# ADM-Aeolus VAMP Mie Core QC

Jos de Kloe,

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(copy of VAMP PM4 slides)

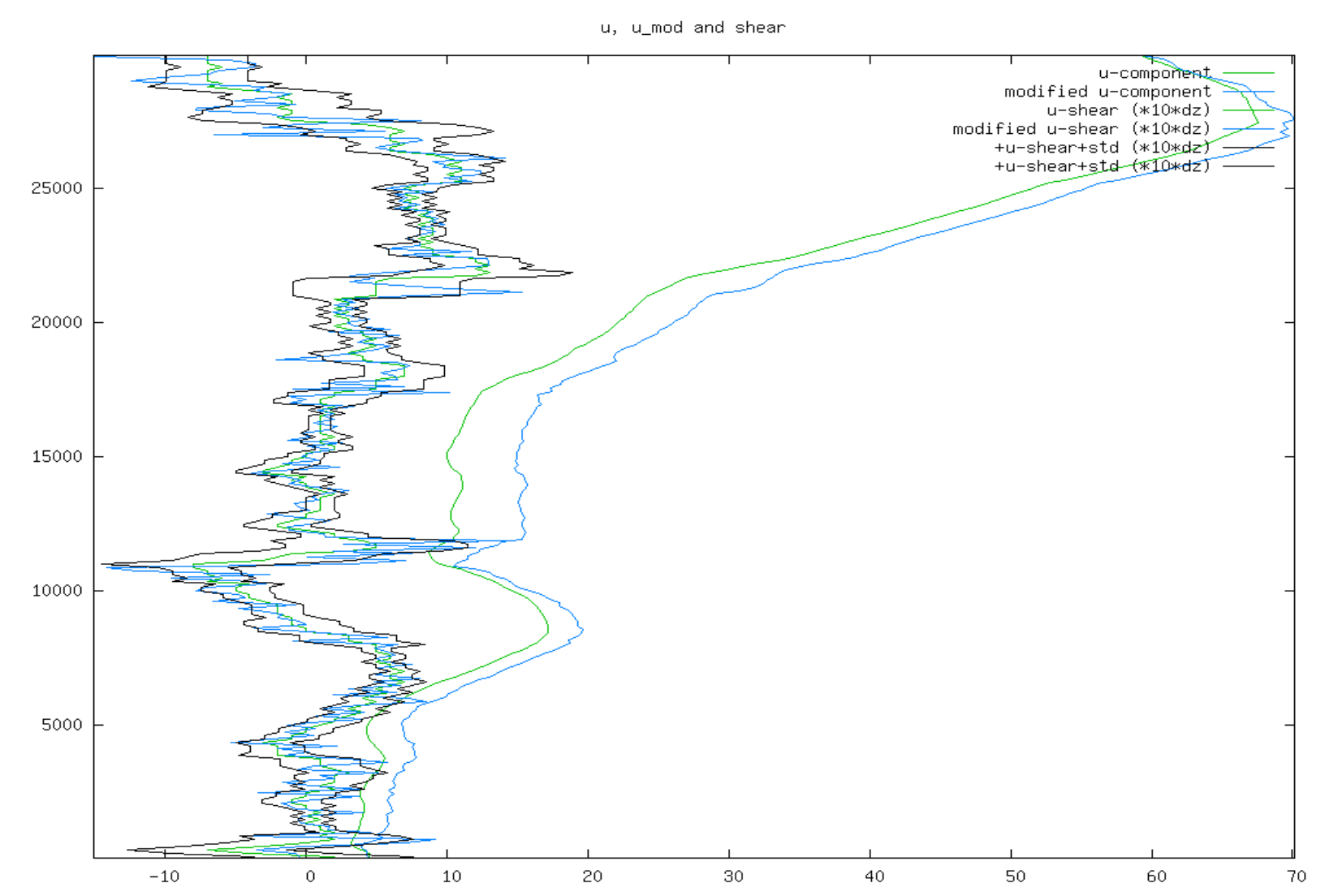
# Task WP 4a

- Investigate the utilization of MieCore algorithm outputs as quality indicators:
  - Mie line width (FWHM) against wind shear, turbulence and horizontal gradients
  - other MieCore outputs?
- Investigate usefulness of Rayleigh line-width
  - to be retrieved from known amplitude and A,B signal
  - assumption optical properties above well known
- look at differences with LIPAS implementation

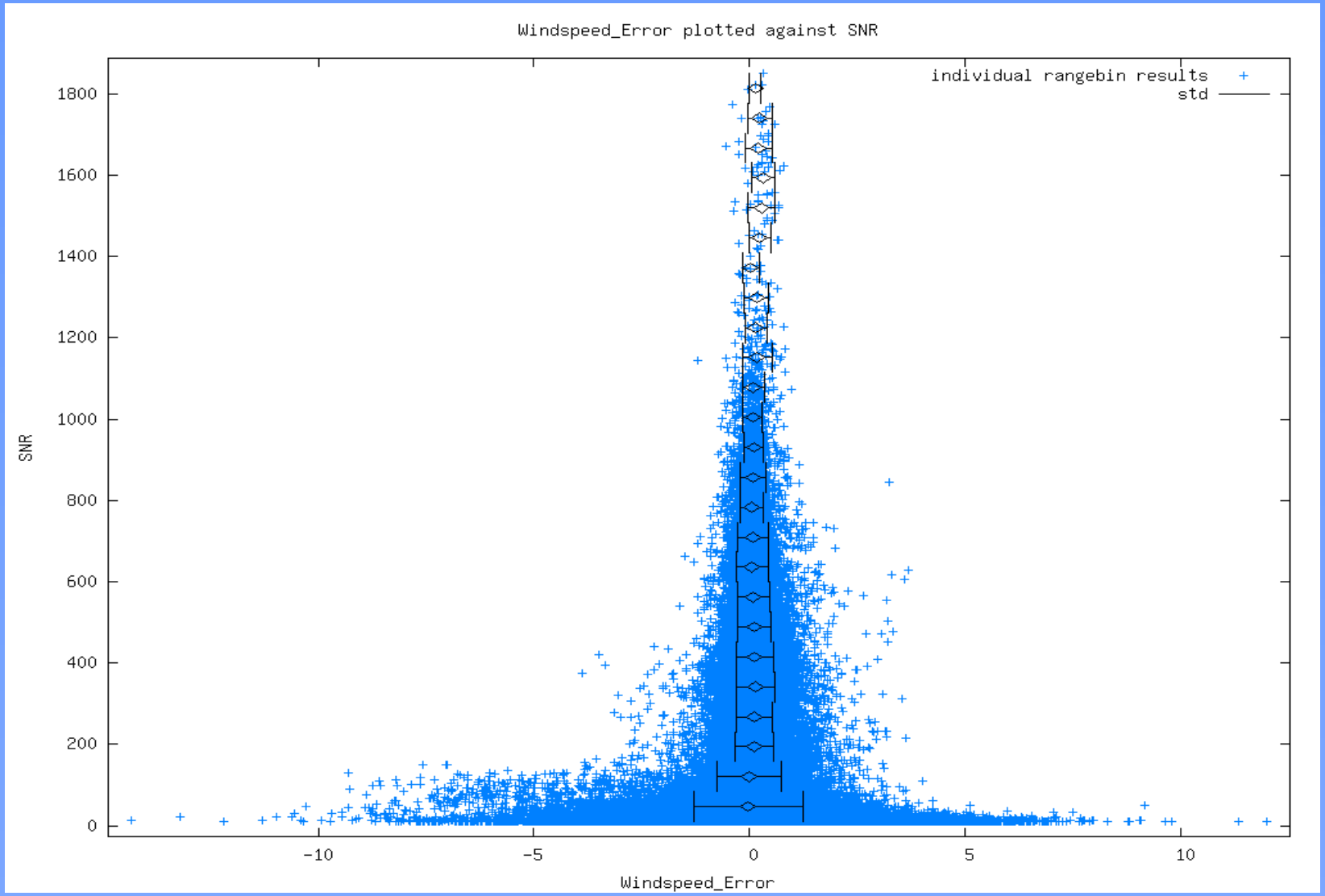
# Tool improvements

- Simultation tool:
  - correction of u,v,w wind component to los conversion
  - addition of error multiplier method (multiplier=2)
- Plotting tool:
  - calculation of statistics: mean and std for selected layers of data in the scatterplots

# •••• Error multiplier method



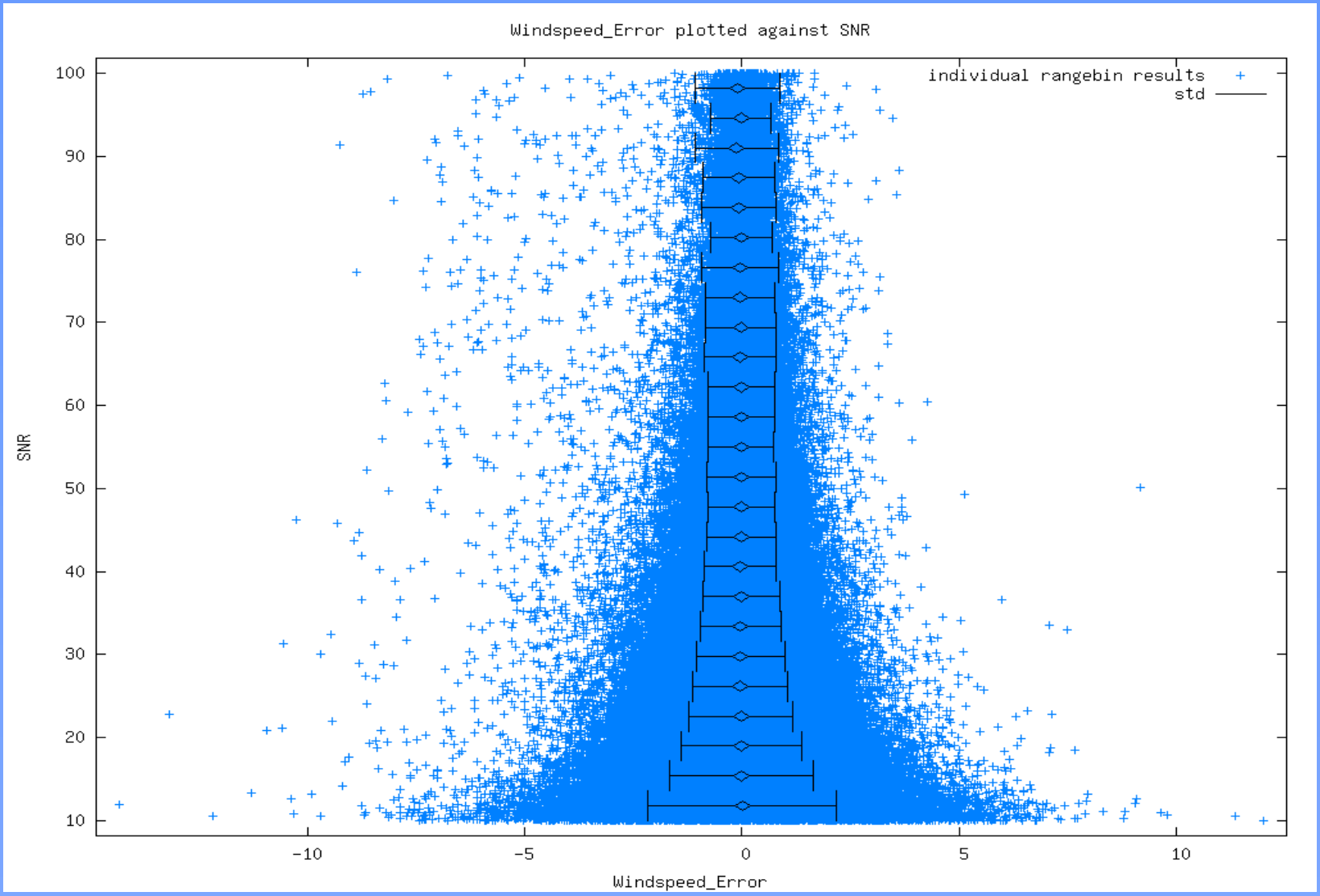
# •••• Statistics: mean and std: SNR



# Statistics: mean and std: SNR

- For most SNR values std in windspeed_error is far below 1 m/s.
- This is caused by the fact that extremely high SNR values seem to dominate in this plot, even though this forms just a small part of all data
- Only for SNR between 10 and 83 the std is 1.27 m/s
- So zoom in on the bulk of all data (SNR below 100)

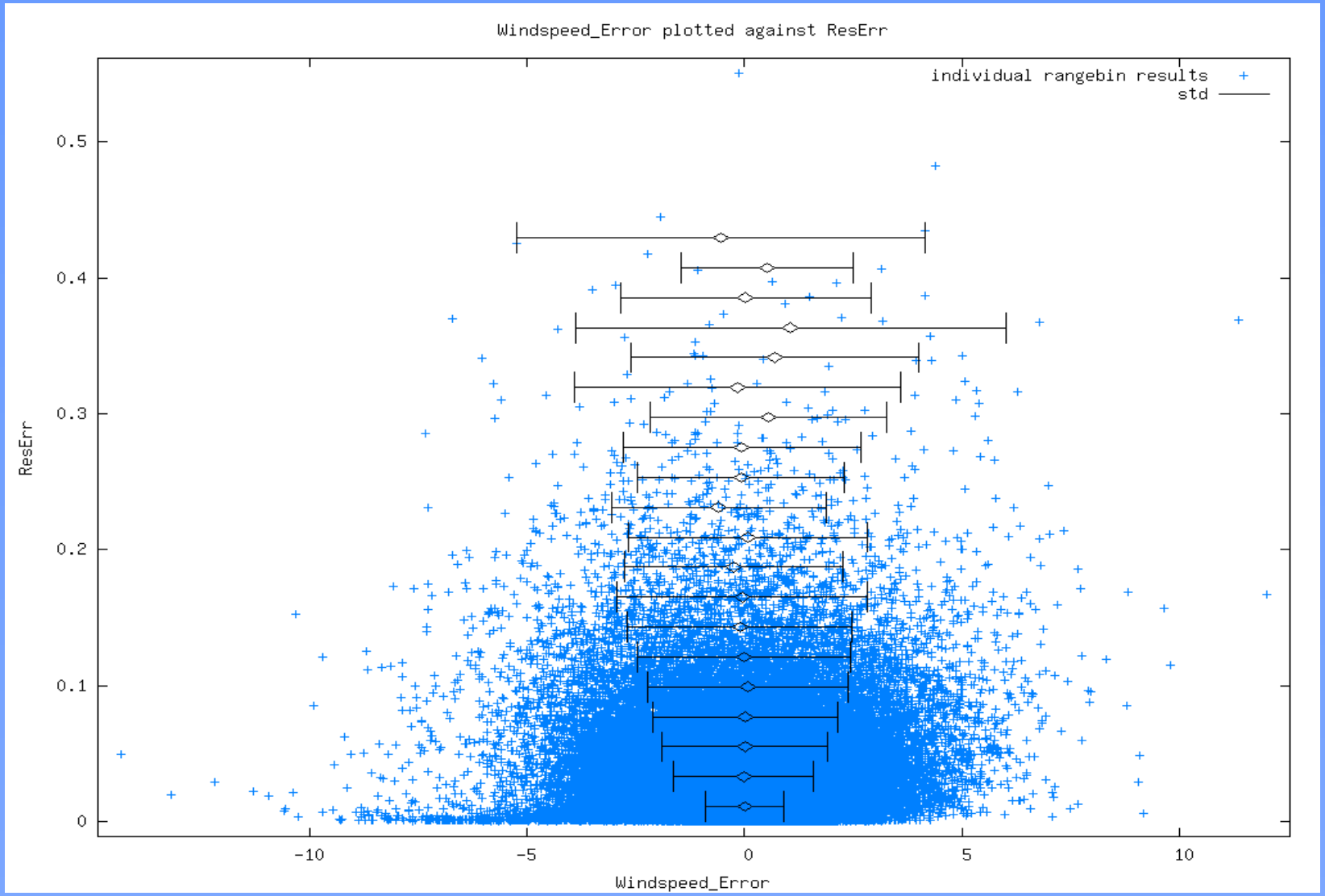
# •••• SNR below 100



# SNR below 100

- Now data with SNR between 10 and 32 has std > 1 m/s in windspeed error
- All higher SNR values have smaller std in windspeed error
- So when applying a threshold if for example SNR=32, datapoints with std < 1 m/s are selected, and the average data quality will improve significantly

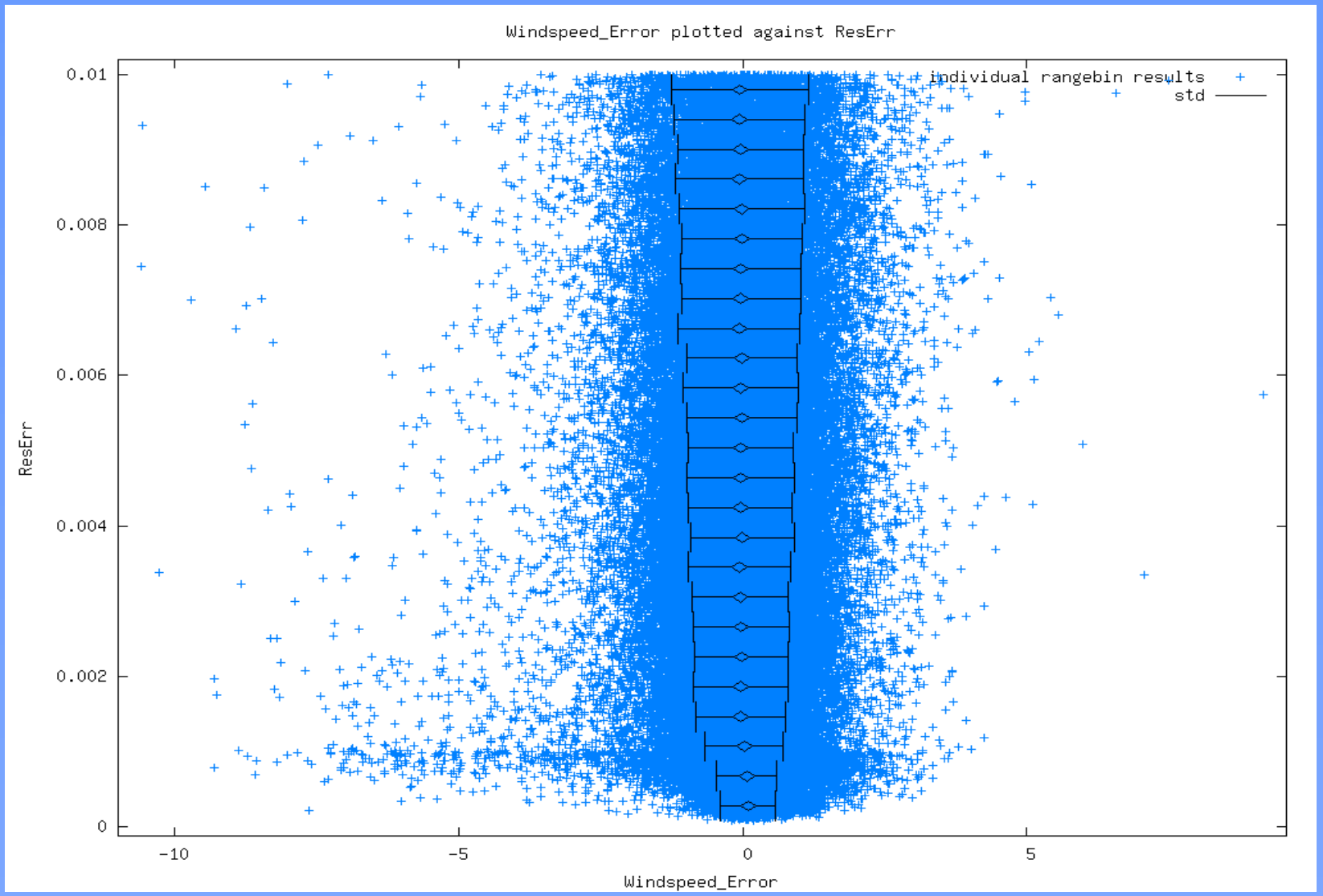
# •••• Residual Error: mean and std



# Residual Error: mean and std

- For most Residual Error values std in windspeed_error is far above 1 m/s.
- This is caused by the fact that extremely bad (high) values seem to dominate in this plot, even though this forms just a small part of all data
- Only for Res.Err. below 0.022 the std is below 1 m/s (0.913 m/s)
- So zoom in on the bulk of all data (Res.Err. below 0.01)

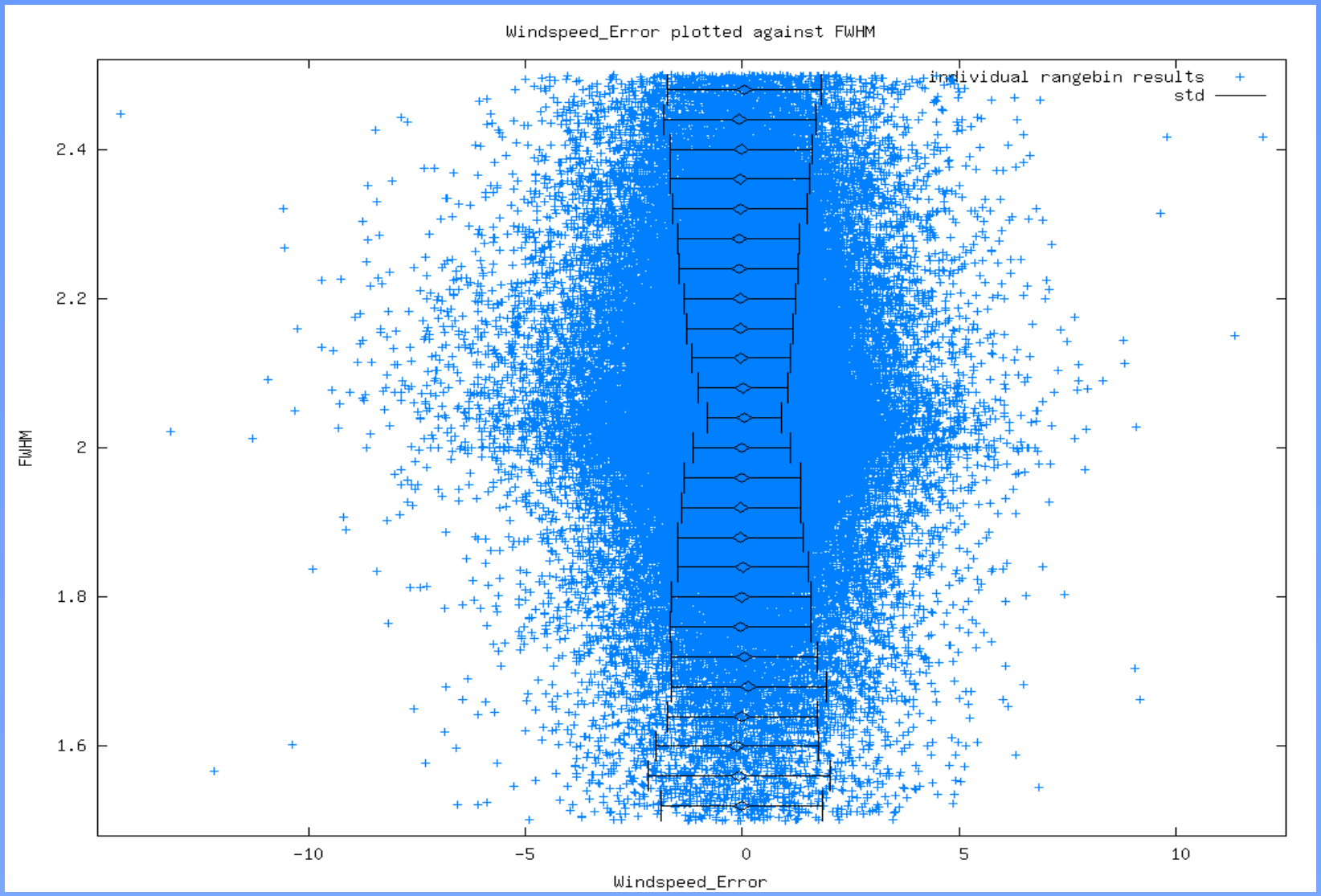
# •••• Residual Error below 0.01



# Residual Error below 0.01

- Now data with Res.Err. below 0.0055 has std < 1 m/s in windspeed error
- Allmost all higher Res.Err. values have larger std in windspeed error
- So when applying a threshold if for example Res.Err.=0.005, datapoints with std < 1 m/s are selected, and the average data quality will improve significantly

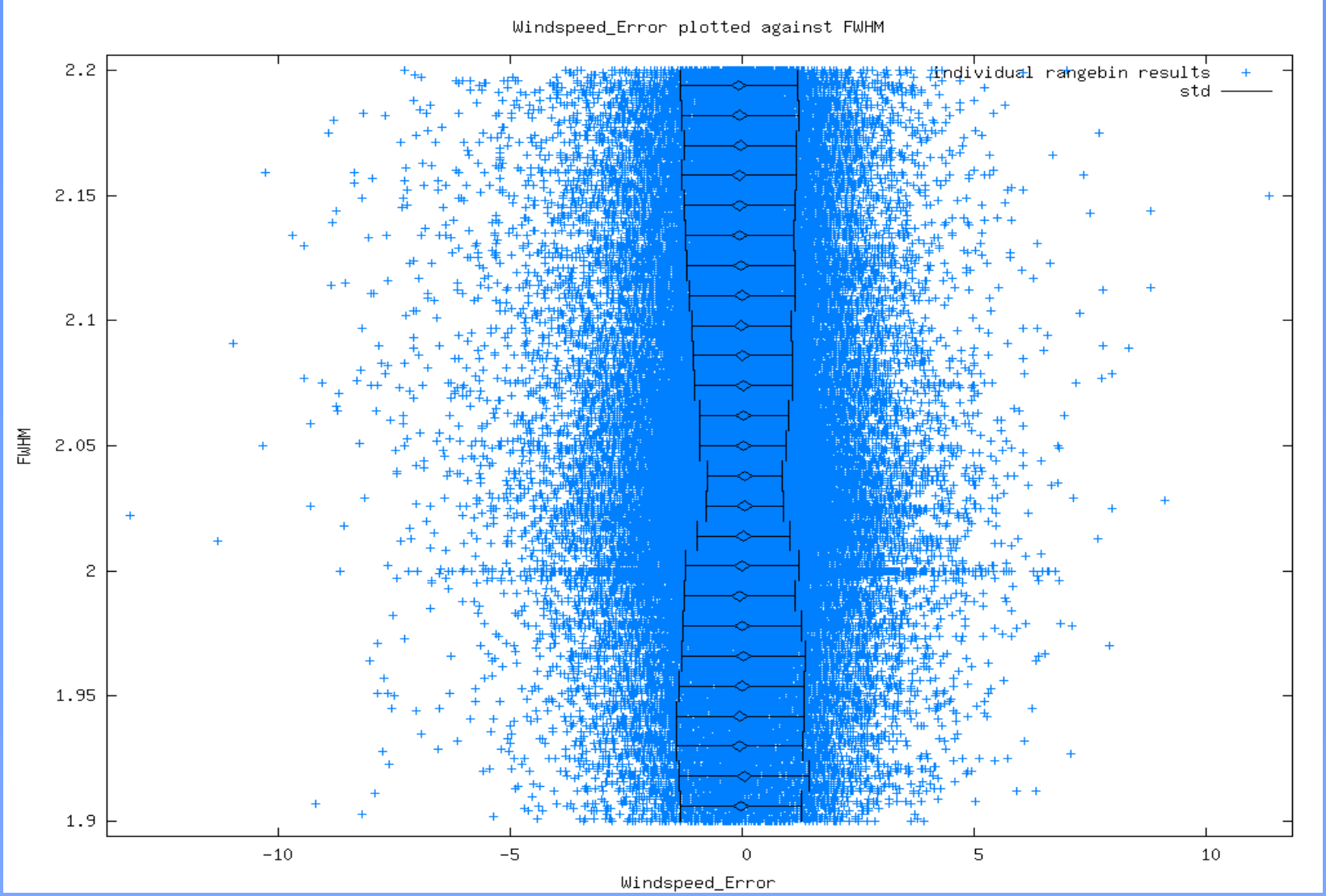
# FWHM: mean and std



# FWHM: mean and std

- For most FWHM values std in windspeed_error is far above 1 m/s.
- In this plot this is unfortunately true for most of the data
- Only for FWHM between 2.02 and 2.06 the std is below 1 m/s (0.851 m/s)
- So zoom in on the region 1.90<FWHM<2.20

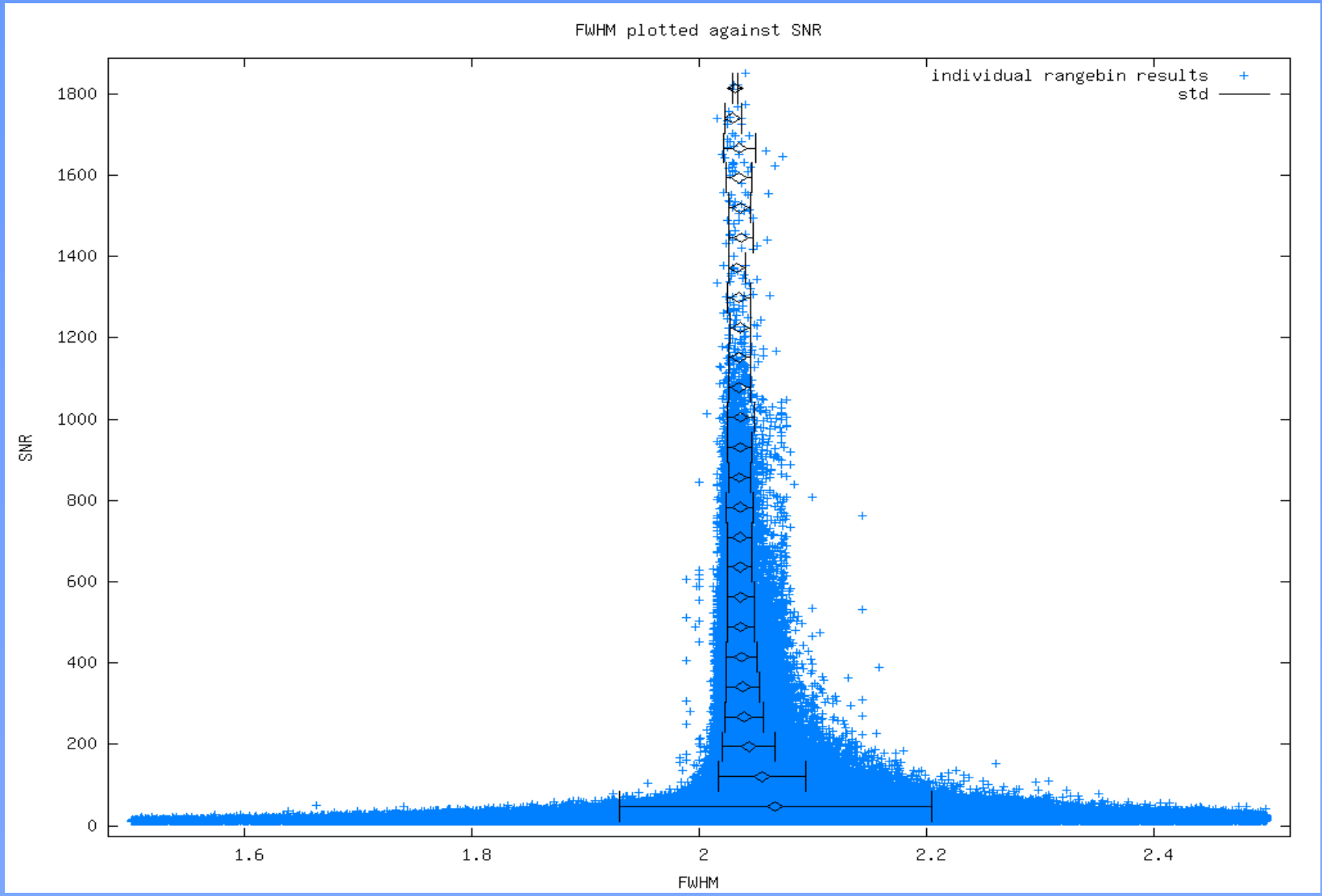
# FWHM between 1.90 and 2.20



# FWHM between 1.90 and 2.20

- Now data with FWHM between 2.01 and 2.07 has std < 1 m/s in windspeed error
- All other FWHM values have larger std in windspeed error
- So when applying a threshold if for example 2.01<FWHM<2.07, datapoints with std < 1 m/s are selected, and the average data quality will improve significantly
- However, this rejects the majority of all data now

# •••• Relation FWHM and SNR



# Conclusions

- selecting data on statistical grounds is possible and will improve the average quality of the remaining data
- Typical thresholds could be:
  - SNR>32
  - Residual Error < 0.005
  - 2.01 < FWHM < 2.07
- these 3 selections reduce the std in windspeed error to 1 m/s.
- when combining these thresholds the individual values may probably be relaxed a bit to get the same end result

# Summarising the effect of these Thresholds

| Condition | Number of accepted datapoints | Percentage of accepted datapoints | Std in windspeed error |
|---|---|---|---|
| SNR>10 and ValFlag=True | 223.226 | 100.00% | 1.148 m/s |
| Additional conditions | | | |
| SNR>32 | 120.045 | 54.00% | 0.733 m/s |
| ResErr<0.005 | 116.766 | 52.00% | 0.730 m/s |
| 2.01<FWHM<2.07 | 93.124 | 42.00% | 0.882 m/s |
| all 3 combined | 66.091 | 30.00% | 0.590 m/s |

# Conclusions (2)

- High SNR values lead mainly to hight assignment errors
- Moderate SNR values may also show broadening of the Mie peak
- Horizontal wind gradients have similar effects as vertical wind shear, when single range bins are considered. Therefore this is not studied in more detail.
- The same argument holds for convective cases.

# Todo's:

- QC on the Rayleigh line width
  - this requires an accurate absolute calibration of the usefull signal levels, which is currently not implemented in the L2B software. Therefore this cannot be done right now.
- Possible other QC checks on Rayleigh channel:
  - examine horizontal variability on meas. scale within an observation
  - examine presence of cross-talk

# The end

- questions ?