COSMIC RAY FLUX VARIATIONS COMPARED TO ATMOSPHERIC PRESSURE VARIATIONS

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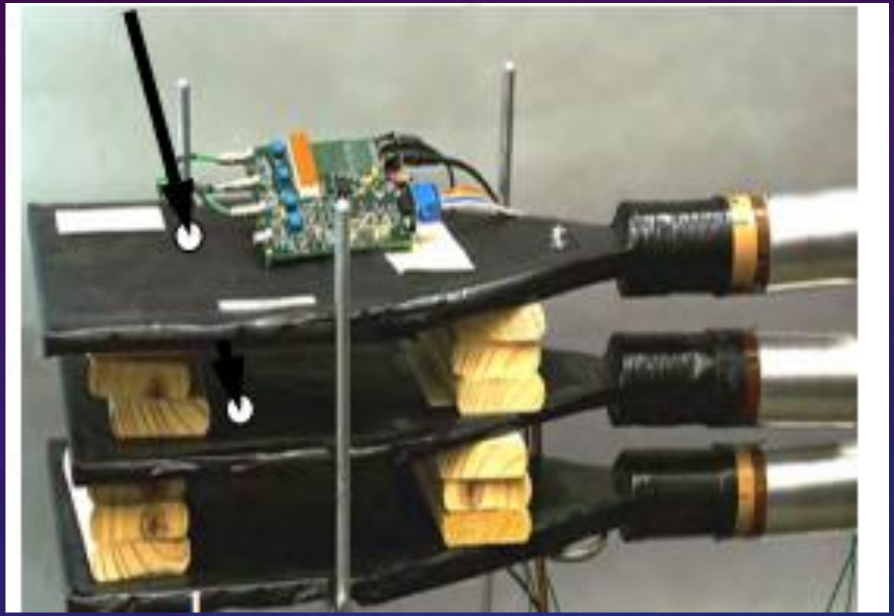
INTRODUCTION



- Muons travel into the counters very quickly.
- The way we determine what is a muon and what isn't is by plateauing the PMTS and then finding the coincidence rate.
- If two counters are hit in a very small amount of time the chance of it being a muon is high.

FLUX

- The average rate of 2-fold coincidence events, *# events*, was measured to be 10 Hz; to calculate the flux, we used the following formula:

$$\phi = \frac{\frac{\#event}{seconds} * 60sec/min}{area\ of\ counter\ cm^2 * \frac{1m^2}{10{,}000^2}} = \text{counts/min}*m^2$$

STUDY OF PRESSURE VS FLUX

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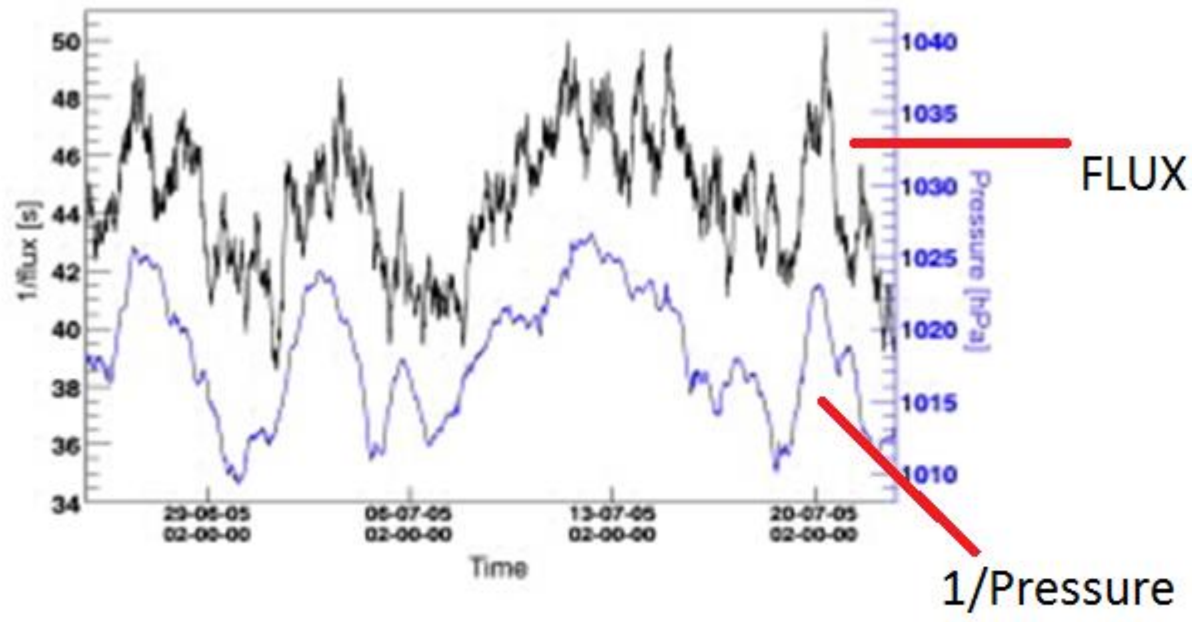


Fig. 6. Time development of the inverse flux of detected showers and atmospheric pressure in time. In the plot, strong influence of the atmospheric condition on the measured event rate is evident.

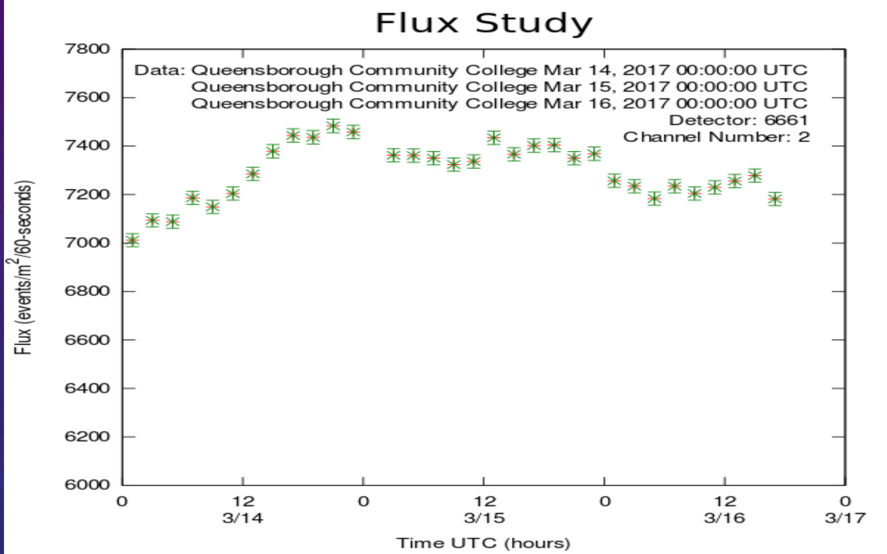
ALTA/CZELTA-A Spare Very Large Air Shower Array: Overview of the Experiement and First Results,Karel Smolek Et.Al., Proceedings of the 31st ICRC,EODZ 2009.

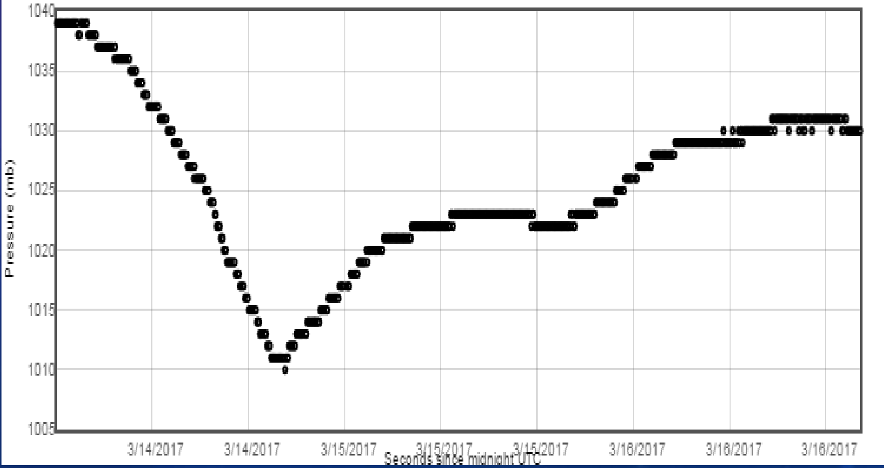
FLUX CALCULATIONS

Counter 1 flux:

$$\Phi = \frac{\left(\frac{10\ events}{sec} * 60\ sec/min\right)}{802.9cm^2 * \frac{1m^2}{10{,}000cm^2}} =$$

7472.9 counts/min*m^2





EXPLANATION OF DATA

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
10C8FBF1	80	00	26	00	00	00	25	00	10C67B29	000000.004	140317	A	09	0	+0054
10C8FBF1	00	00	00	28	00	00	00	00	10C67B29	000000.004	140317	A	09	0	+0054
10C8FBF1	00	00	00	36	00	37	00	34	10C67B29	000000.004	140317	A	09	0	+0054
125BCFA9	80	00	25	00	26	00	23	00	1243F369	000001.012	140317	A	09	0	+0054

	Hex	Decimal
J1	10C67B29	281443113
J2	1243F369	305443113

- For calculations having to do with the data first we calculated the amount of clock periods the data is separated into.
- To do that we took the number (in hex) of time passed in one seconds (column j) and subtracted it from J's initial value.
- In one second the 25 MHz clock has J1-J2(in decimal) clock periods, this is equal to 2.5x10^7 40 ns clock periods.
- In other words 2.5x10^7*40ns is equal to one second.

COLUMN B-I

B	C	D	E	F	G	H	I
80	00	26	00	00	00	25	00
Denotes new “event” i.e: Muon	Empty, no falling edge in this period.	0010 0110, From hex to binary, rising edge in channel 2.	Empty, no falling edge in this period.	Empty, no falling edge in this period.	Empty, no falling edge in this period.	0010 0101, From hex to binary, rising edge in channel 4.	Empty, no falling edge in this period.

	0-4	5	6	7
26	01100	1	0	0
	Count of rising edge	Channel edge tag,(1 valid, 0 =no rising edge)	Always 0, not used.	Indicates a new event only in column b, always 0 in all other rising edges.

RISING AND FALLING EDGE

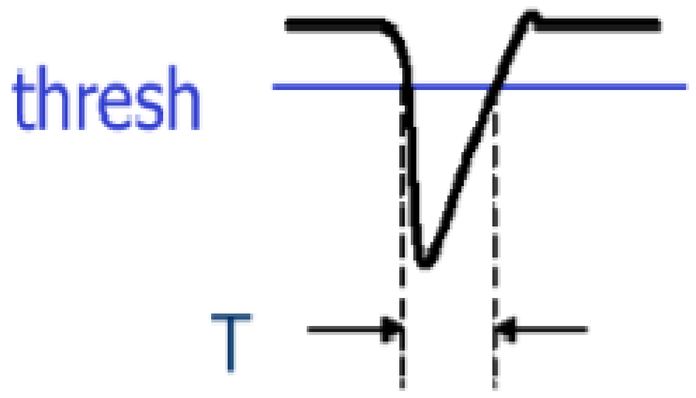


Figure 10. Typical PMT pulse from which the time over threshold (ToT) can be

COLUMN K-O

K	L	M	N	O	P
000000.004	140317	A	09	0	+0054
000000.004	140317	A	09	0	+0054
000000.004	140317	A	09	0	+0054
000001.012	140317	A	09	0	+0054

- Column K gives the time from midnight that day and is separated into HH,MM,SS,MS.

  -An example is 000000.004 which denotes 0 hours , 0 minutes, 0 seconds.
- Column L gives the date and is separated into DD,MM,YY.

  - An example is 140317 which denotes 14th , March, 2017.
- Column M checks to see if the GPS signal is valid or not, A means valid, V means not valid, this data is excluded automatically.
- Column N is the number of satellites that can be seen.
- Column O denotes whether the status of the DAQ board; 0 means valid , 1 means invalid, this is also excluded if 1.
- Column P is the time delay in milliseconds between the 1PPS pulse and the GPS data interrupt.