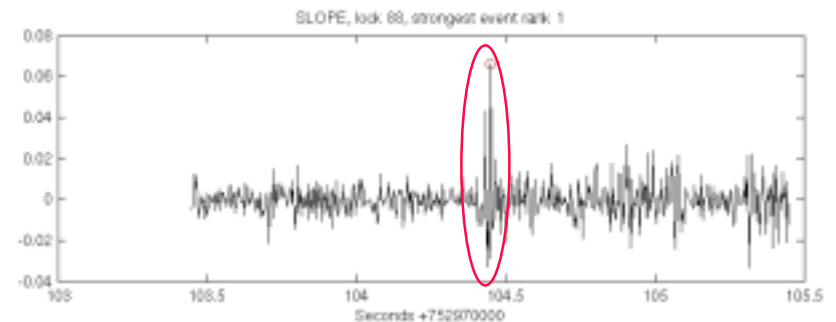
# Event Timeseries: Strongest Power

- Events are short duration and tend to pick up on ‘spikes’ in the data.
- These are typical strongest events. Even when looking at more events, there are no obvious, by eye, differences between each ETG’s events.

**BlockNormal:**



**SLOPE:**

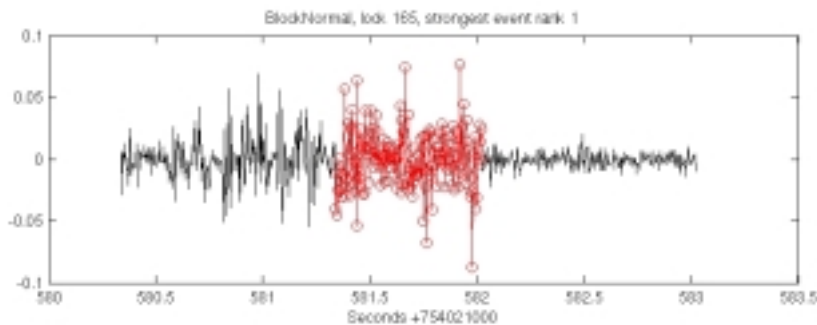


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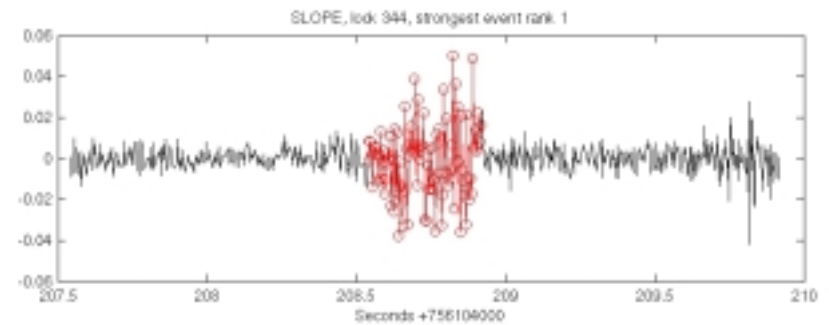
# Event Timeseries: Strongest Energy

- Events are longer in duration than the relative excess power strongest events.
- Again, these are typical strongest events. Even when looking at more events, there are no obvious, by eye, differences between each ETG's events.

BlockNormal:



SLOPE:

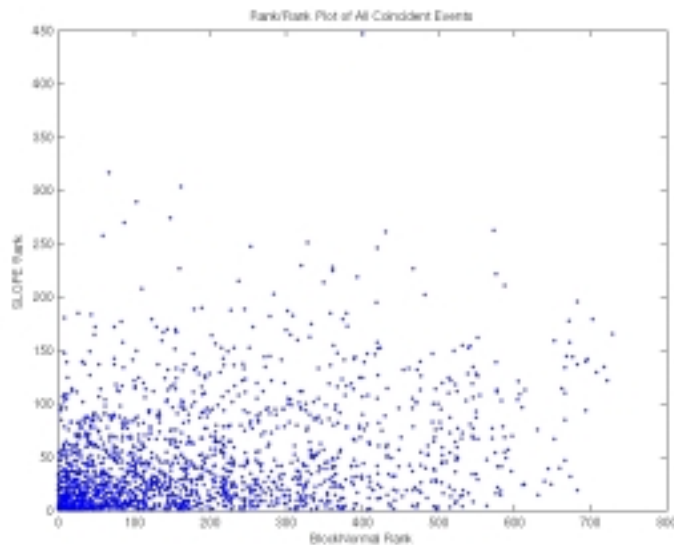


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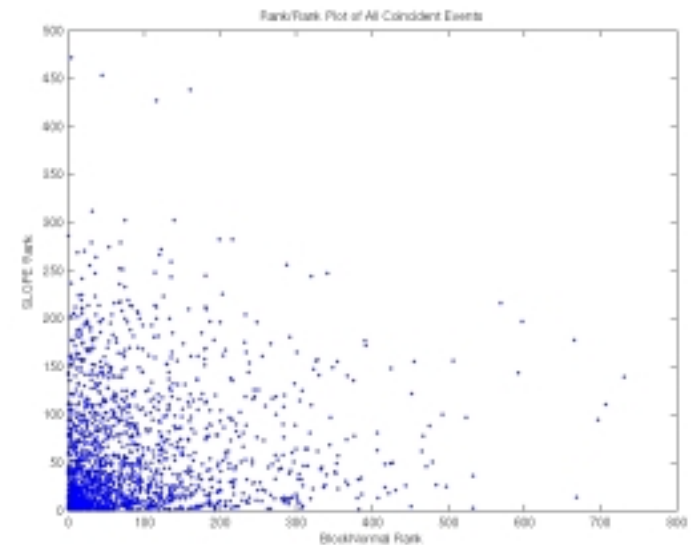
# Coincident Events

- Even when they do identify the same event they see them as qualitatively different.
  - » Only about 10% of BlockNormal events were coincident with 15% of SLOPE events.

Power:



Energy:



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# Conclusions

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- **BlockNormal and SLOPE see different things.**
  - » Therefore, they do not look at the data in equivalent ways.
- **The most significant events identified by each are not different in any obvious way.**
  - » The next step is to use statistical tools to better understand what aspects of the data each of these ETG's is most sensitive.