Temperature (Time?) Variation in Muon Detection Rate

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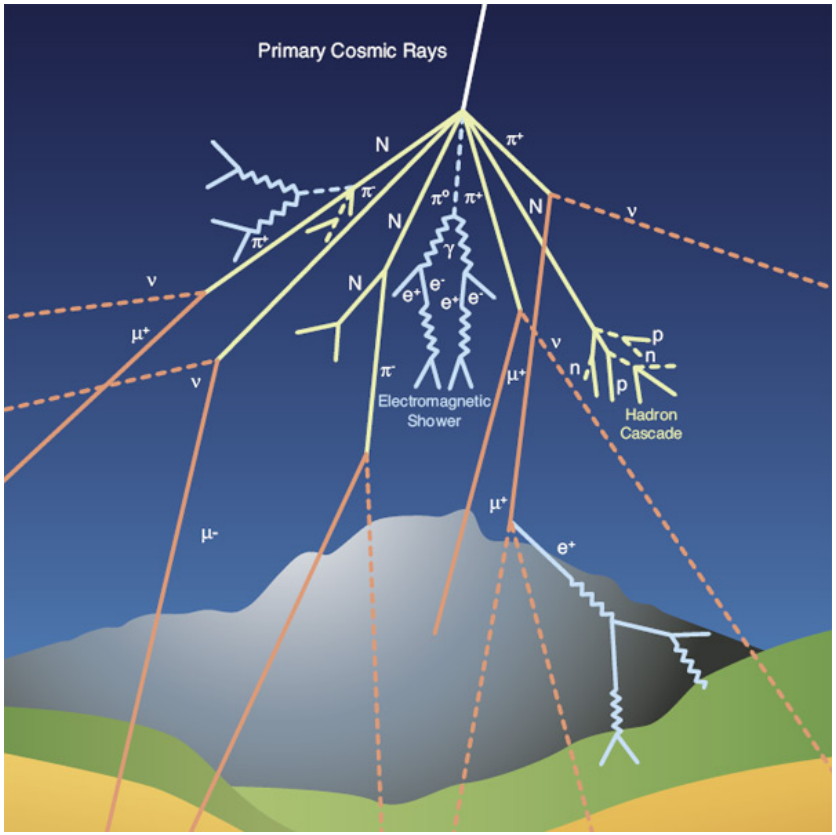
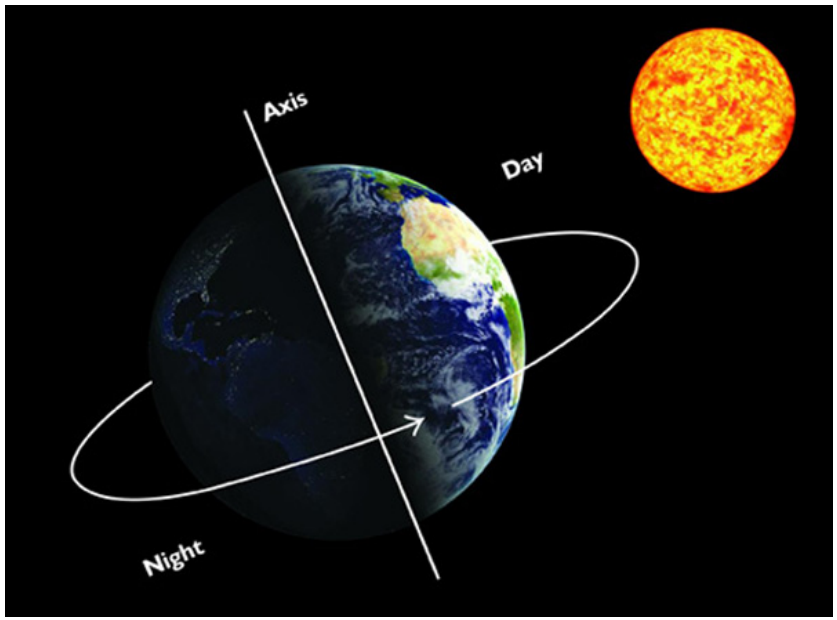
Muon Sources

- Cosmic Rays → Muons
- Sun Cosmic Rays → Day/Night rate variation?

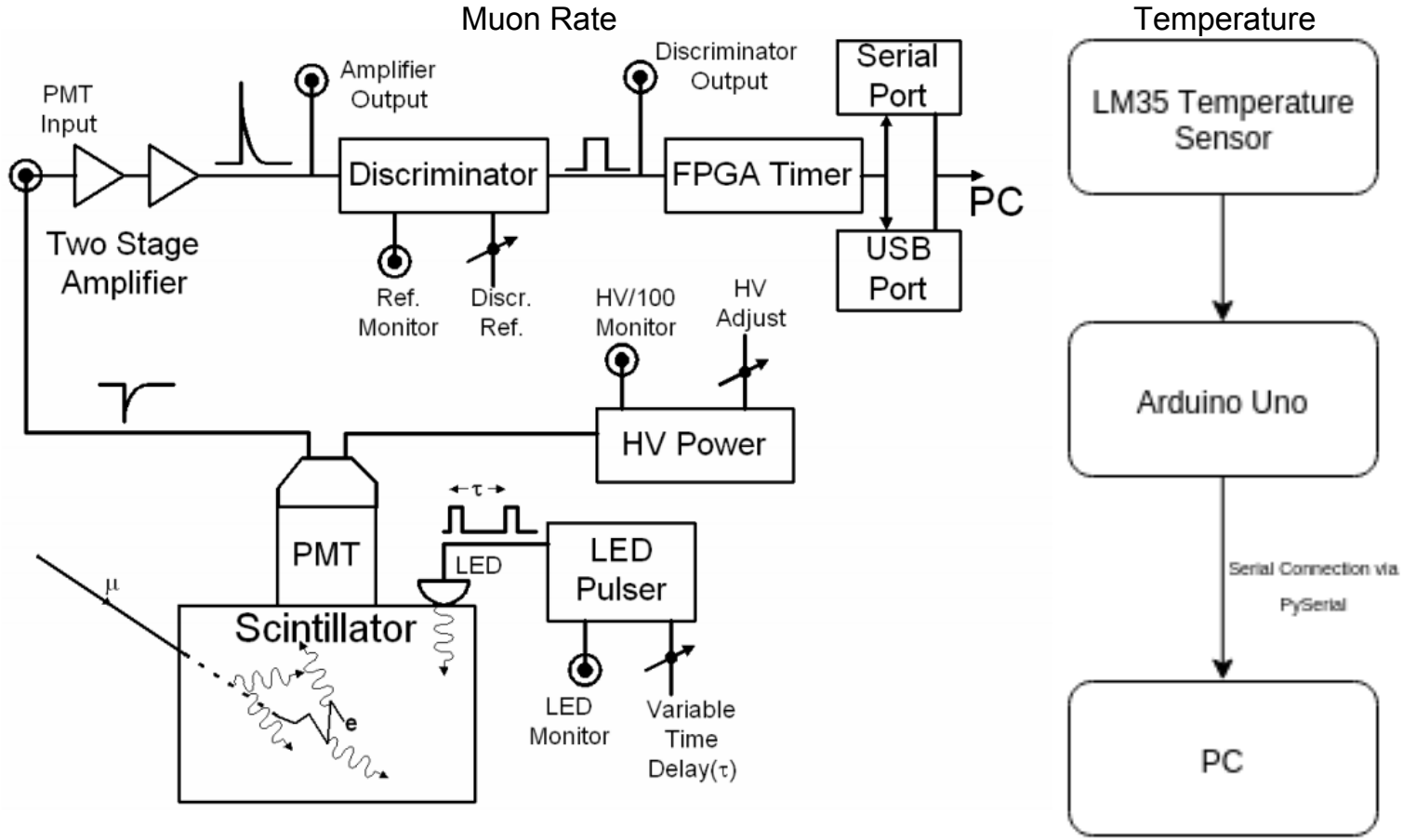




Confounding Effects

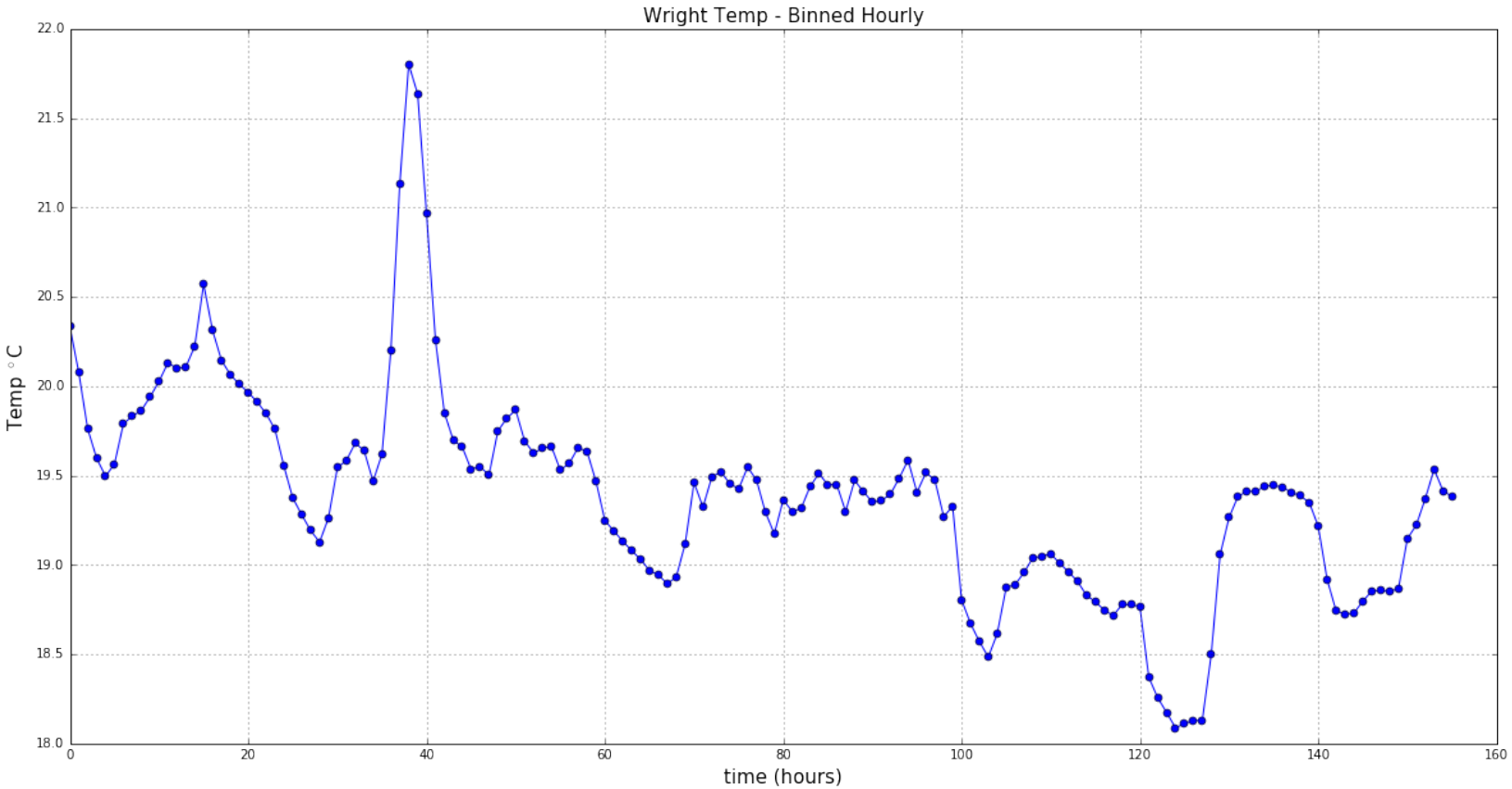
- Temperature affecting Detector
- Solar Activity

Experimental Setup

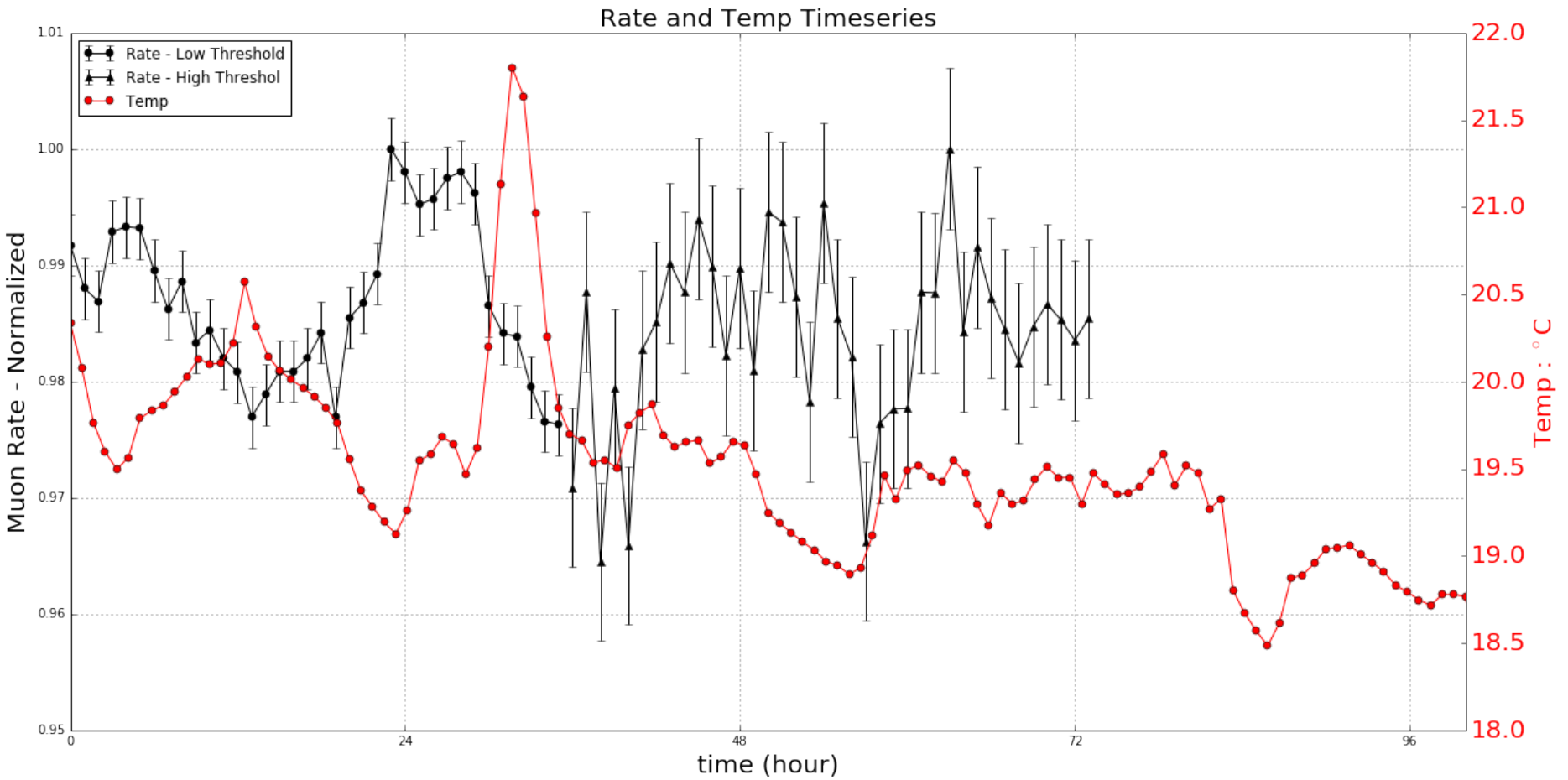


Left Diagram from [1]

Results - Hourly Temperature Variation

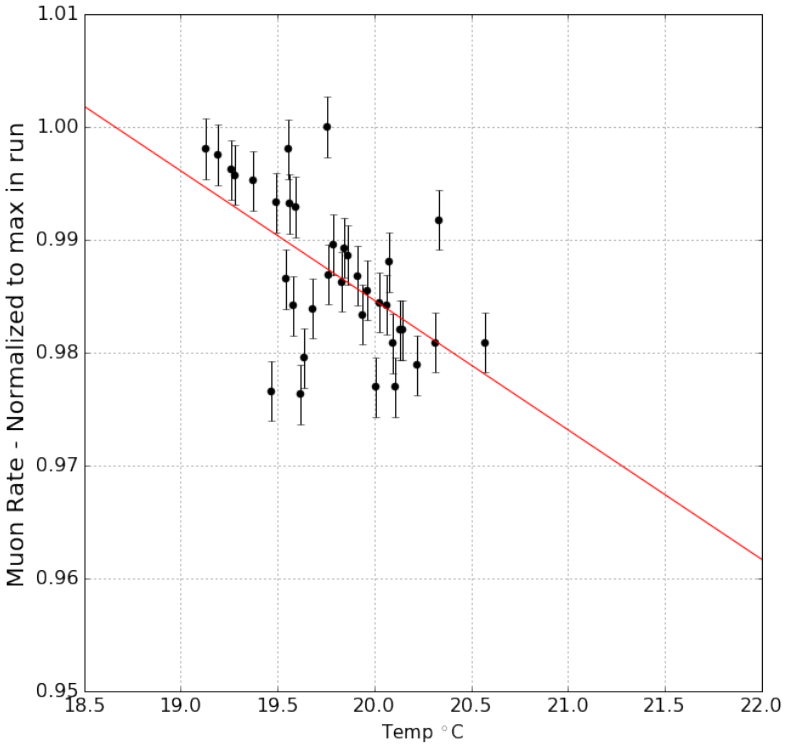


Hourly Temperature Variation with Muon Rate

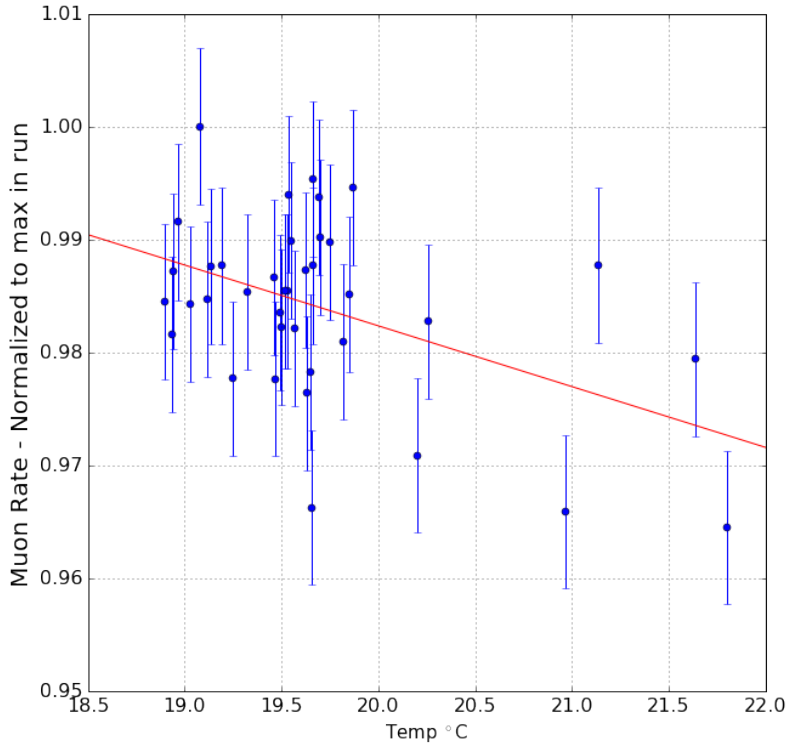


Temperature Rate Correlation

Data Set	Slope	$\tilde{\chi}^2$
Low Threshold	-0.0114 ± 0.0028	4.681
High Threshold	-0.0053 ± 0.0017	1.099



200 mV Threshold



400 mV Threshold

Possible Explanations

- Threshold voltage drift
- Photomultiplier Gain
- Electronics Efficiency
- Noise
- Muons only come inside when its cold out

Next Steps...

- Fix Muon Rate Data collection
- Record Threshold voltage to try to detect drift
- Correct for temperature offset
- Better Data $\rightarrow$ More Complicated Temperature Dependence

[1] T.E Coan, J. Ye, *Muon Physics*, Accessed from Blackboard site

[2] J. Stalnaker, Personal Correspondence

[3] N. Ramesh, M. Hawron, C. Martin, A. Bachiri, *Flux Variation of Cosmic Muons* arxiv.org/pdf/1203.0101.pdf

[4] Accessed from `http://i.cdn-surfline.com/forecasters/blog/2013/12_dec/121813_3.jpg`