Statistical analysis of the risk of fires in the Pantanal in the first five months of 2022

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Topics

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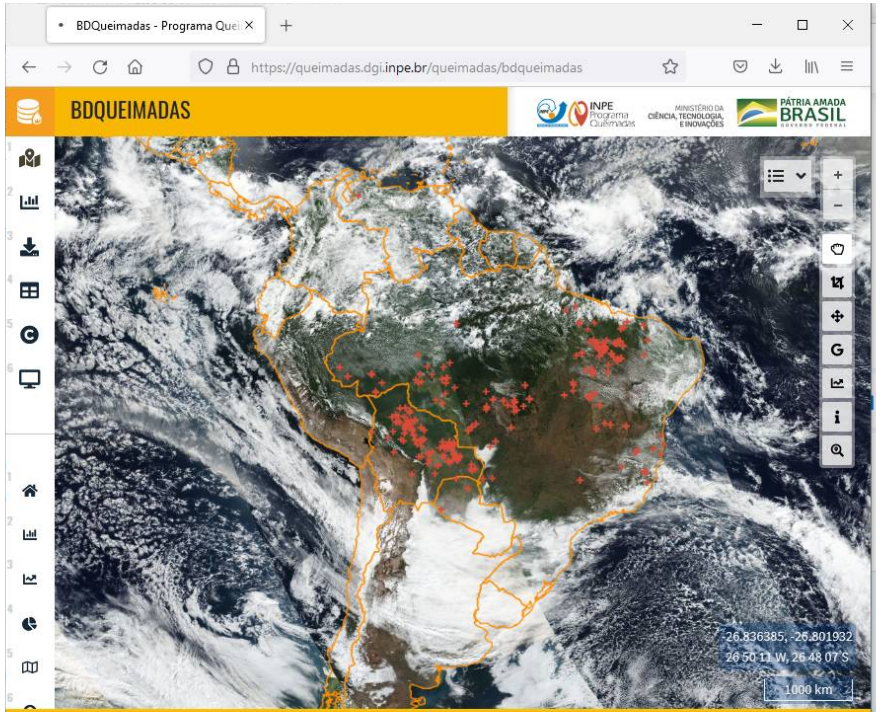
- Methodology
- Results
- Conclusion

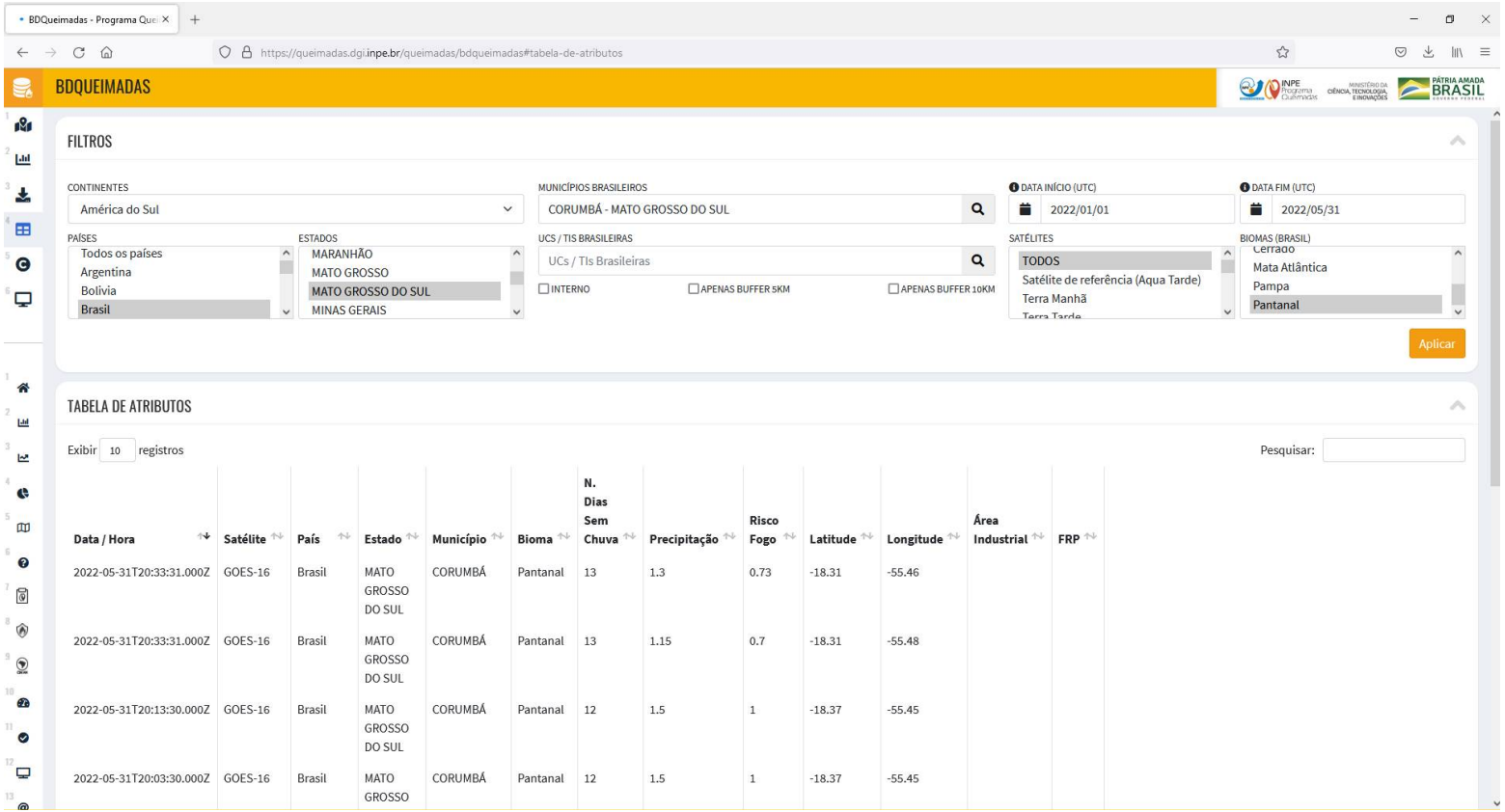
Introduction

Fires in the pantanal biome have increased significantly in recent years. The National Institute for Space Research (INPE) has developed a research, development and product innovation program, and technological geoservices development processes for monitoring risk and active development in research, its extension and gravity development, using Remote Sensing techniques, Geoprocessing and Numerical Modeling.



Methodology

- Dataset



Methodology

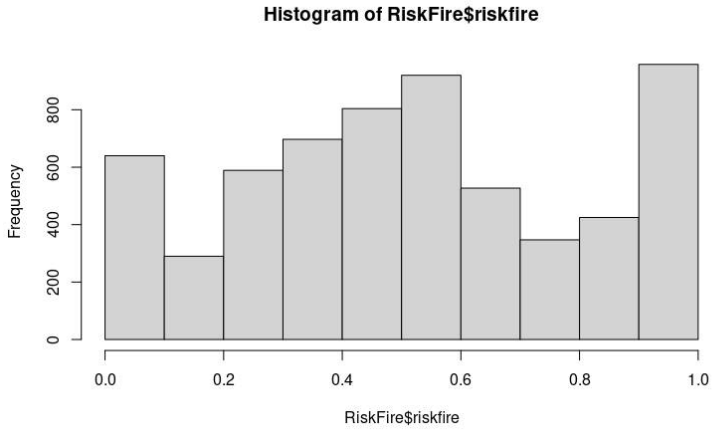
- 6197 Samples;
- Between-Subject;
- Risk Fire Levels: Minimum, Low, Medium, High, Critical;
- Ajust Dataset;
- Factors: Days without rain, precipitation value and Fire Radiative Power (FRP) measured in MW (megawatts);
- Response variable: Risk Fire Value.

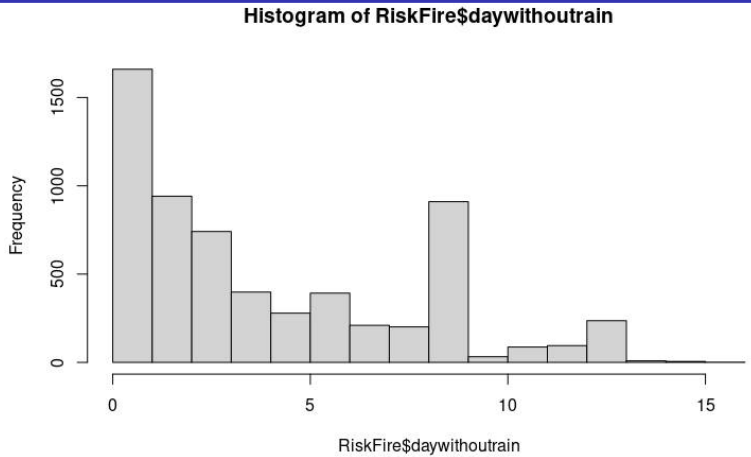
Results

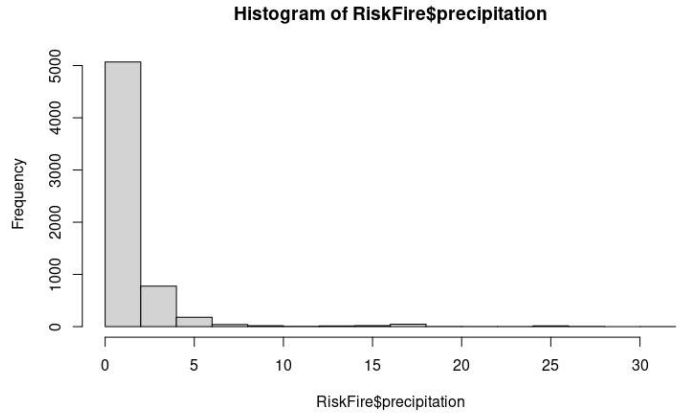
- Summary

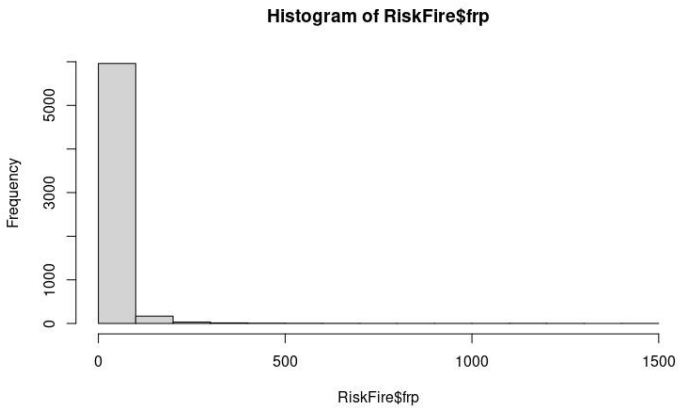
daywithoutrain	precipitation	riskfire	frp	RiskFireLevel
Min. : 0.000 1st Qu.: 1.000 Median : 3.000 Mean : 4.379 3rd Qu.: 8.000 Max. : 16.000	Min. : 0.000 1st Qu.: 0.000 Median : 0.000 Mean : 1.094 3rd Qu.: 1.220 Max. :30.400	Min. :0.0000 1st Qu.:0.4000 Median :0.6000 Mean :0.5594 3rd Qu.:0.8000 Max. :1.0000	Min. : 0.0 1st Qu.: 3.5 Median : 8.4 Mean : 22.6 3rd Qu.: 19.9 Max. :1425.3	Minimum : 642 Low : 879 Medium :2552 High :1210 Critical: 914

Results

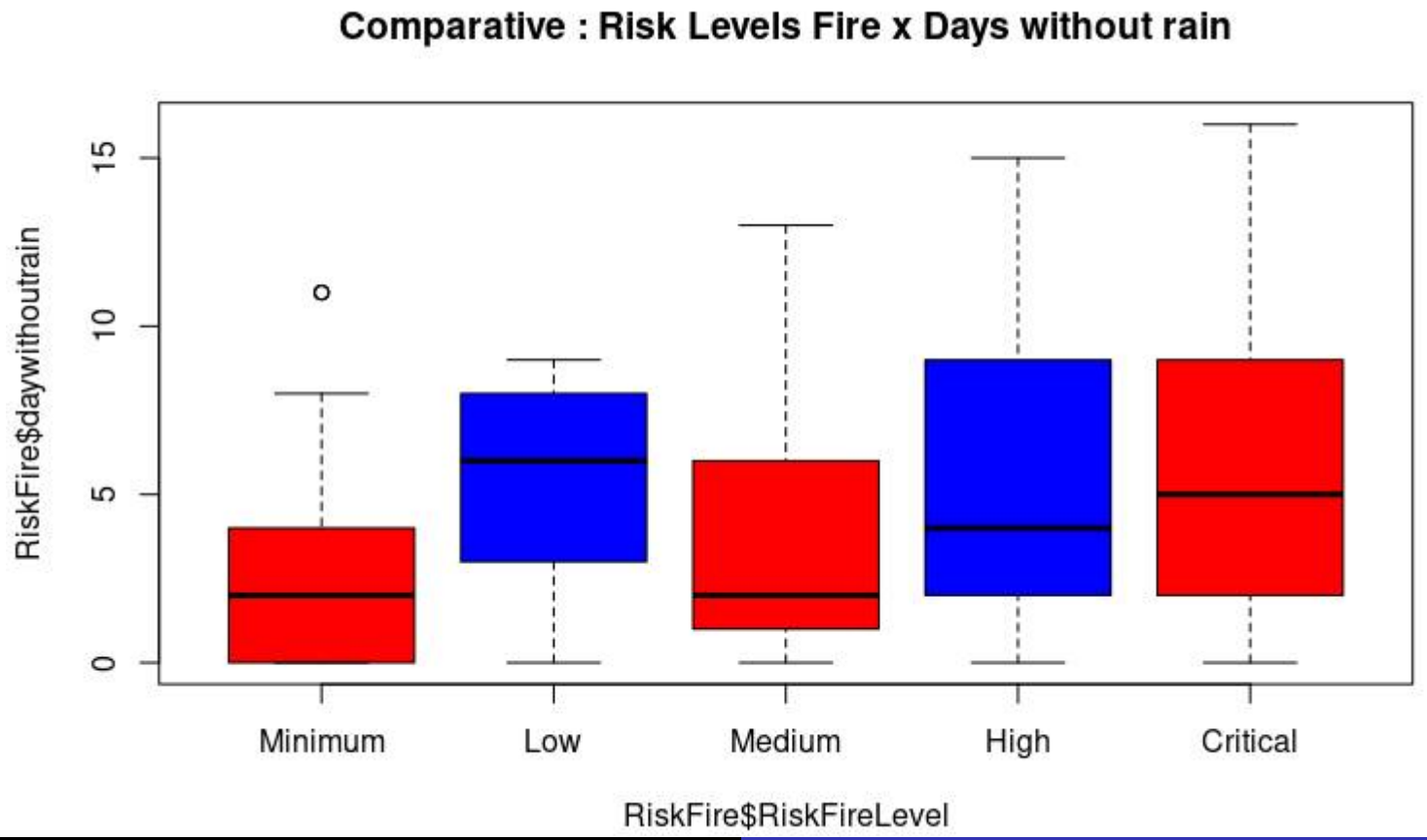

Histogram of RiskFire$riskfire
Frequency
0
200
400
600
800
0.0
0.2
0.4
0.6
0.8
1.0
RiskFire$riskfire


Histogram of RiskFire$daywithoutrain
Frequency
0
500
1000
1500
0
5
10
15
RiskFire$daywithoutrain

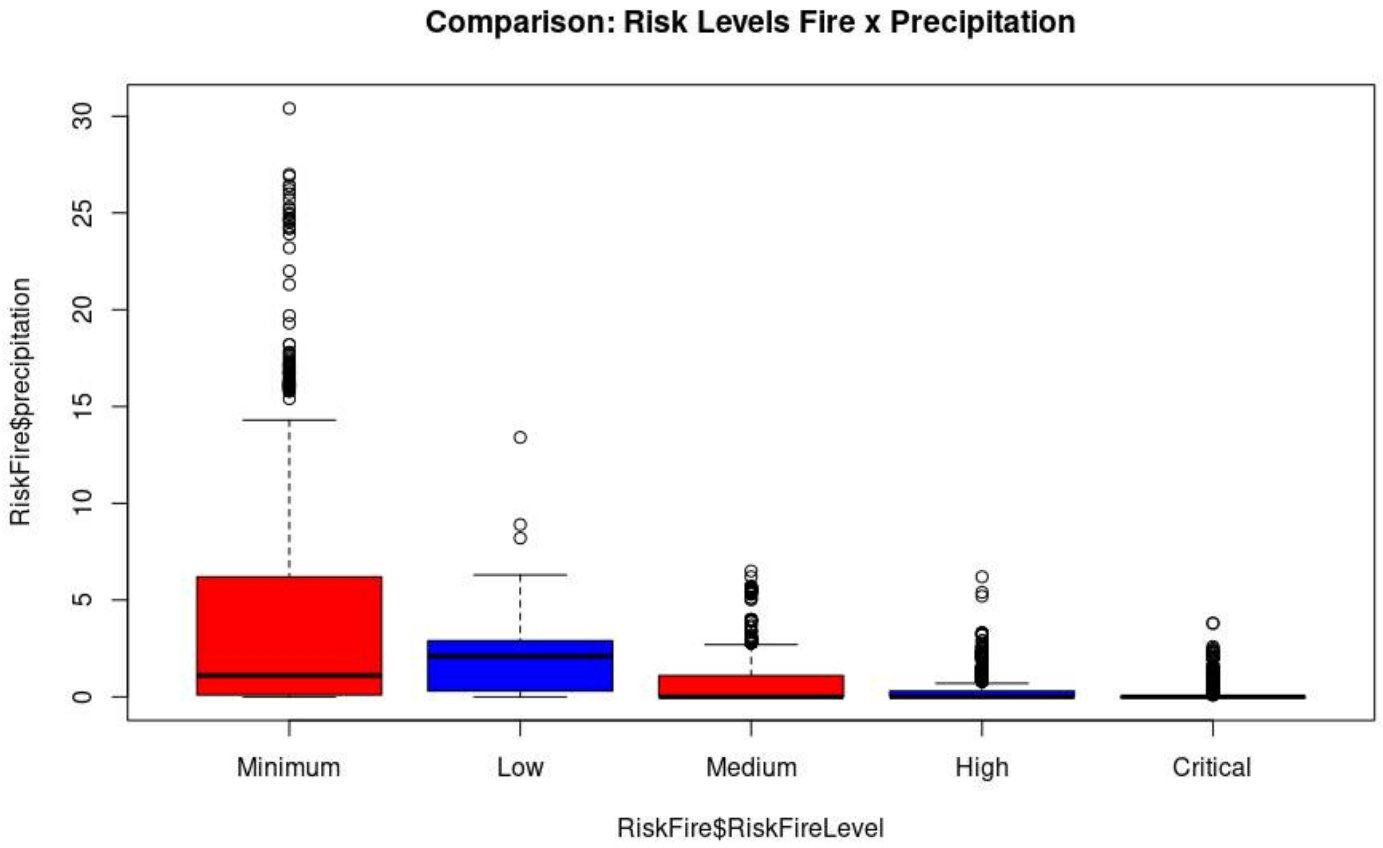

Histogram of RiskFire$precipitation
Frequency
0
1000
2000
3000
4000
5000
0
5
10
15
20
25
30
RiskFire$precipitation


Histogram of RiskFire$frp
Frequency
0
1000
3000
5000
0
500
1000
1500
RiskFire$frp

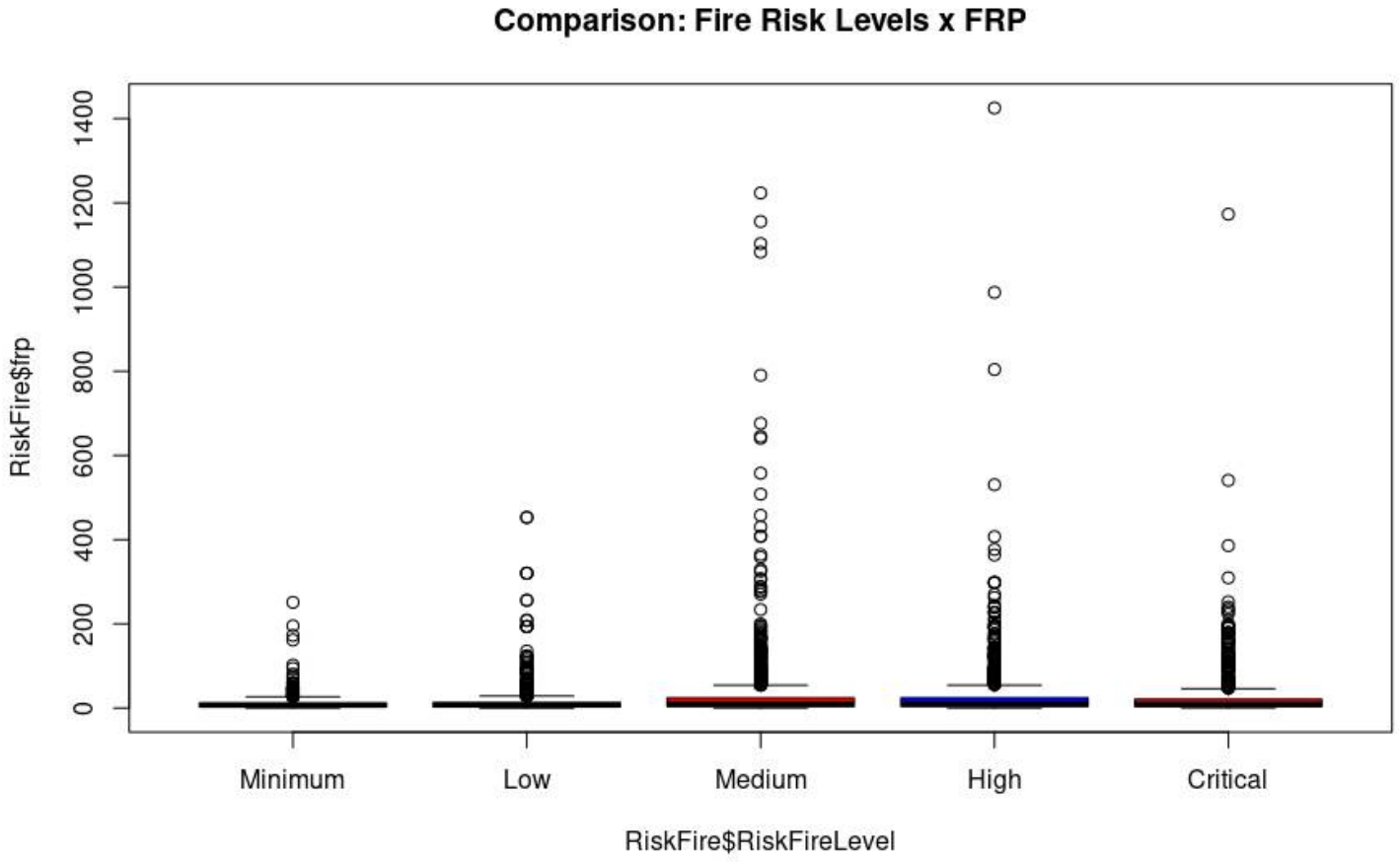
Results


Comparative : Risk Levels Fire x Days without rain
RiskFire$daywithoutrain
0
5
10
15
Minimum
Low
Medium
High
Critical
RiskFire$RiskFireLevel

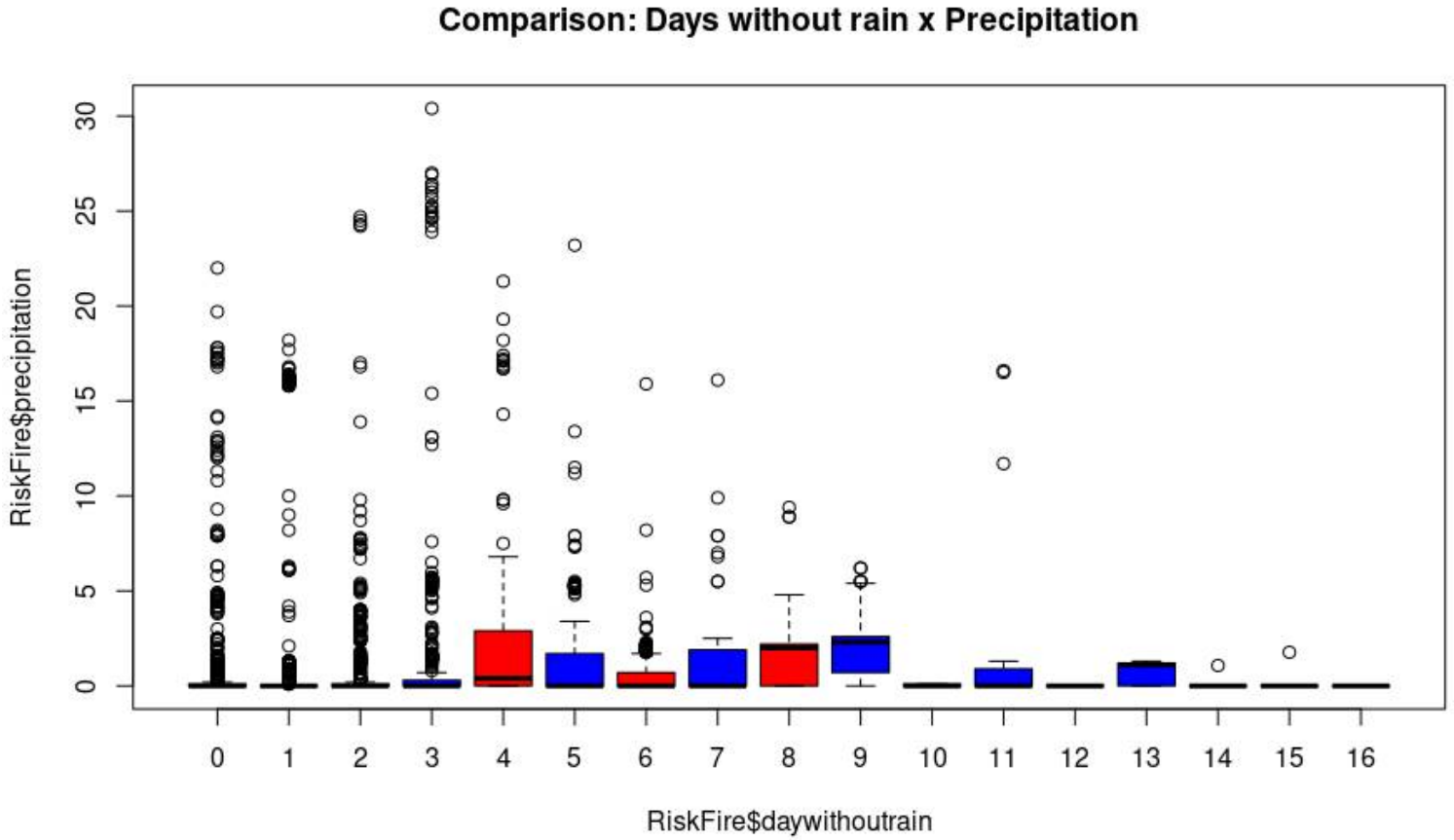
Results


Comparison: Risk Levels Fire x Precipitation
RiskFire$precipitation
0
5
10
15
20
25
30
Minimum
Low
Medium
High
Critical
RiskFire$RiskFireLevel

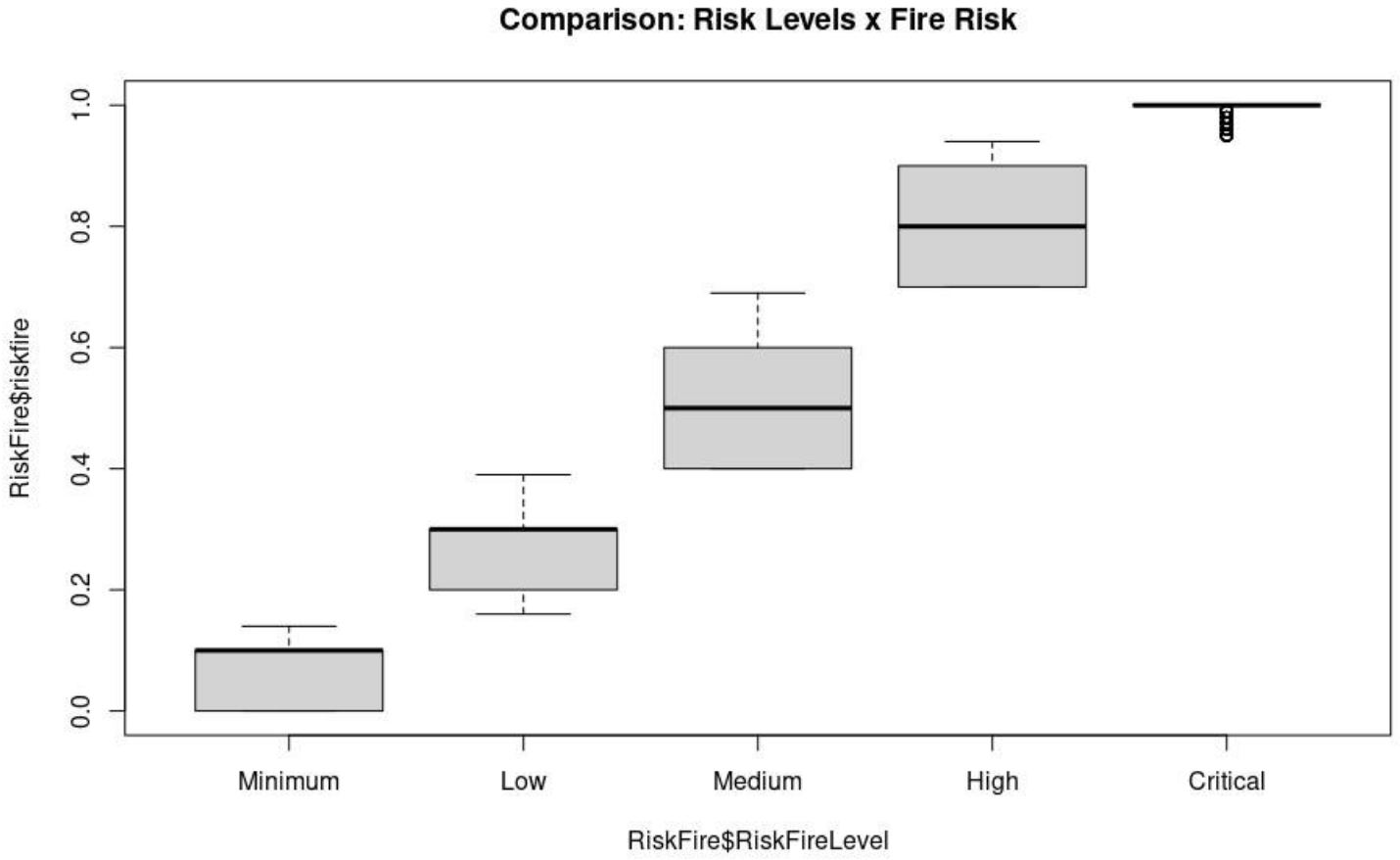
Results


Comparison: Fire Risk Levels x FRP
RiskFire$frp
0
200
400
600
800
1000
1200
1400
Minimum
Low
Medium
High
Critical
RiskFire$RiskFireLevel

Results


Comparison: Days without rain x Precipitation
RiskFire$precipitation
0
5
10
15
20
25
30
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
RiskFire$daywithoutrain

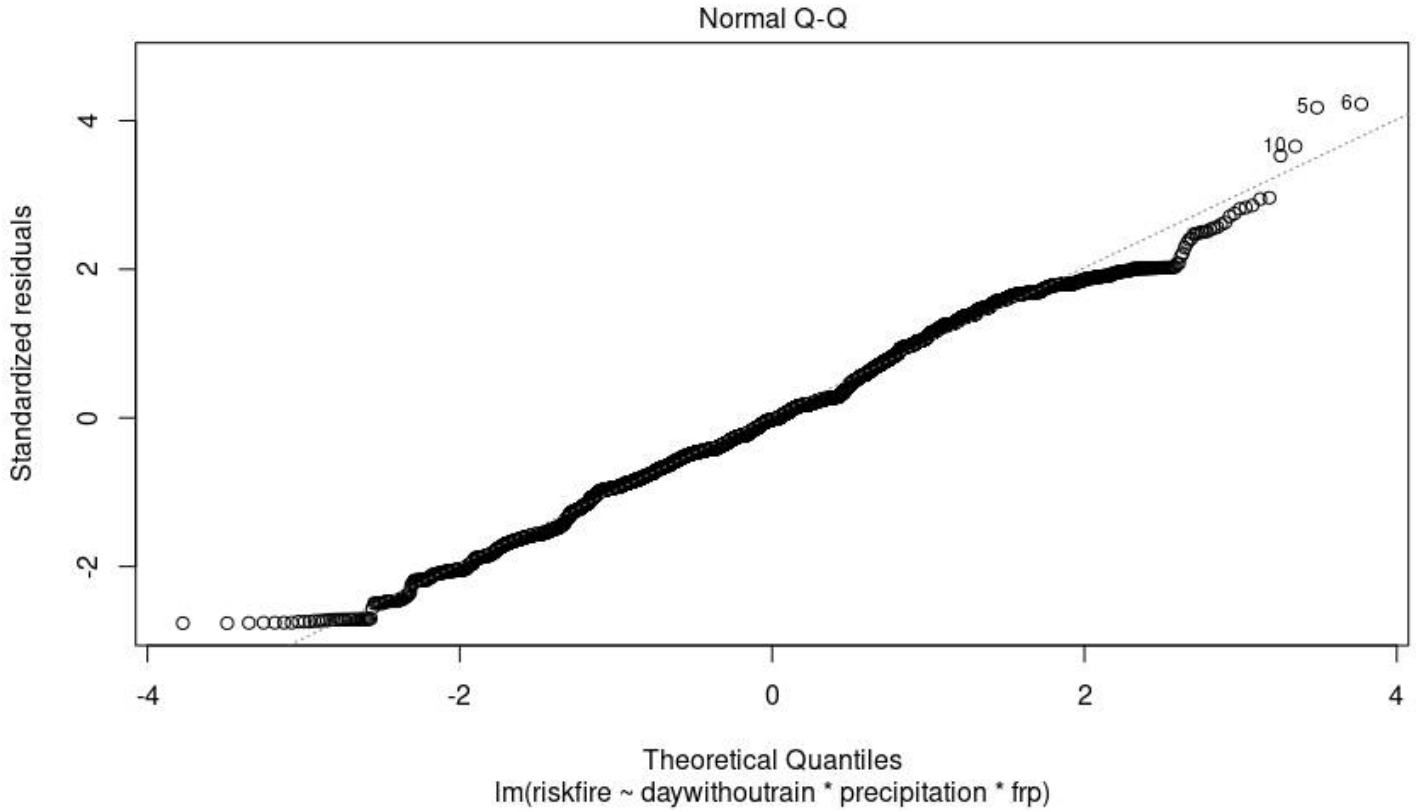
Results


Comparison: Risk Levels x Fire Risk
RiskFire$riskfire
0.0
0.2
0.4
0.6
0.8
1.0
Minimum
Low
Medium
High
Critical
RiskFire$RiskFireLevel

Results

Factor	value	linear relationship
riskfire and daywithoutrain	0.1683654	weak uphill
riskfire and precipitation	-0.5012815	moderate downhill
riskfire and fire radiation power	0.1183027	weak uphill
daywithoutrain and precipitation	0.3059806	weak uphill
daywithoutrain and fire radiation power	-0.1006599	weak downhill
precipitation and fire radiation power	-0.0655393	weak downhill

Results


Normal Q-Q
Standardized residuals
4
2
0
-2
-4
-2
0
2
4
5
6
1
8
Theoretical Quantiles
lm(riskfire ~ daywithoutrain * precipitation * frp)

Conclusion

- The number of days without rain until the detection of the outbreak, precipitation accumulated value on the day until the moment of focus detection and Fire Radiotive Power are independent but have significance
- Precipitation showed the highest correlation with risk fire levels, where the higher the precipitation value, the lower the risk fire.
- The number of days without rain showed a weak uphill correlation with precipitation.
- The best model discovered in the prediction of linear regression was the multilinear one with interactions between the factors, with lower residual error and higher coefficient of determination.