

Monitoring the Transient Sky

Tom Weisgarber
SGSO Meeting
9 October 2018

Transient section components

- Active galactic nuclei ← I will focus here
- Galactic monitor
- Gamma-ray bursts and gravitational waves
- High-energy neutrinos
- Multi-messenger correlations
- Exploratory searches for new transient phenomena

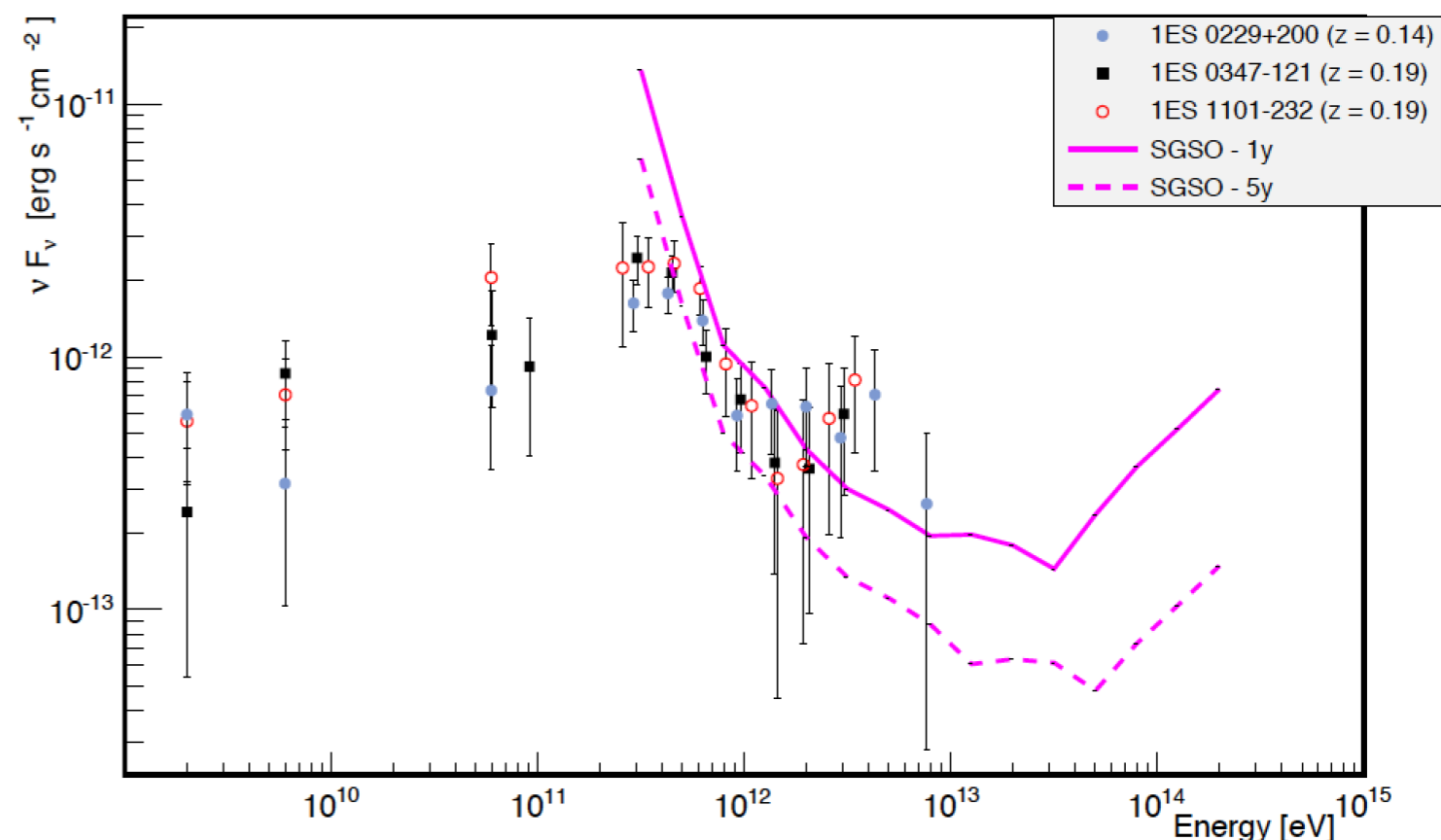
AGN section in general

- A lot of people have made contributions to the sections—thanks!
- Due to several writers, AGNs and blazars are introduced several times throughout the section; requires some cleanup
- Considerable time is spent on a summary of the current state of knowledge; this could be made more concise

AGNs: Extreme HBLs

- Extreme HBLs show a synchrotron peak at 10^{17} Hz or higher
- Section highlights 3 AGNs, two of which would be good targets for SGSO
- Connection to IGMF and exotic physics
- Incorporated comments from Markus: not sure why statement about CTA is in bold:

Extreme blazars - zoom at the highest energies



energies is presented, is due to the EBL absorption effect. In the near future, deep observations of these targets with the CTA will allow a better characterization the highest energies (where current measurements with IACTs lack statistics) and identify the inverse Compton peak position, still largely uncertain for these objects.

AGNs: SSC model

- Section mostly focused on what is currently known about the SSC model
- We should think carefully about what SGSO could do to distinguish between different acceleration models

AGNs: Variability

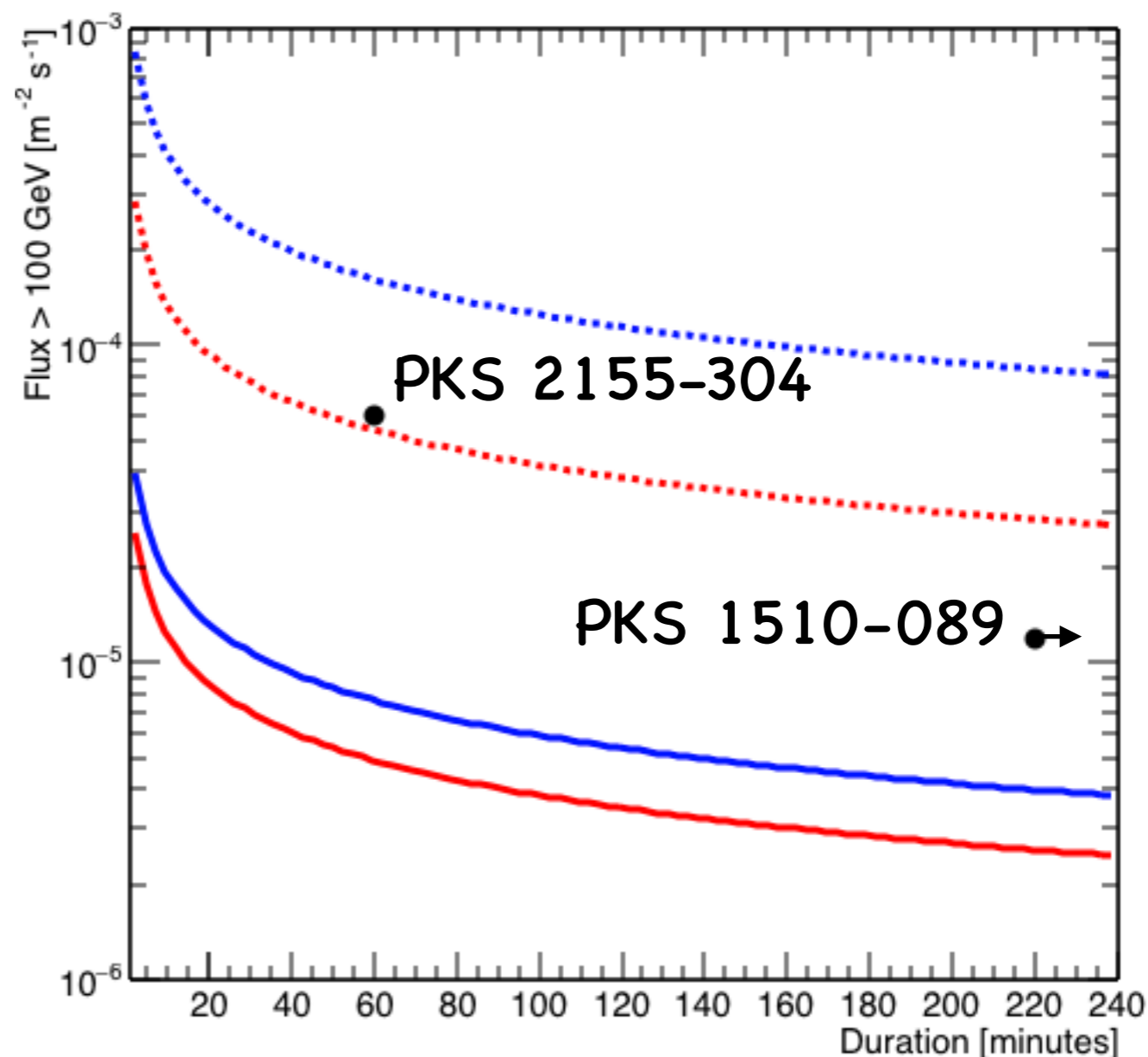
- Similarly, there is considerable information here about summarizing variability that could be made much more concise
- “Predictions of flux doubling times could be used to test these models”: refers to shock acceleration, magnetic reconnection; could elaborate on whether SGSO can do this outright or we would need an SGSO trigger of CTA

AGNs: Systematic study of variability

- Could logically be merged with previous subsection
- Some nice points:
 - SGSO can measure level of quiescent emission if it exists
 - SGSO can measure unbiased flux state distributions
- Motivation for pushing the low-energy sensitivity

AGNs: Flare population study

- SGSO monitors large fraction of the sky in an unbiased way for systematic flare studies
- Flare duration and amplitude can be an indication of the underlying process
- One important question to address is whether we can have the sensitivity to detect enough flares
- This would be a good place for the plot at the right, with more past flares filled in
- Dashed curves are for HAWC, solid curves for SGSO

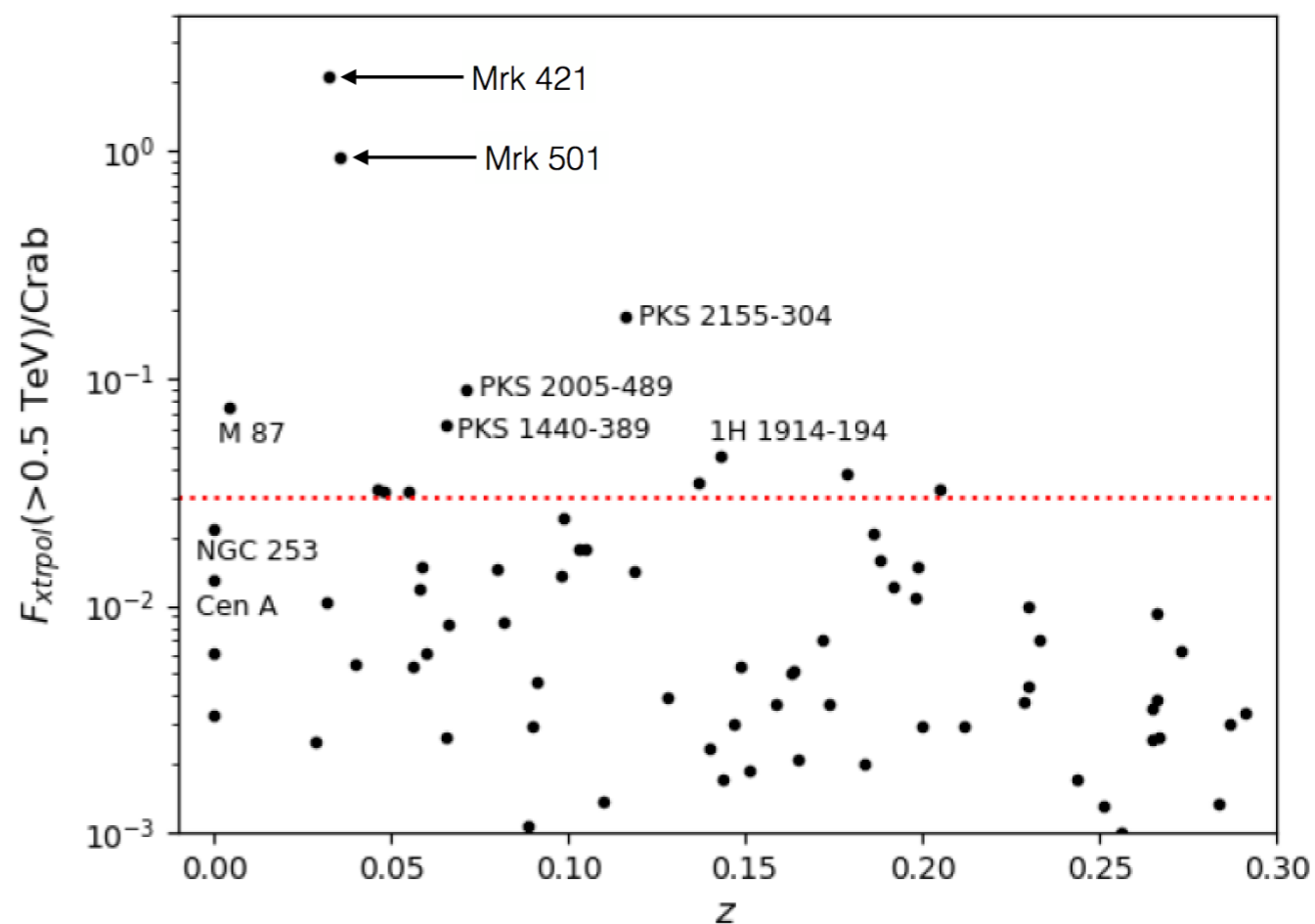


AGNs: periodicity

- Cites previous work showing evidence for periodicity
 - Mrk 501
 - PG 1553+113
 - Are there good targets in the southern hemisphere?
- Highlights SGSO's unique monitoring capabilities for this measurement
- Has a bit of introductory material that should be cleaned up or removed

AGNs: Searching for new blazars

- Comment from Markus: Substantiate the statement that obtaining a population of blazars is necessary for identifying the acceleration mechanism
- Another comment from Markus: Are there any plausible new radio galaxy candidates for TeV emission?
- A point that maybe we could expand: can we characterize the far-IR EBL via 10+ TeV observations of known radio galaxies?
- Rework tone to highlight 3FHL extrapolation with EBL attenuation as reasonable expectation for what SGSO could see
- Plot at right could add Markarians to explain why we expect to see other sources' steady emission when HAWC sees only the Markarians



AGNs: EBL horizon

- Explains EBL effect at a good level
- Could use some assessment of what specifically SGSO could contribute

AGNs: Measuring the IGMF

- Discusses relevance of long-term observations to help with assumptions that are often made about the average blazar flux
- Could probably be discussed as an input to CTA searches for the IGMF

AGNs: Multimessenger studies

- Mentions AGNs as possible UHECR sources
- Recommend merging with the later Multi-messenger correlations section

AGNs: empty sections

- Probably sufficient to cover in previous subsections:
 - FR I galaxies
 - Measuring the EBL
 - Potential discovery of new sources
- Would be nice to have something for these two:
 - Cosmology and fundamental physics
 - Searching for axion-like particles

Galactic monitor

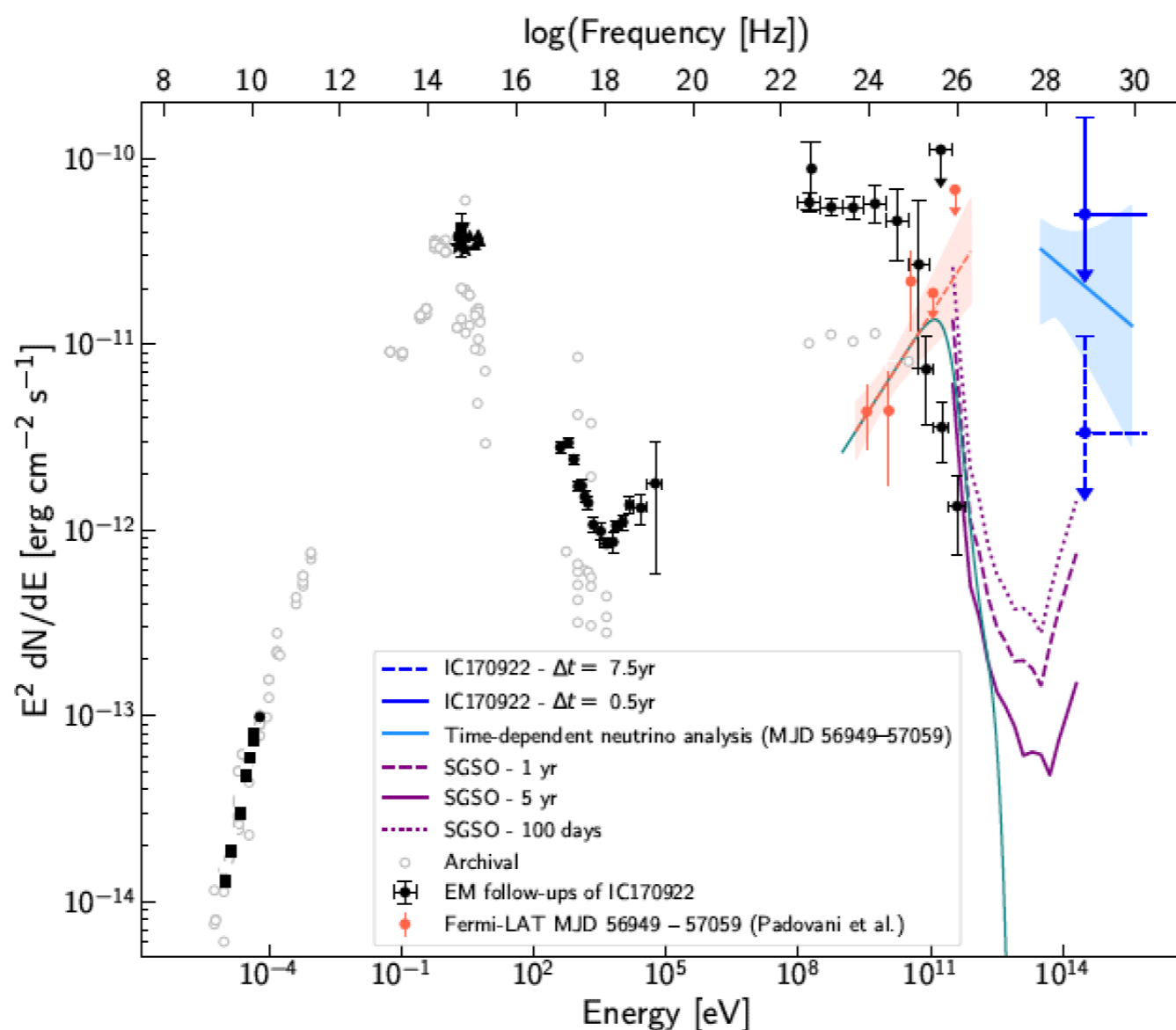
- This section has only a single subsection, on binaries and microquasars, so it should probably be made the whole section
- General tone of the text needs some cleaning up
- Confusing table listing several potential sources, some of which would not be observable to SGSO

GRBs and gravitational waves

- Nice summary highlighting SGSO's 100% duty cycle, all-sky monitoring, and ability to search archival data
- Description of GW connection meanders and repeats itself a bit and could benefit from some tightening up of the text
- Also highlights the problem of applying event selection criteria for GW events for IACTs: obviously no such problem for SGSO
- Figure 9 shows GRB timescales but is not referenced in the text

High energy neutrinos

- Key points made: SGSO can look for EM counterparts on all timescales and without the need for choosing which events to follow up
- Less convincing point: SGSO can help evaluate coincidence significance by measuring rate of blazar flares
- Should we mention Km3Net's improved angular resolution and relevance for southern sky?



Multi-messenger correlations

- AMON sub-threshold analysis
- Coincidence with IceCube-Gen2 or Km3Net
- Potentially move the UHECR connection from the AGN section here

Exploratory searches for new transient phenomena

- Largely dedicated to FRBs, refers to models predicting TeV emission
- Archival data of SGSO can be used to search sky if new transients are detected in older data of other experiments (like FRBs were)
- SGSO can discover its own new transients

Recommendation

- For those interested in AGN transients, let's have a short discussion this afternoon to address:
 - What are the key strengths of SGSO relevant for AGNs?
 - Do we think that SGSO can address topics like acceleration mechanisms? If so, we should say how. If not, take this out.
 - Any other ways to improve the AGN section