GRUPPO L(APLACE)

STUDY OF THE BAROMETRIC COEFFICIENT

AND HOW IT IS INFLUENCED BY THE Θ ANGLE

INTRODUCTION

What is EEE project?

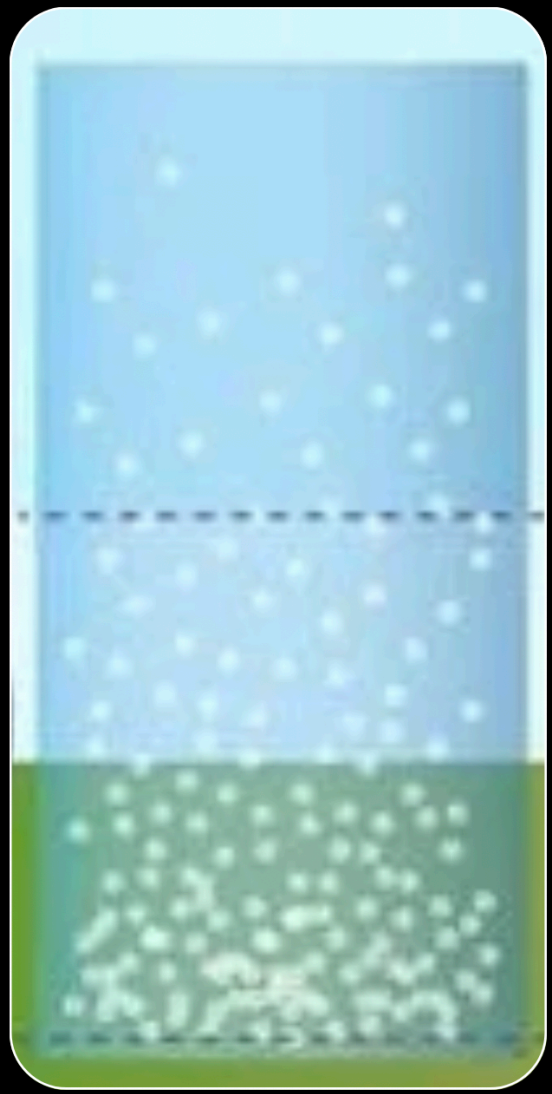
The EEE Project (Extreme Energy Events) is a scientific initiative focused on studying cosmic rays and their interactions with the Earth's atmosphere. It uses a network of telescopes, known as Multi-gap Resistive Plate Chambers (MRPCs), installed in high schools, research centers, and universities.

The project also emphasizes educational outreach, engaging students and teachers in hands-on science and data analysis.

INTRODUCTION

What is the barometric coefficient?

When measuring the rate of cosmic rays, we observe an almost constant flow of them. However, this rate can change due to various environmental factors, with pressure being one of the most influential. To solve this problem, we will correct the measured rate using the barometric coefficient, a parameter determined experimentally that makes the data independent from pressure.



Which factors does the barometric coefficient depend on?

$$\frac{dR}{dp} = \beta R$$

- Temperature
- If the telescope is covered
- Cosmic rays' inclination
- Various ambiental factors

The final form of the formula used to correct the observated rate is:

$$R_{cor} = R_{oss} + \beta R(P_{oss} - P)$$

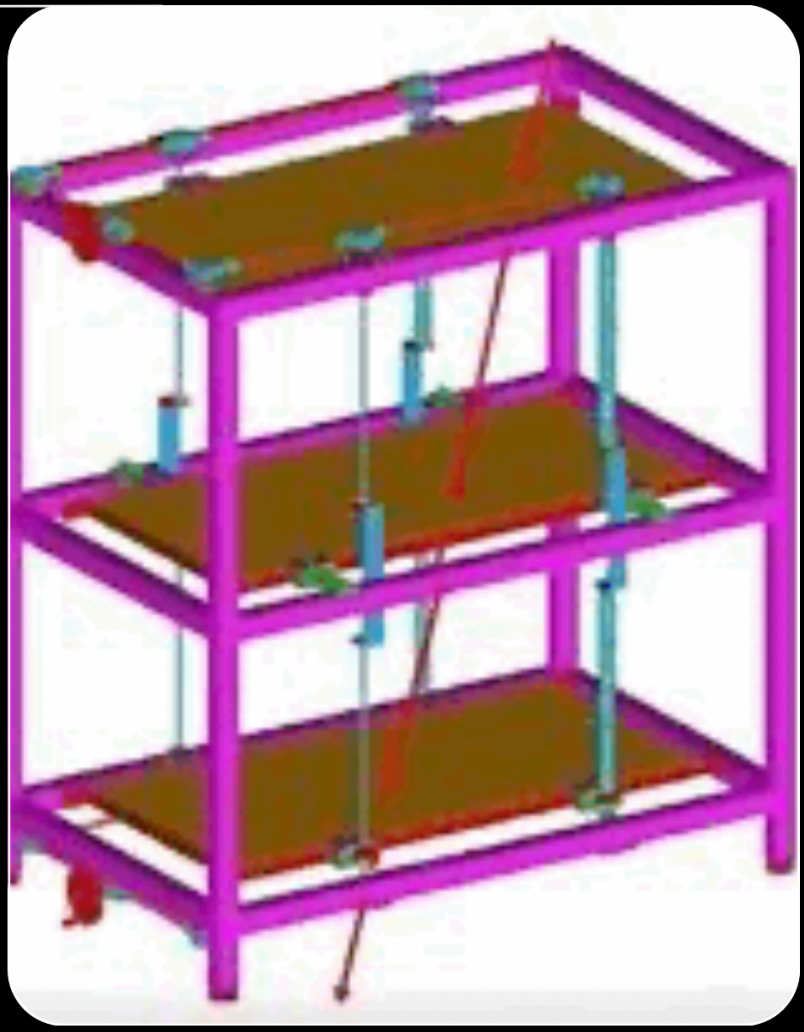
with:

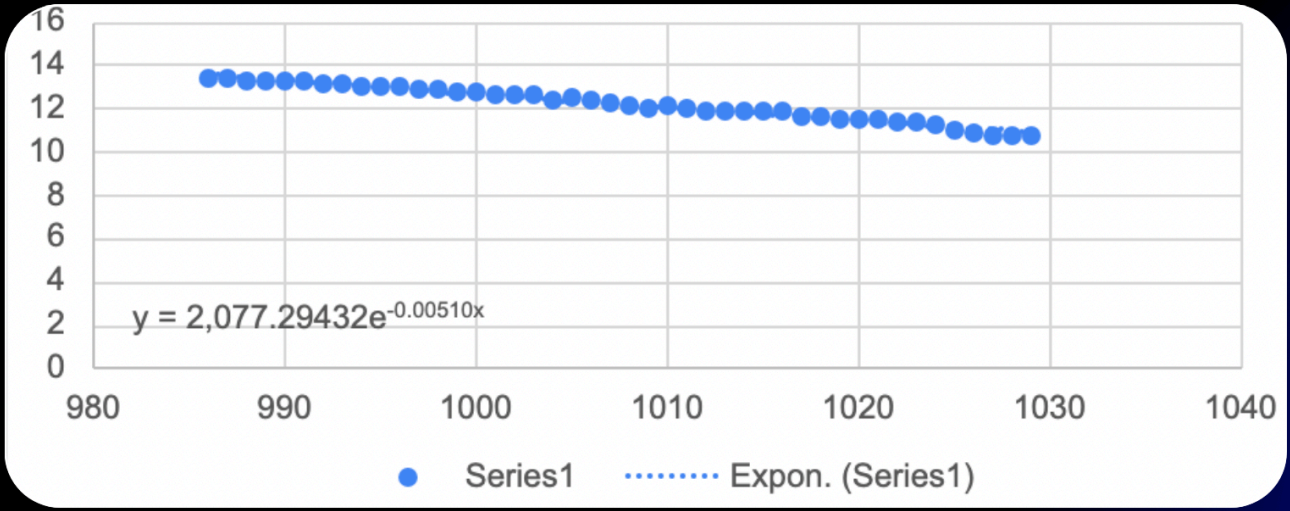
- β being the barometric coeffcient
- R-oss being the observed rate
- P-oss being the observated pressure
- R-cor being the correct rate
- R being the average measured rate
- P being the average measured pressure

GOAL

What do we aim at?

With this work, our goal is to demonstrate how the barometric coefficient depends on the variation of the θ angle.





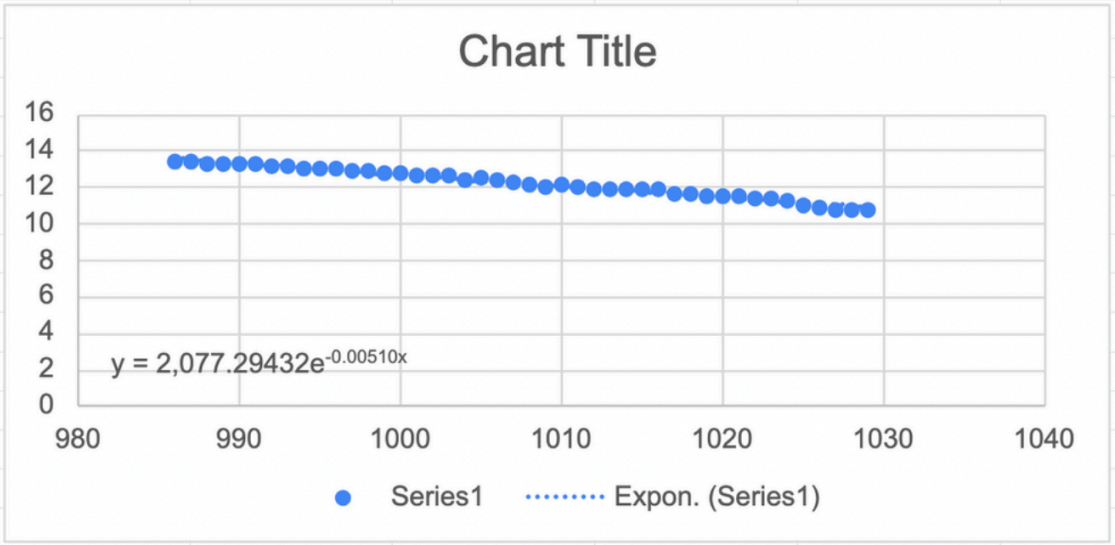
PROCEDURE

How did we proceed in analyzing the data

We started by calculating the general barometric coefficient of the datasets we used, by using a linear regression.
We then repeated the same procedures but for subsets of the tracks divided by the angle (we took an interval of 10 degrees).

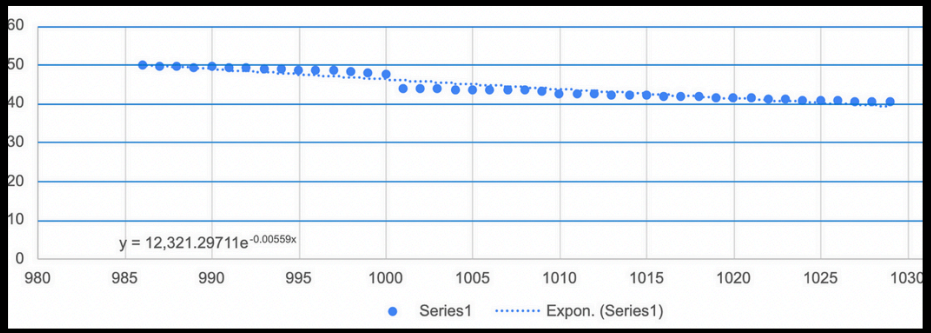
=IMABS(INDEX(LINEST(LN(B2:B45),A2:A45),1))

	B	C	D	E	F	G	H	I	J	K	L
	RATE(Hz)		coef bar	5.10E-03	n giorni	10	start	5.64E+08		duration	8.64E+05
986	13.33341		ref pressure	1009.484149			stop	5.65E+08		time inteval	7200
987	13.33951										
988	13.24703		Pmin	986							
989	13.17471		Pmax	1029							
990	13.24221										
991	13.21282										
992	13.13645										
993	13.07018										
994	12.98648										
995	13.00786										
996	12.91694										
997	12.89919										
998	12.8953										
999	12.70874										
1000	12.68842										
1001	12.6208										
1002	12.58887										
1003	12.64332										
1004	12.37131										
1005	12.44653										
1006	12.34653										
1007	12.18577										
1008	12.09494										
1009	12.01275										
1010	12.06195										
1011	11.94867										
1012	11.83945										

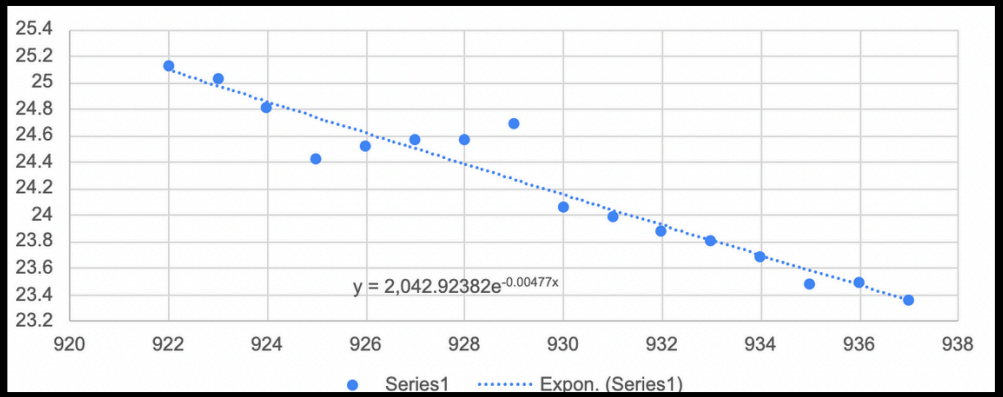


_import | DATI | pressure | trending | DATI0_10 | pressure0_10 | trending0_10 | DATI10_20 | pressure10_20 | trending10_20 | DATI20_30 | **pressure20_30** | +

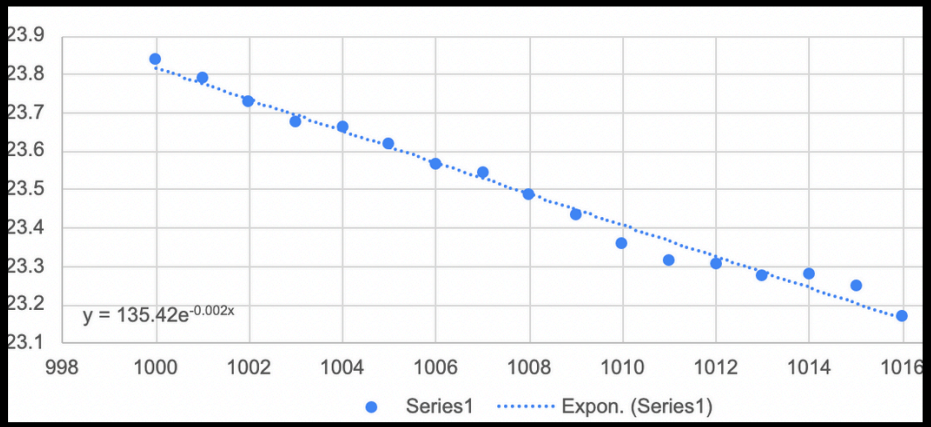
VICE01



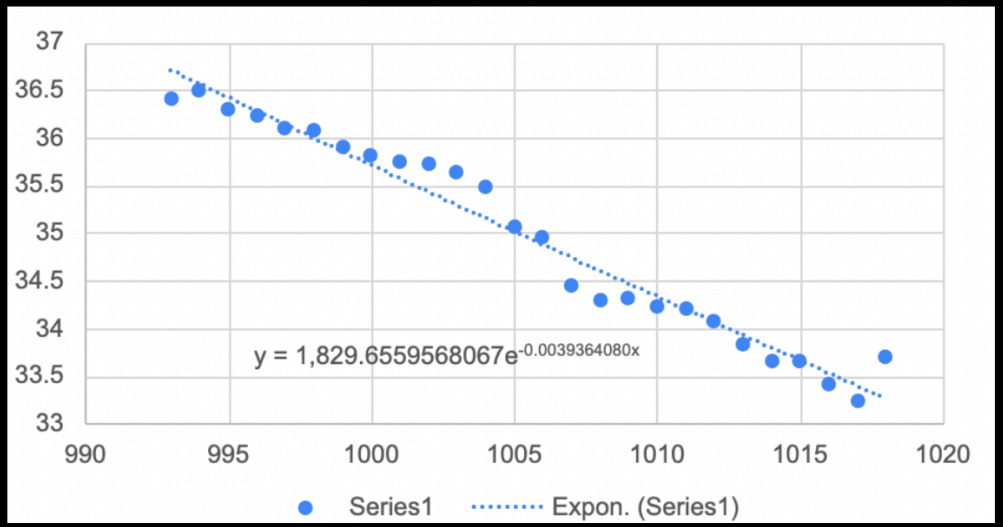
LAQU01



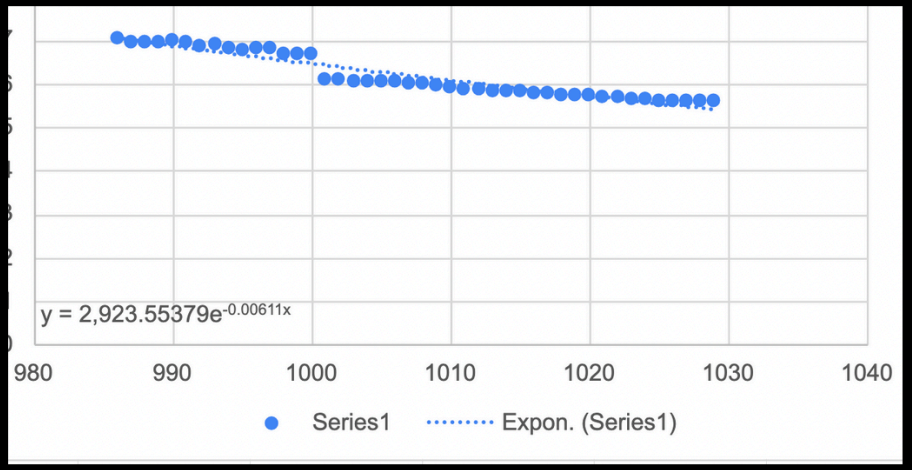
FERM01 (06/10-15/10)



FERM01 (16/11-25/11)



VICE01



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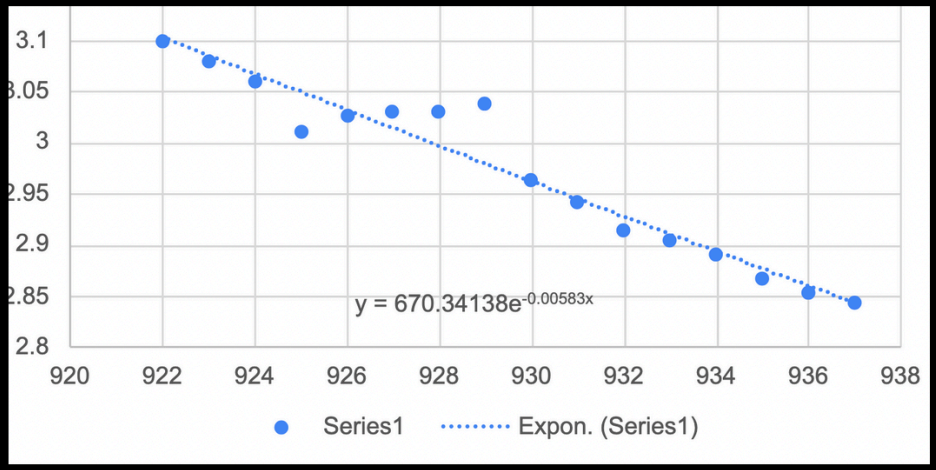

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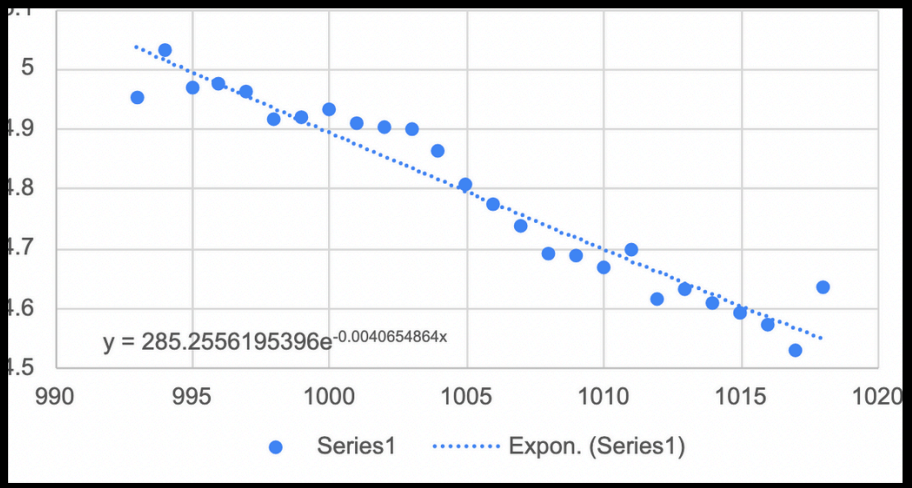

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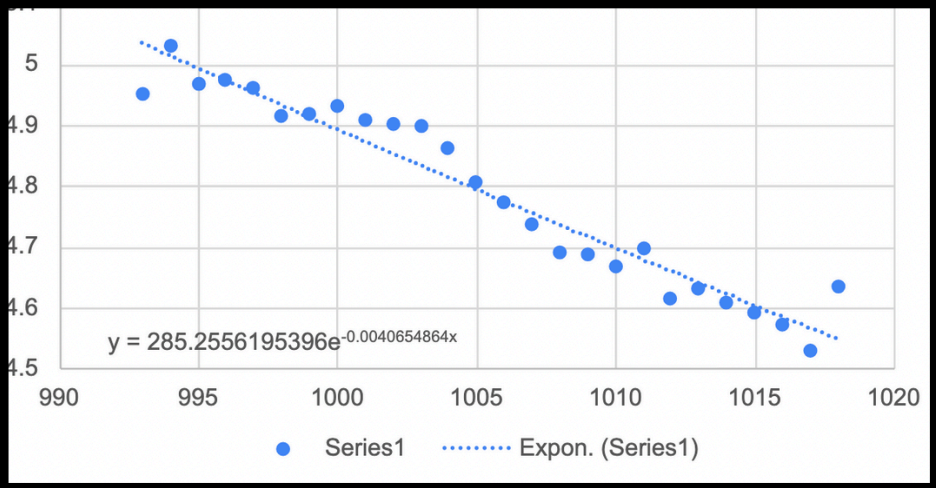

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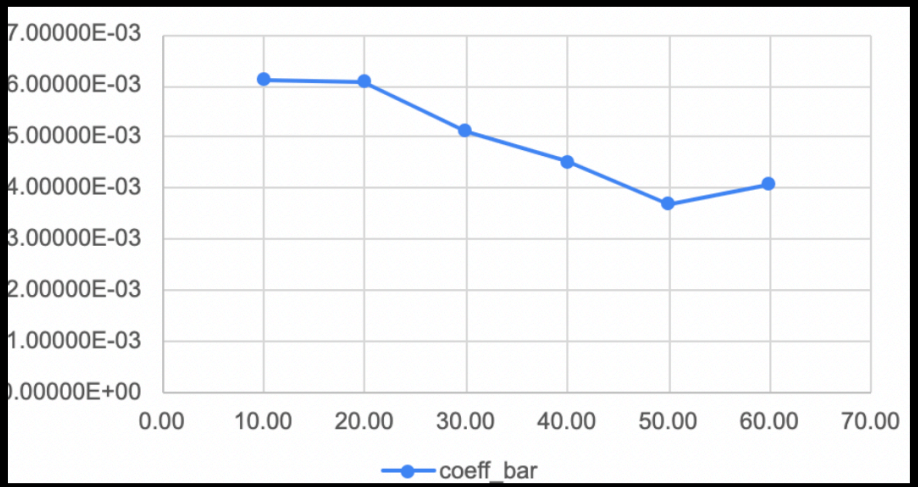
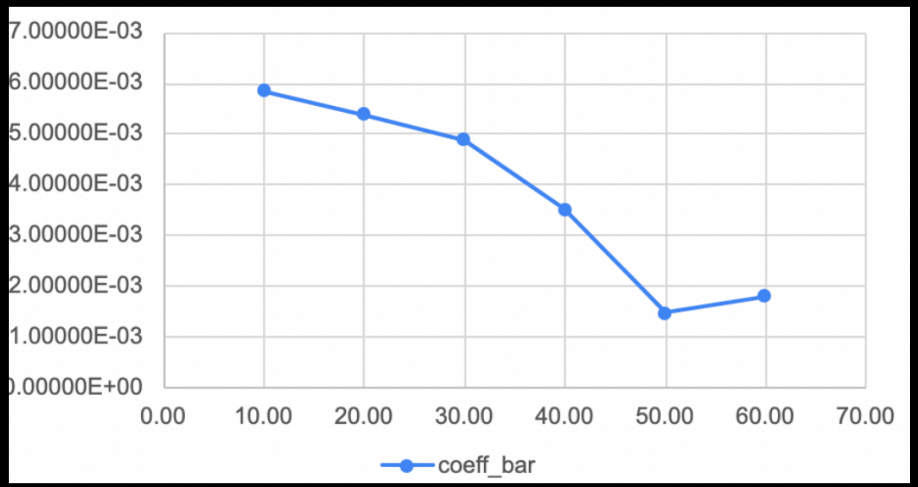


LAQU01



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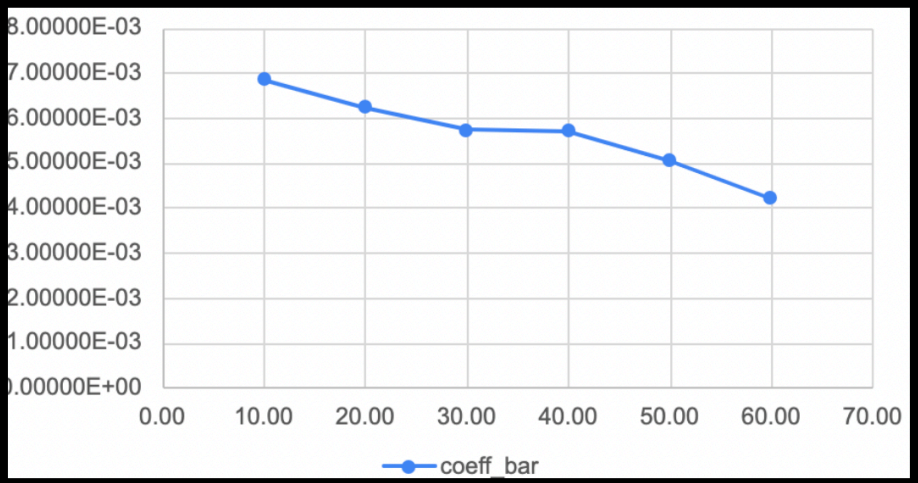

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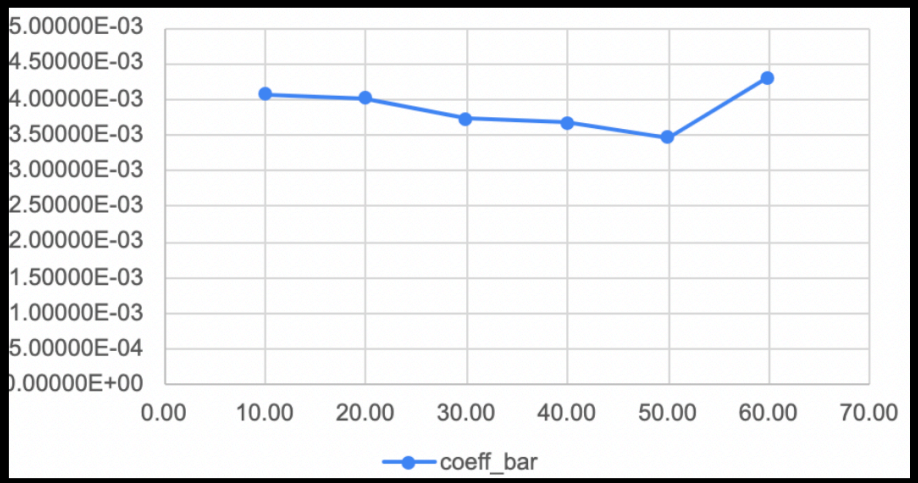
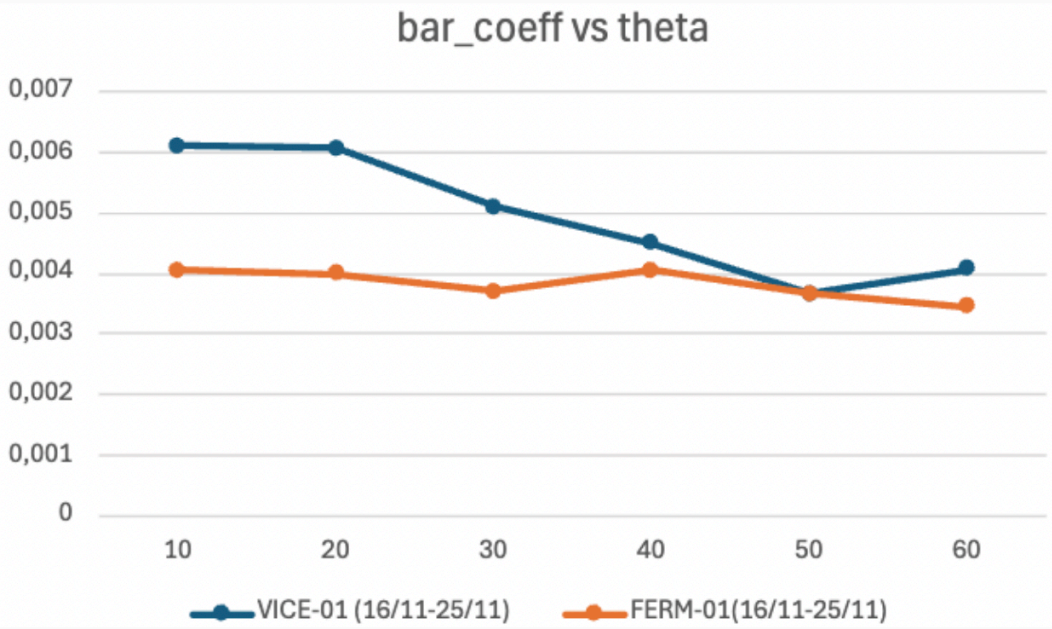
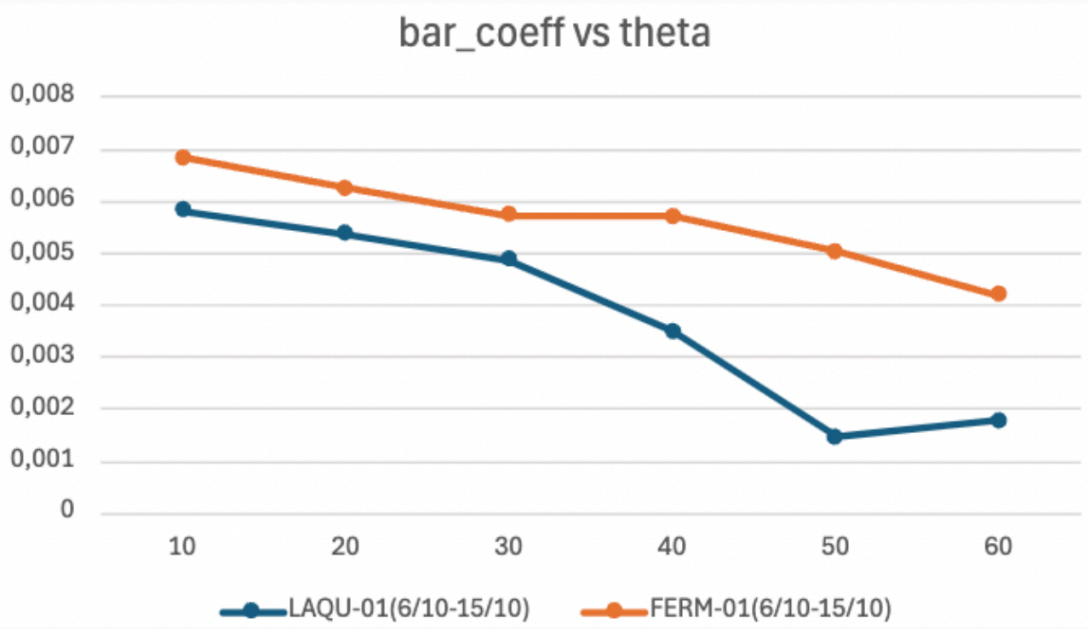



bar_coeff vs theta
0,007
0,006
0,005
0,004
0,003
0,002
0,001
0
10
20
30
40
50
60
VICE-01 (16/11-25/11)
FERM-01(16/11-25/11)


bar_coeff vs theta
0,008
0,007
0,006
0,005
0,004
0,003
0,002
0,001
0
10
20
30
40
50
60
LAQU-01(6/10-15/10)
FERM-01(6/10-15/10)

CONCLUSIONS

We have eventually demonstrated how the barometric coefficient depends on the theta angle of the tracks, probably with a function of the type $\beta = k * \cos(x)$.