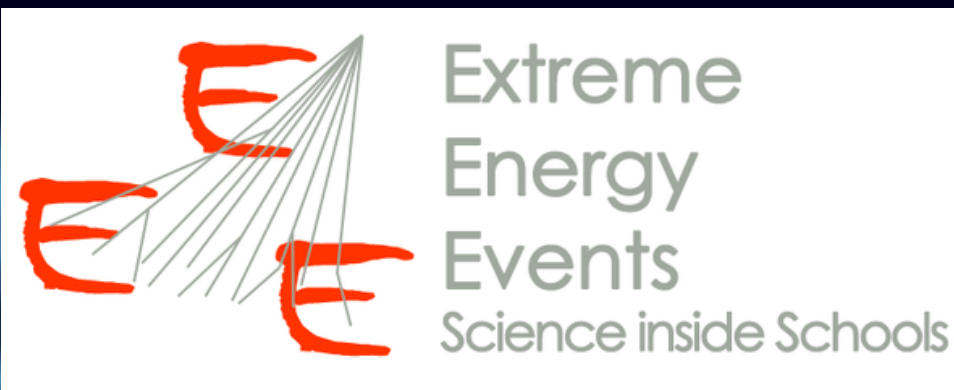


INTRODUCTION TO DATA ANALYSIS

OF THE FLOW OF COSMIC RAYS AS A
FUNCTION OF LATITUDE
by

Alessandro Guizzetti, Joseph Rodella – LICEO MORETTI IIS C.BERETTA

Livia Kamberaj, Giacomo Giribone – LICEO CALASANZIO



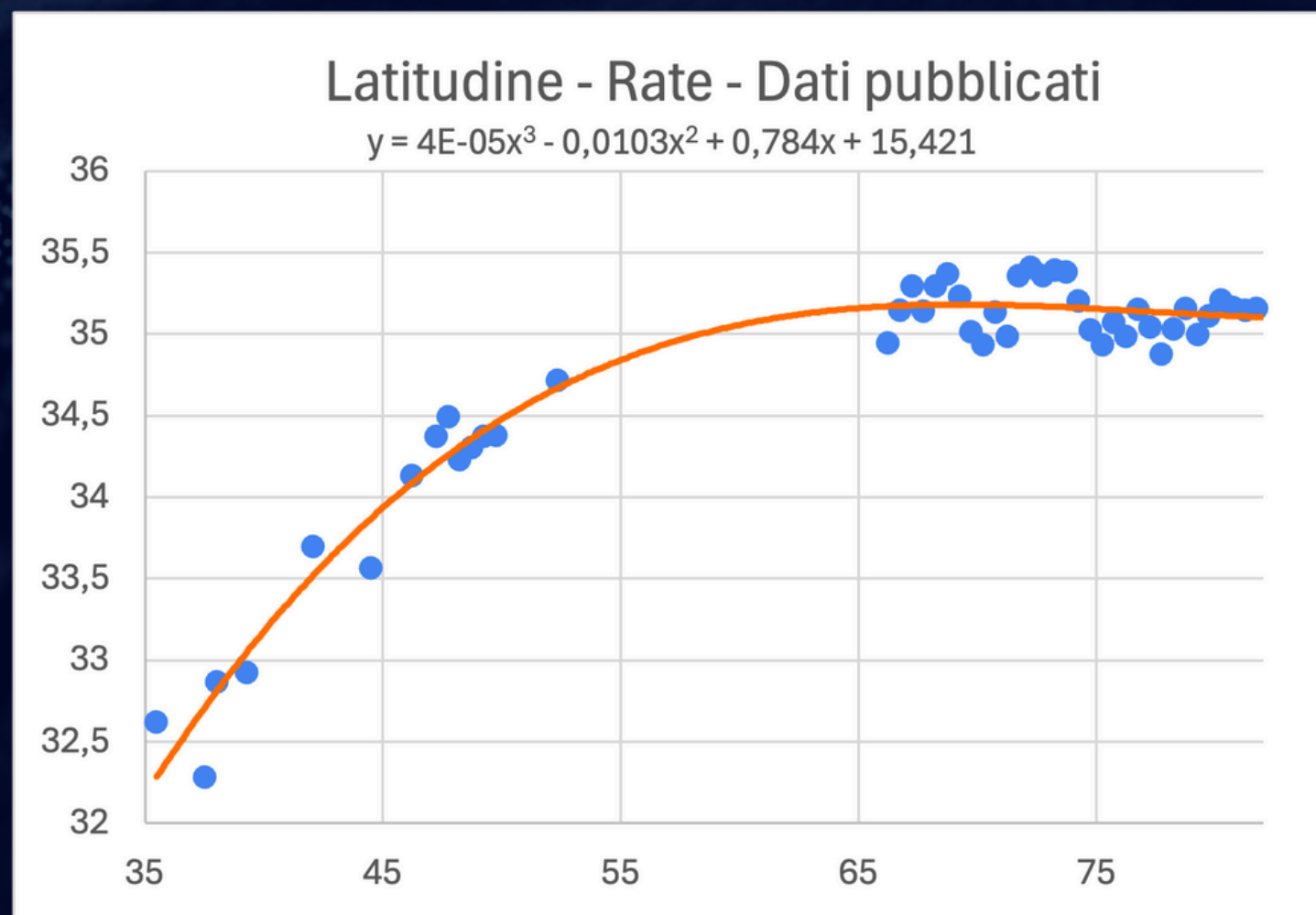
13 november, 2025

OBJECTIVES

- Compare old and new data (through normalization) and expose and eventual differences
- Verify the correlation between hit rate and latitude
- Verify the quality of the new measurements

DATA ANALYSIS PROCEDURE - EXCEL

- Import run data from the **fixed.csv** file
- Convert run timestamp to date and time: **=Run/86400+DATA(2007;1;1)**
- Correct the barometric effect: **=Rate*EXP(α *(P-Pr))**
- Analyze the published data (Vespucci '22) with the plot below:



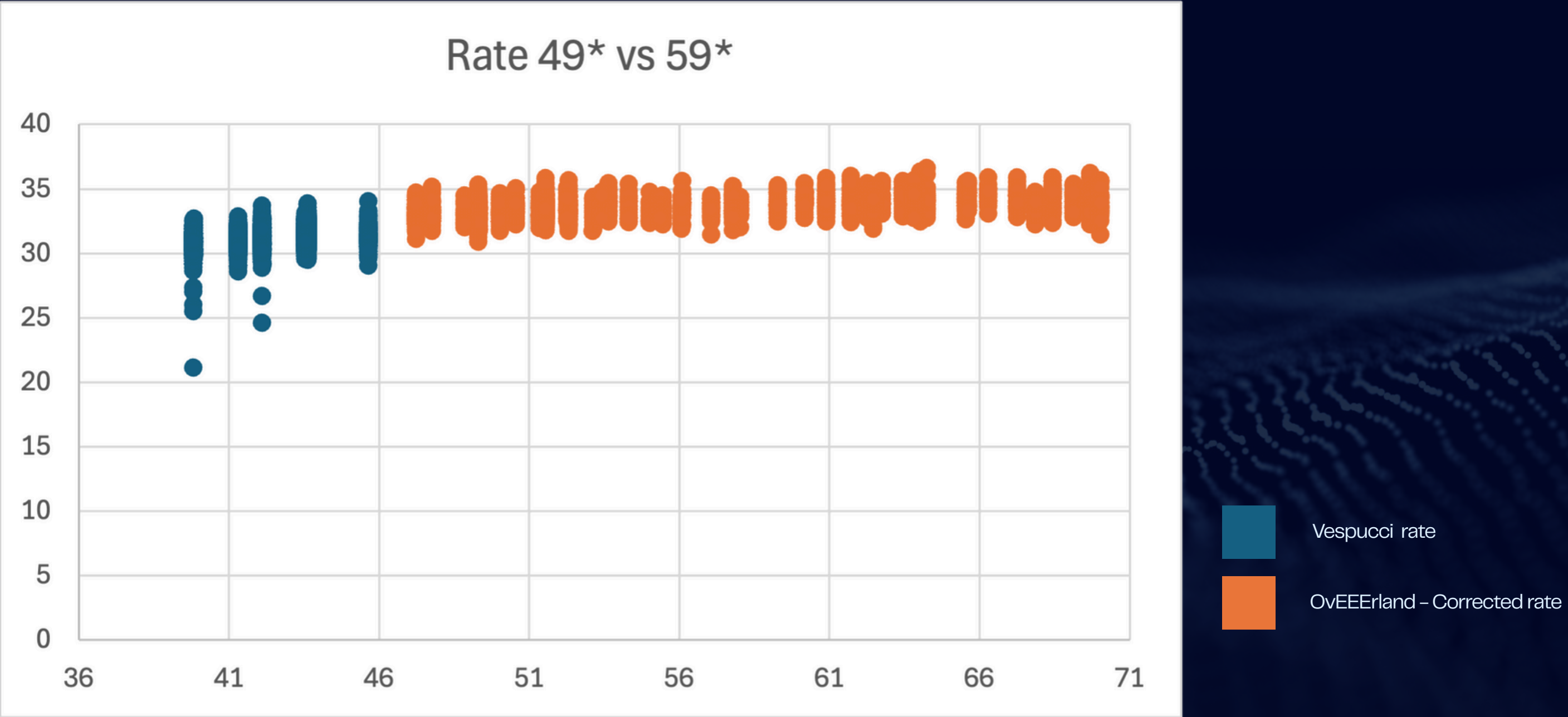
- Apply 3rd grade polynomial trend-line fit and extract the equation
- Calculate the ratio between the RatePCorr and the value calculated with the fit function
- Calculate the normalization factor (mean of the ratios) and apply it to the data

$$\alpha = 2,3E-03$$

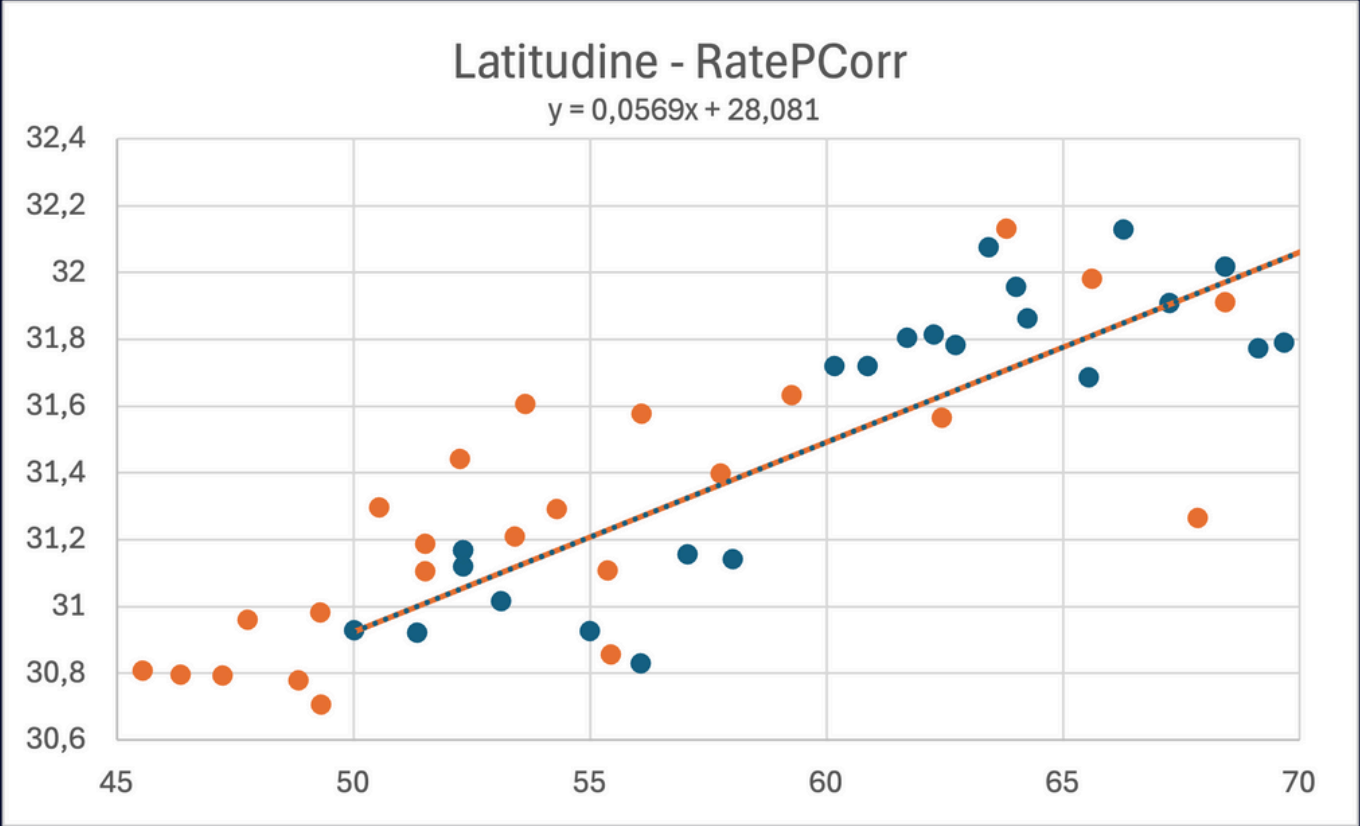
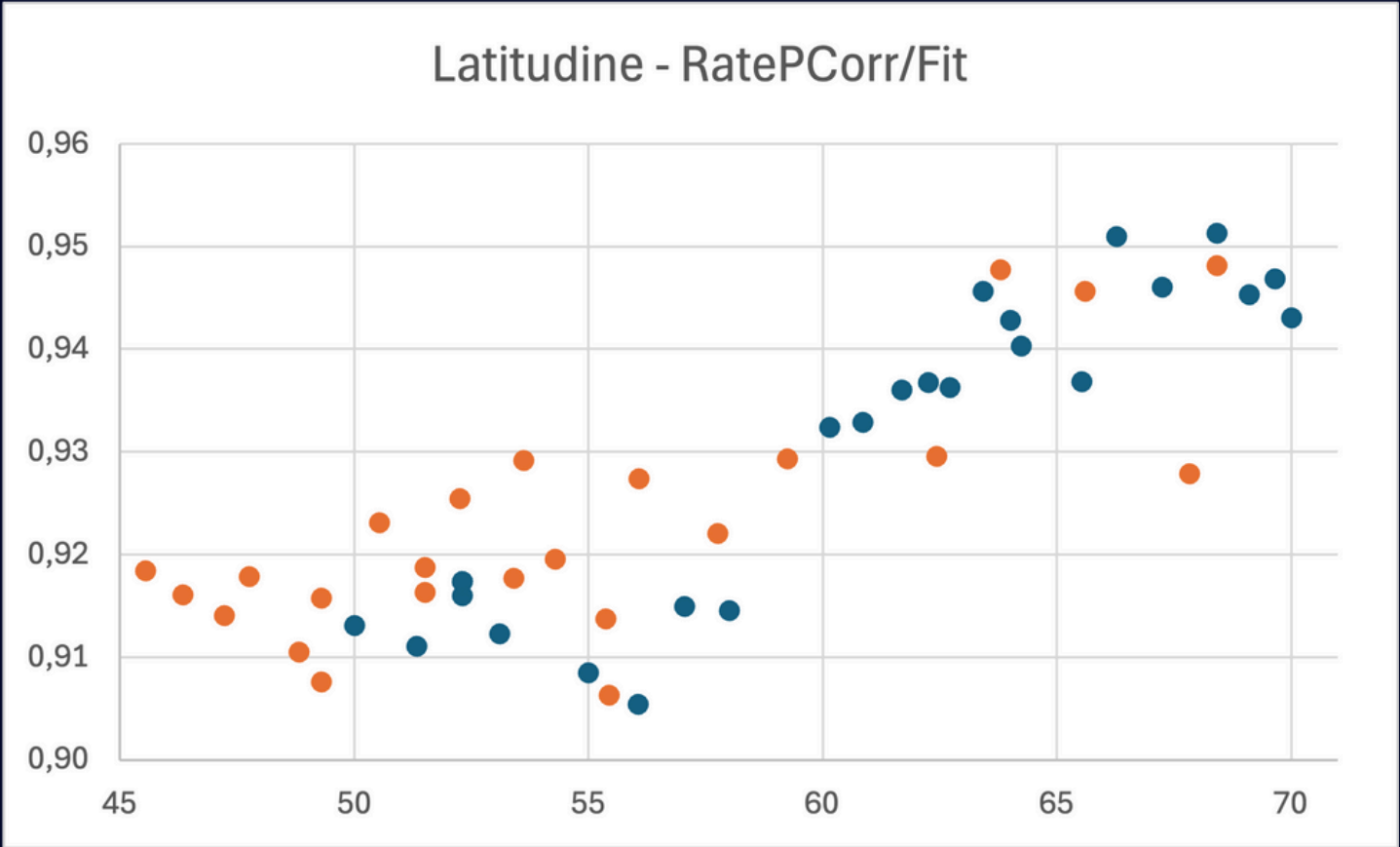
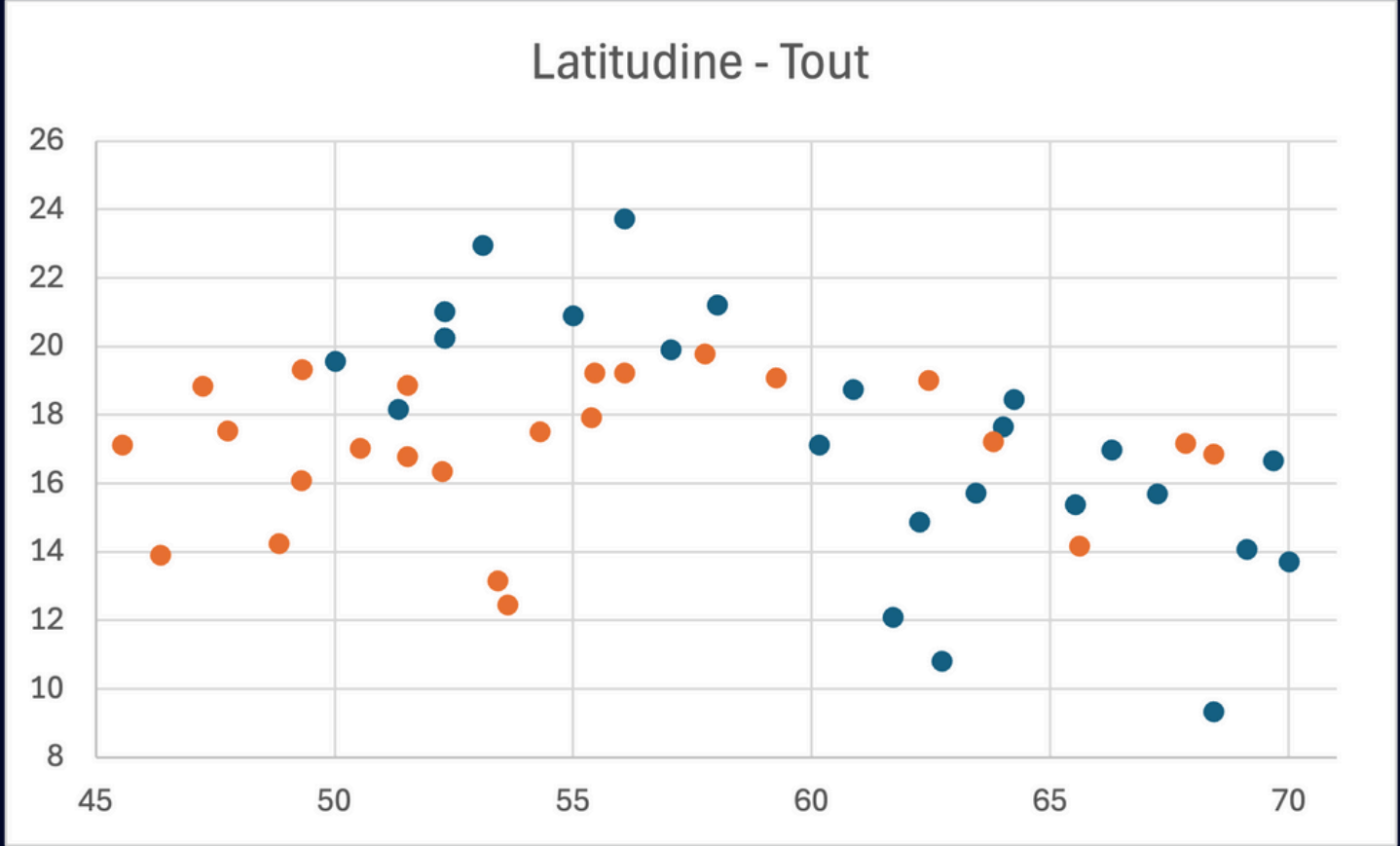
$$Pr = 1014 \text{ mbar}$$

$$\text{Normalization factor} = 0,93$$

VESPUCCI VS OVEEEERLAND



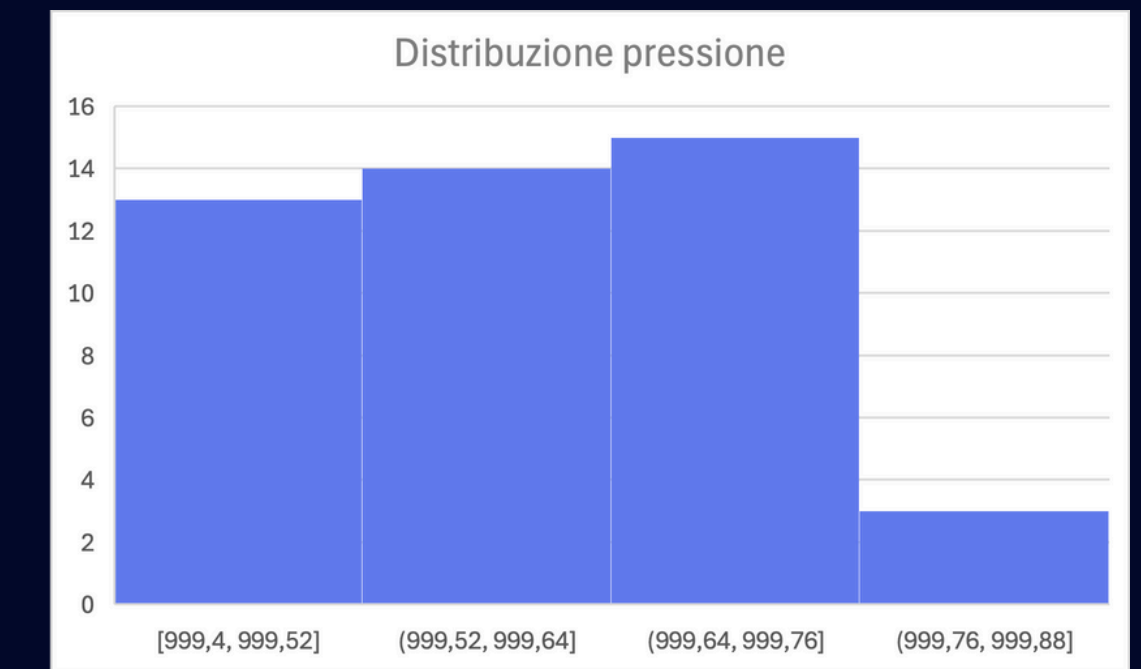
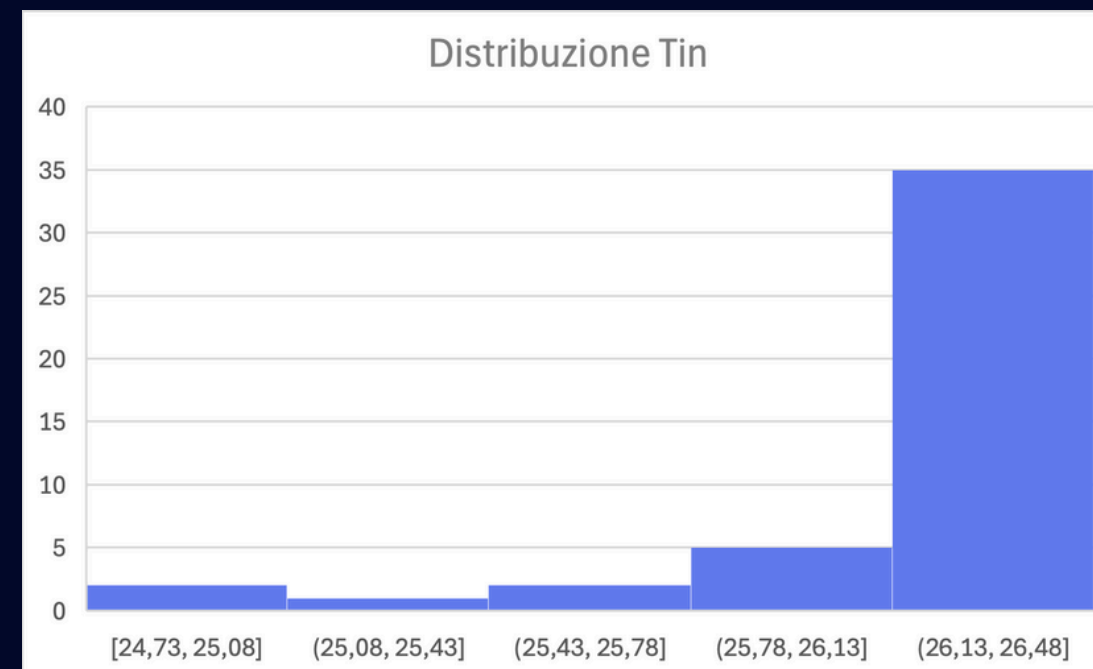
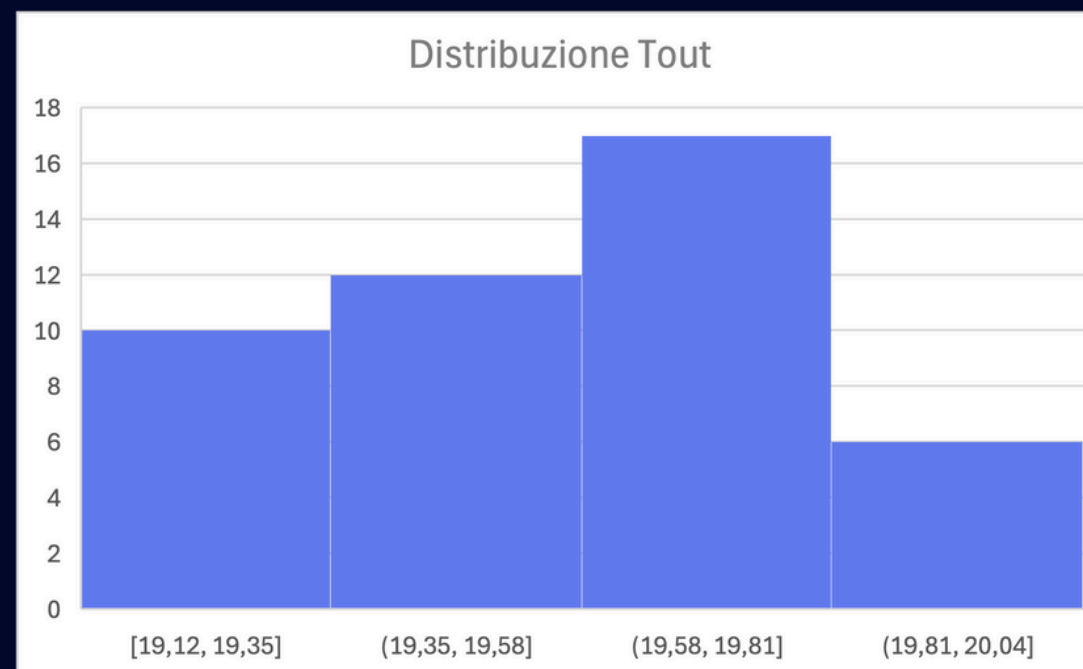
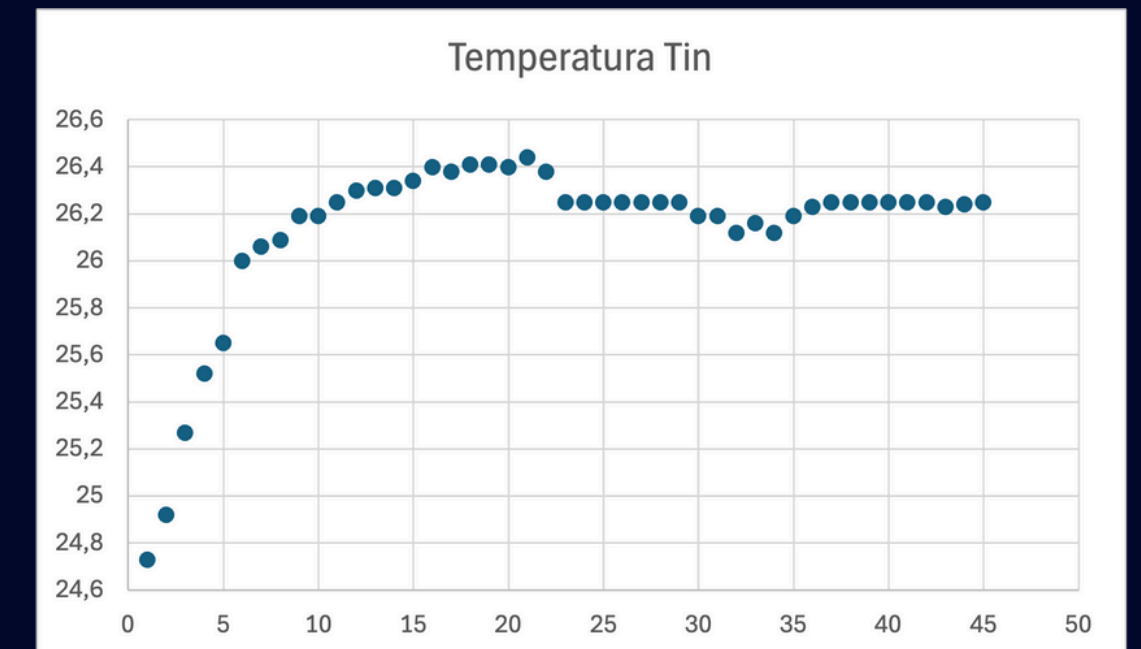
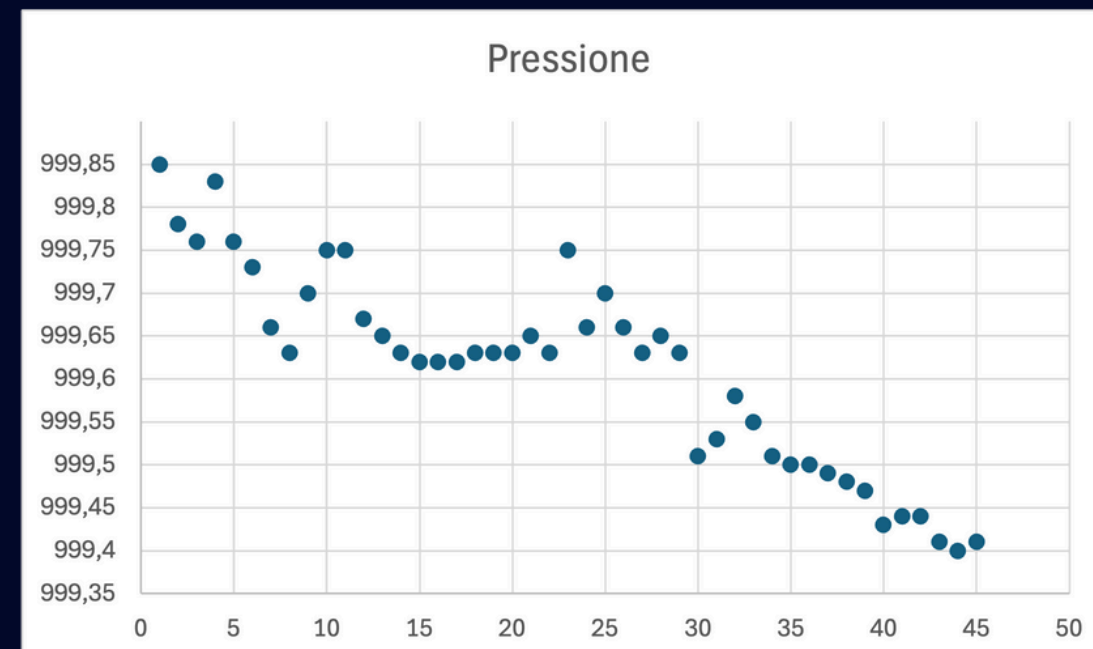
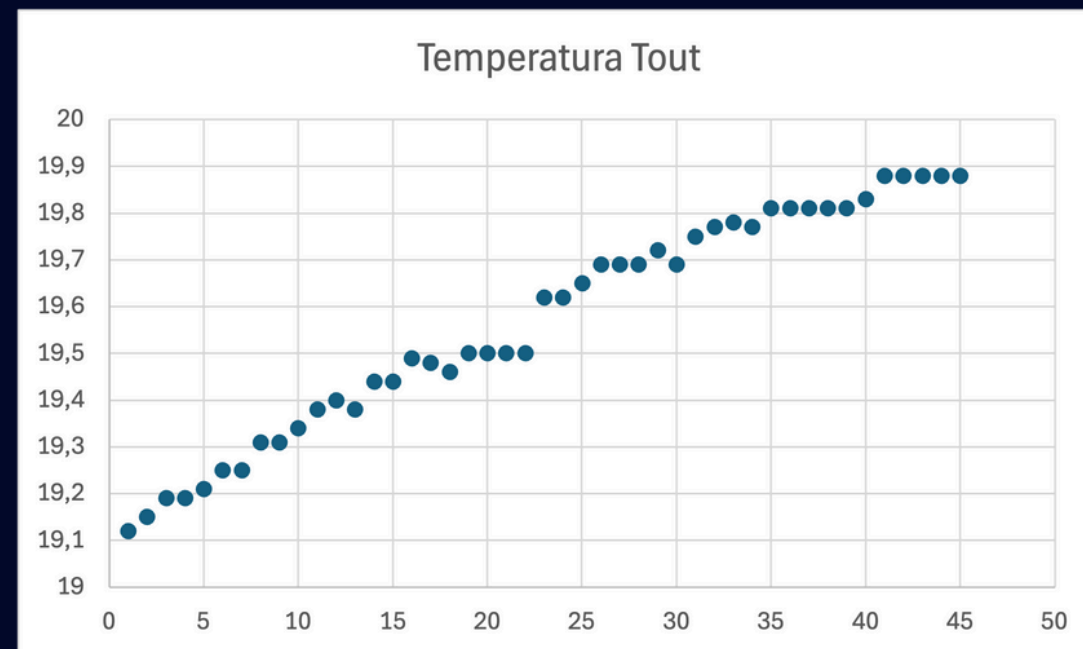
SOME PLOTS: FIXED.CSV ALL DATA



TEMPERATURE AND PRESSURE

For each Run we plotted similar graphs (first run set graphs reference)

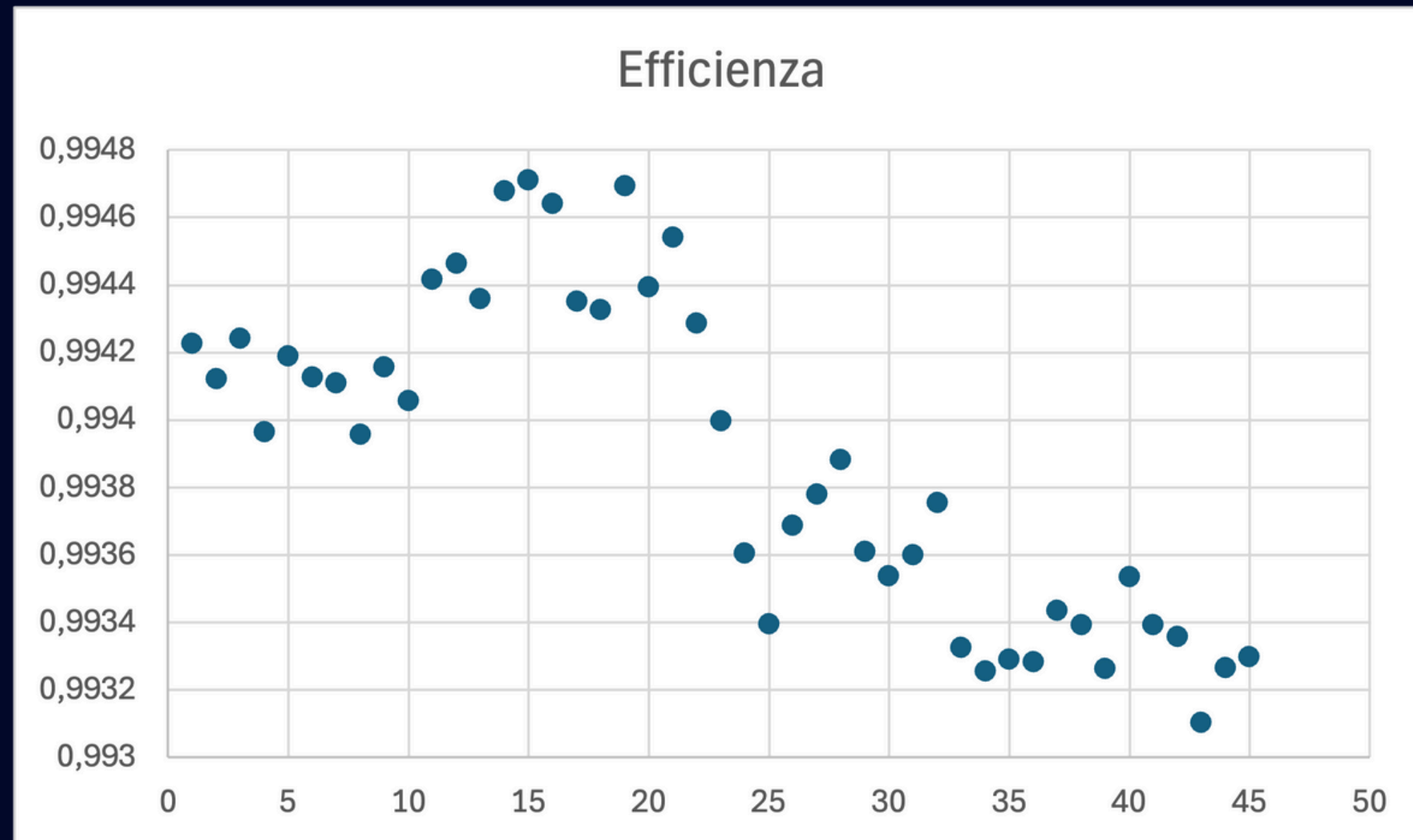
590496185 – 590500214:



EFFICIENCY CALCULATION

$$= \text{Rate} / \text{RateEffCorr}$$

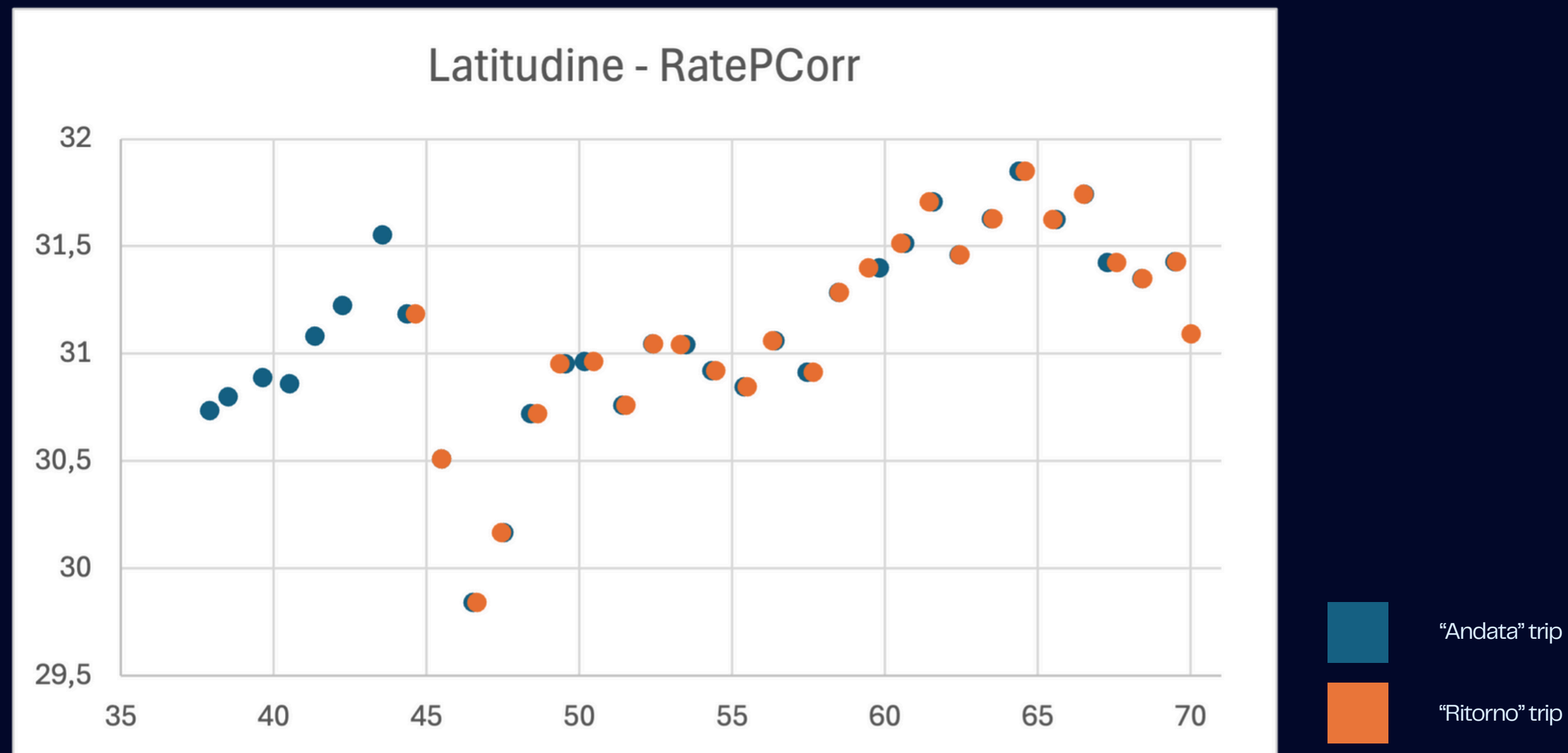
Example from same run interval:



We haven't found any discrepancy between efficiency, temperature (T_{in} , T_{out}) and pressure values in any of the analyzed run intervals. Also, the efficiency was above 0.99 for all data tested, thus allowing us to safely make use of them

THE MOVING DATA

We also briefly analyzed the moving.csv data: in contrast to the fixed.csv file, we can see that the rate doesn't seem to change in respect to latitude values



CONCLUSIONS AND RESULTS

- ➔ Rates increase with greater latitude
- ➔ Stability of temperature and pressure measurements
- ➔ Rates of past years were higher as the solar magnetic field was in a dimmer phase

THANK YOU

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