



# Preliminary Analysis of the Changvan Neutron Monitor Operation in Latitude Surveys during 2019-2020

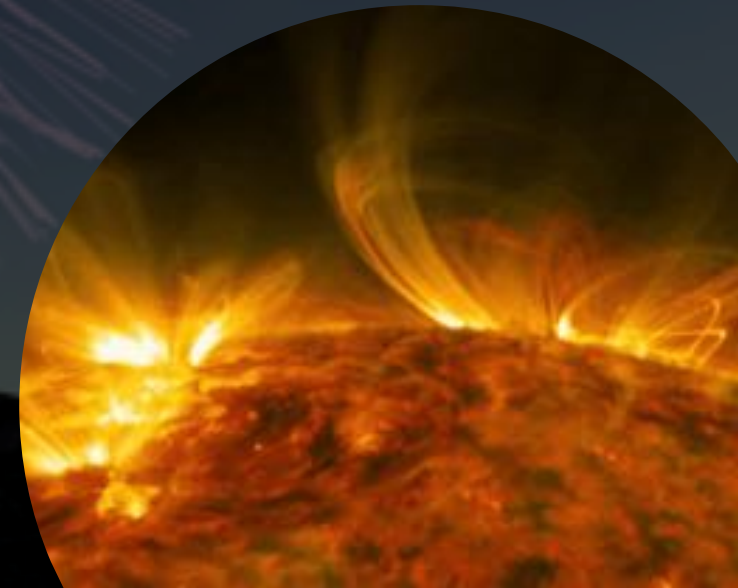
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# Cosmic Rays

- Cosmic rays are a form of high-energy radiation, mainly originating outside the Solar System
- Upon impact with the Earth's atmosphere, cosmic rays can produce showers of secondary particles that sometimes reach the surface.





# Changvan Neutron Detectors

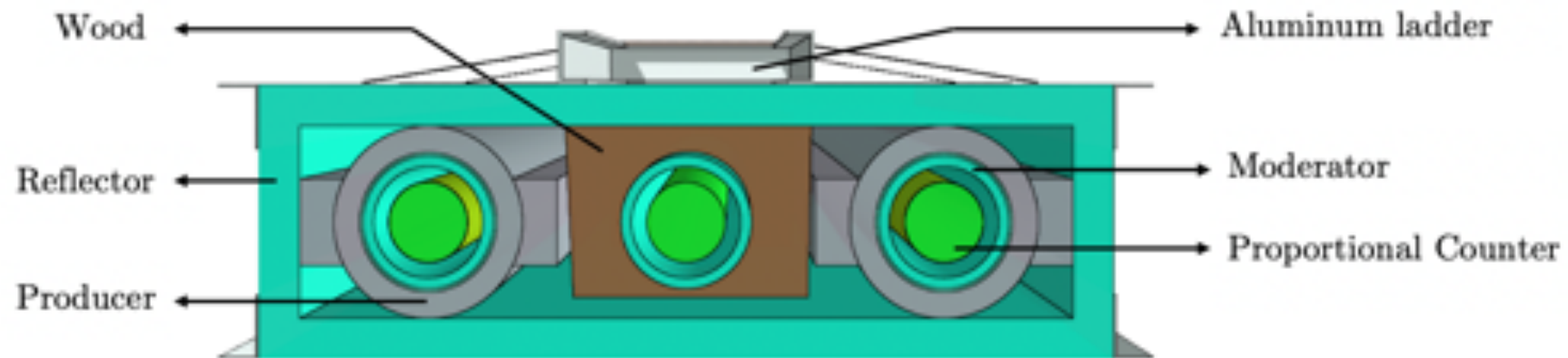
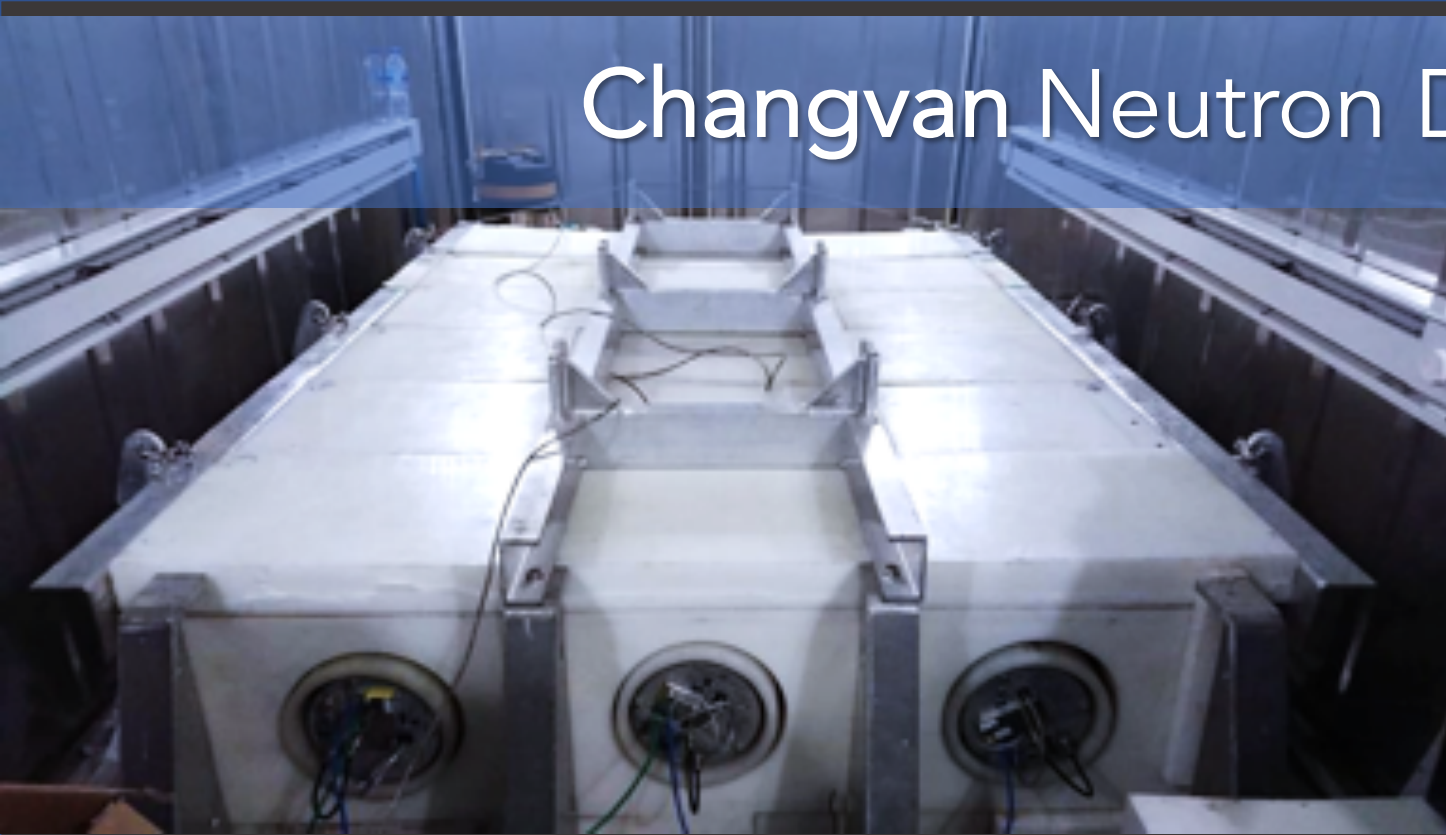


**T3: NM64**

**T1: NM64**

**T2: Lead-free NM64**

# Changvan Neutron Detectors





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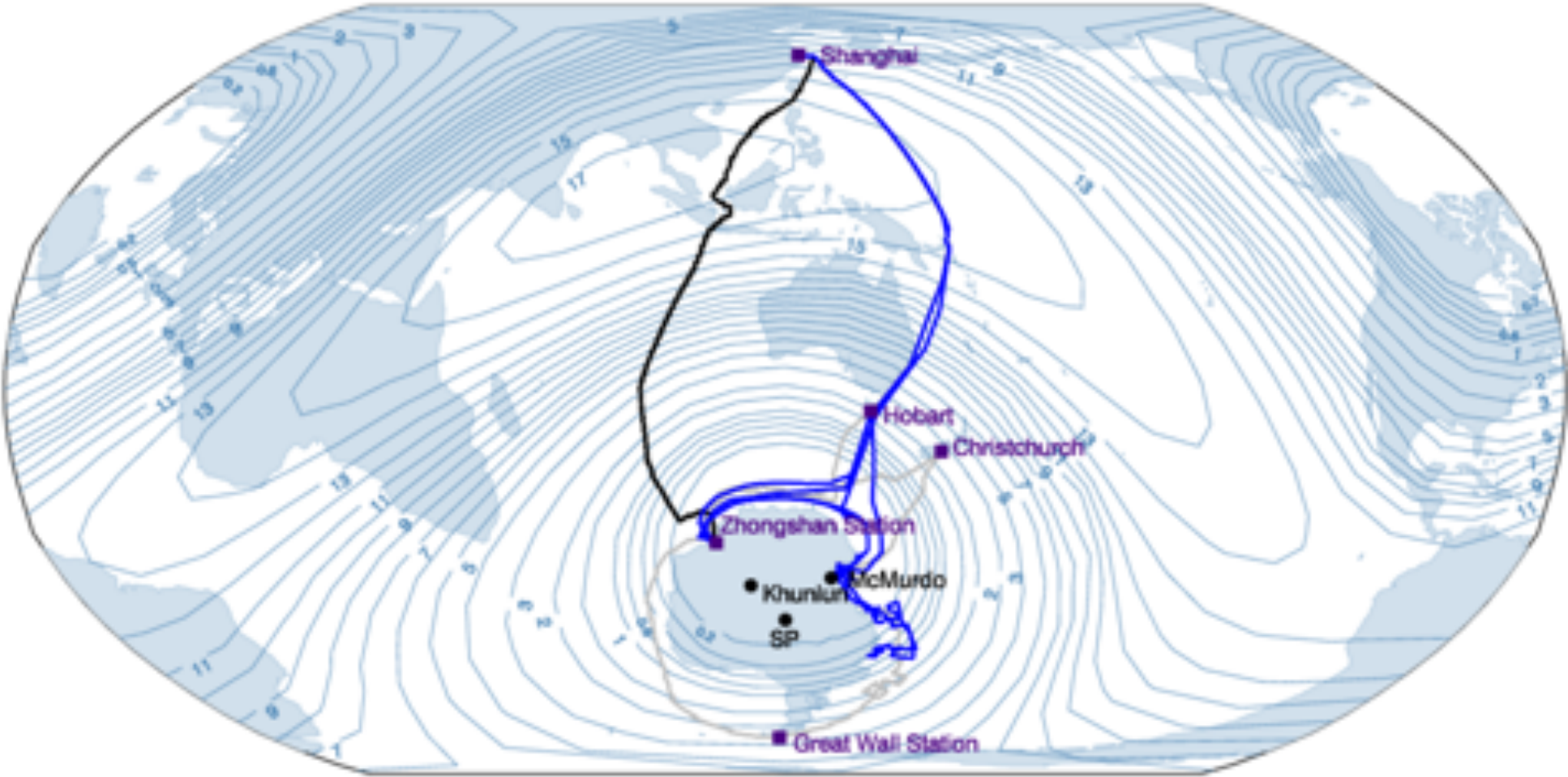
The Chinese  
icebreaking  
Xue Long  
(Snow Dragon)

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# Latitude Survey during 2019-2020

- Chinare35-XueLong
- Chinare35-Changvan
- Chinare36



1

## Distribution of 1-s

- Removed the same counts for all 3 tubes (Frozen Data) for at least 3 consecutive seconds
- Removed zero counts for all tube.
- Removed count  $\geq 30$  in the second.
- Removed the hour that secondly recording are less than 300

2

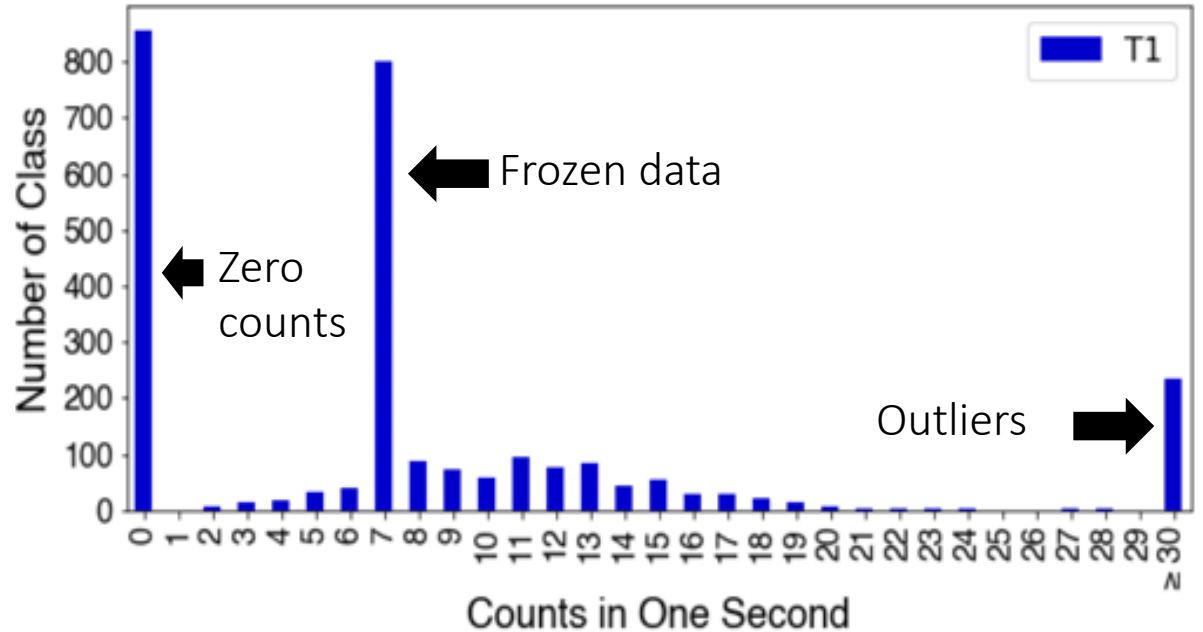
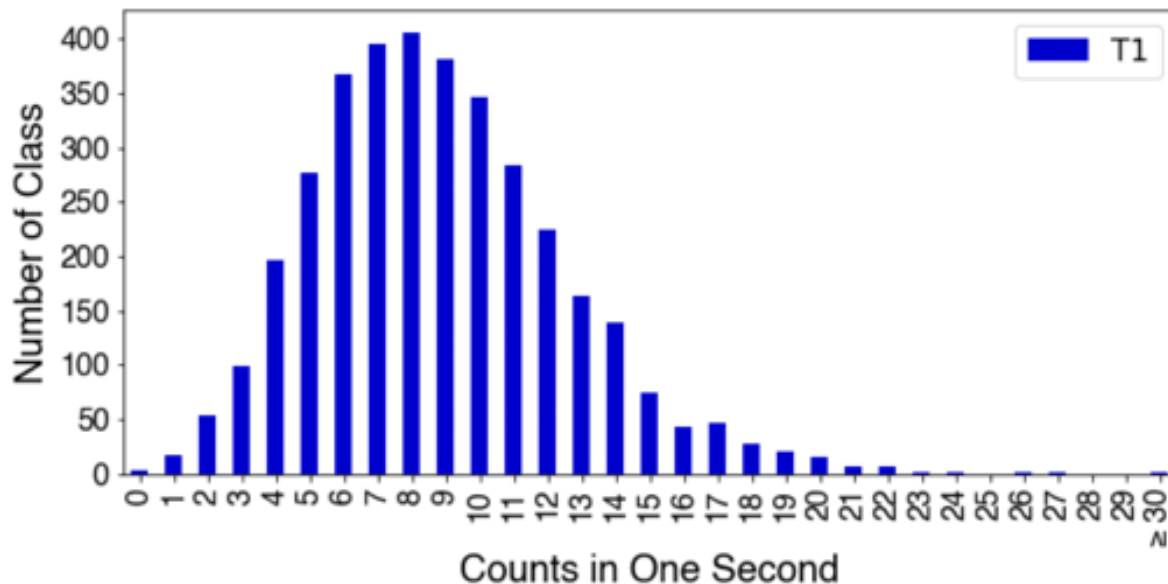
## Tube Ratios

- Histogram to set by fitting Gaussian distribution

# Data cleaning based on histograms of the 1-second distribution

## Distribution of a bad hours

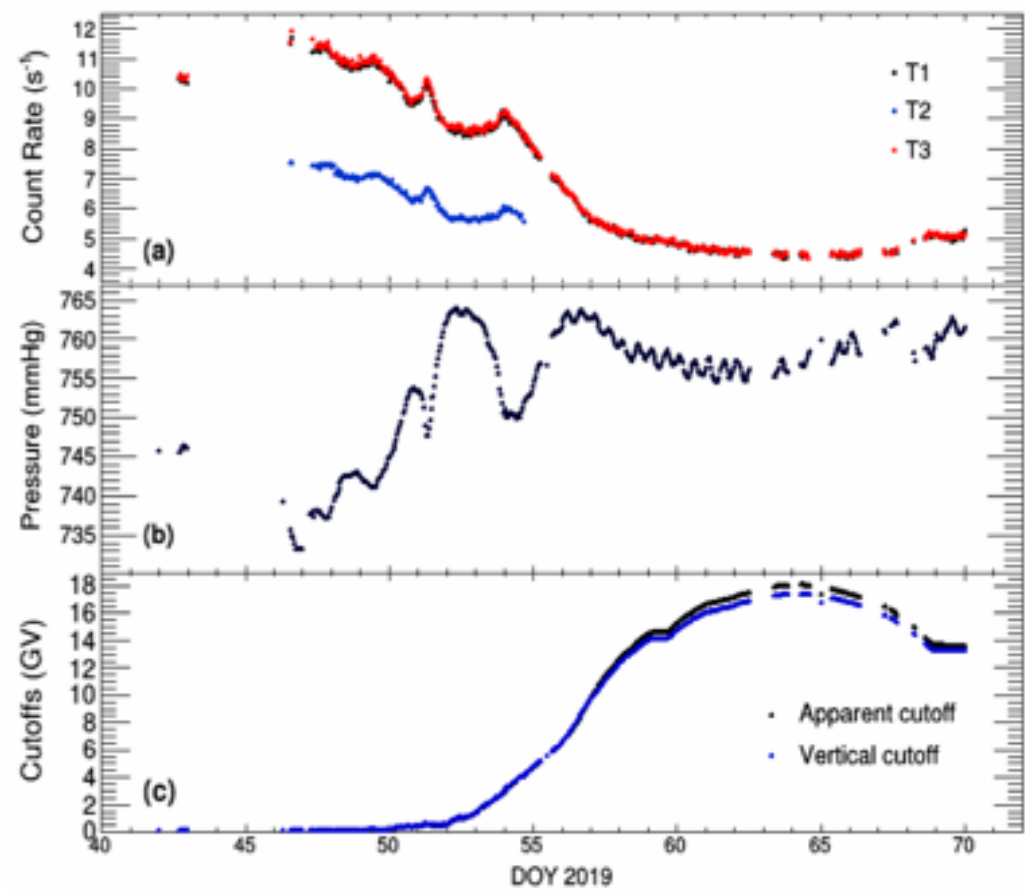
- obvious outliers 330 counts in the second
- repeated counts consecutively 3 seconds (frozen data)
- all counts from three tubes appeared zero.



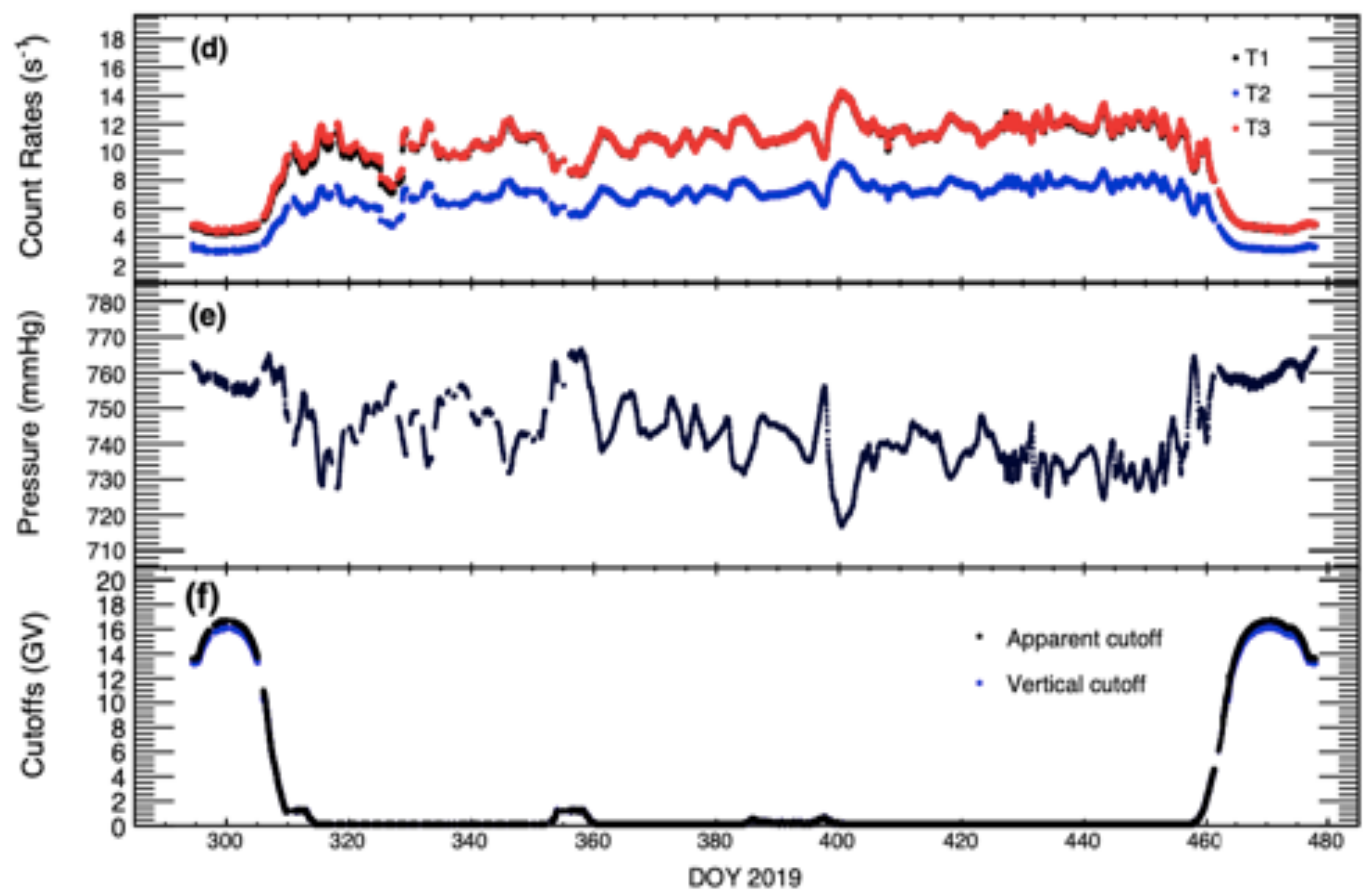
## Distribution of the proper hour



Survey Year 2019 (Chinare35)

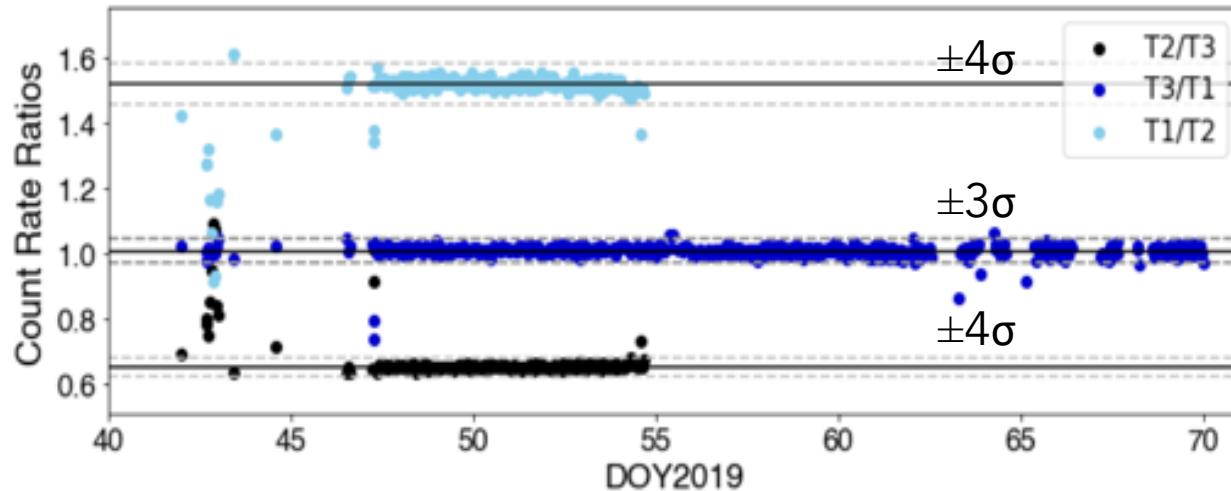


Survey Year 2020 (Chinare36)

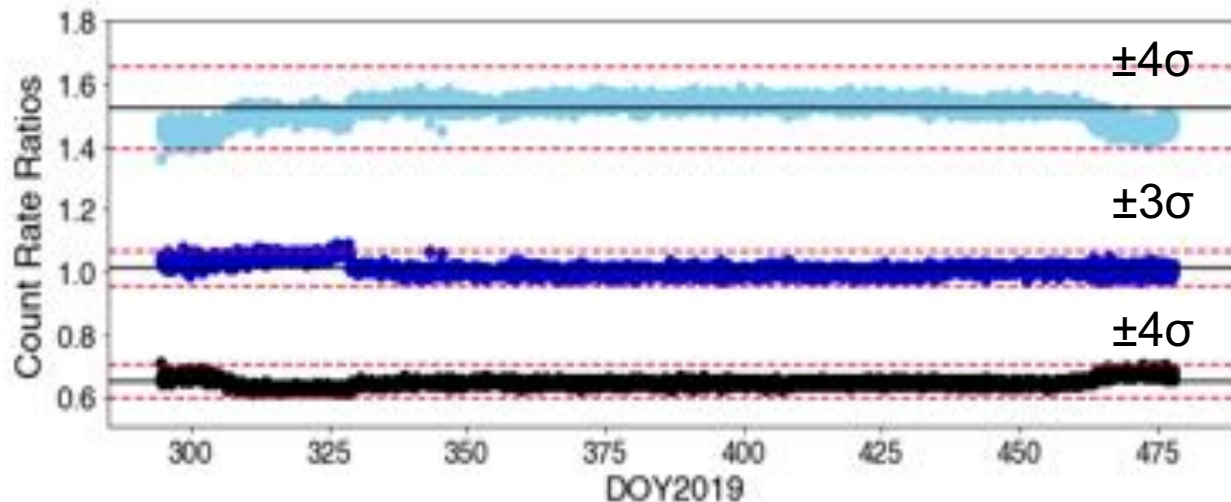


# Data cleaning based on the count rate ratios

Survey Year 2019 (Chinare35)



Survey Year 2020 (Chinare36)



The horizontal black solid line  
the mean value of the Gaussian distribution for  
each ratio

The grey dashed line  
 $\pm 4\sigma$  interval around the mean for the ratios T2/T3  
and T1/T2  
 $\pm 3\sigma$  interval for the ratio T3/T1 (blue circle)

# Pressure Correction



Count rate - Corrected Pressure ( $s^{-1}$ )

count rate - Uncorrected Pressure ( $s^{-1}$ )

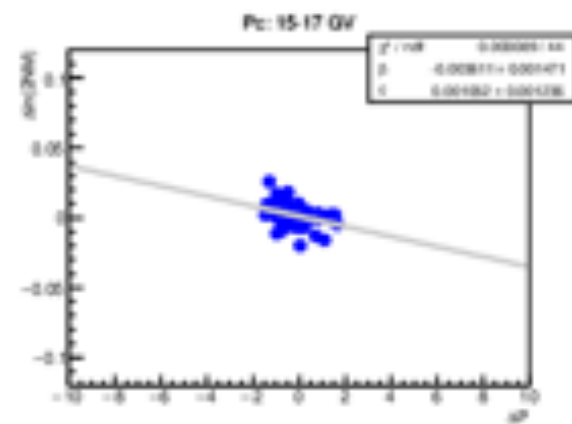
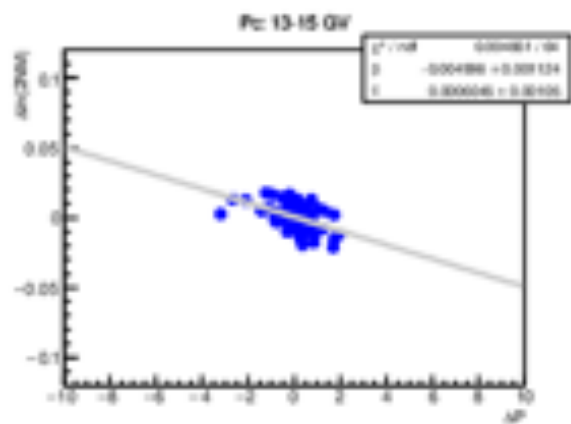
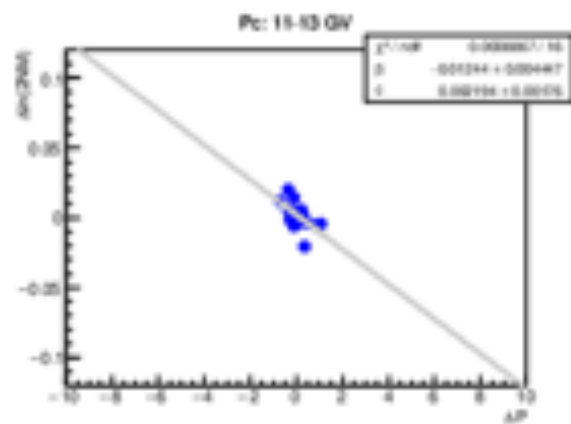
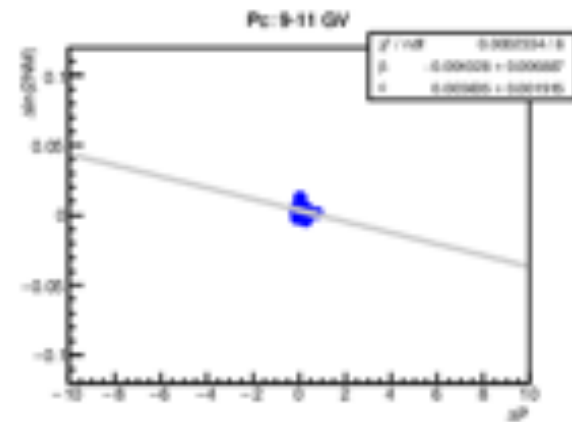
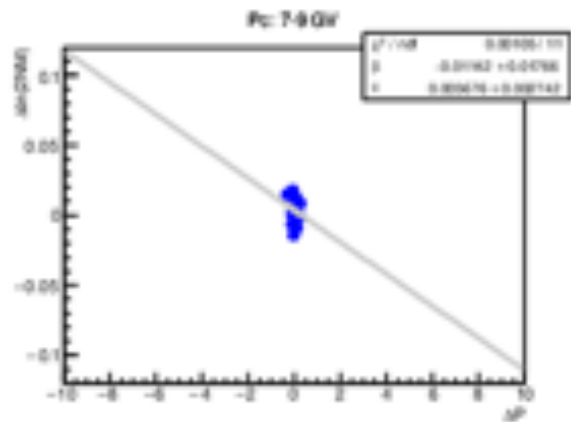
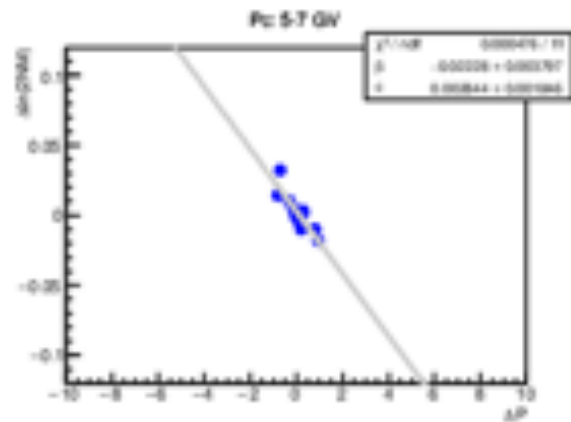
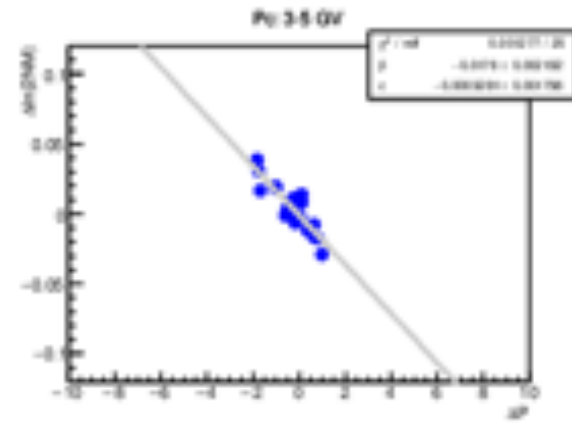
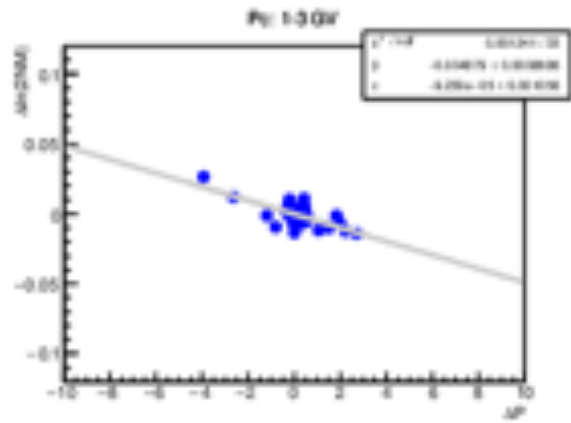
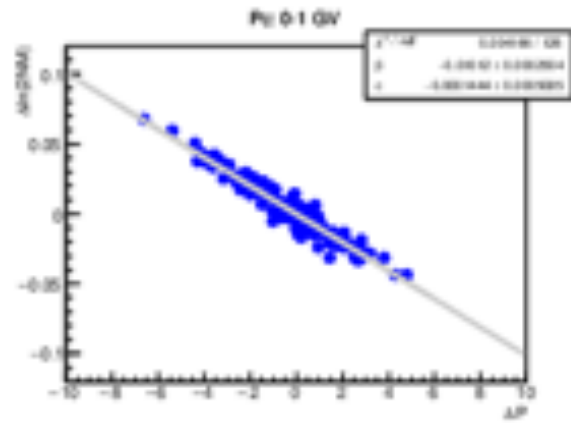
$$C = C_0 e^{-\beta(p-p_0)}$$

760 mmHg

Barometric Pressure (mmHg)

Pressure Coefficient ( $mmHg^{-1}$ )





## Pressure Coefficient $\beta$

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

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

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

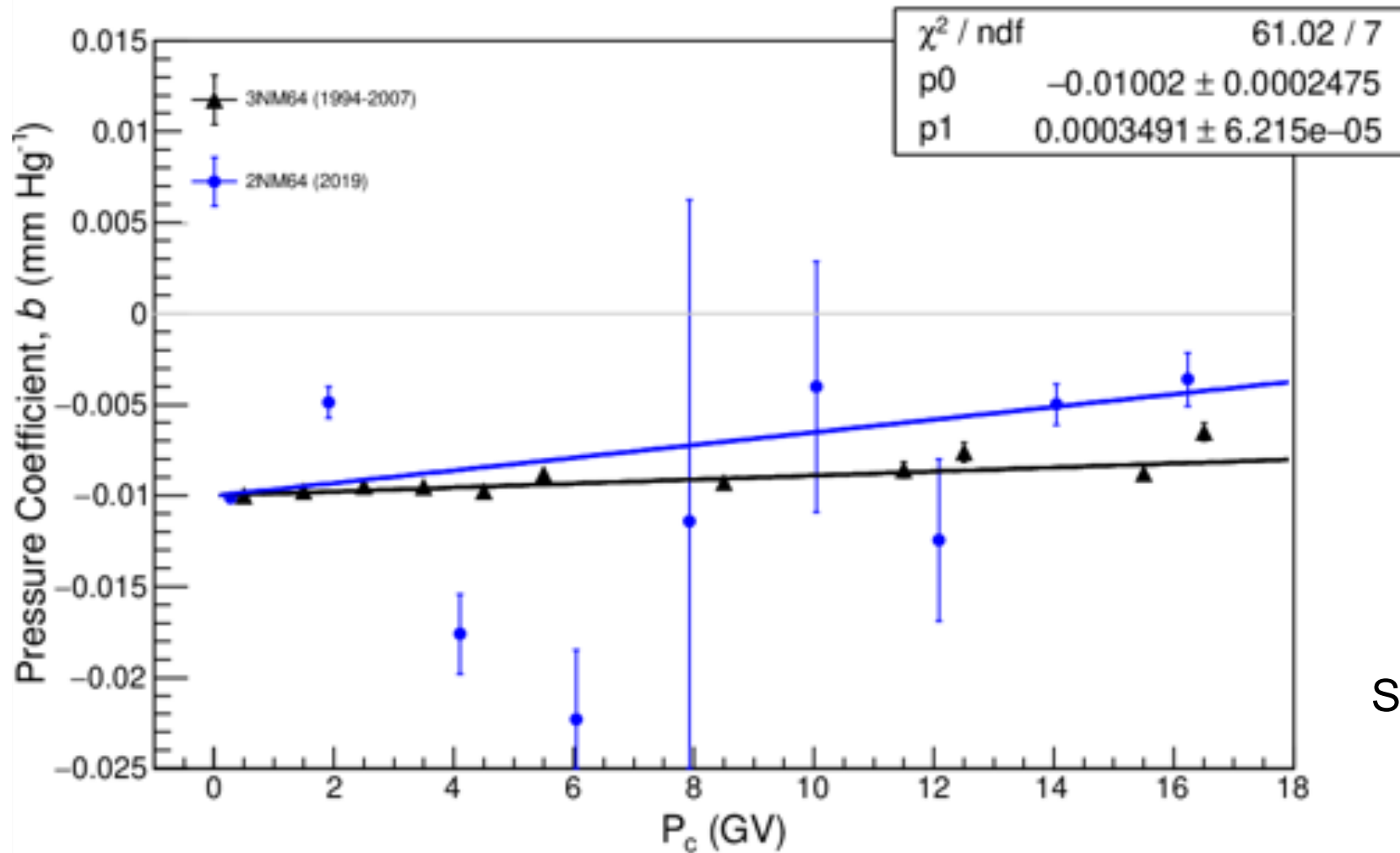
$$\ln C - \ln C_0 = \ln e^{-\beta(p-p_0)}$$

$$\Delta \ln C = -\beta \Delta P$$

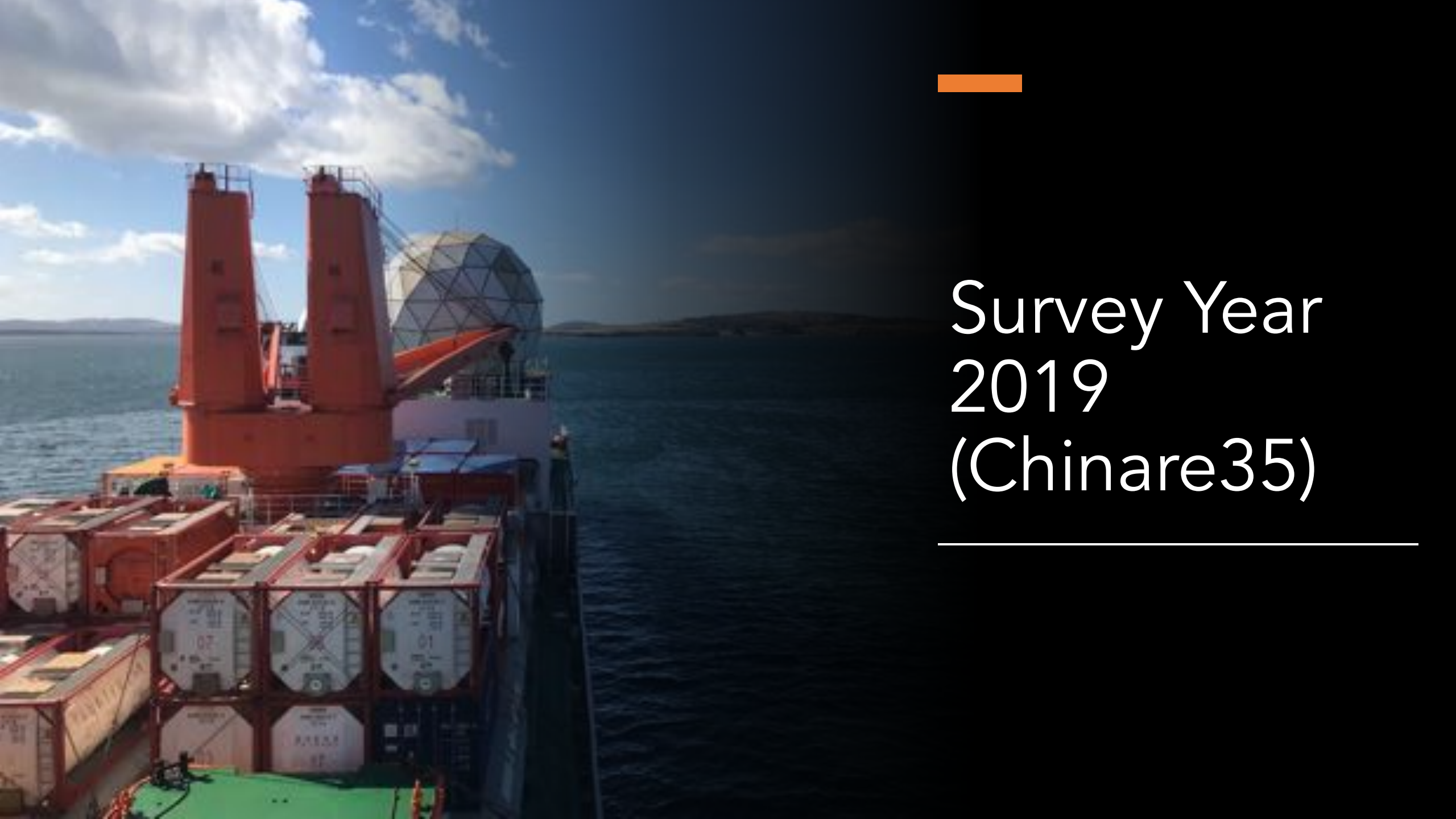
Survey Year 2019  
(Chinare35)



## ► Pressure Coefficient



Survey Year 2019  
(Chinare35)



Survey Year  
2019  
(Chinare35)

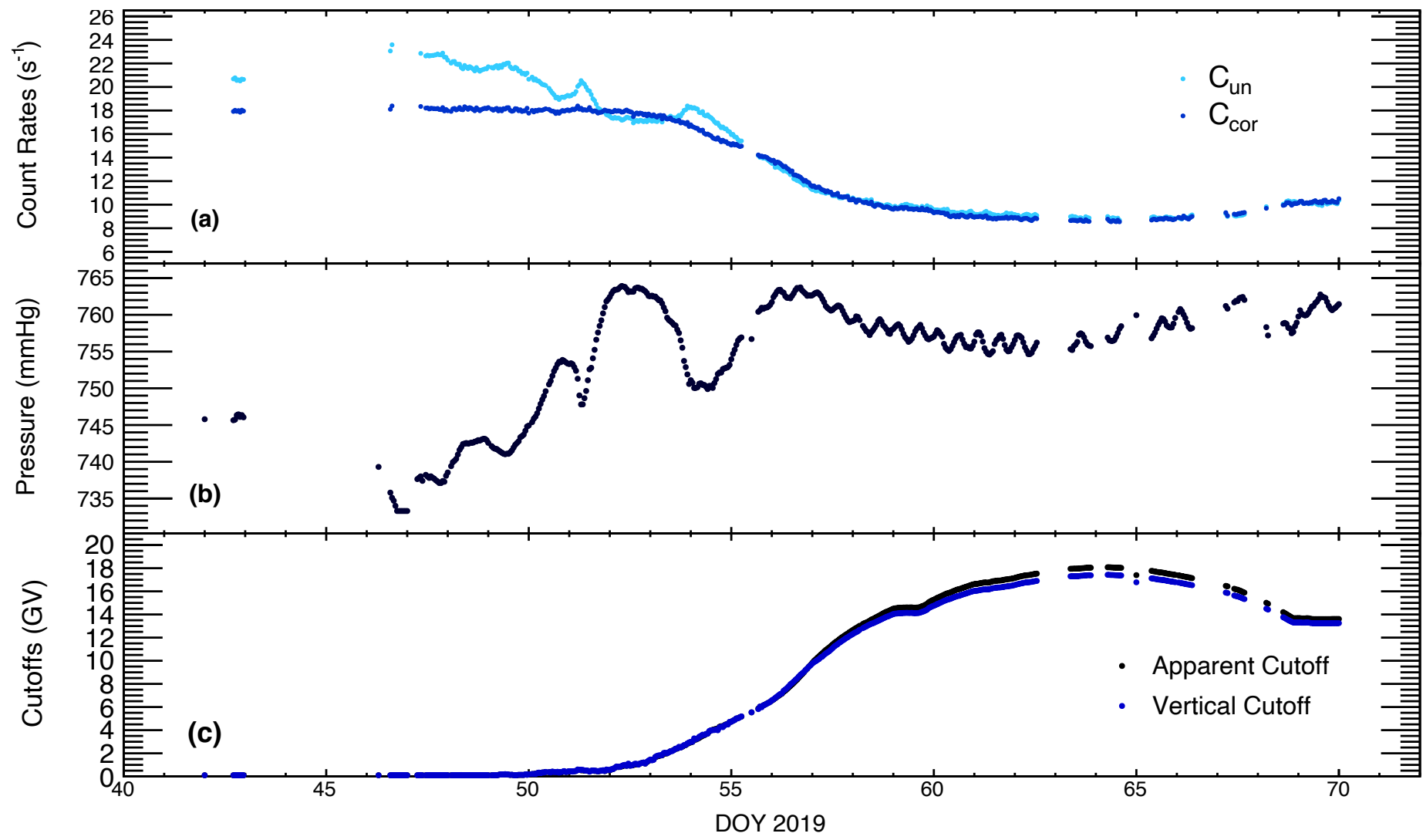
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# Result of corrected for pressure



Survey Year 2019 (Chinare35)

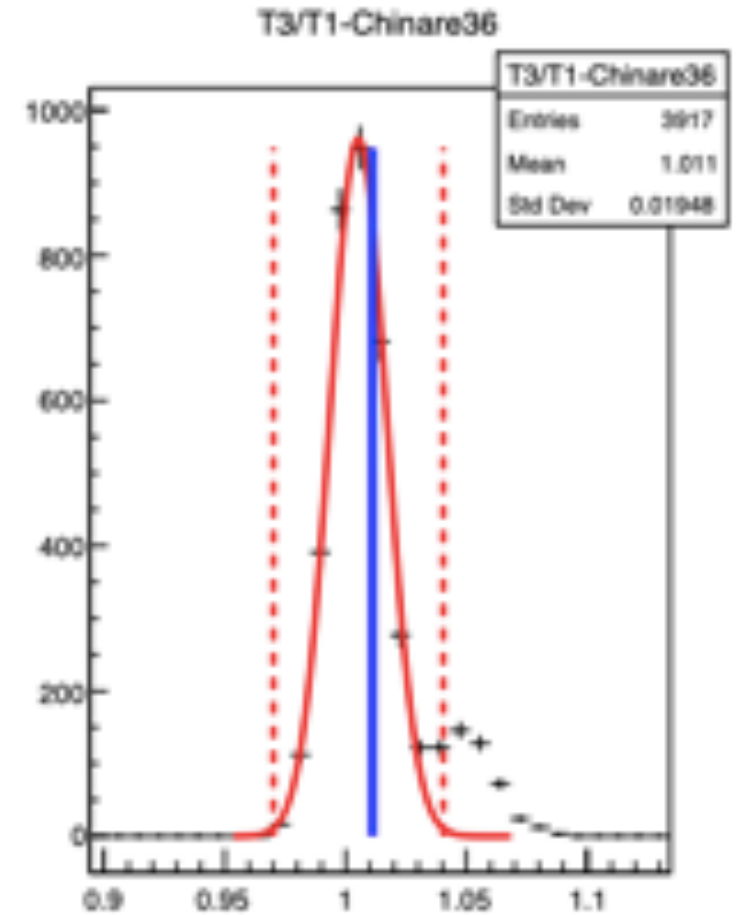
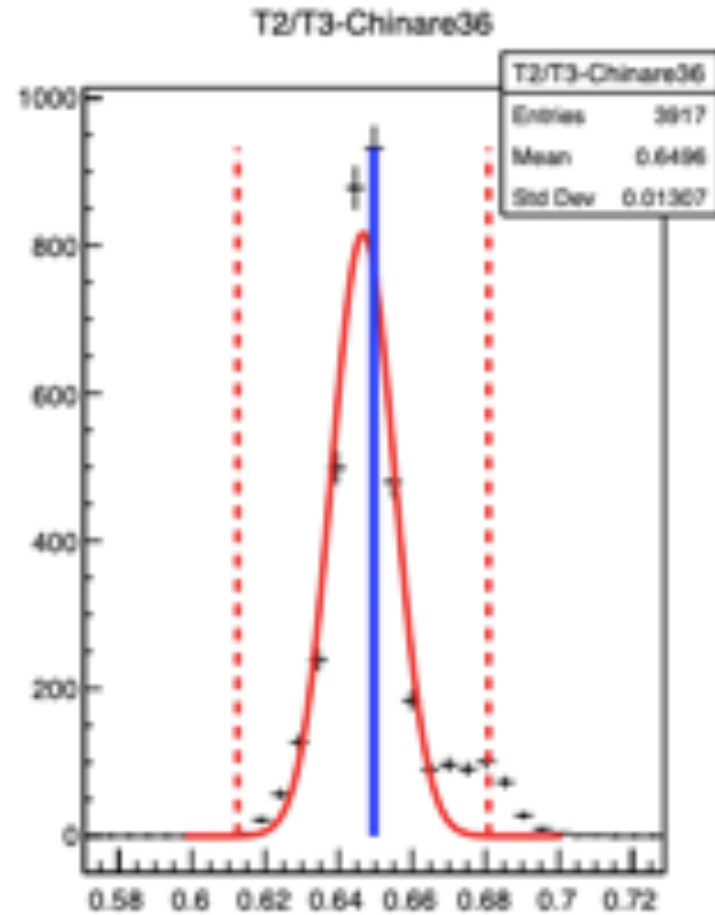
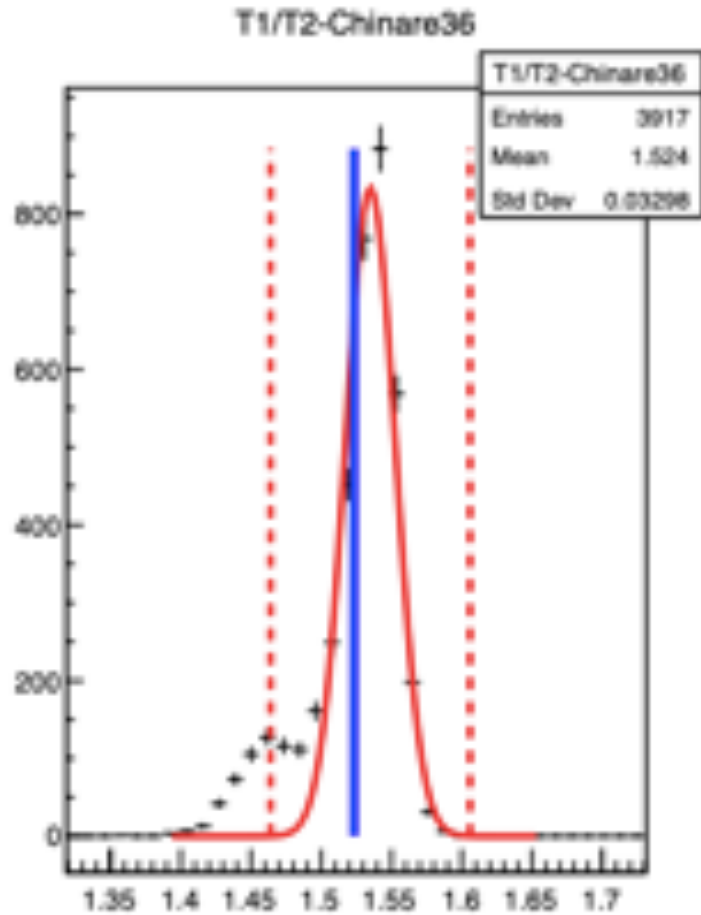




Survey Year 2020  
(Chinare36)

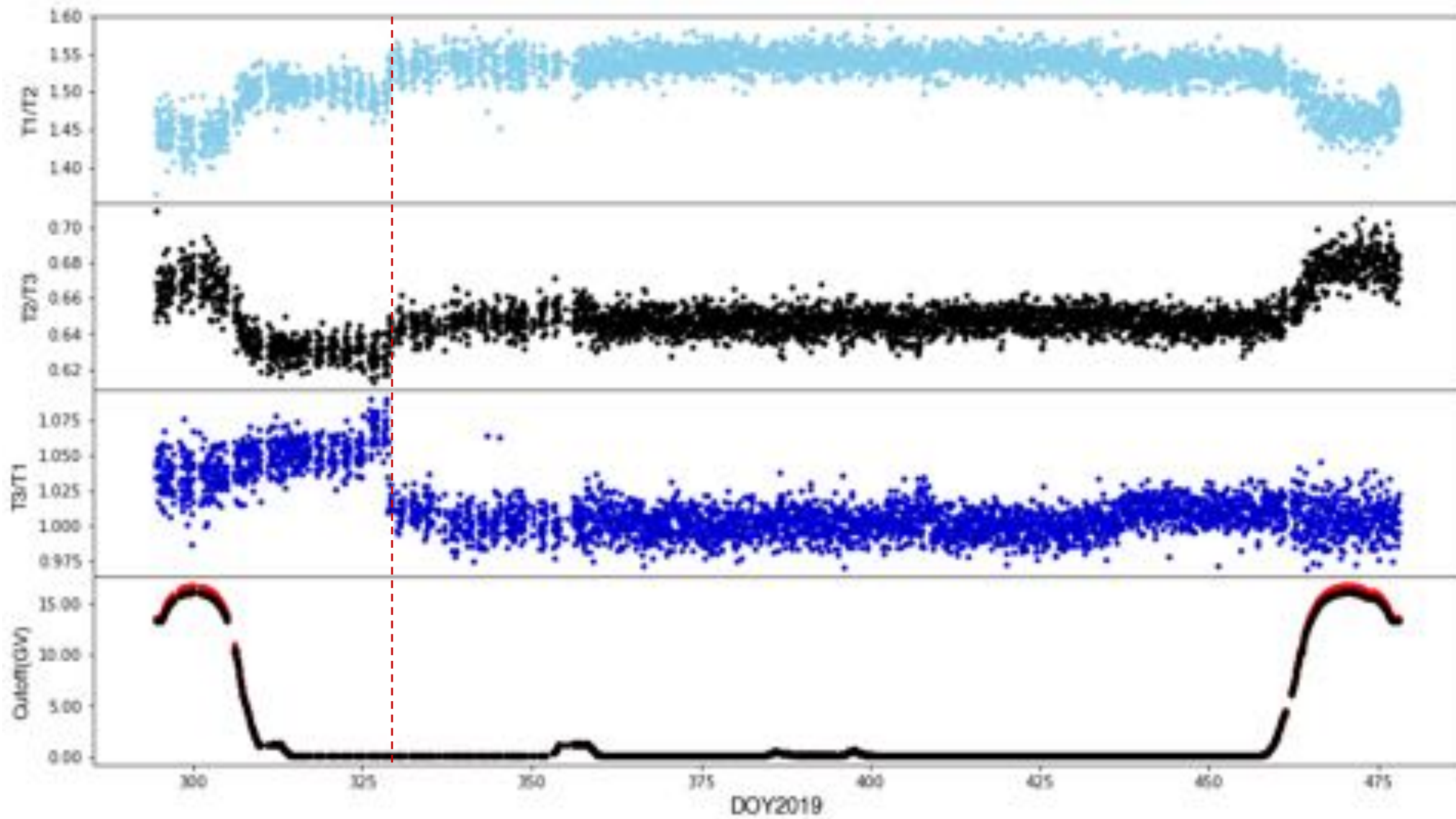
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# Fitting Tube Ratios Histogram base on Gaussian Distribution





# Survey Year 2020 (Chinare36)





**THANK YOU**

