Determination of the Correlation Function between the Stations vs. time Lag(Jang Bogo Vs. McMurdo)

Presented by

Kittinan Jomprasert (Undergraduate)

Department of Physics , Faculty of Science , Chiang Mai University , Chiang Mai , Thailand

OUTLINE

From : Wikipedia(2017)

INTRODUCTION

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METHODOLOGY

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RESULTS

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CONCLUSION

INTRODUCTION

From : Wikipedia(2006)

COSMIC RAYS

↓

JBGO&MCMU STATION

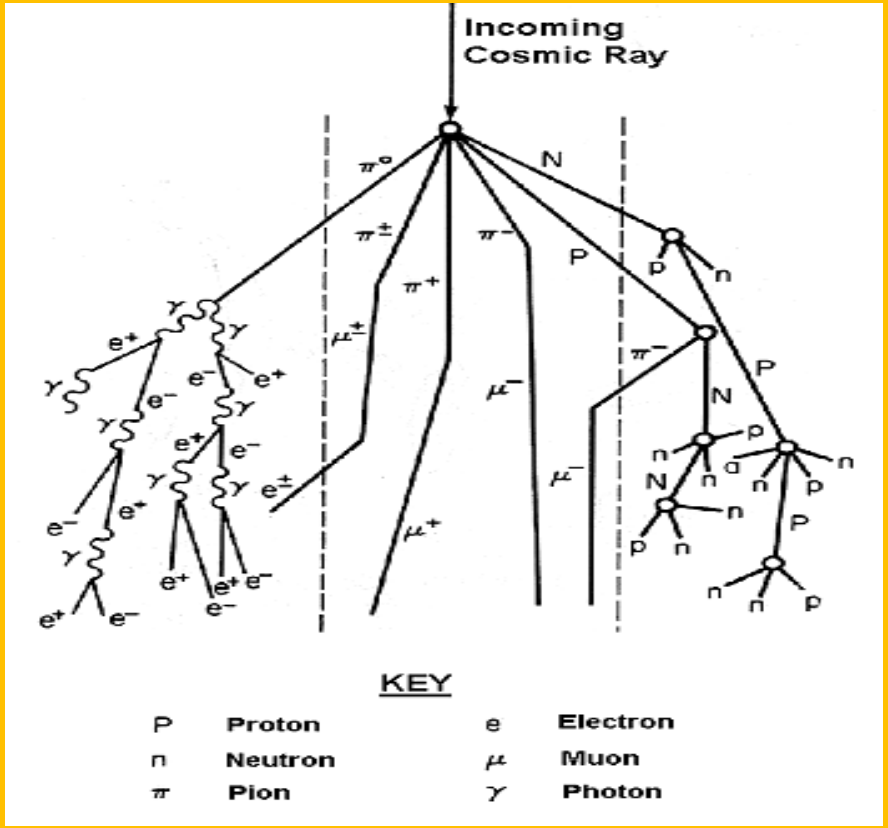
↓

NEUTRON MONITOR

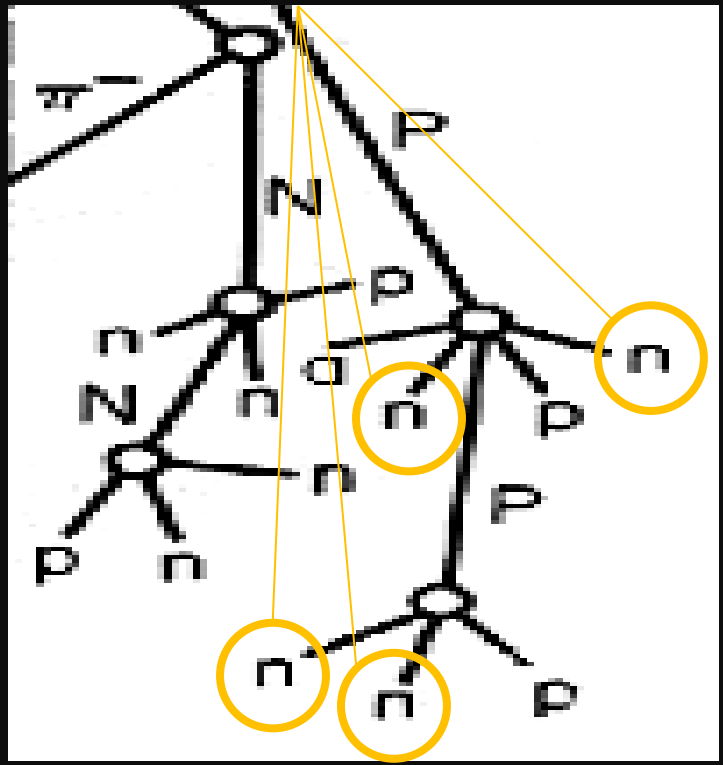
↓

TIME LAG

COSMIC RAYS



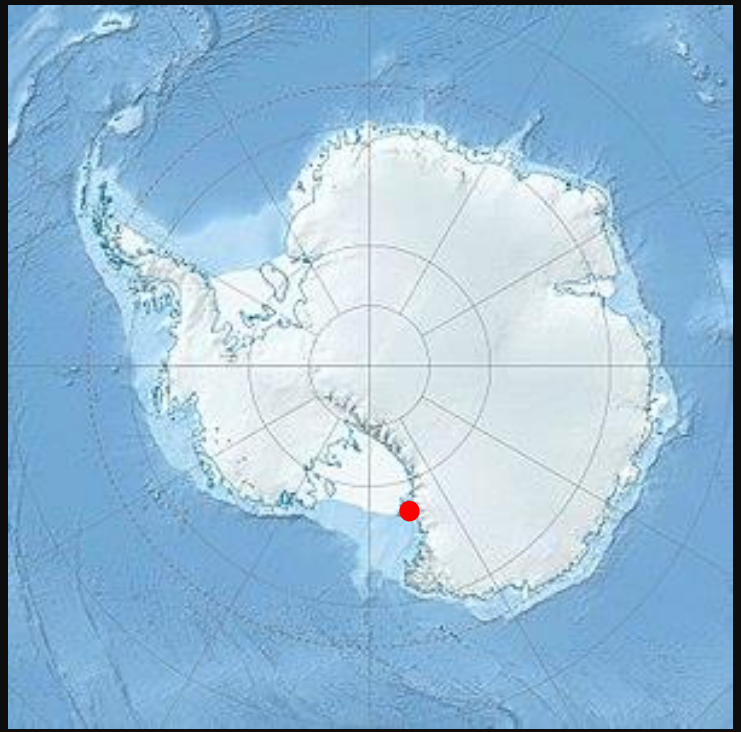
WE ARE INTERESTED IN MEASURING NEUTRONS



From : www.scielo.br (2019)

McMurdo & Jang Bogo NEUTRON MONITER STATIONS

Jang Bogo



McMurdo

McMurdo & Jang Bogo NEUTRON MONITER STATIONS

- McMurdo NM station (from http://www.nmdb.eu)

Specifications:	
Detector	Standard 18-NM64 neutron monitor in three units of six BF3 counters.
Geographic latitude	77.90° S
Geographic longitude	166.6° E
Altitude	48 m
Effective vertical cutoff rigidity (Epoch 2010.0)	0.3 GV
In continuous operation since	1960-05-11
Detailed station information	11 May 1960 - 20 October 2016

From : Wikipedia(2017)

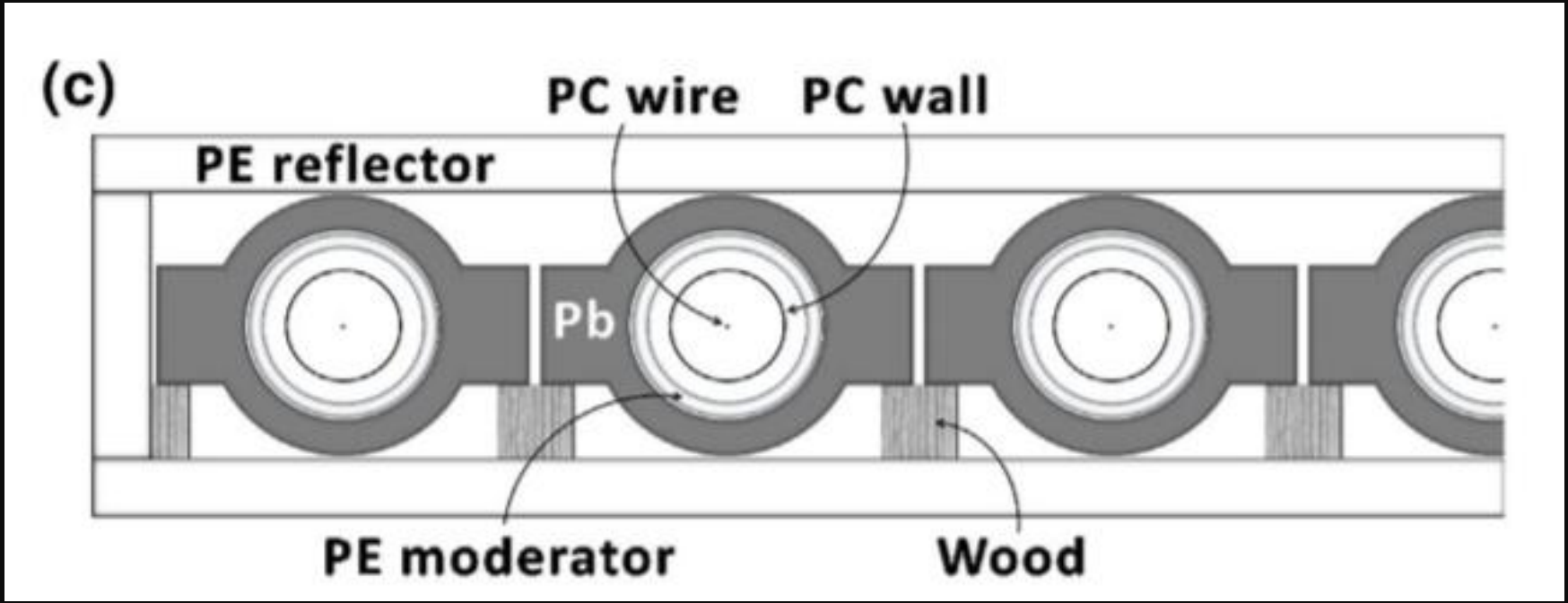
McMurdo & Jang Bogo NEUTRON MONITER STATIONS

- Jang Bogo NM station (from http://www.nmdb.eu)

Specifications:	
Detector	Standard 6-NM64 neutron monitor (1 tube has broken)
Geographic latitude	74.62° S
Geographic longitude	164.23° E
Altitude	29 m
Effective vertical cutoff rigidity (Epoch 2010.0)	0.3 GV
In continuous operation since	2015-12-16
Detailed station information	16 December 2015 - present

From : Wikipedia(2006)

NEUTRON MONITOR (NM-64)



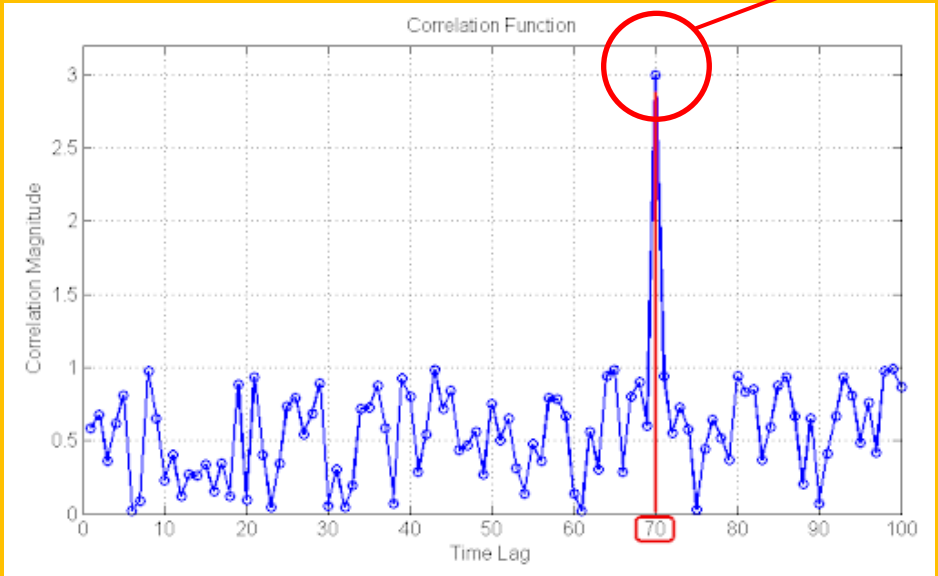
From : Ruffolo et al. (2016)

NEUTRON MONITOR(NM-64)

Example

Image Credit : Cosmic Rays and Polar Science Research Group

TIME LAG



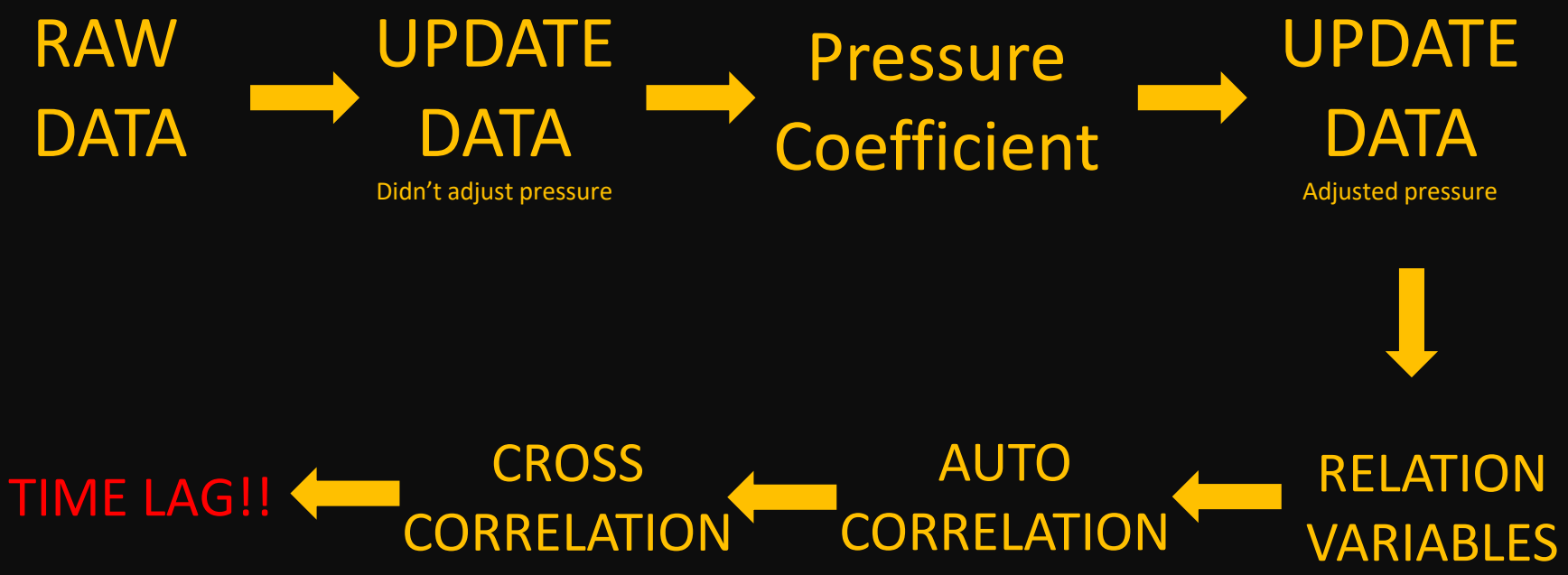
DELAY OF 2 POINTS
FROM PEAK/MAX VALUE

AUTO CORRELATION

CROSS CORRELATION

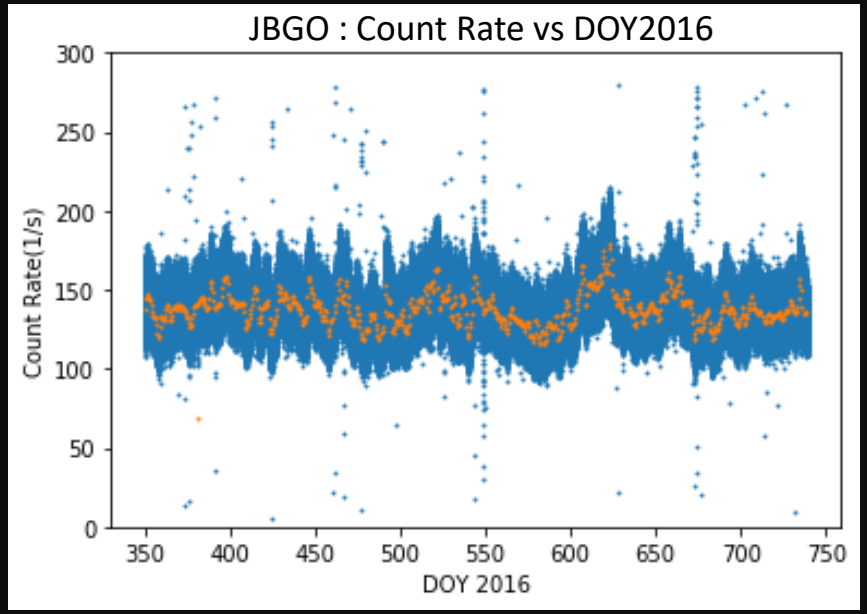
From : Panoradio (2019)

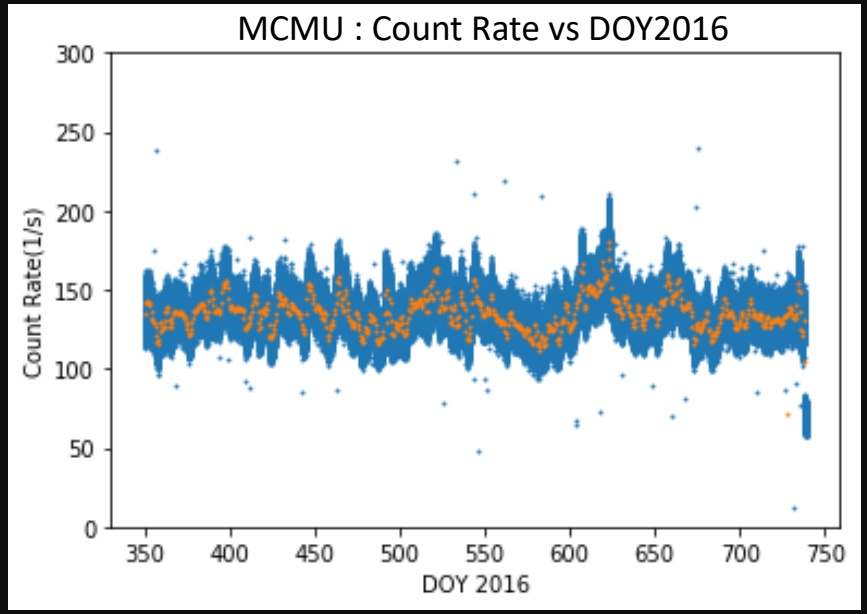
METHODOLOGY



Moving Average 24 Hr.
JBGO & MCMU

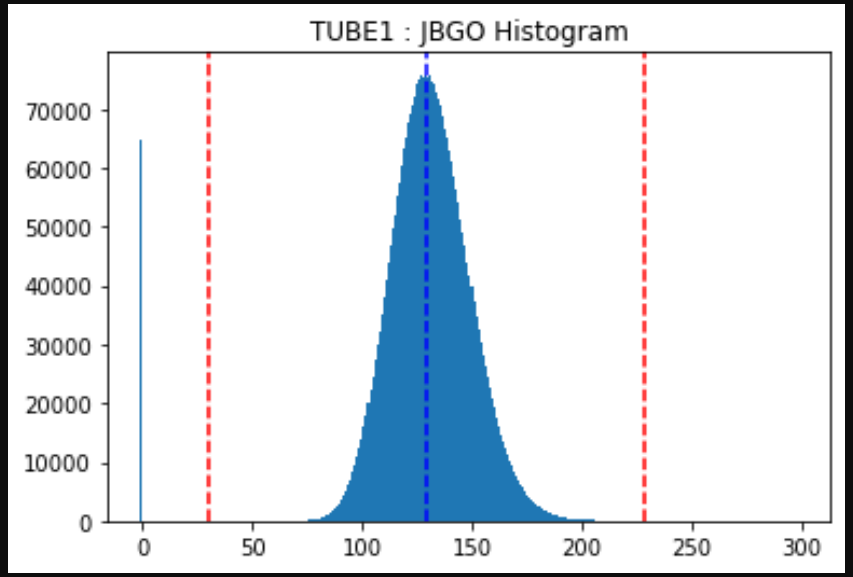
10-s data


JBGO : Count Rate vs DOY2016
Count Rate(1/s)
DOY 2016
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750


MCMU : Count Rate vs DOY2016
Count Rate(1/s)
DOY 2016
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750

Raw Data Histogram at 4 sigma

Histogram JBGO



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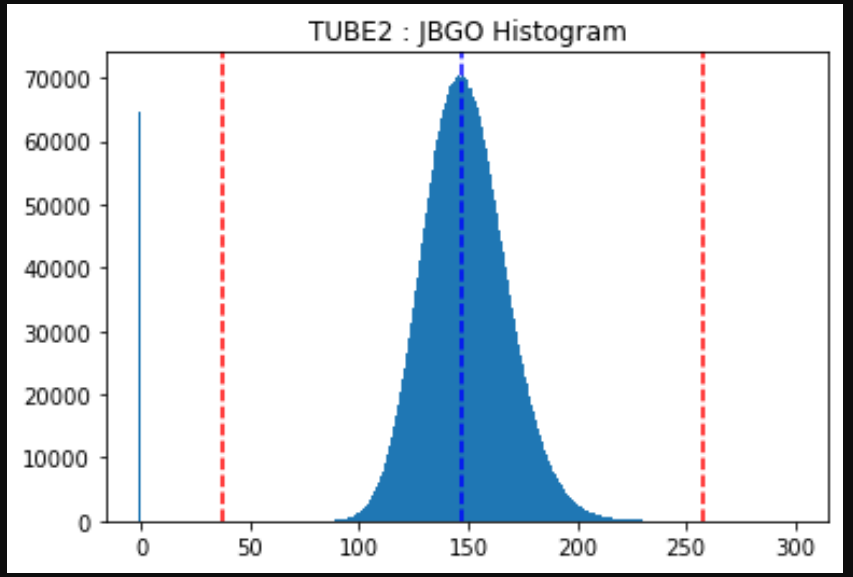

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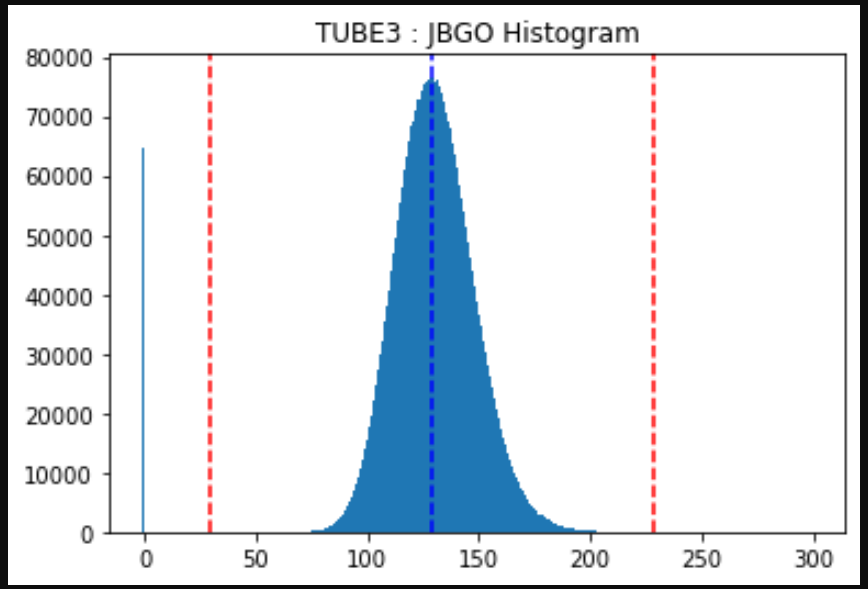
Histogram JBGO



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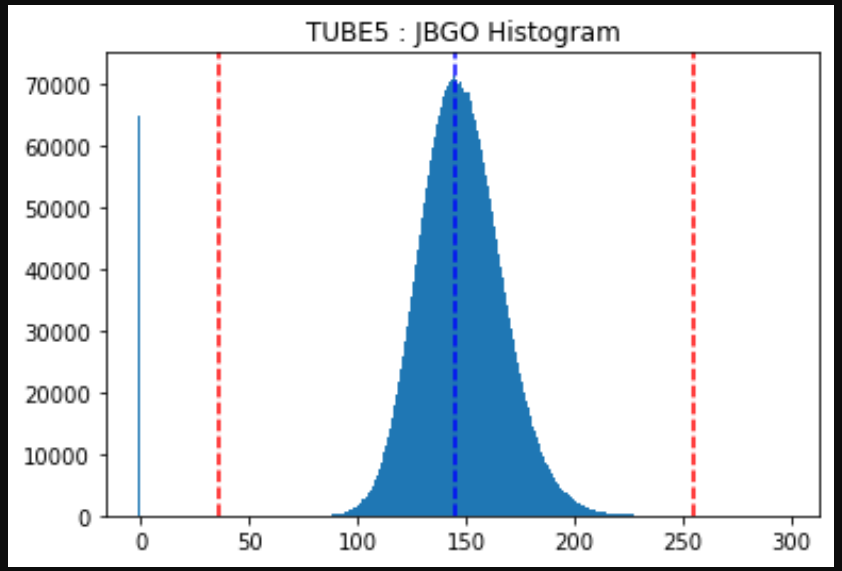
Bins = 300

Histogram JBGO



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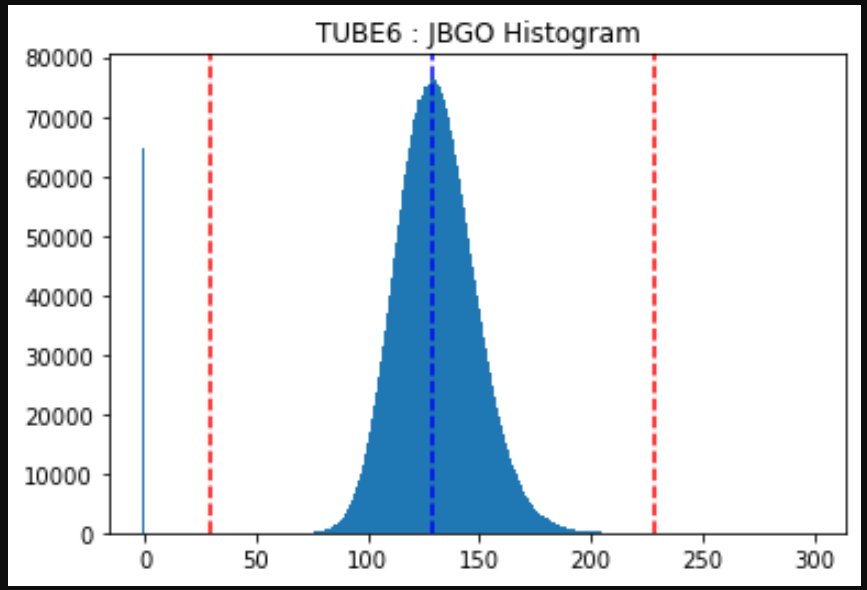

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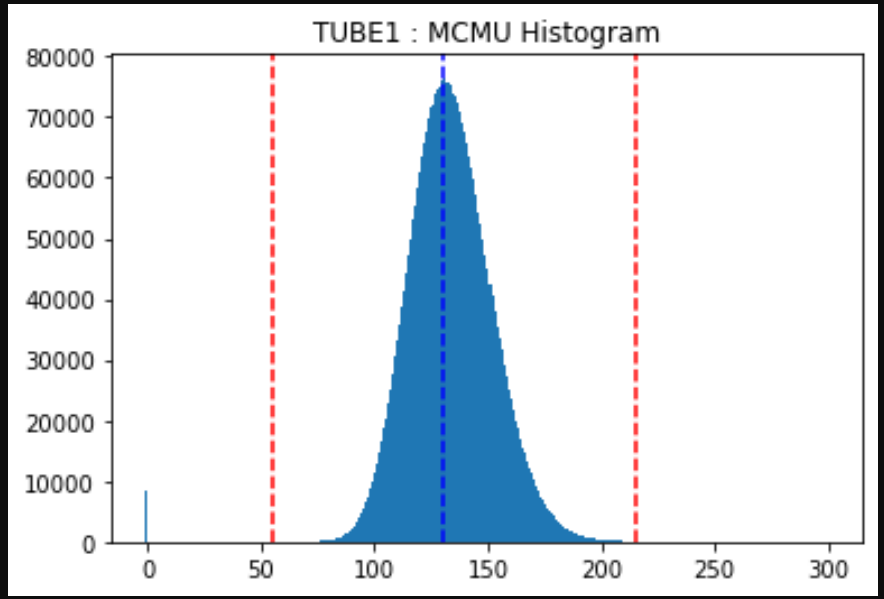
Histogram MCMU



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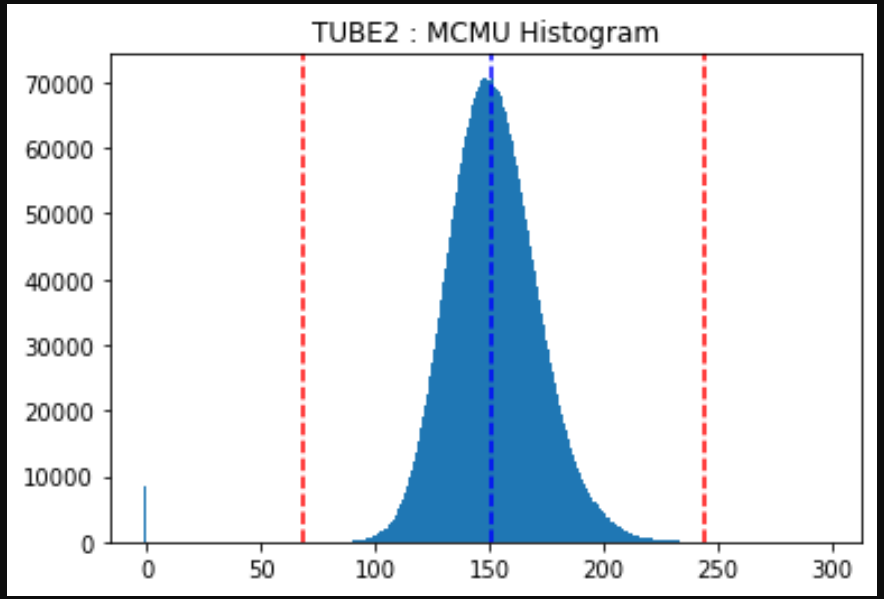

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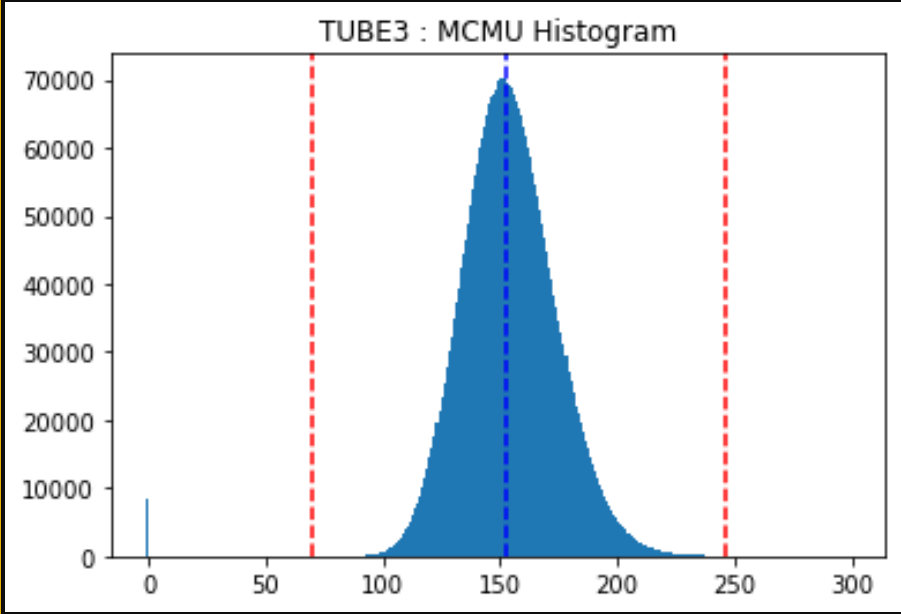
Histogram MCMU



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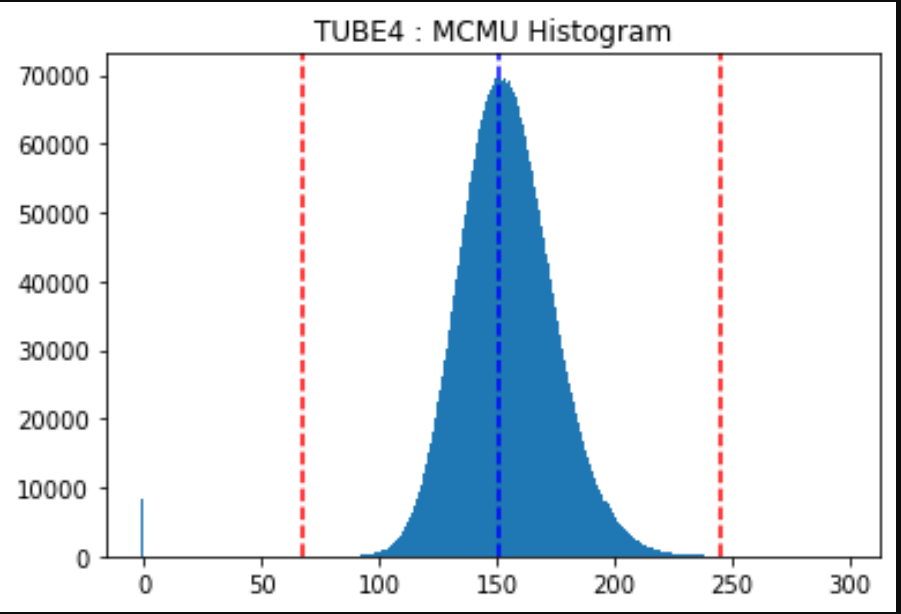

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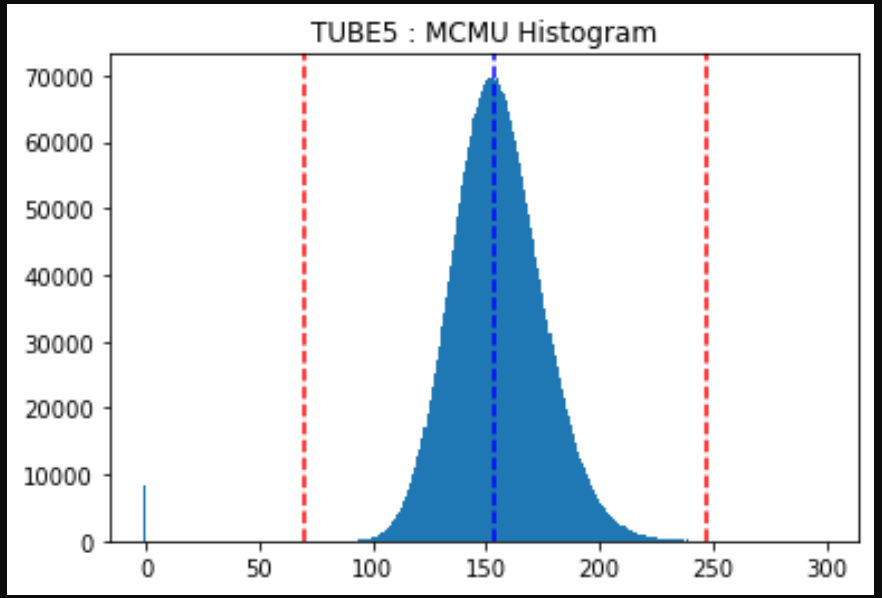
Histogram MCMU



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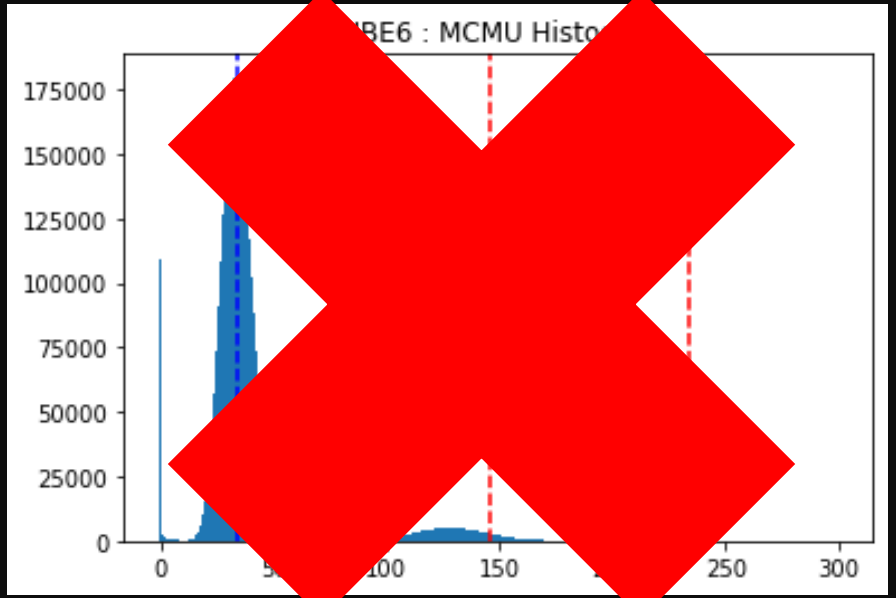

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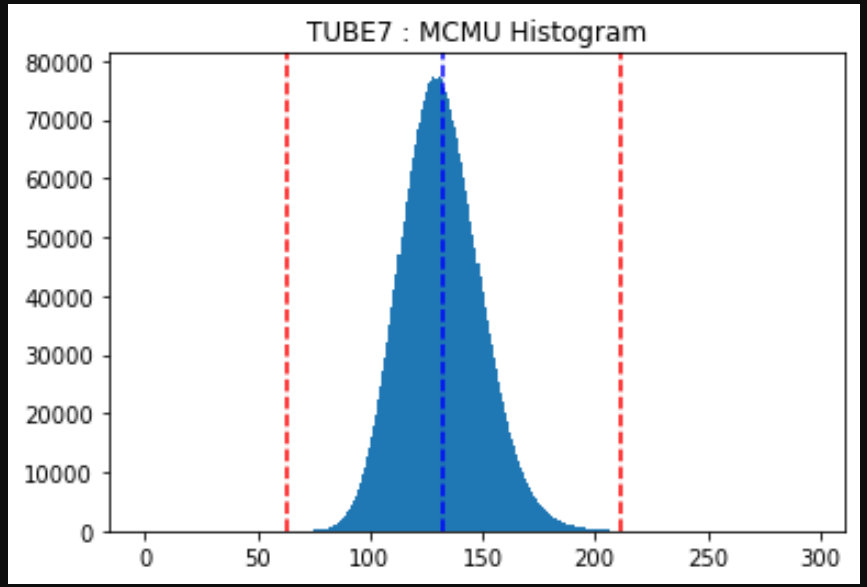
Histogram MCMU



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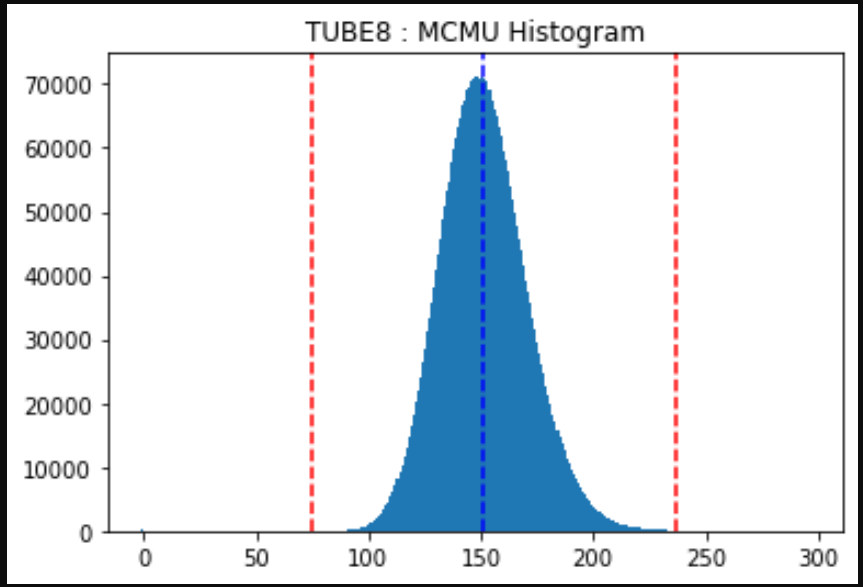

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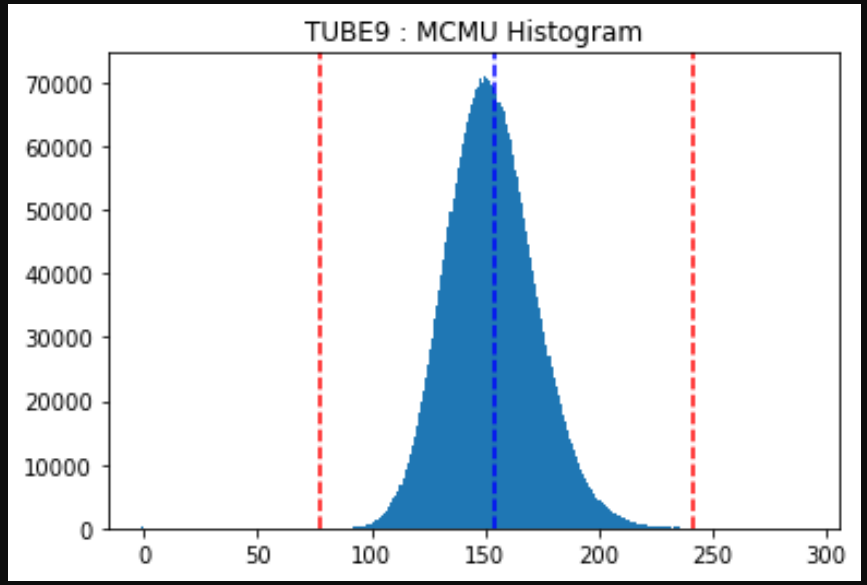
Histogram MCMU



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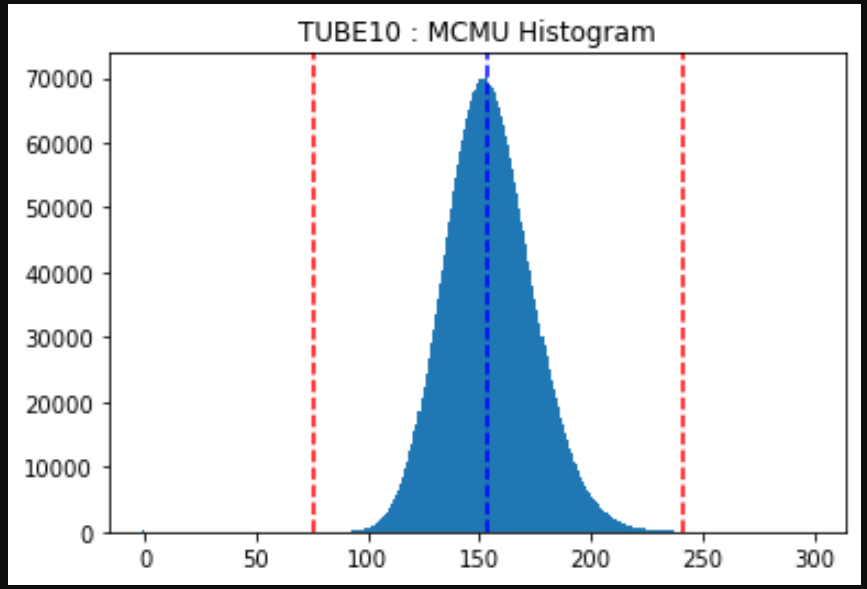

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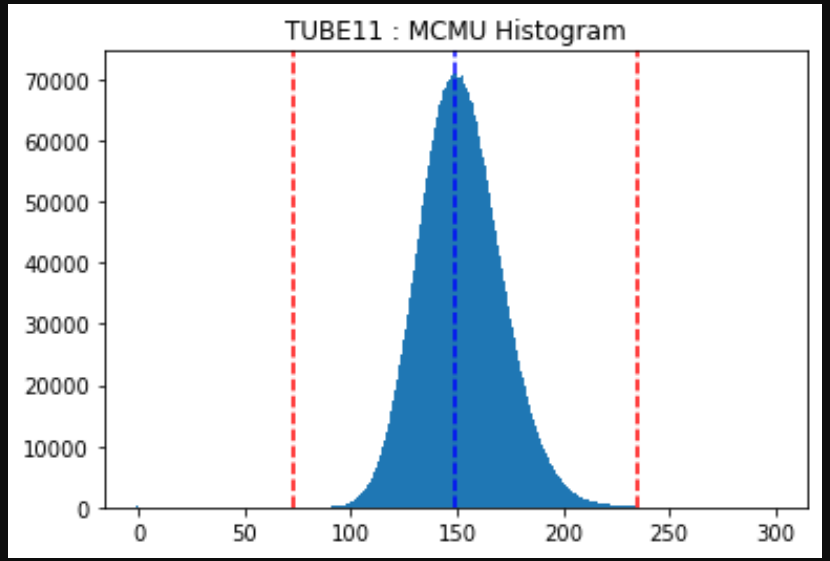
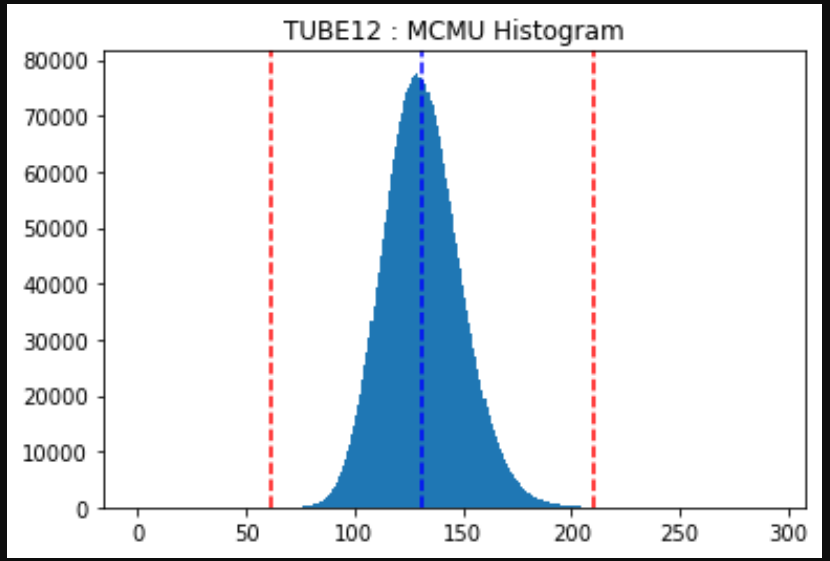
Histogram MCMU



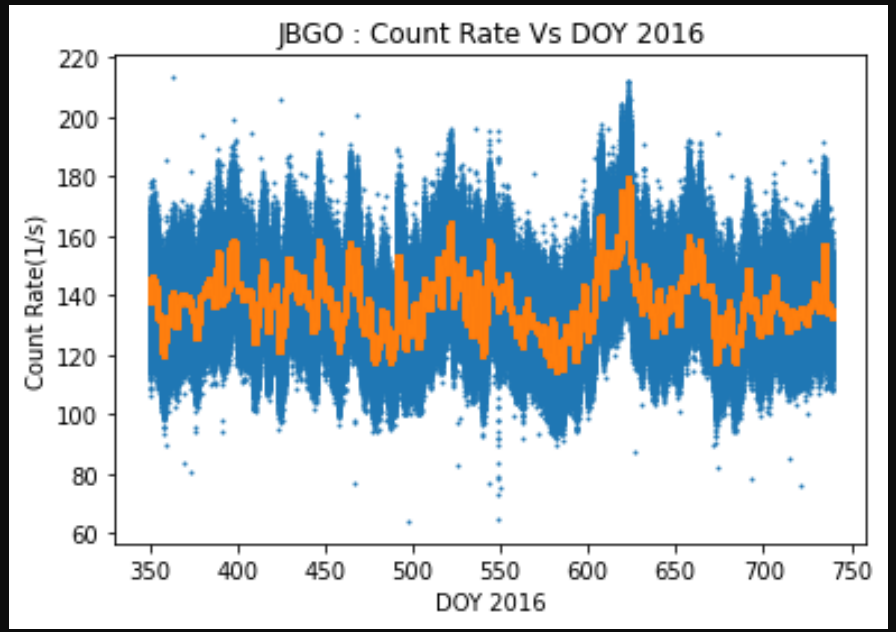


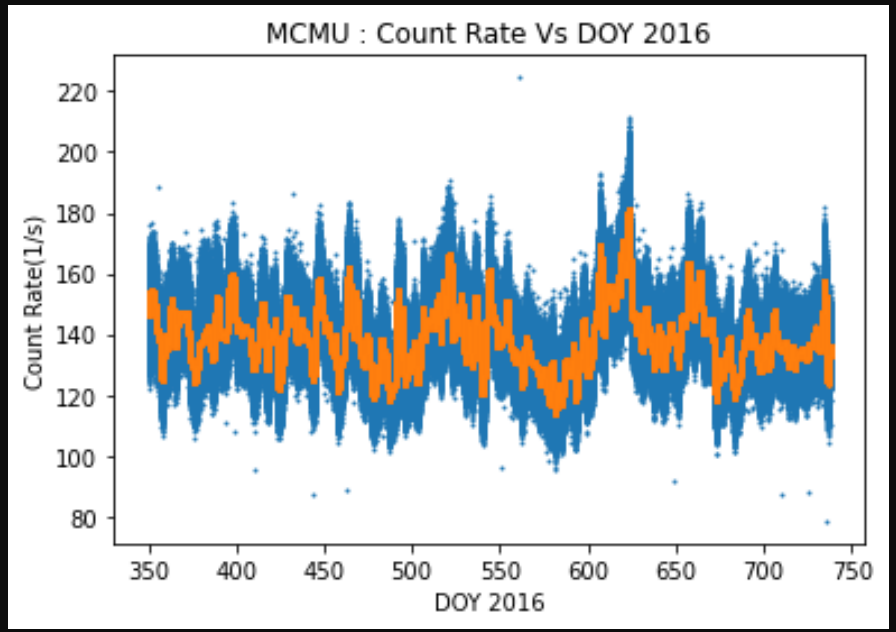
Bins = 300

Bins = 293

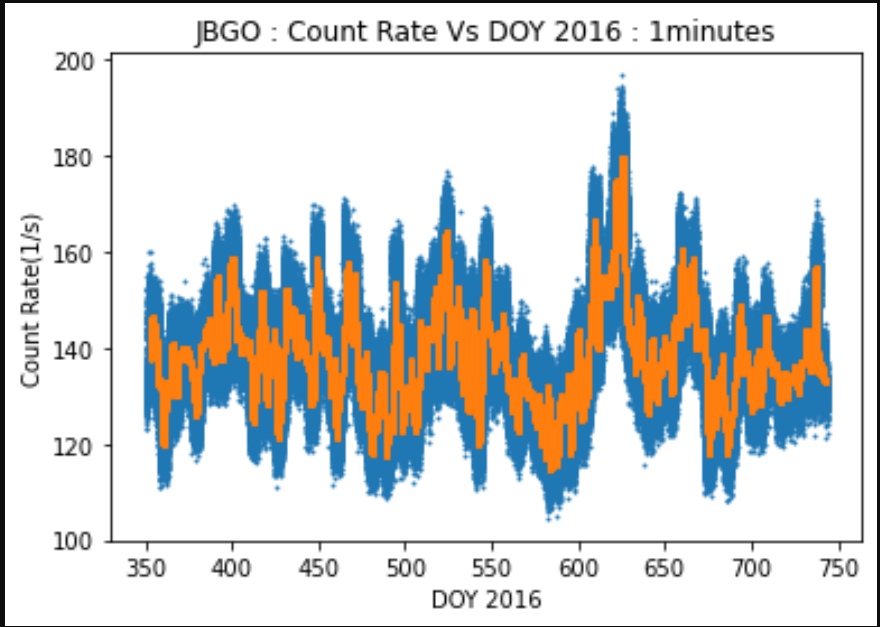
Moving Average 24 Hr.
JBGO & MCMU

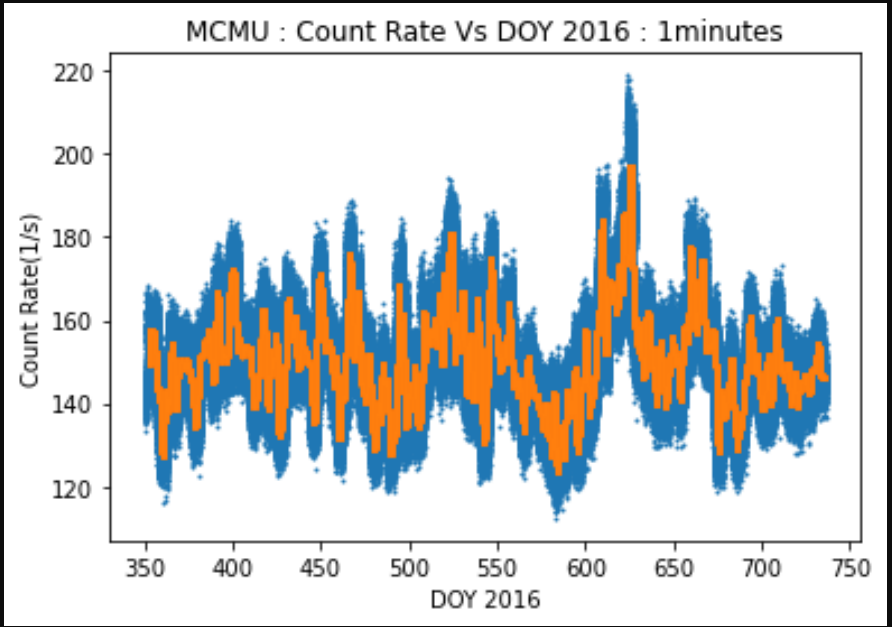
Cleaned 10-s data with 4 Sigma



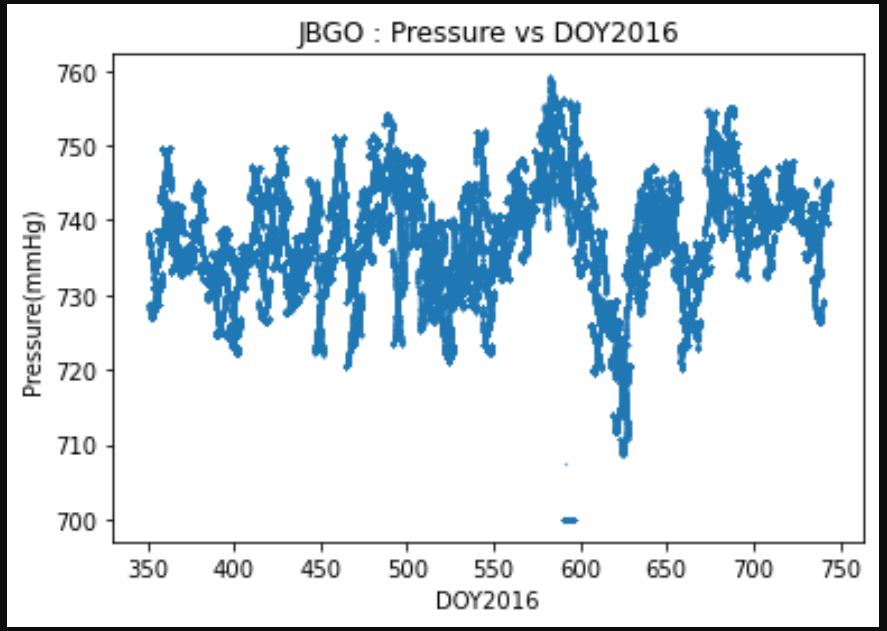


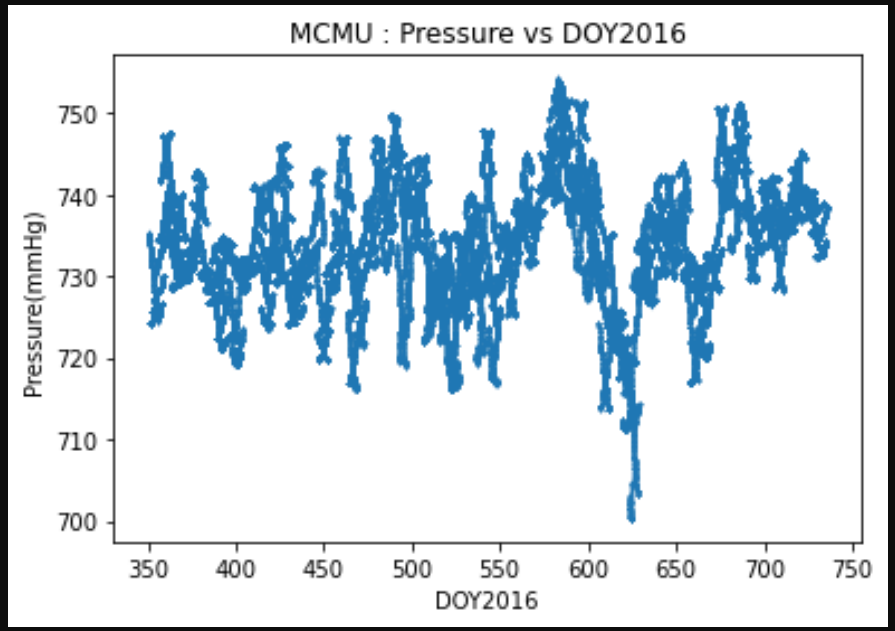
Cleaned 1-min data with 4 Sigma





Pressure vs DOY2016
JBGO & MCMU


JBGO : Pressure vs DOY2016
Pressure(mmHg)
760
750
740
730
720
710
700
350
400
450
500
550
600
650
700
750
DOY2016


MCMU : Pressure vs DOY2016
Pressure(mmHg)
750
740
730
720
710
700
350
400
450
500
550
600
650
700
750
DOY2016

Pressure Coefficient
1 Minutes Data

PRESSURE CORRECTION

$$C = C_0 e^{\beta(p-p_0)}$$

$$\ln \frac{C}{C_0} = \beta(p - p_0)$$

$$\frac{C}{C_0} = e^{\beta(p-p_0)}$$

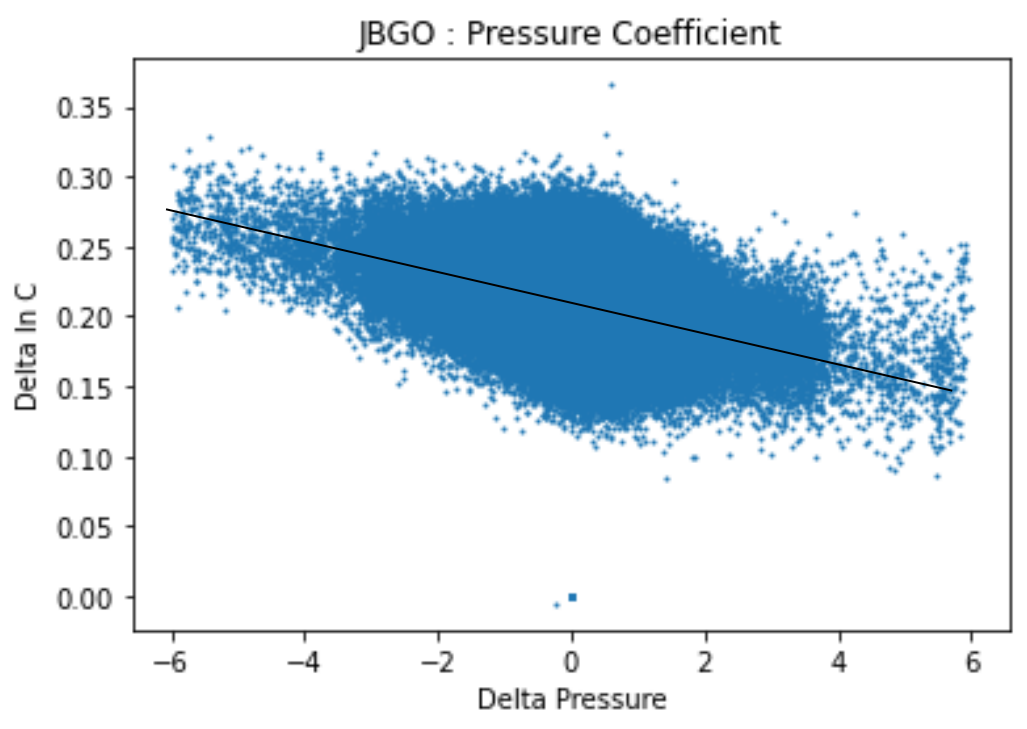
$$\ln c - \ln c_0 = \beta(p - p_0)$$

$$\ln c - \ln c_{aver} = \beta(p - p_{aver})$$

$$\beta = \frac{\ln c - \ln c_{aver}}{p - p_{aver}}$$

Pressure Coefficient (JBGO)

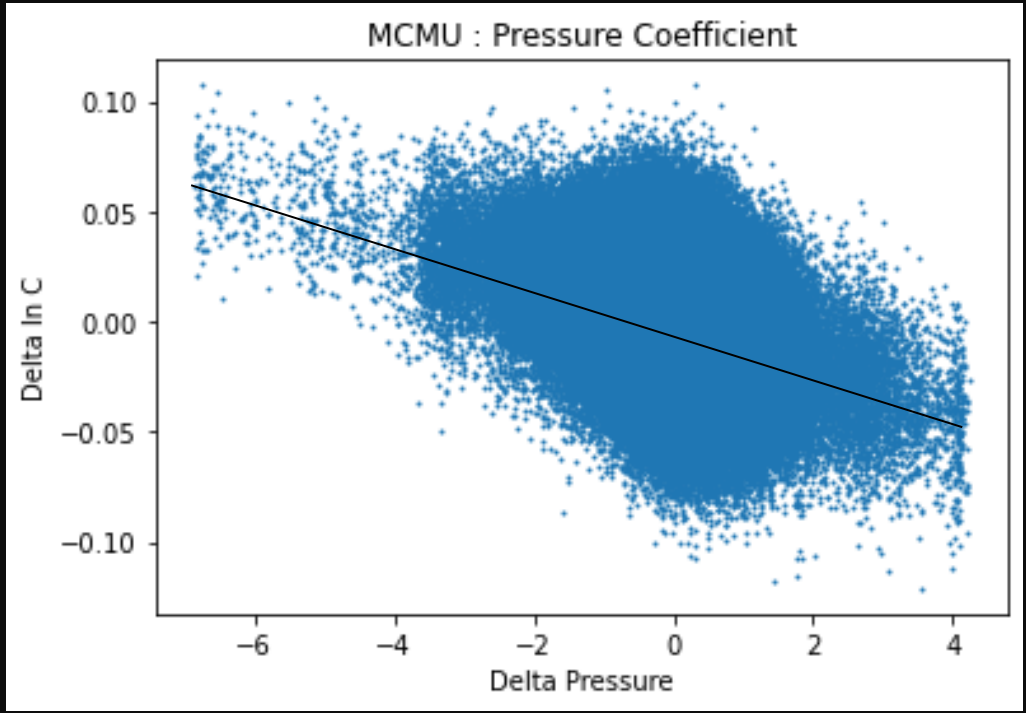
Slope = -0.009732624442658905



P_0 = 737.8157871971658

Pressure Coefficient (MCMU)

Slope = -0.010102266359612073



P_0 = 733.9848292803707