

Combined Threshold Analysis

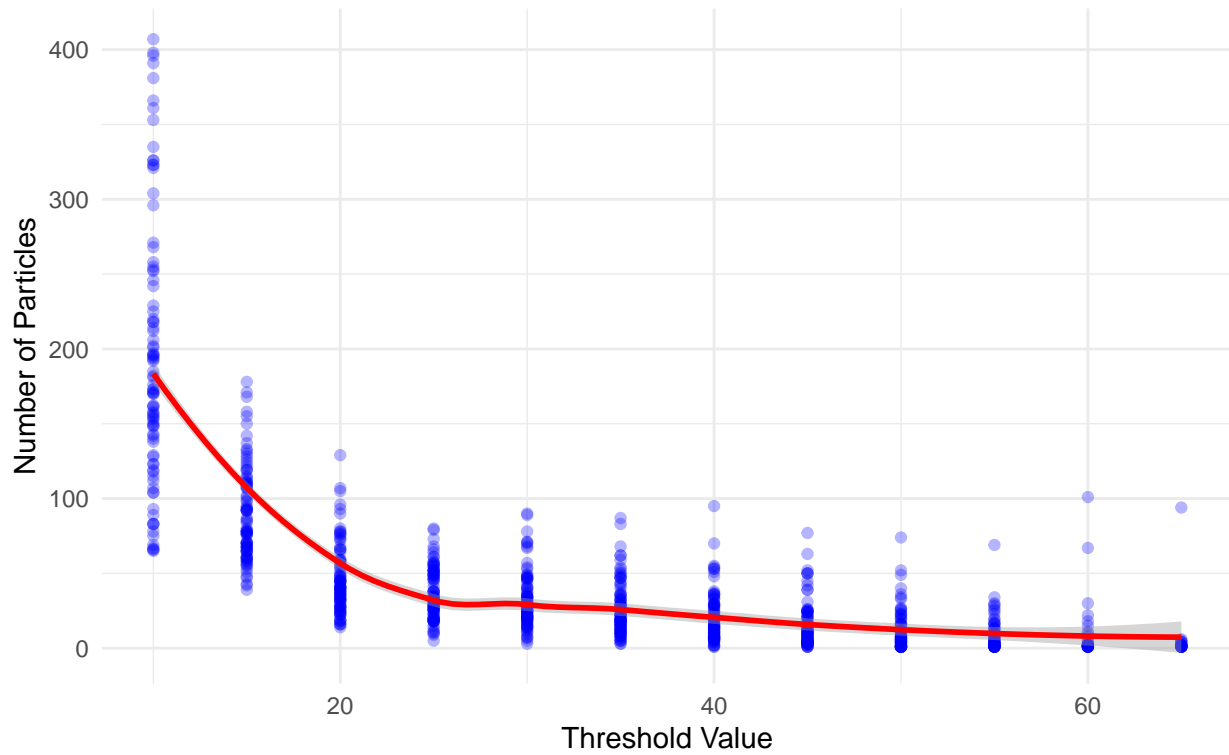
Brandon Titensor

2024-12-11

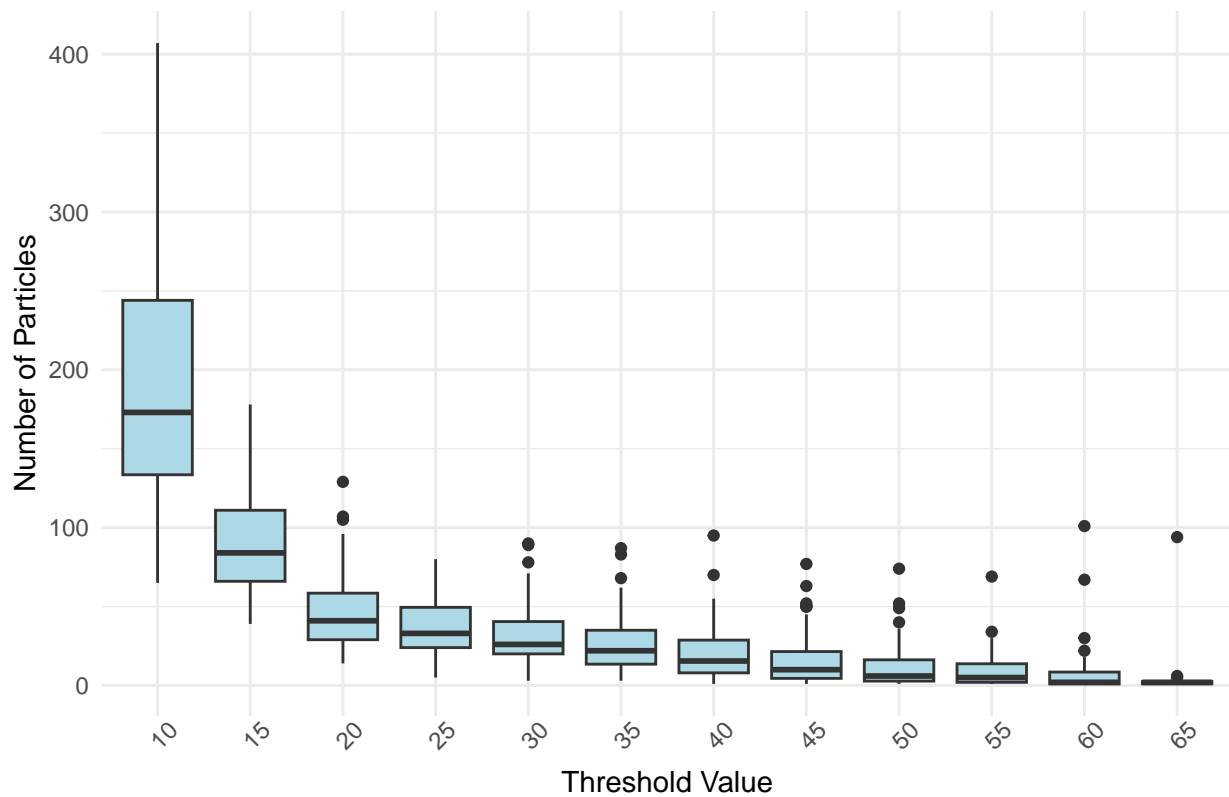
Calibration Images Analysis

Calibration – Particle Count vs Threshold

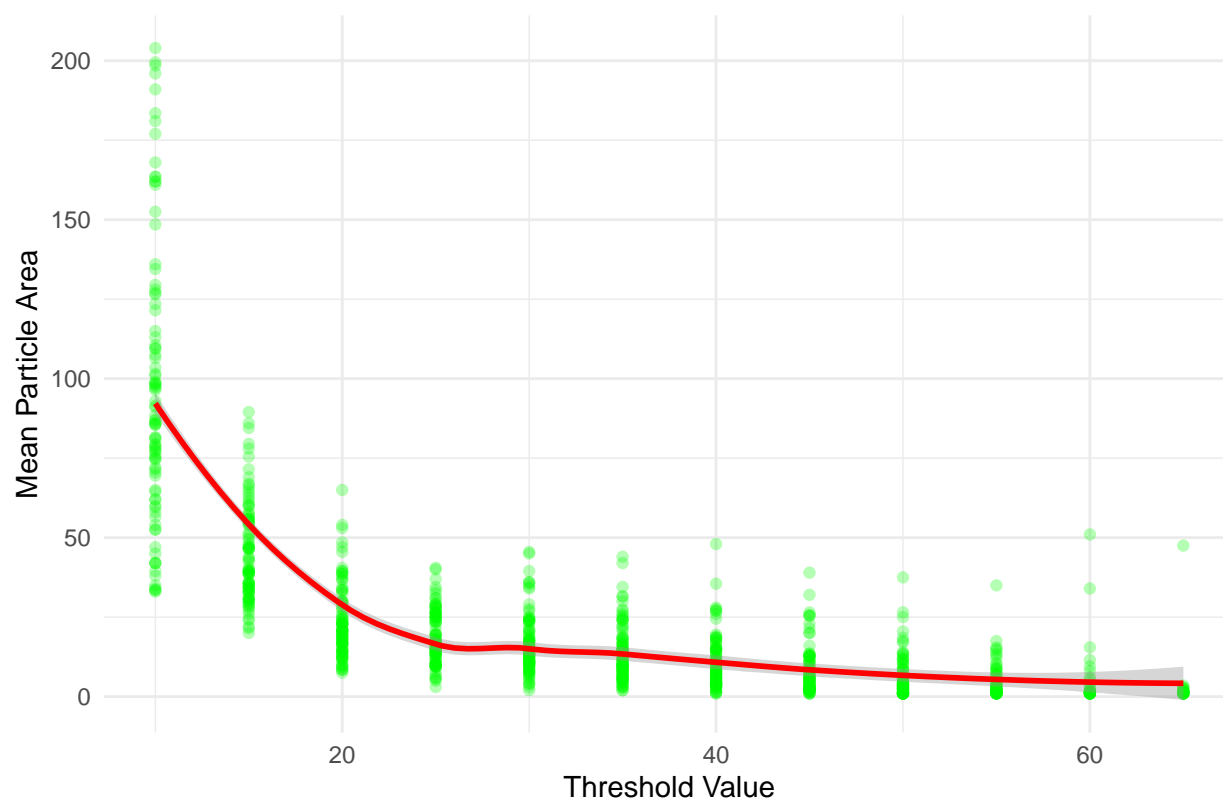
Each point represents one image



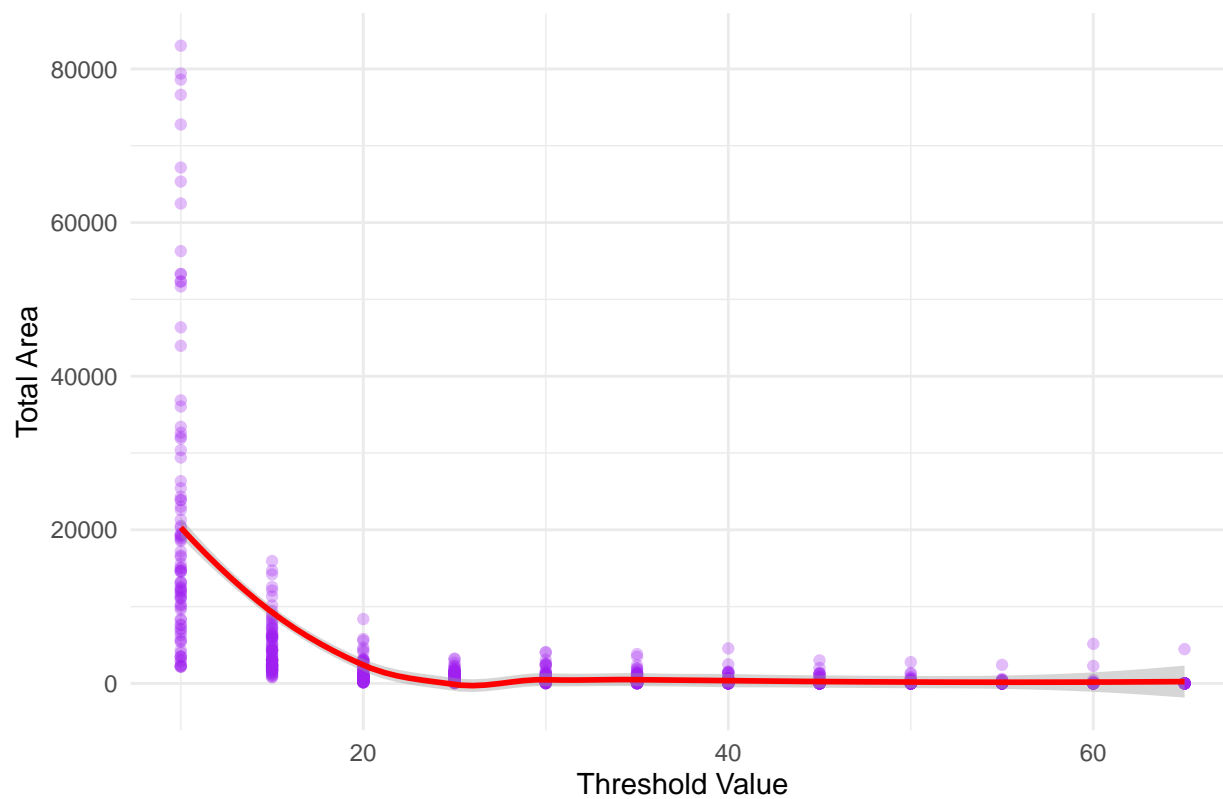
Calibration – Distribution of Particle Counts

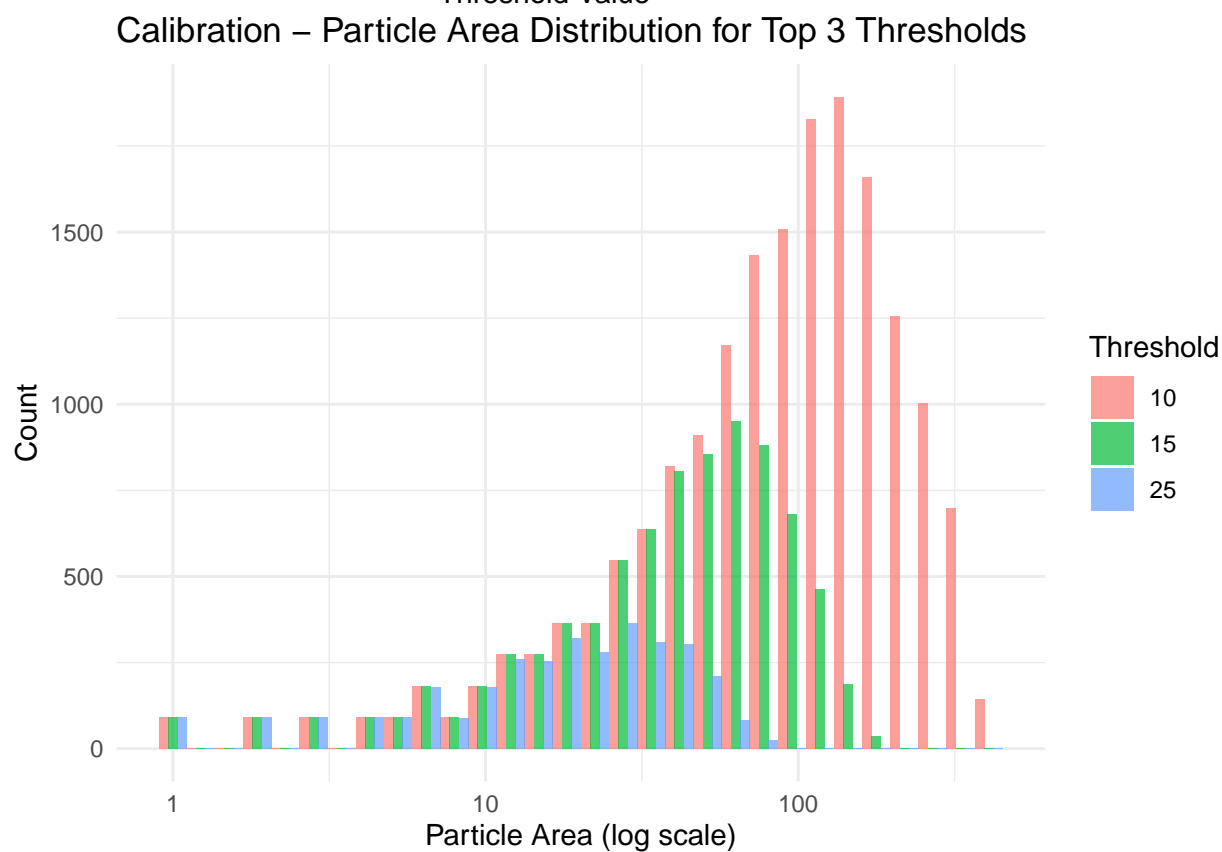
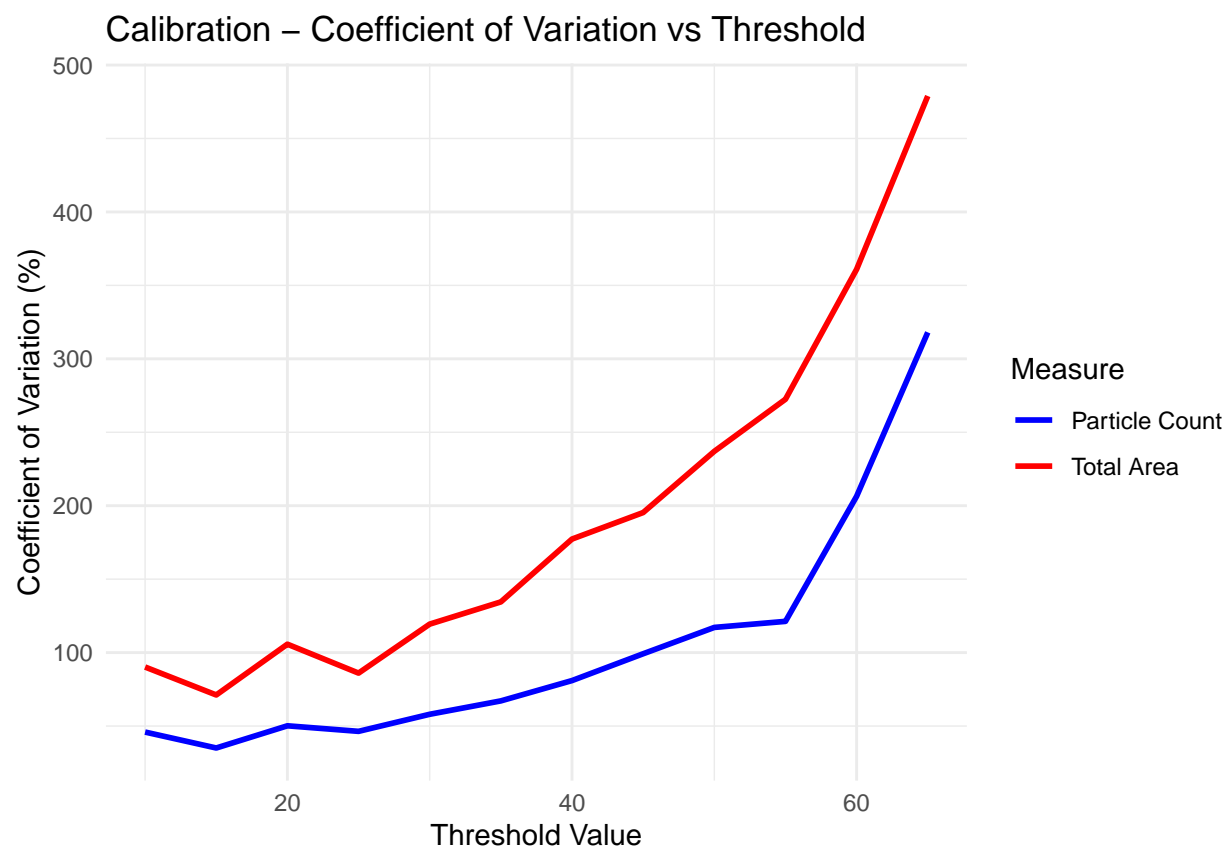


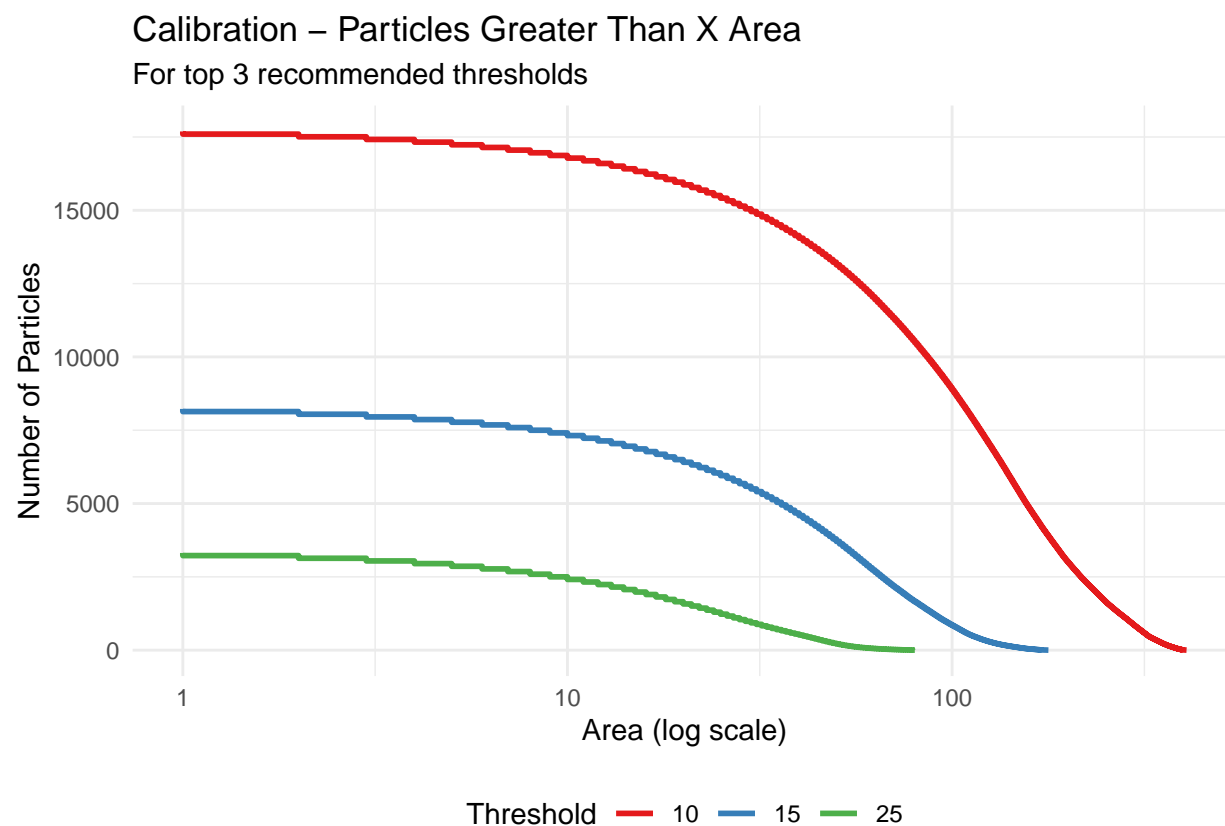
Calibration – Mean Particle Area vs Threshold



Calibration – Total Particle Area vs Threshold





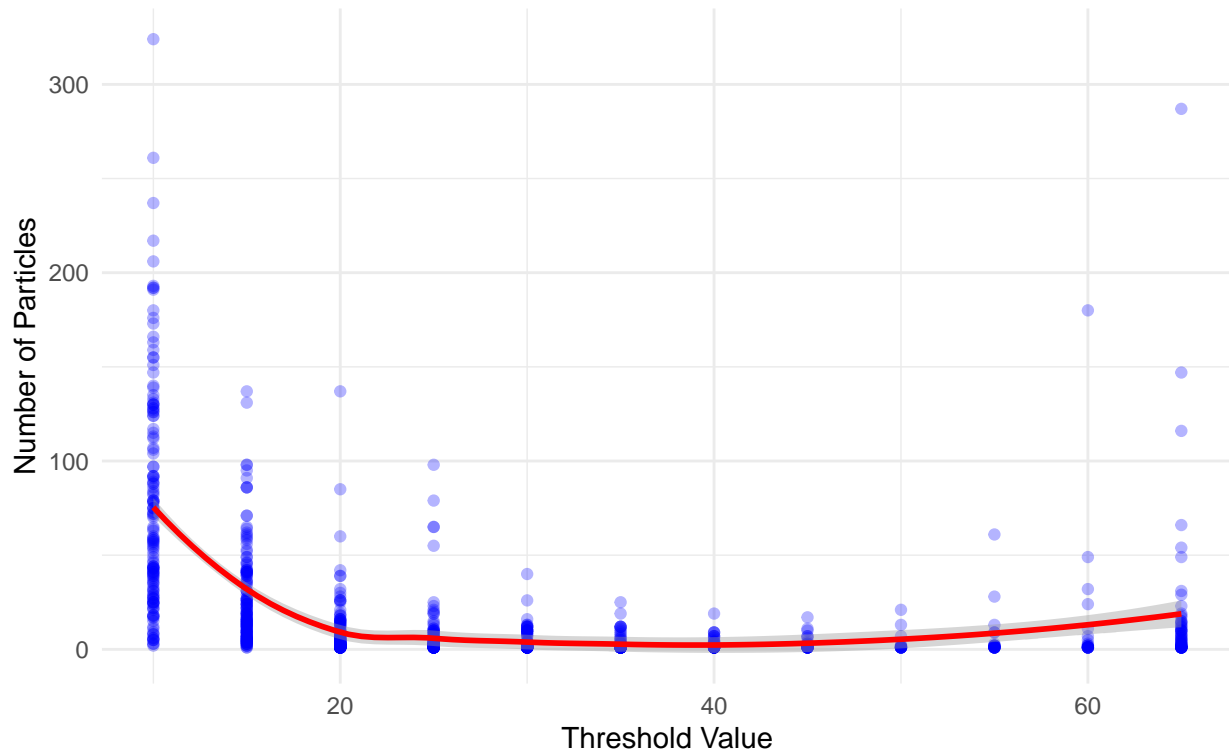


```
##
## Recommended thresholds for Calibration images:
## # A tibble: 5 x 2
##   Threshold Stability_Score[,1]
##   <dbl>          <dbl>
## 1      15          0.908
## 2      25          0.780
## 3      10          0.766
## 4      20          0.678
## 5      30          0.576
```

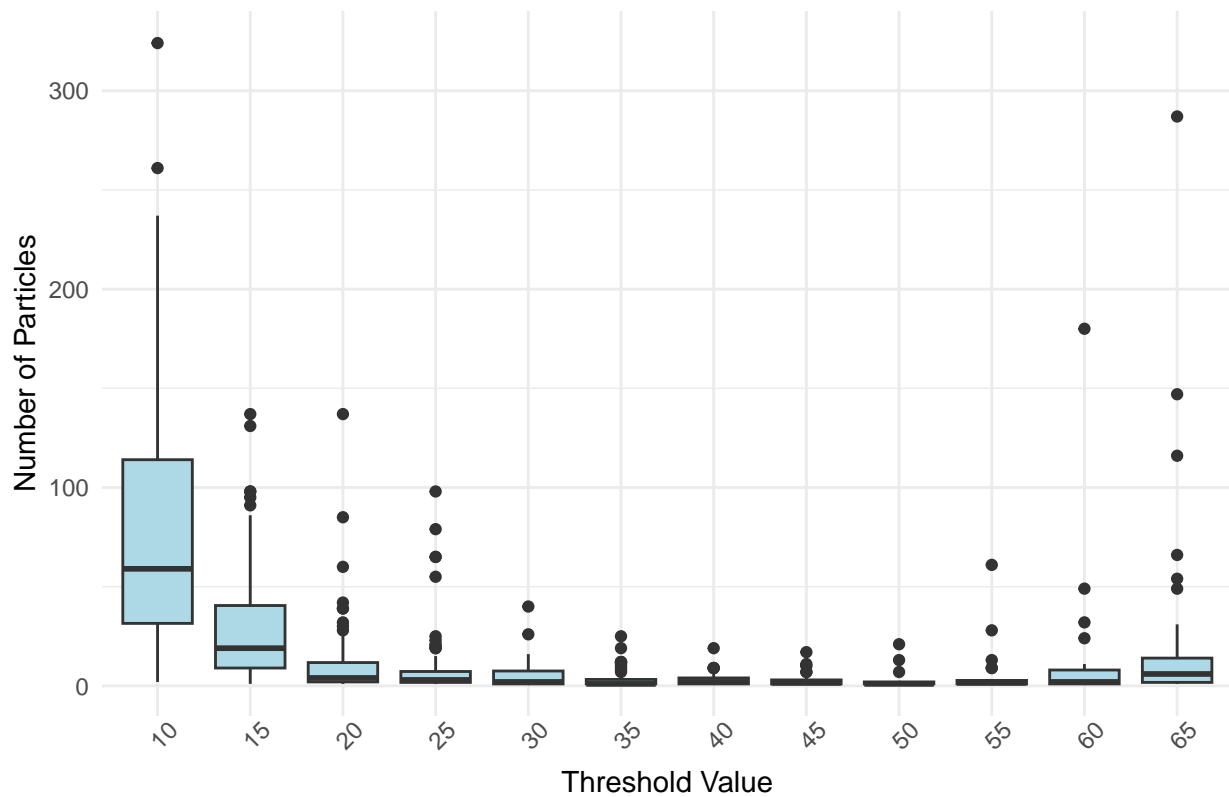
Edge Images Analysis

Edge – Particle Count vs Threshold

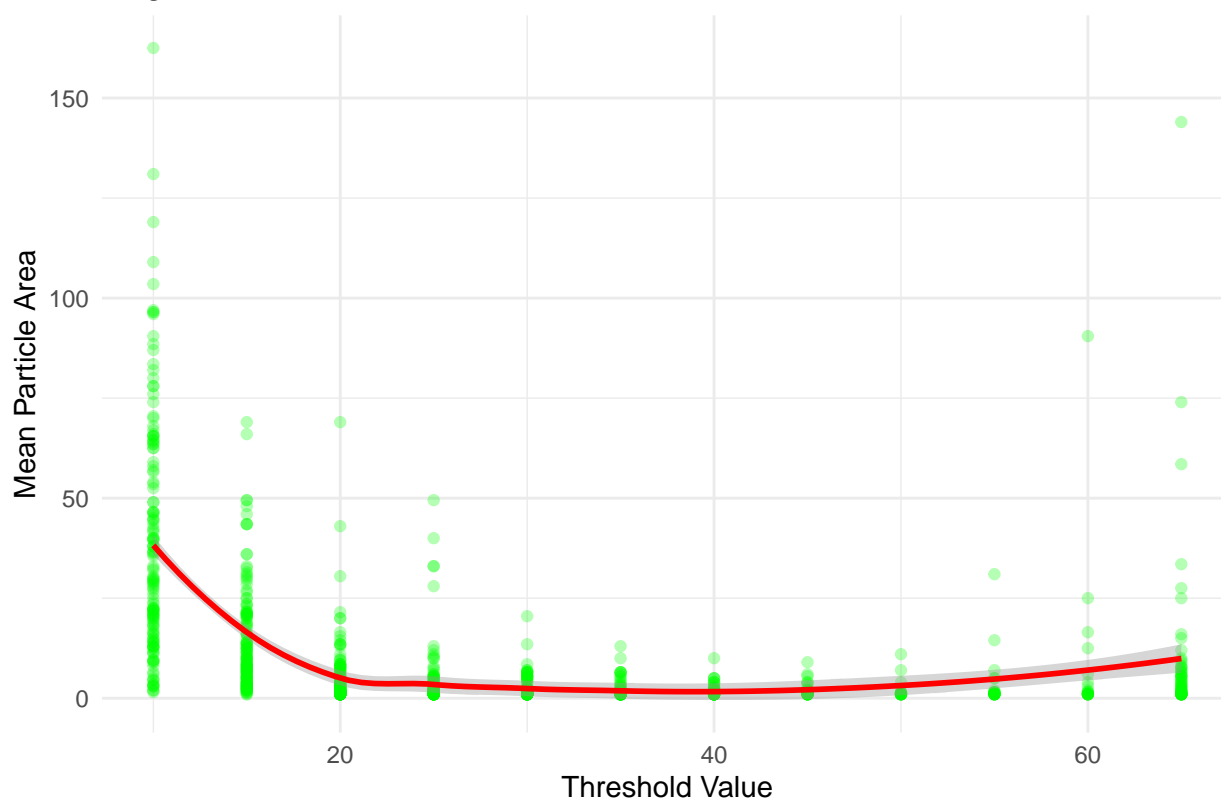
Each point represents one image



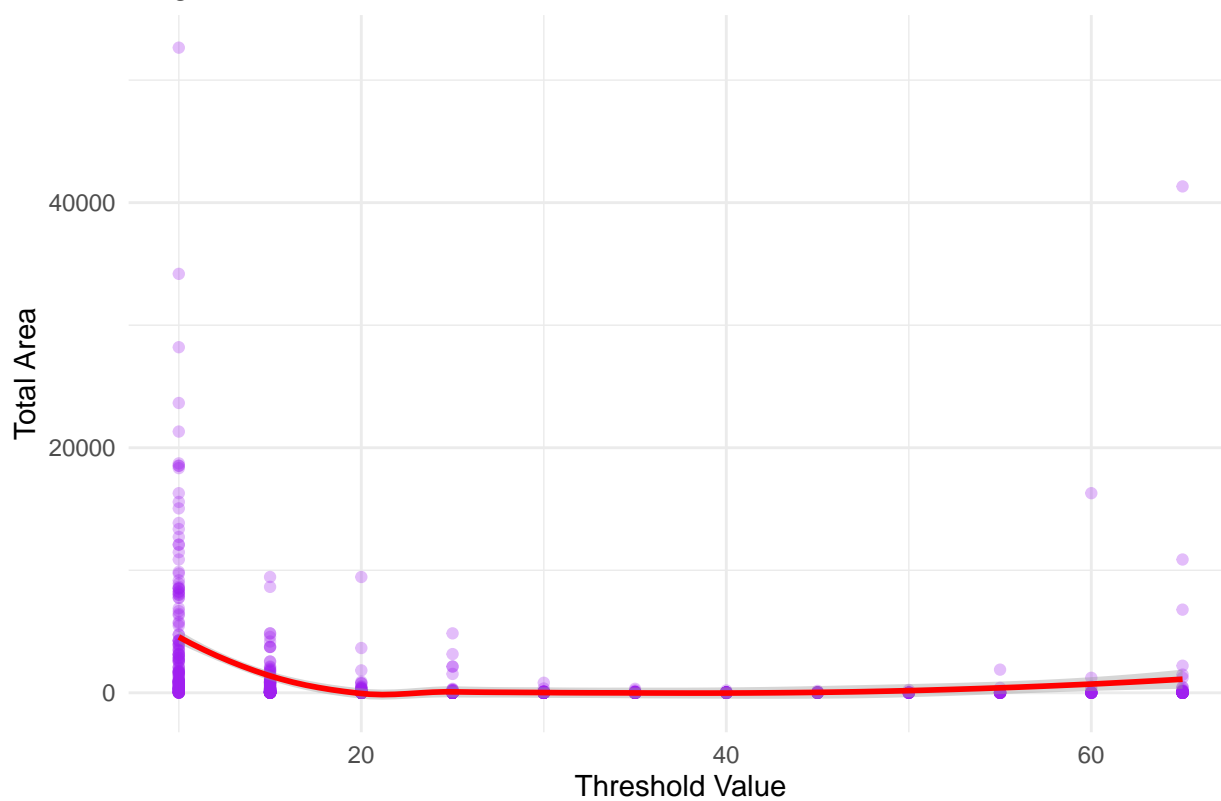
Edge – Distribution of Particle Counts

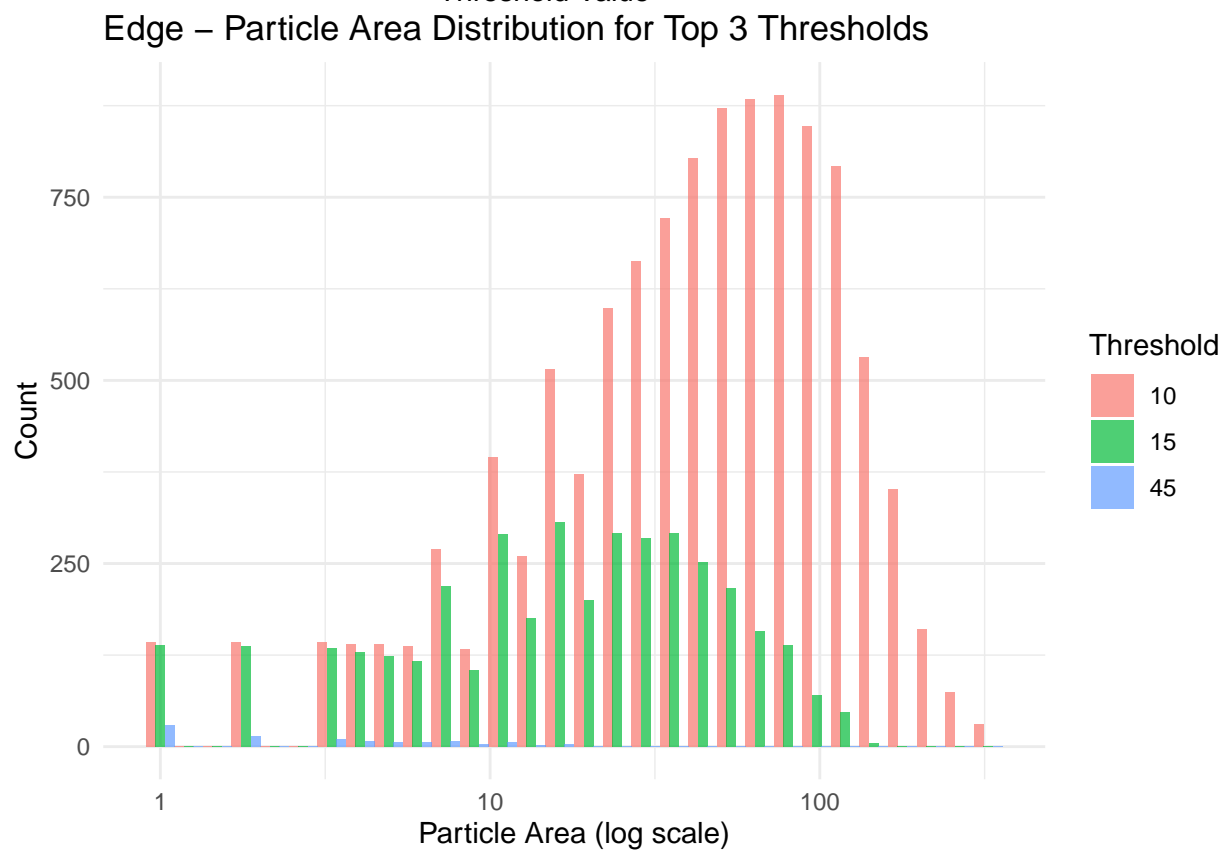
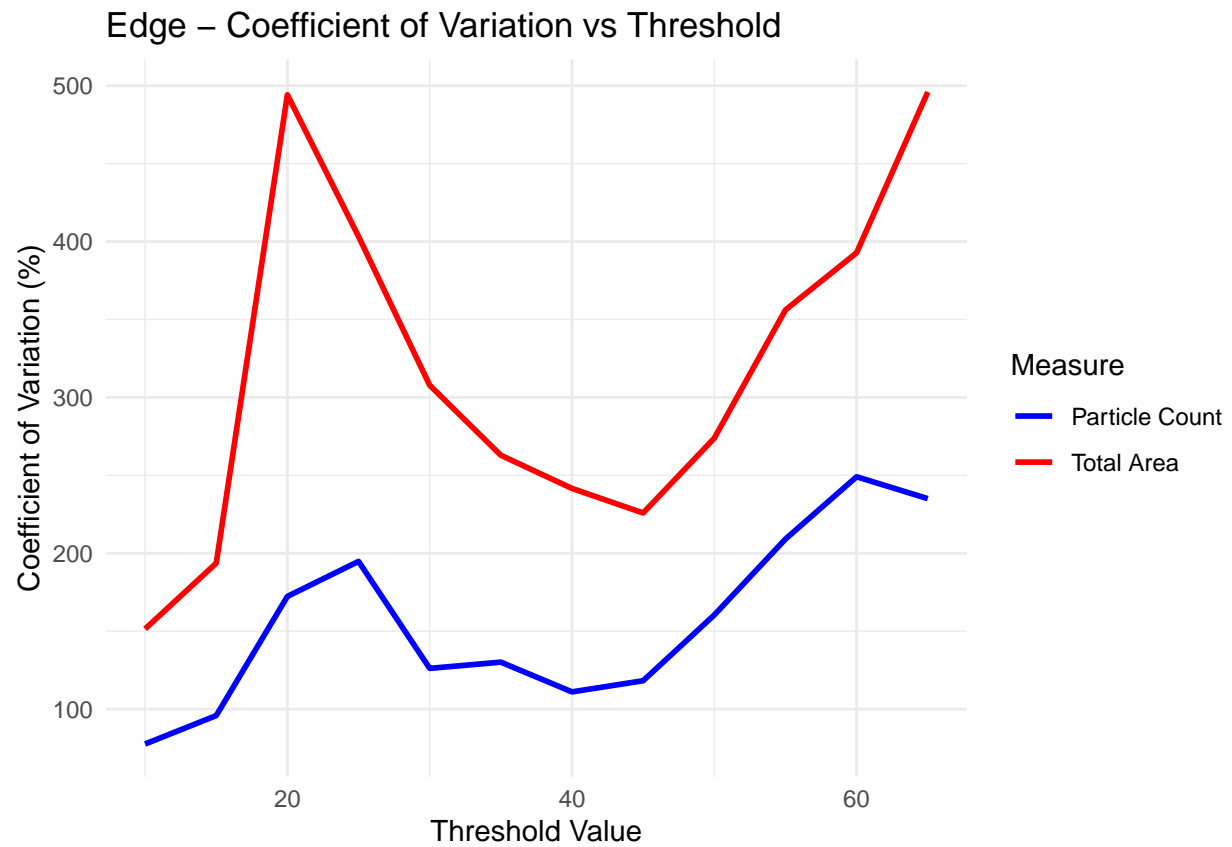


Edge – Mean Particle Area vs Threshold



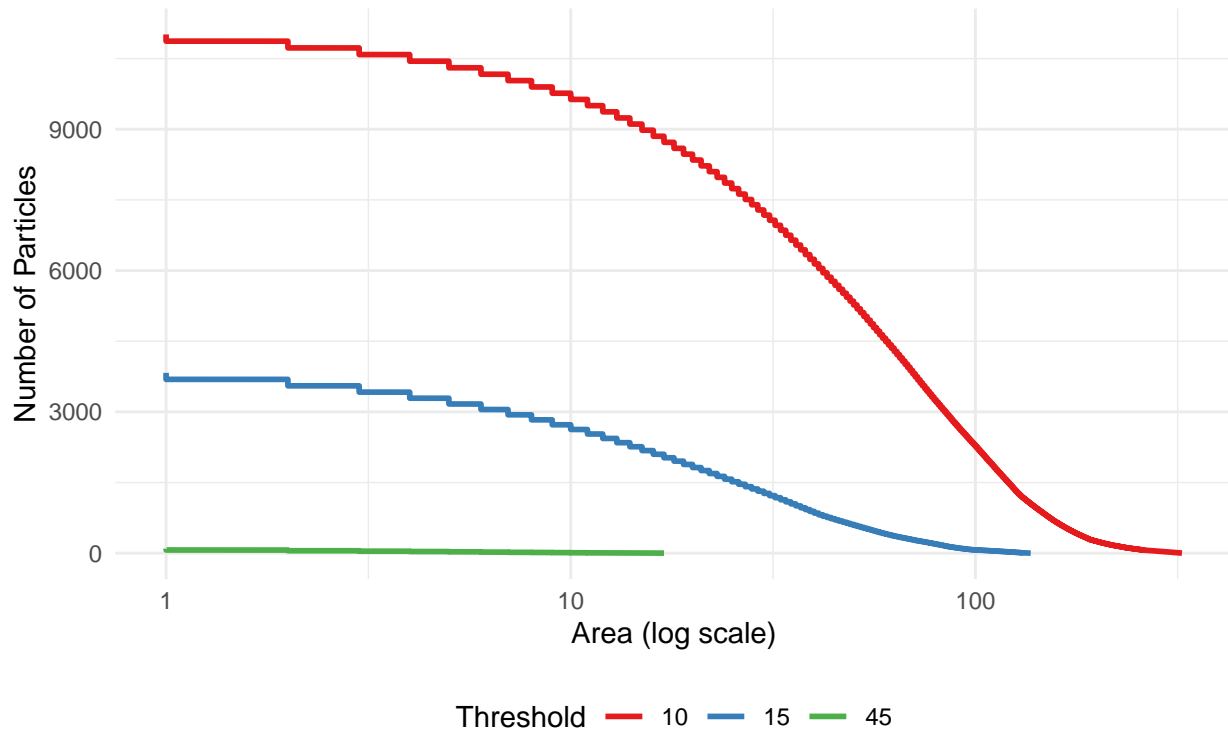
Edge – Total Particle Area vs Threshold





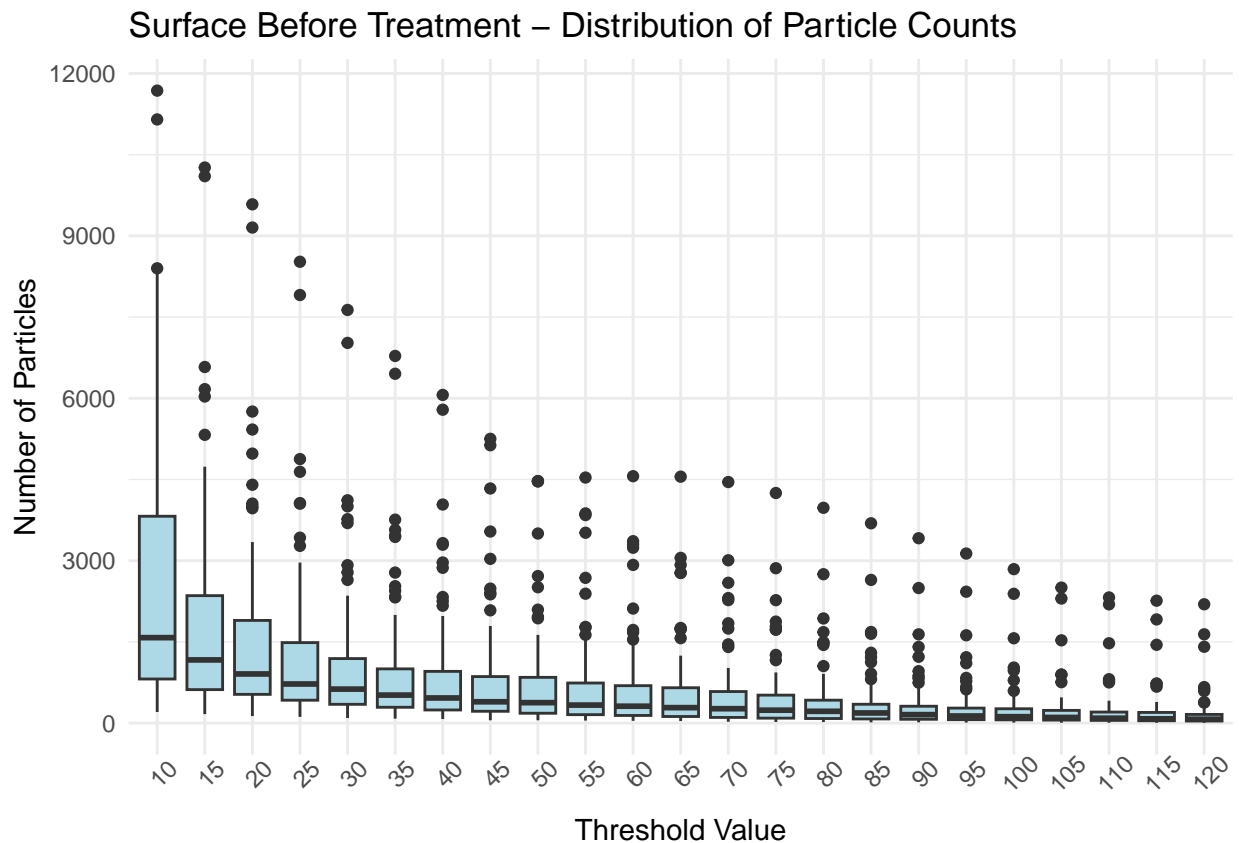
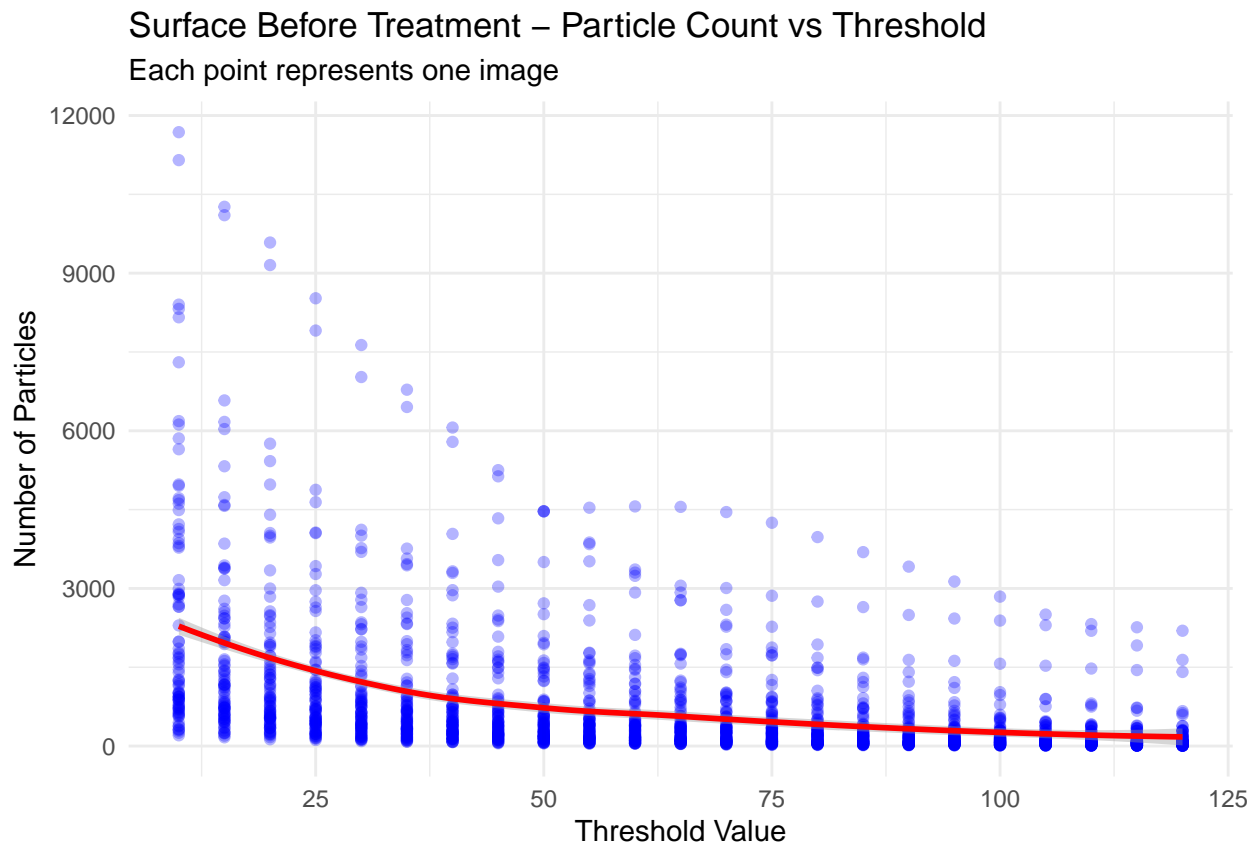
Edge – Particles Greater Than X Area

For top 3 recommended thresholds

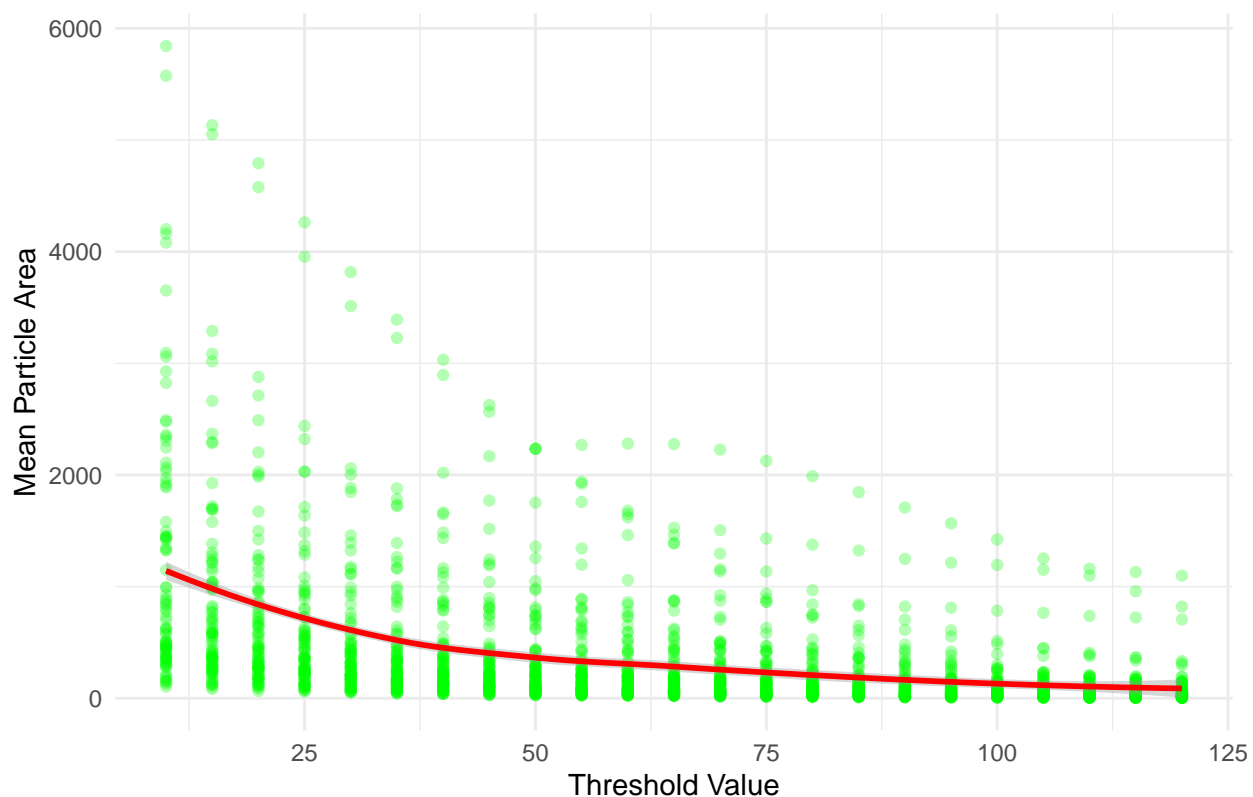


```
##
## Recommended thresholds for Edge images:
## # A tibble: 5 x 2
##   Threshold Stability_Score[,1]
##   <dbl>           <dbl>
## 1      10           1.44
## 2      15           1.09
## 3      45           0.747
## 4      40           0.741
## 5      35           0.476
```

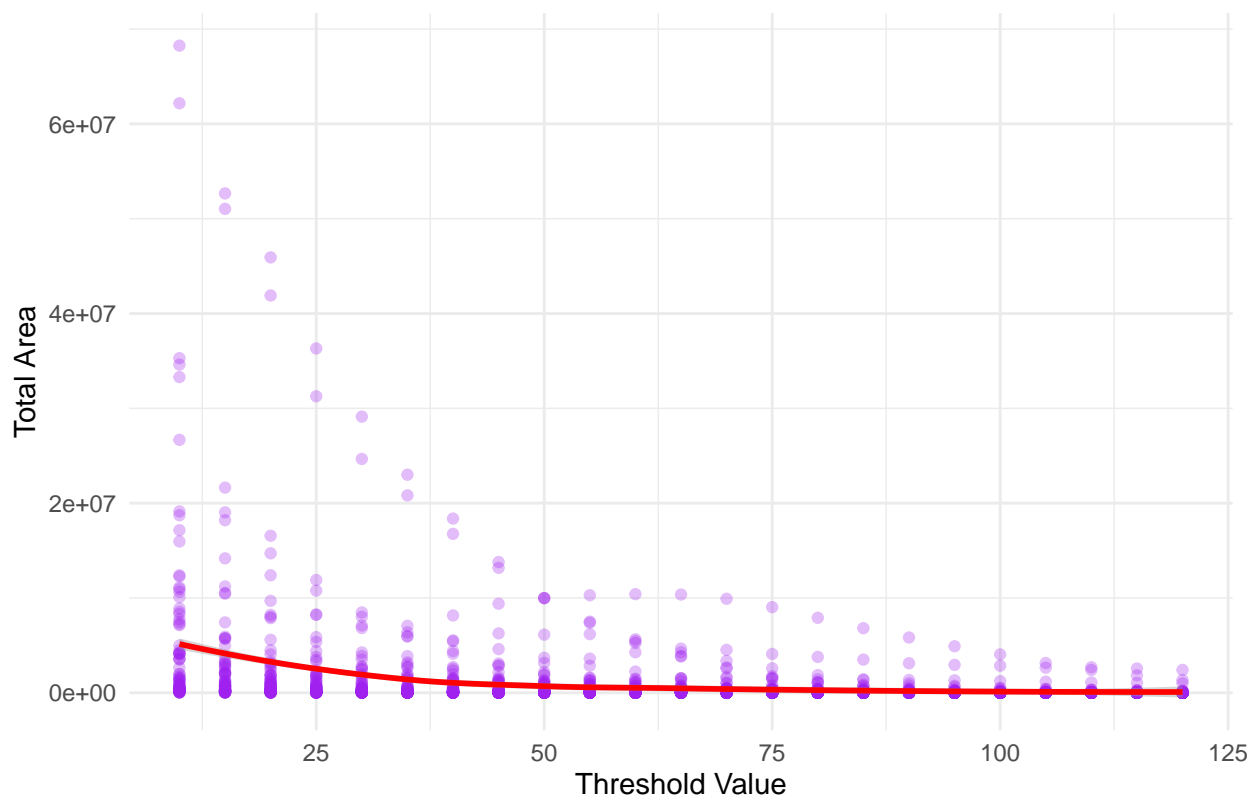
Surface Images Analysis - Before Treatment



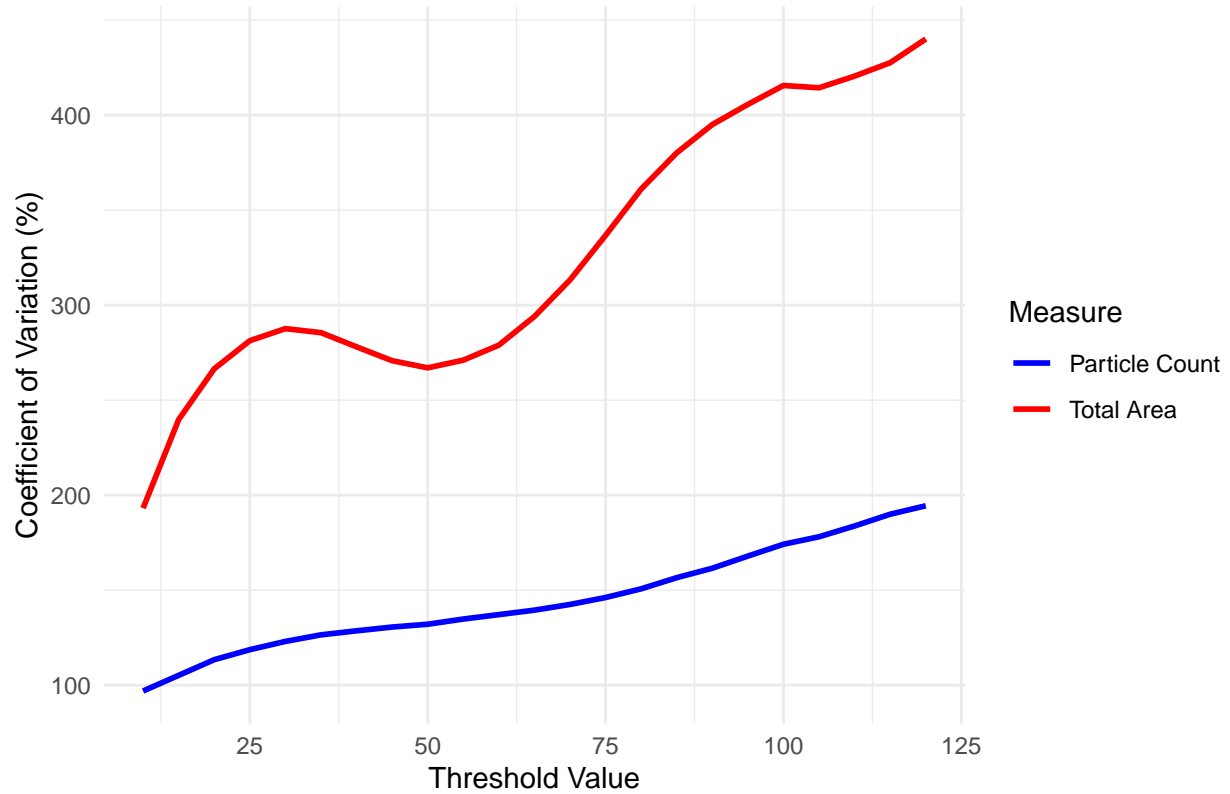
Surface Before Treatment – Mean Particle Area vs Threshold



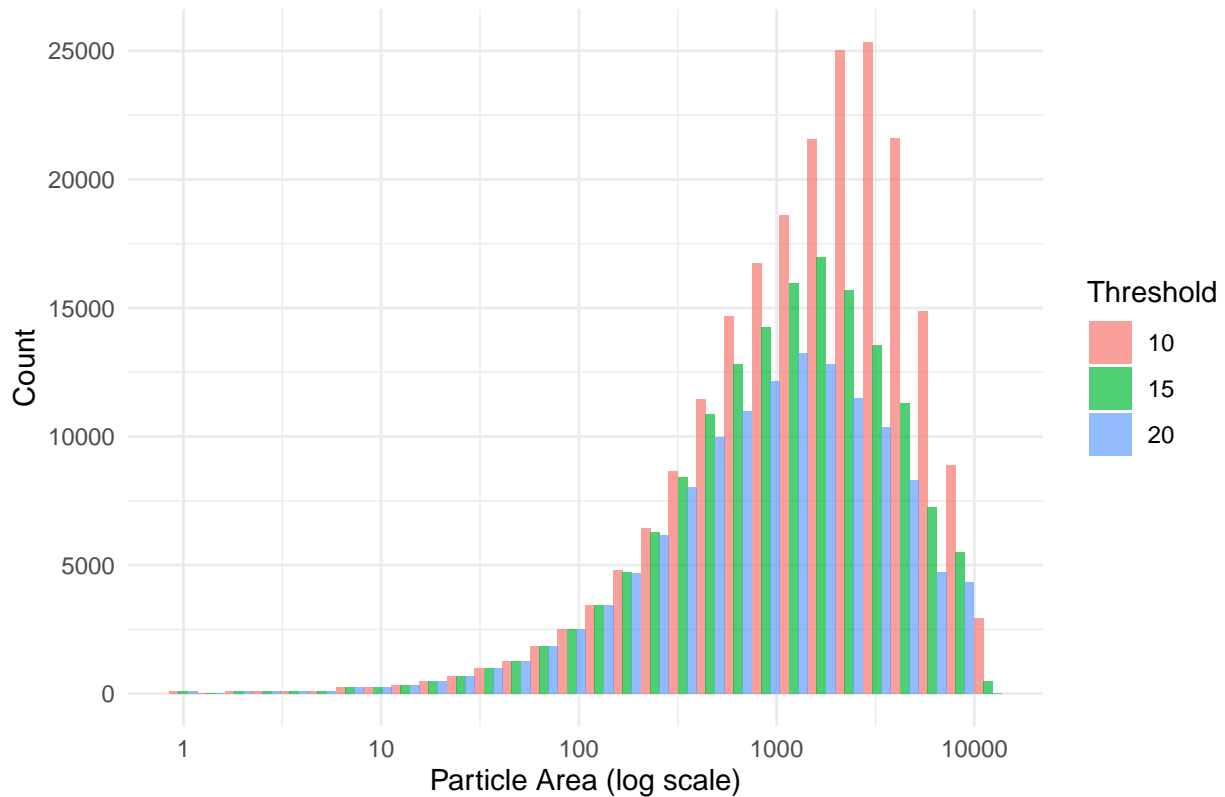
Surface Before Treatment – Total Particle Area vs Threshold

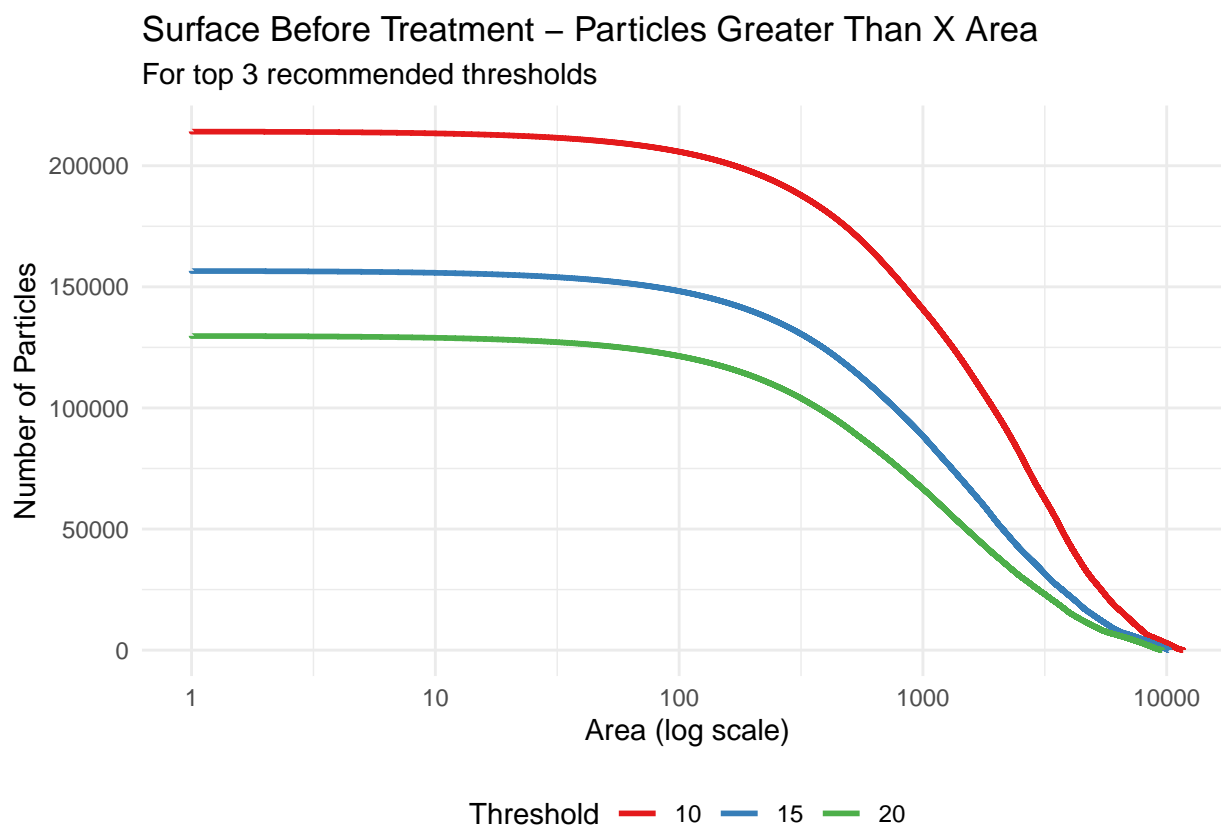


Surface Before Treatment – Coefficient of Variation vs Threshold



Surface Before Treatment – Particle Area Distribution for Top 3 Threshold



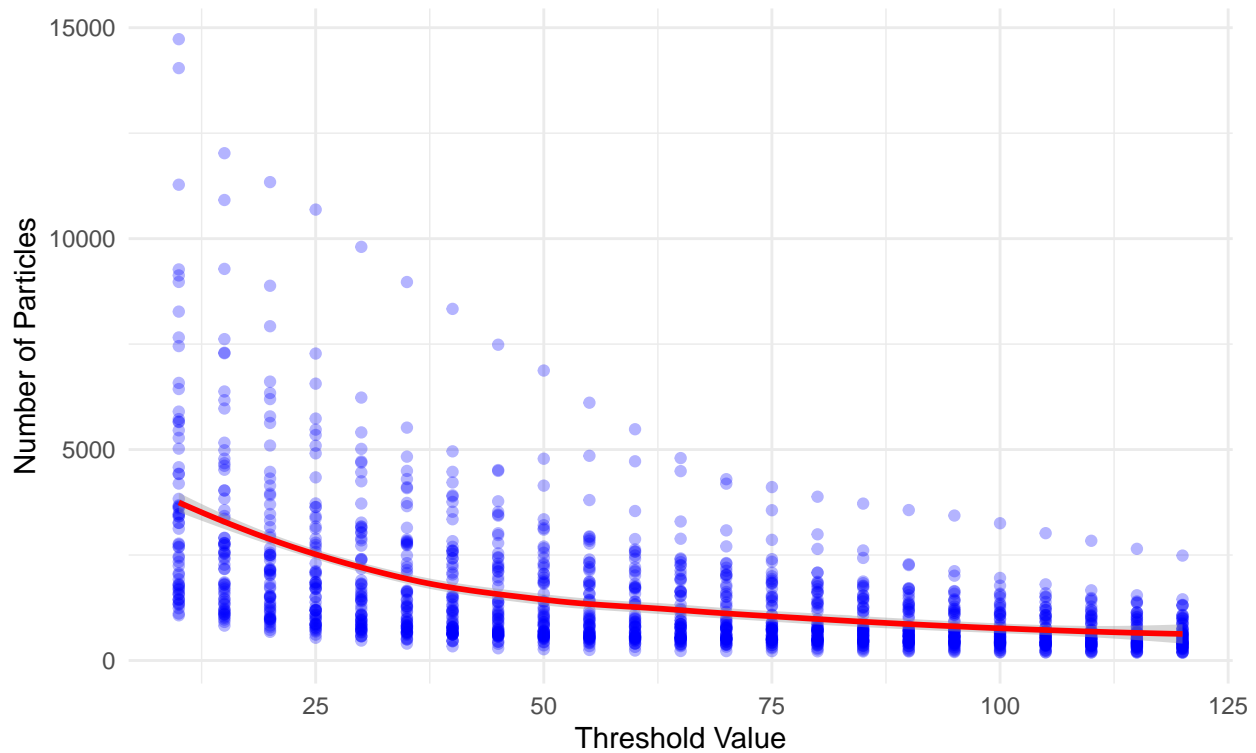


```
##
## Recommended thresholds for Surface Before Treatment images:
## # A tibble: 5 x 2
##   Threshold Stability_Score[,1]
##   <dbl>          <dbl>
## 1      10          1.82
## 2      15          1.34
## 3      20          1.00
## 4      25          0.804
## 5      30          0.679
```

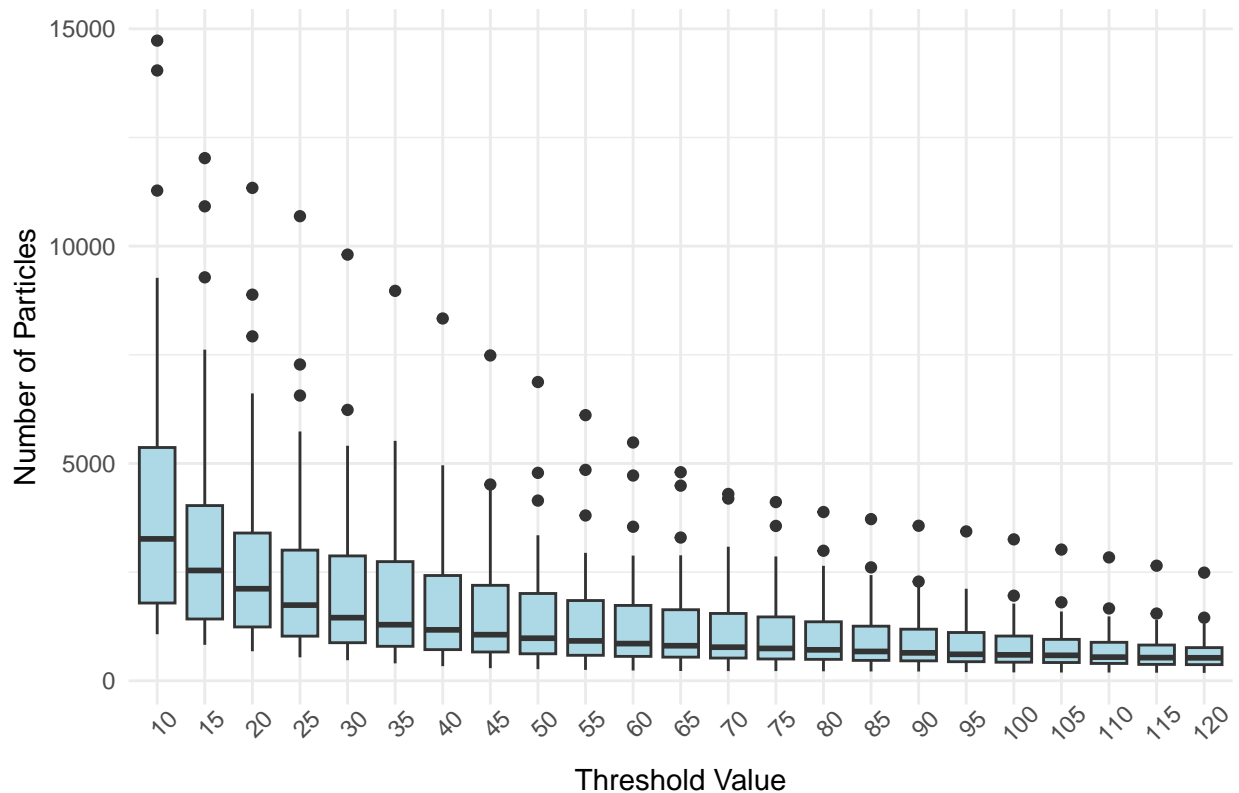
Surface Images Analysis - After Treatment

Surface After Treatment – Particle Count vs Threshold

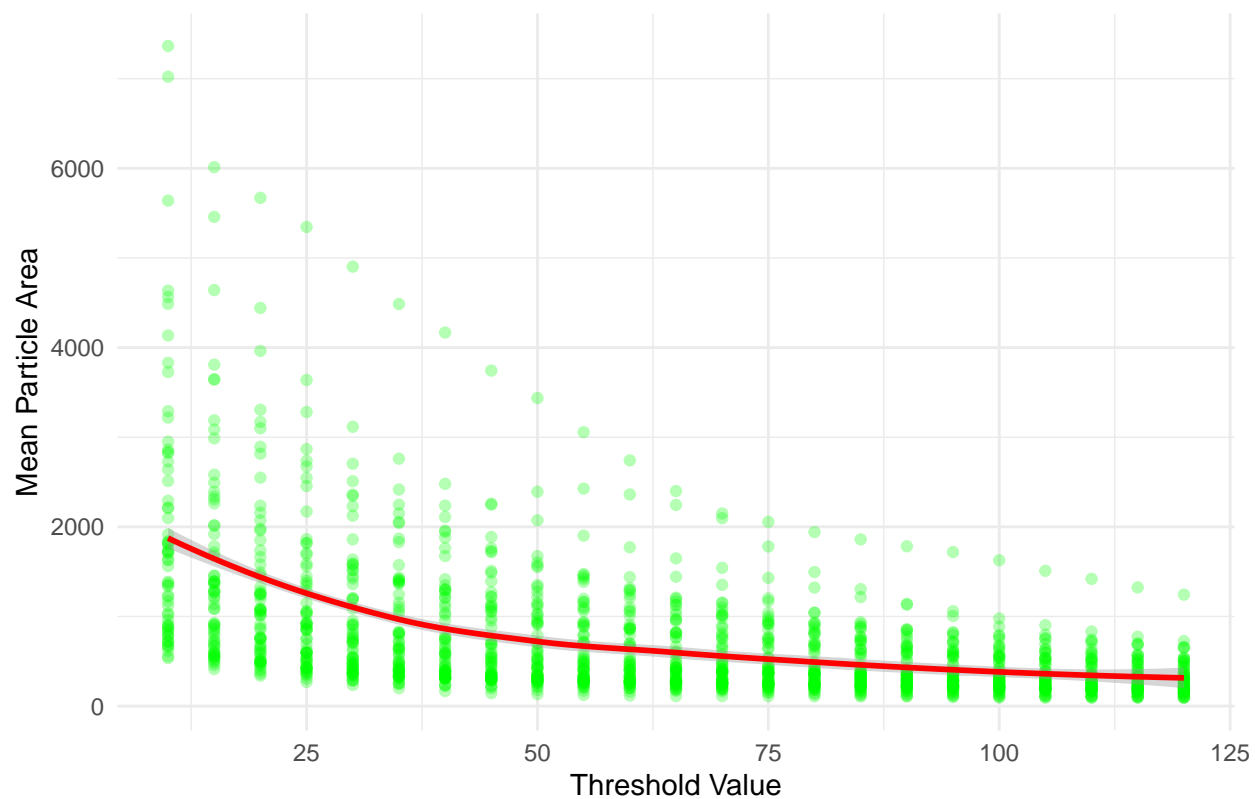
Each point represents one image



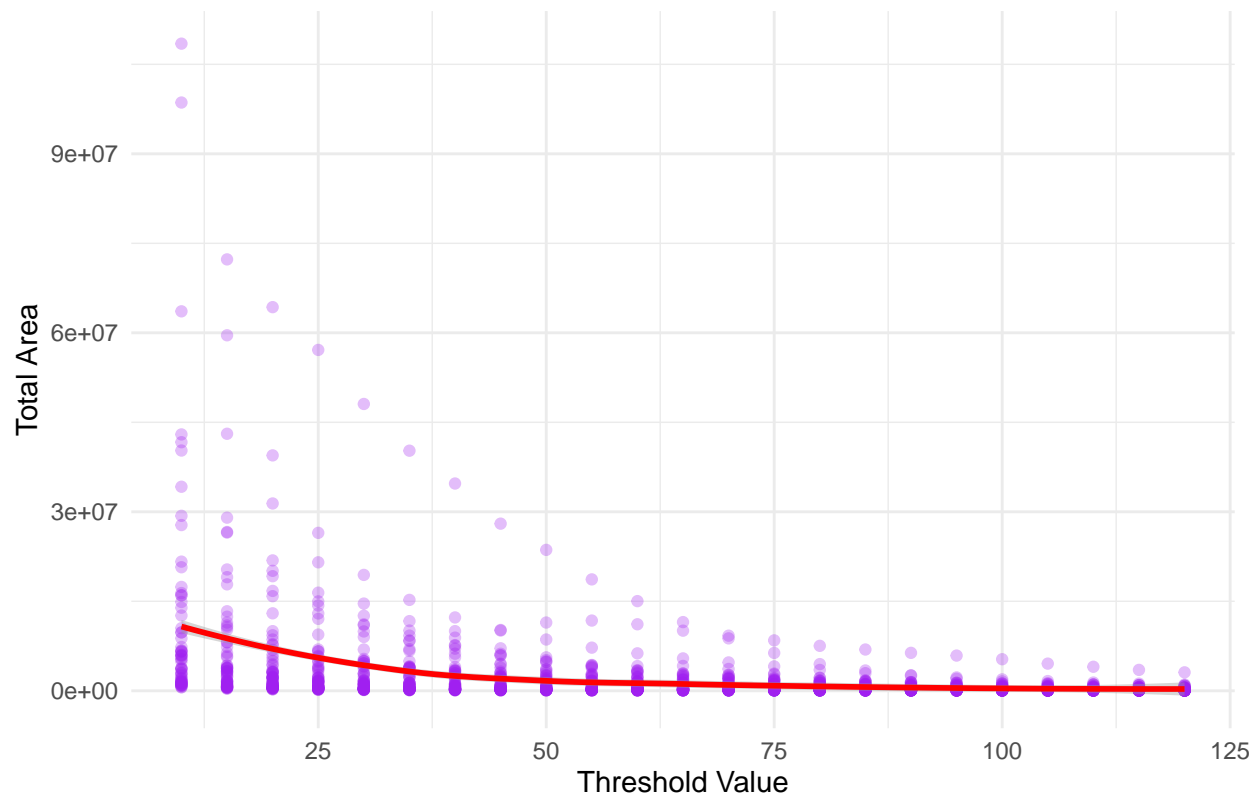
Surface After Treatment – Distribution of Particle Counts



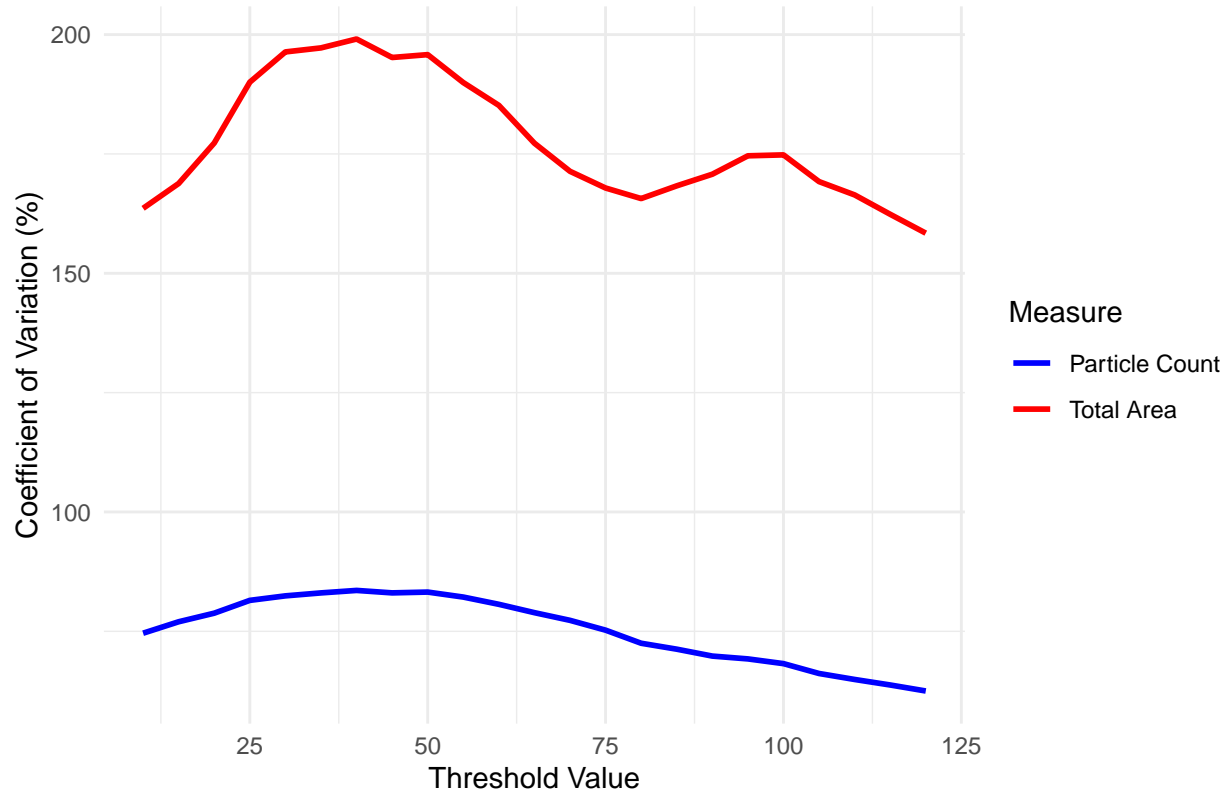
Surface After Treatment – Mean Particle Area vs Threshold



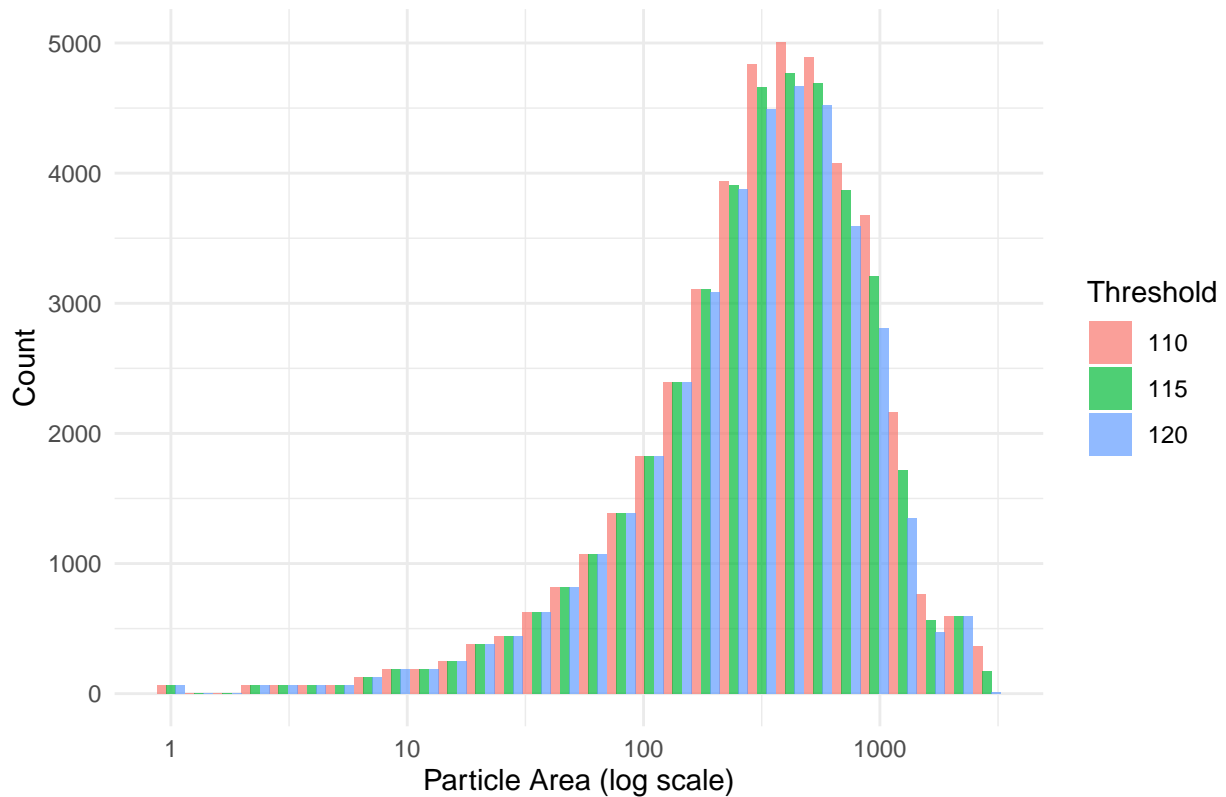
Surface After Treatment – Total Particle Area vs Threshold



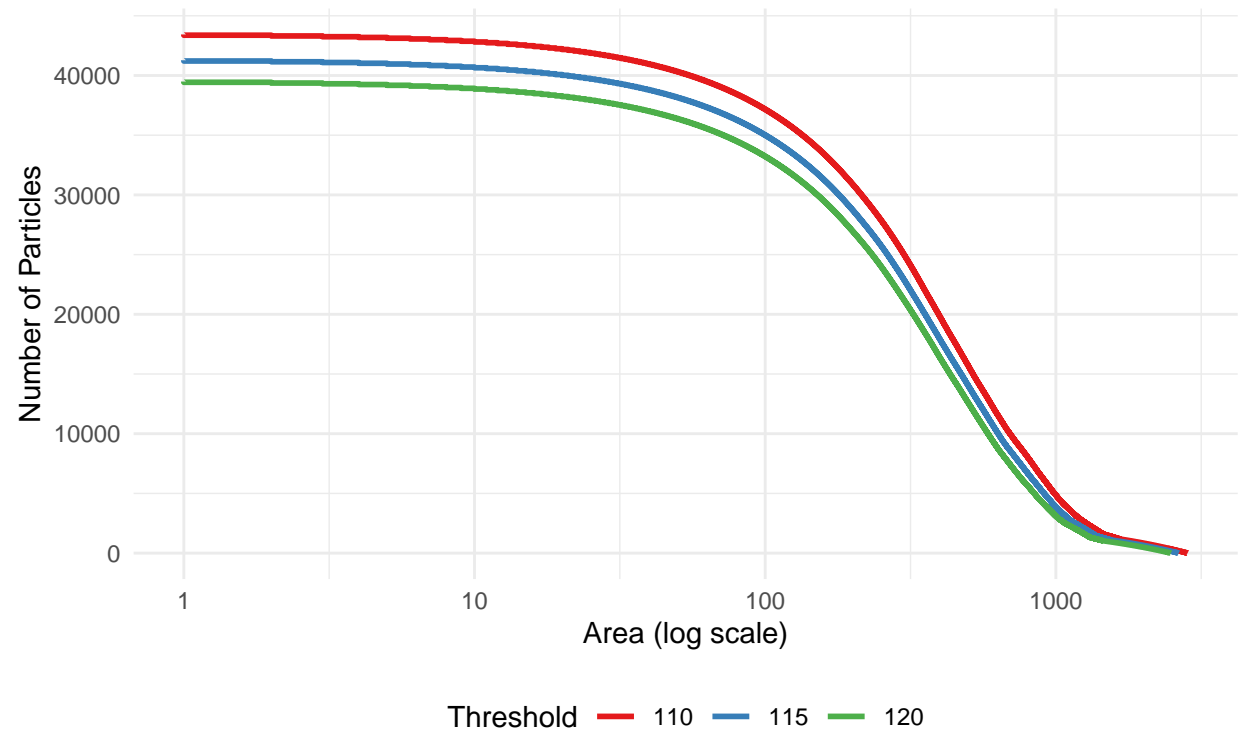
Surface After Treatment – Coefficient of Variation vs Threshold



Surface After Treatment – Particle Area Distribution for Top 3 Thresholds



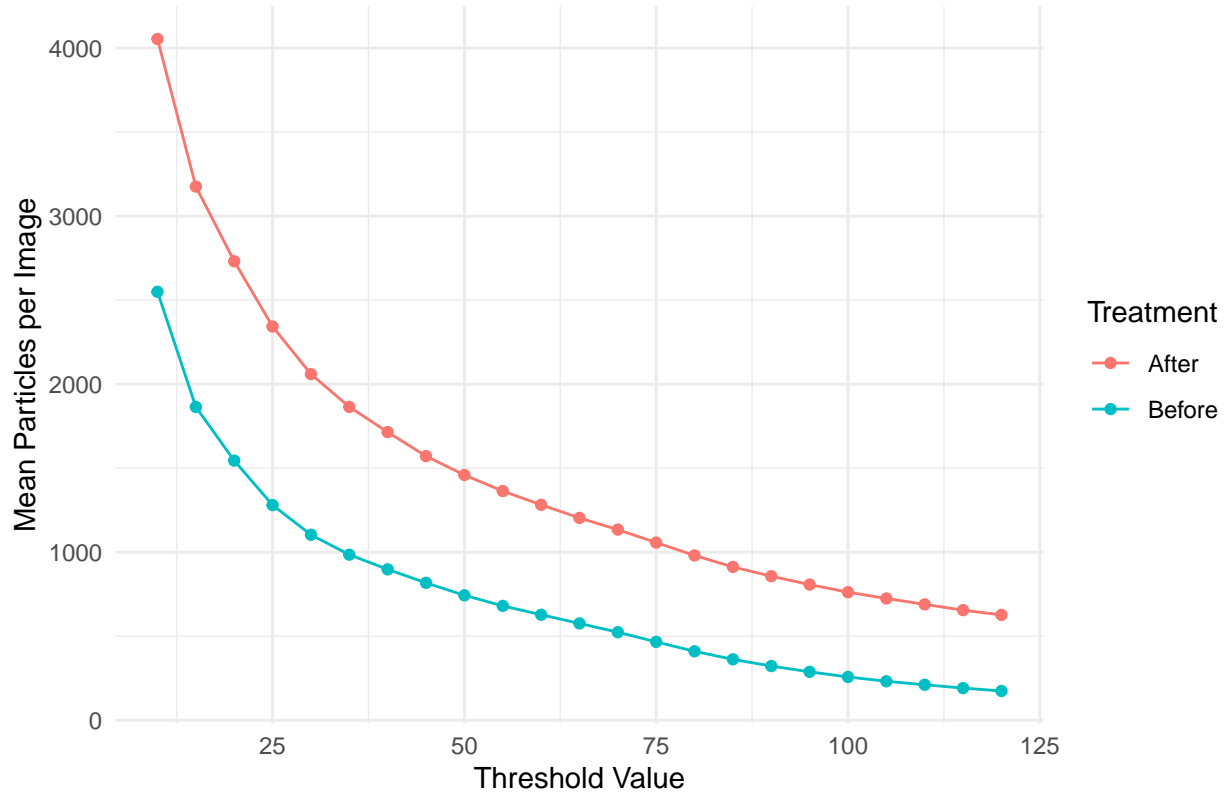
Surface After Treatment – Particles Greater Than X Area
For top 3 recommended thresholds



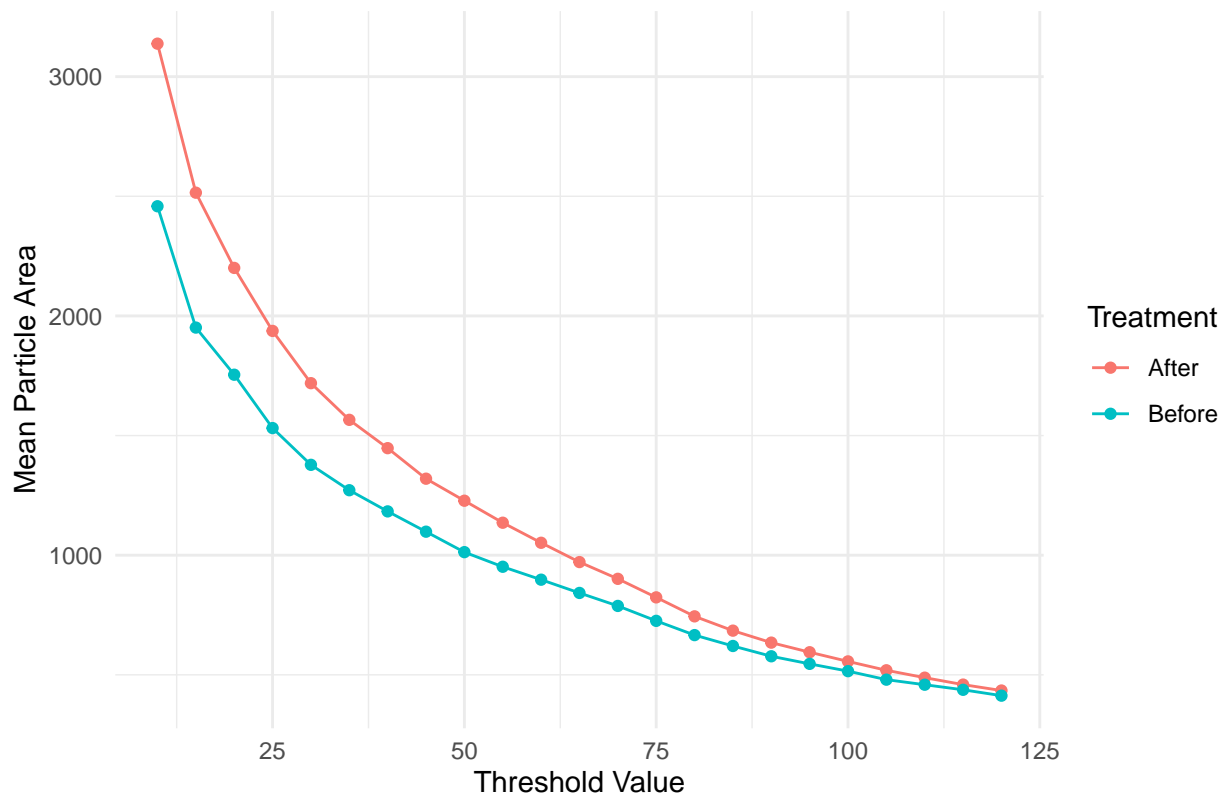
```
##
## Recommended thresholds for Surface After Treatment images:
## # A tibble: 5 x 2
##   Threshold Stability_Score[,1]
##   <dbl> <dbl>
## 1     120         1.65
## 2     115         1.41
## 3     110         1.17
## 4     105         0.971
## 5      80         0.656
```

Surface Treatment Comparison

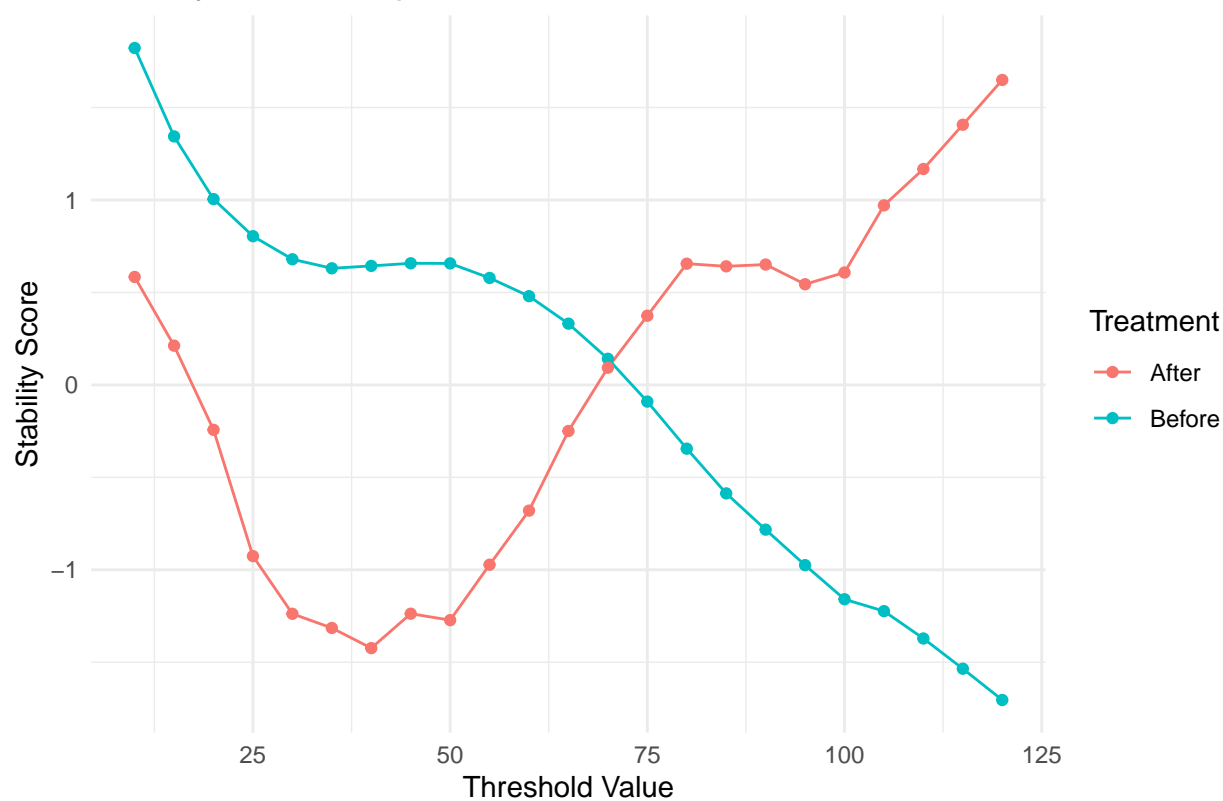
Average Particle Count Comparison – Before vs After Treatment



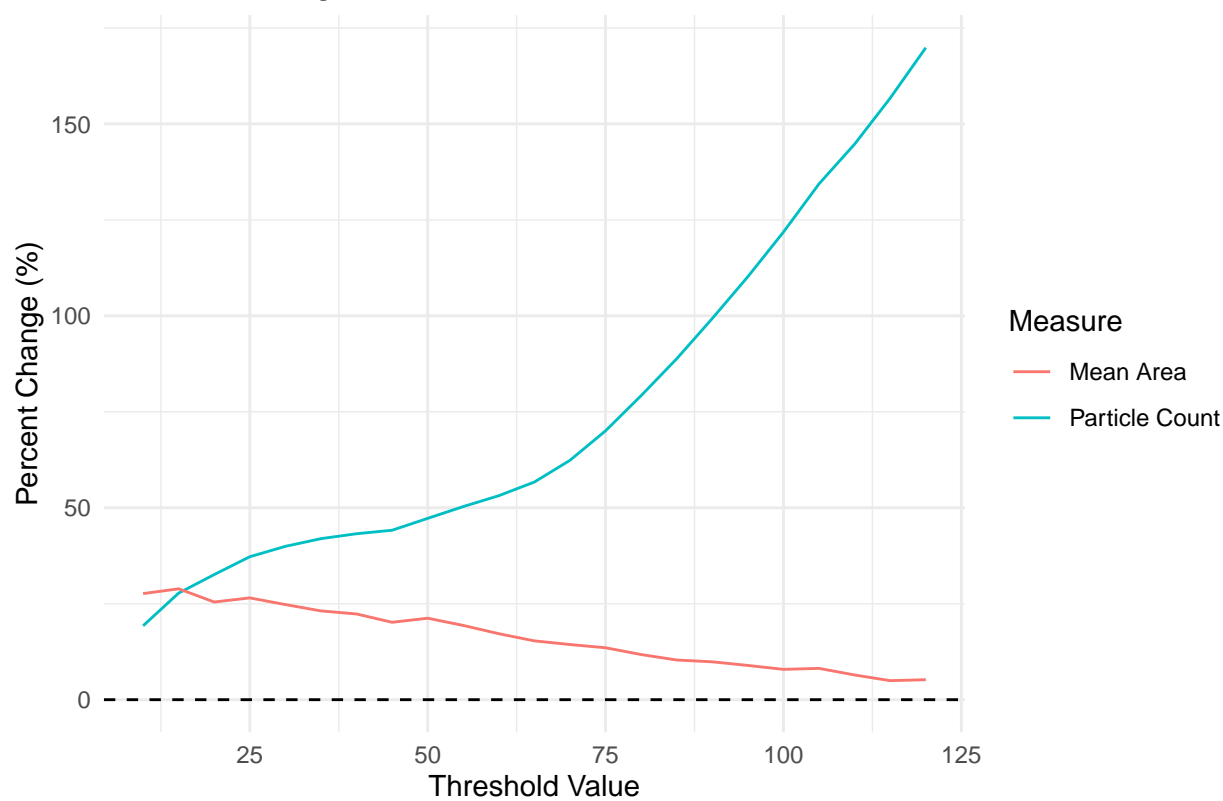
Mean Particle Area Comparison – Before vs After Treatment



Stability Score Comparison – Before vs After Treatment



Percent Change After Treatment

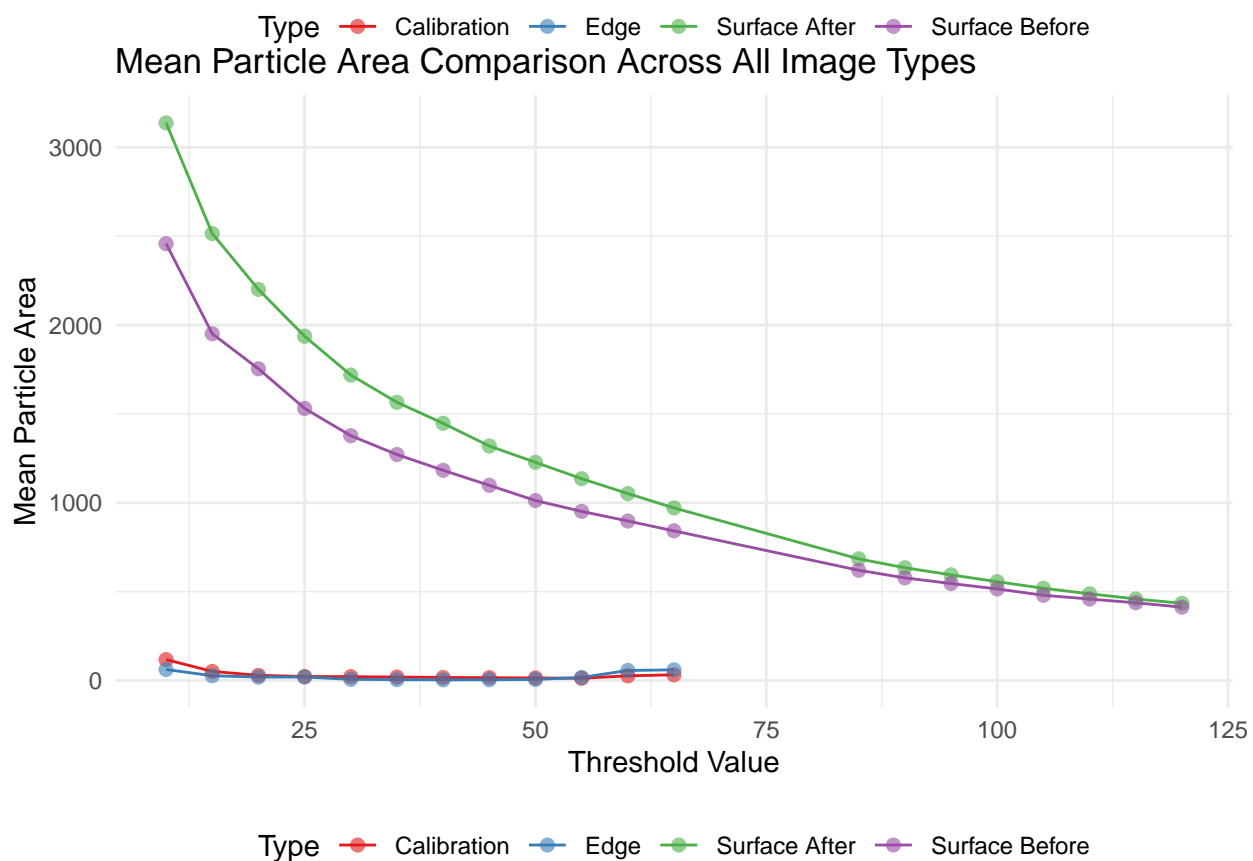
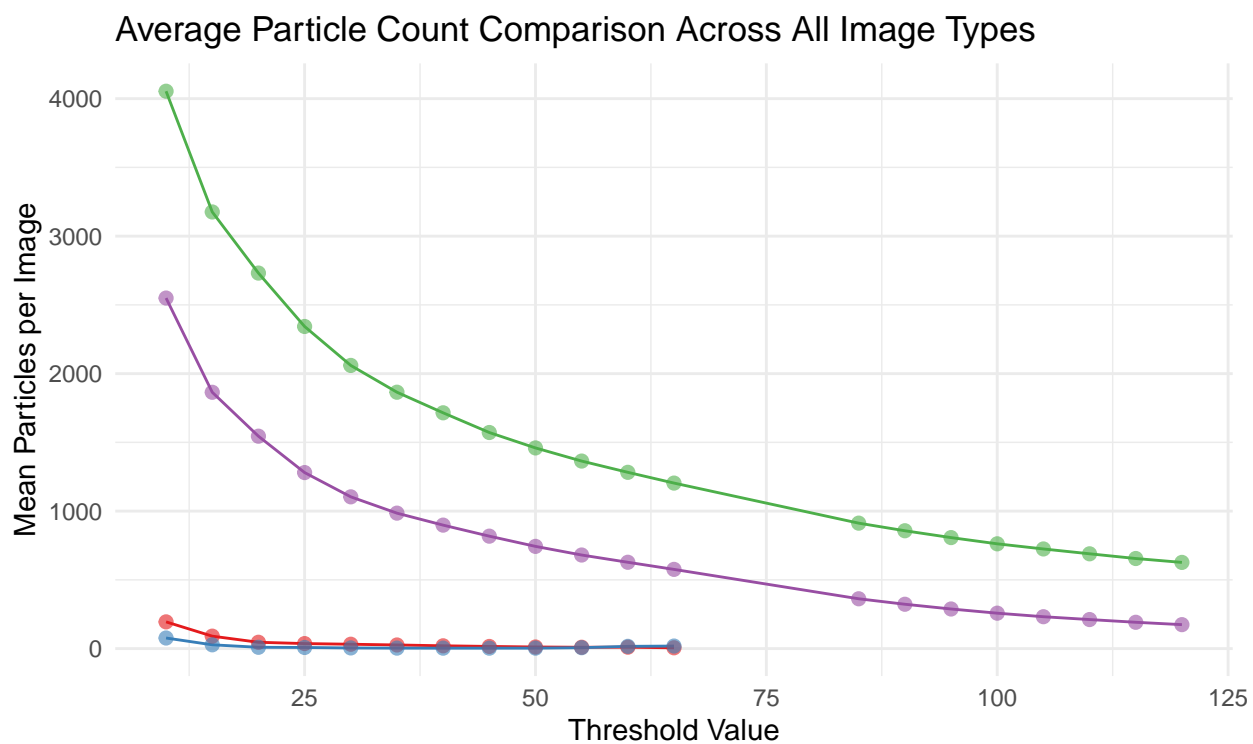


Summary of Optimal Thresholds

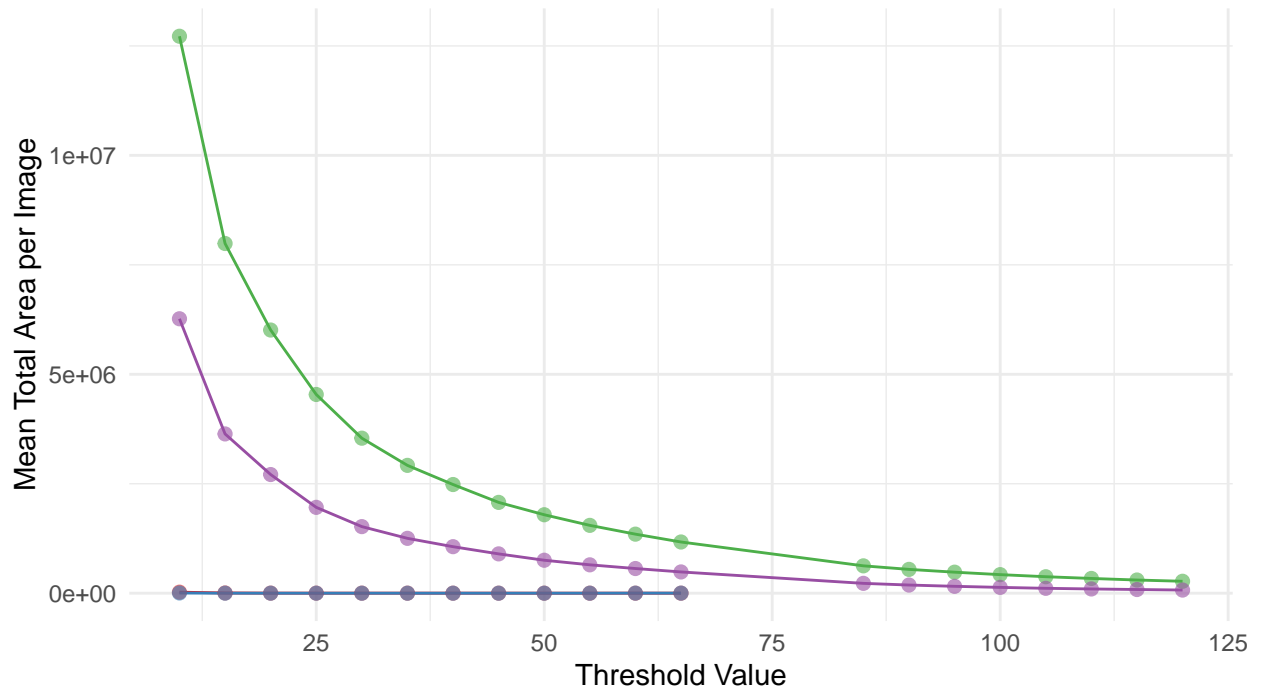
Table 1: Top 3 Recommended Thresholds by Image Type

Type	Threshold	Stability_Score
Calibration	15	0.9077733
Calibration	25	0.7796326
Calibration	10	0.7660797
Edge	10	1.4407812
Edge	15	1.0903653
Edge	45	0.7470100
Surface After	120	1.6491733
Surface After	115	1.4069096
Surface After	110	1.1676173
Surface Before	10	1.8220025
Surface Before	15	1.3437070
Surface Before	20	1.0048167

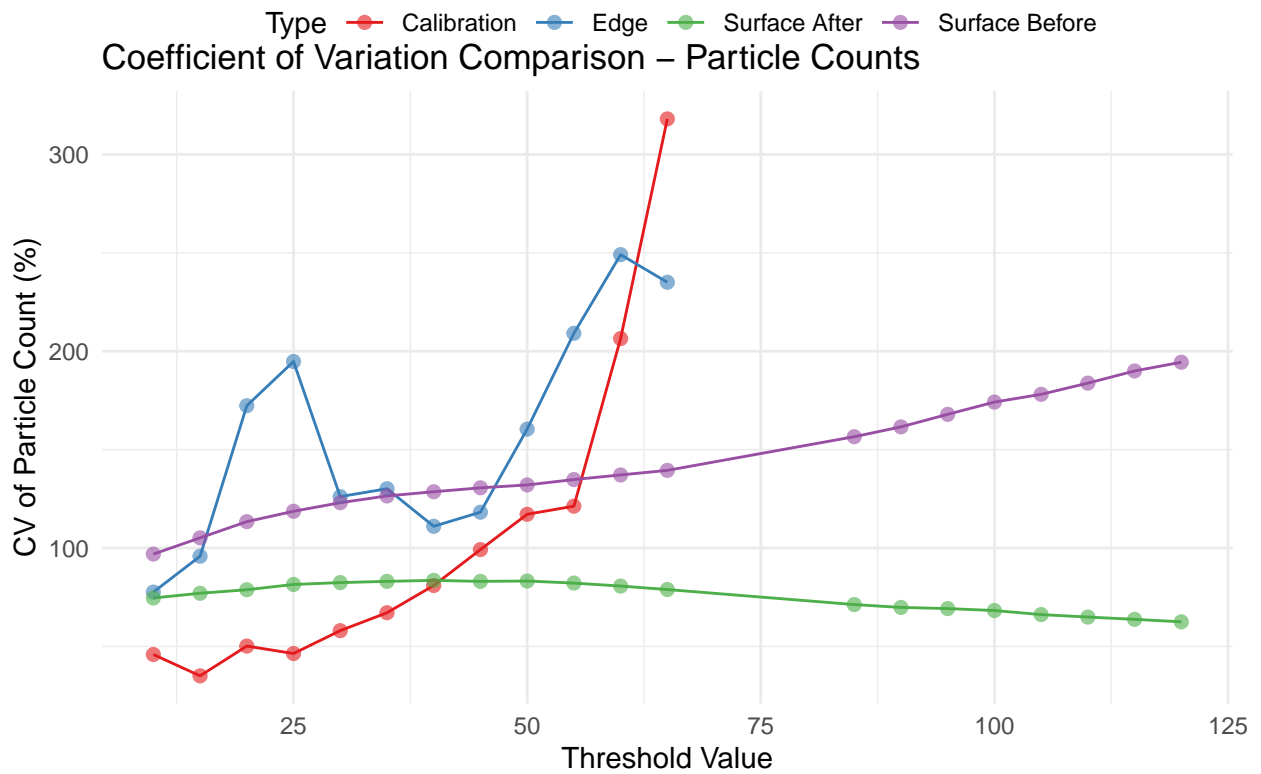
Comprehensive Comparison Across All Image Types



Mean Total Area Coverage Comparison



Coefficient of Variation Comparison – Particle Counts



Type Calibration Edge Surface After Surface Before

Particle Size Distribution Comparison at Threshold 57.5

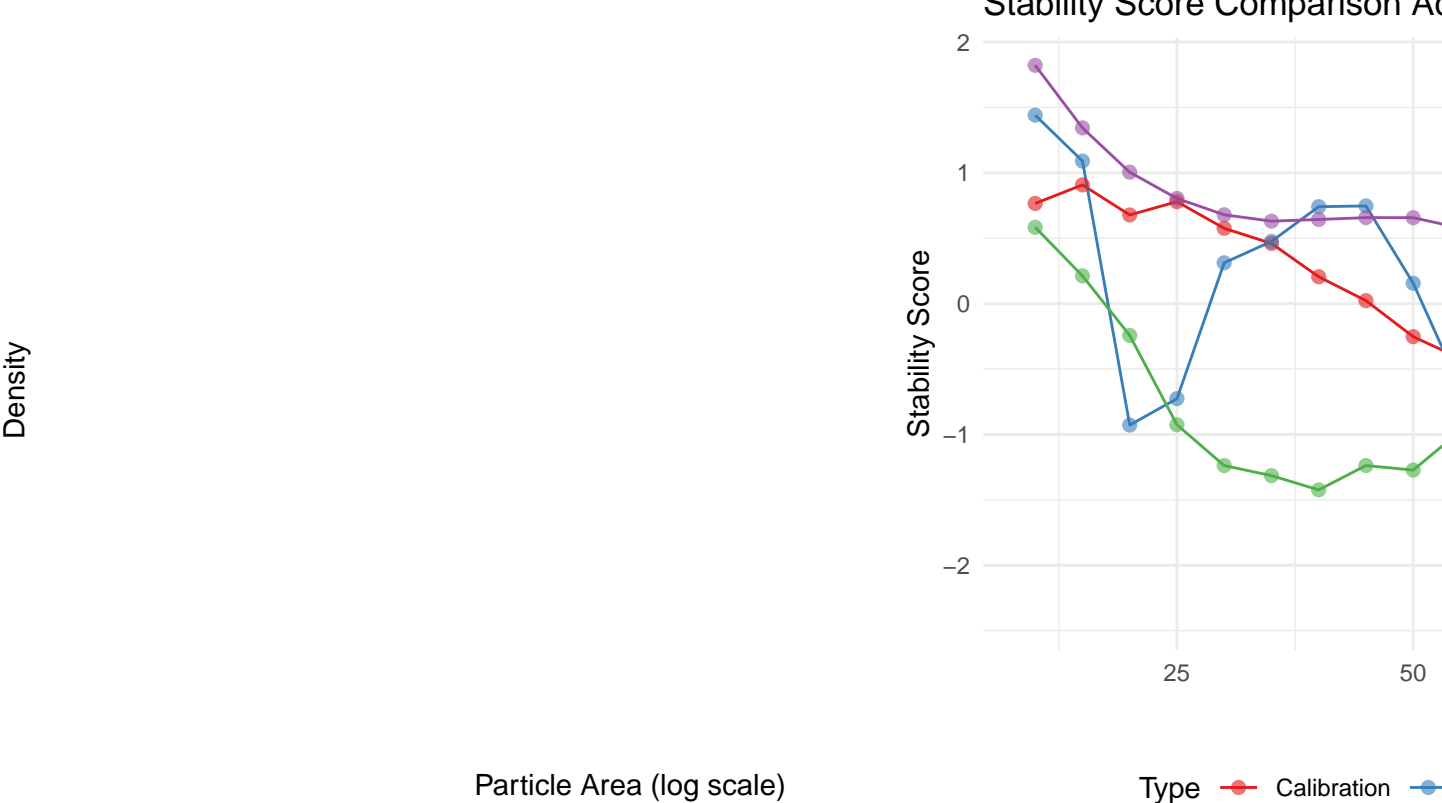


Table 2: Summary Statistics at Optimal Thresholds

Type	Threshold	Mean_Particles	Mean_Area	Total_Area	Stability_Score
Calibration	15	90.41	51.19	4628.12	0.9077733
Edge	10	77.01	62.02	4775.86	1.4407812
Surface After	120	626.87	434.40	272316.71	1.6491733
Surface Before	10	2549.60	2458.35	6267788.43	1.8220025

Key Findings Summary

Table 3: Key Metrics Across Image Types

Type	Total_Images	Total_Particles	Mean_Particles_per_Image	Median_Particle_Area	Median_Particle_Total_Area	Coverage
Calibration	91	43757	480.85	66.25	39	31858.38
Edge	143	19446	135.99	47.27	30	6428.44
Surface After	63	1944162	30859.71	1668.53	973	51490231.11
Surface Before	84	1319739	15711.18	1452.72	802	22823967.99

Correlations between image types (based on particle counts):

	Mean_Particles_Calibration	Mean_Particles_Edge	Mean_Particles_Surface After	Mean_Particles_Surface Before
Mean_Particles_Calibration	1	NA	NA	NA
Mean_Particles_Edge	NA	1	NA	NA
Mean_Particles_Surface After	NA	NA	1.000	0.999
Mean_Particles_Surface Before	NA	NA	0.999	1.000