NWP calibration – applied to Aeolus Mie winds

Gert-Jan Marseille

KNMI

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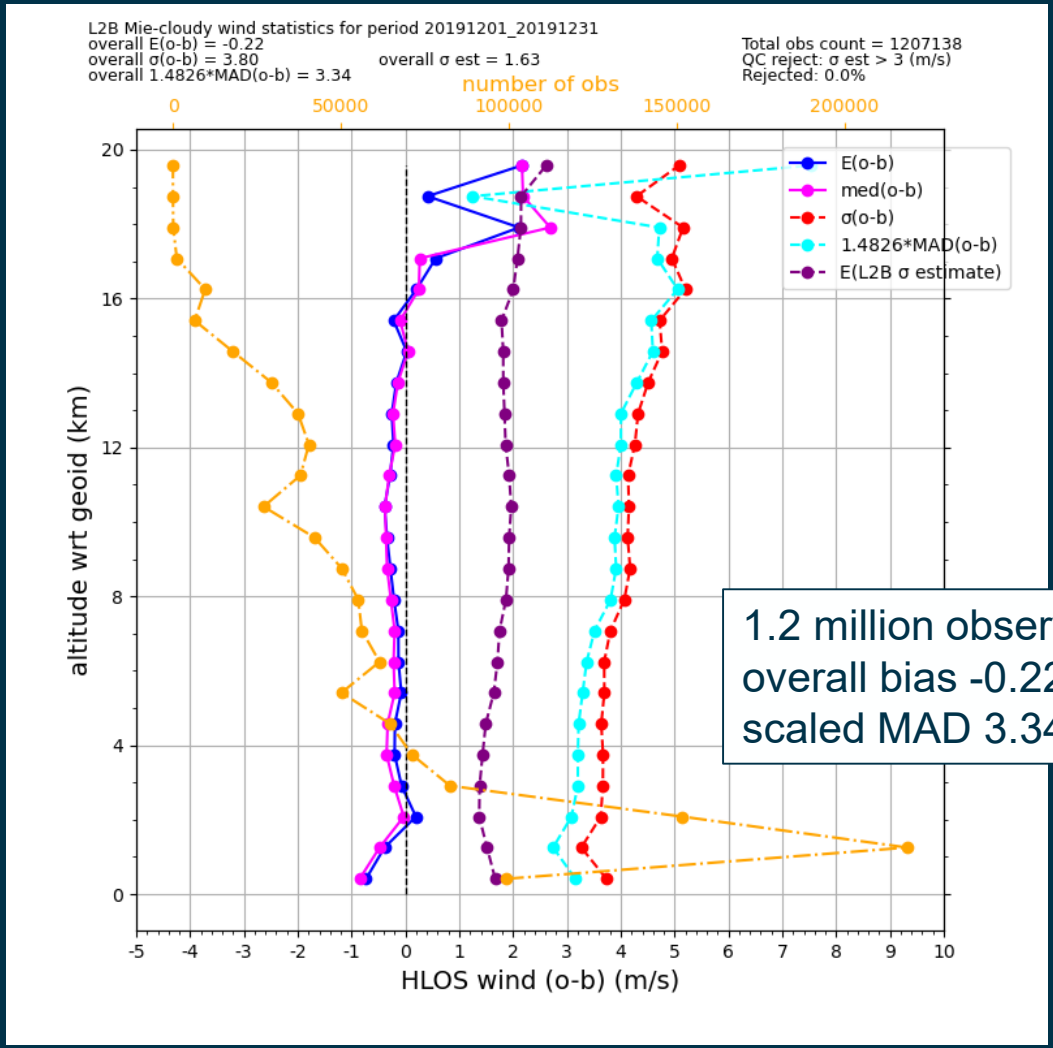
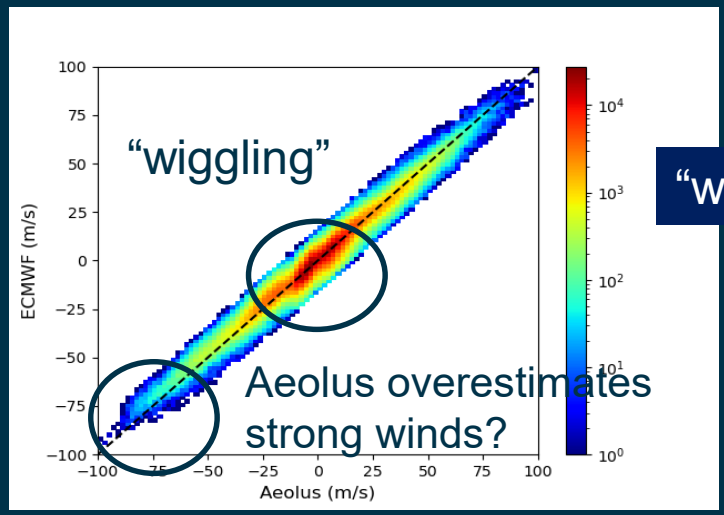
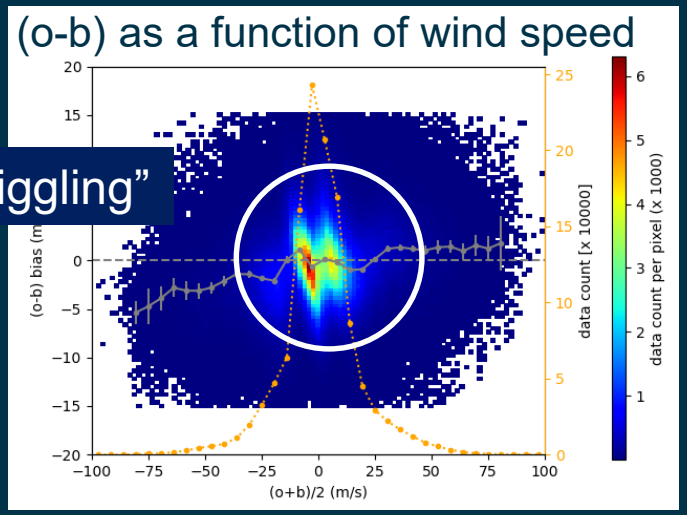
Aeolus Mie wind statistics – December 2019



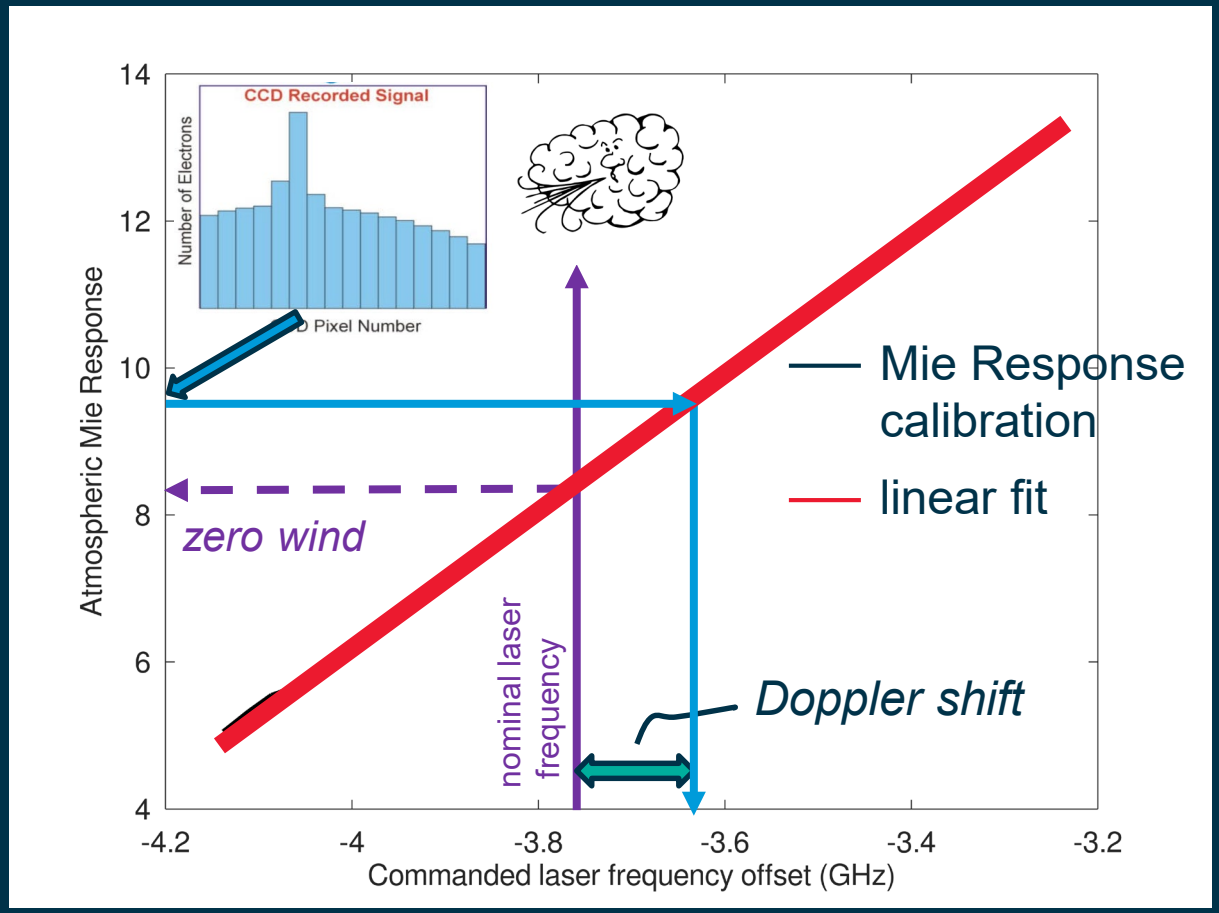
1.2 million observations
overall bias -0.22 m/s
scaled MAD 3.34 m/s



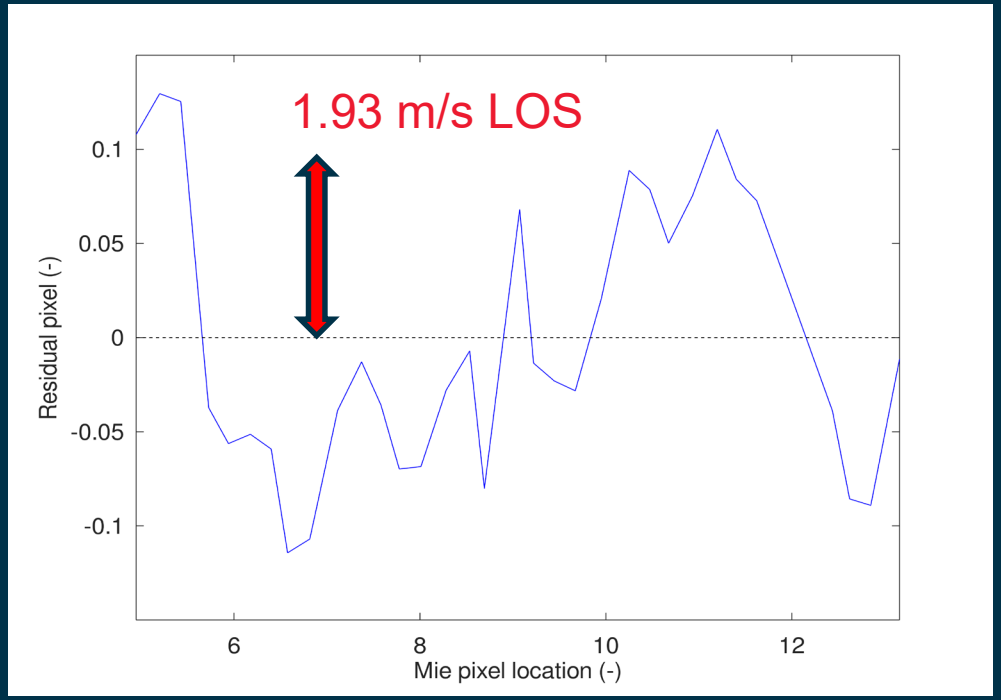


- Although Mie wind statistics look well at first glance, some artefacts are clearly visible in the statistics
- Can we explain these?

L2B Mie wind retrieval



non-linear contribution to the Mie Response obtained from in-orbit calibration

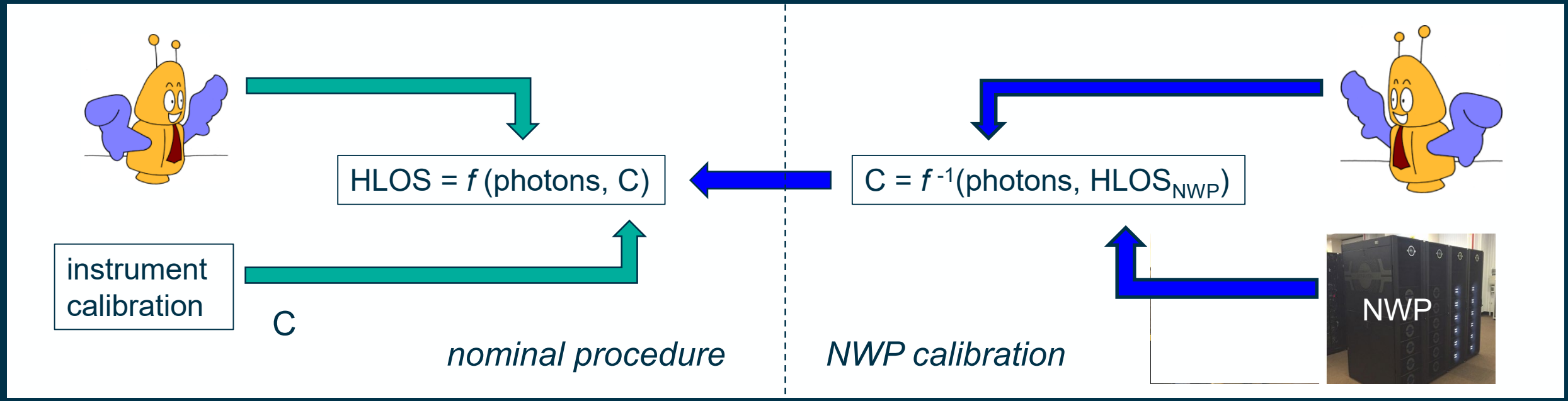


- The non-linear contribution is not negligible
- Correction for non-linear effect is needed

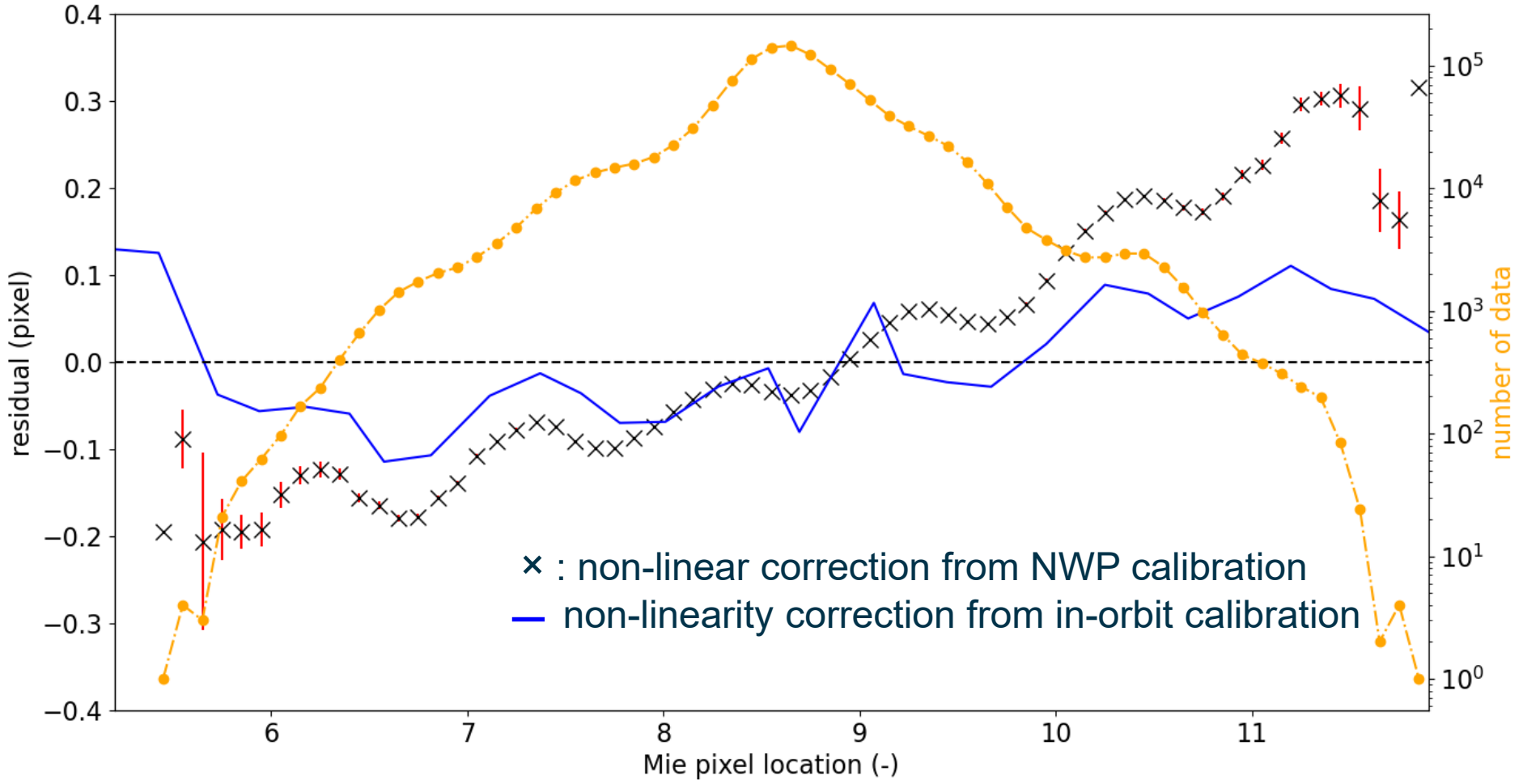
May be the in-orbit calibration strategy does not perform as expected?

Alternative approach: NWP calibration

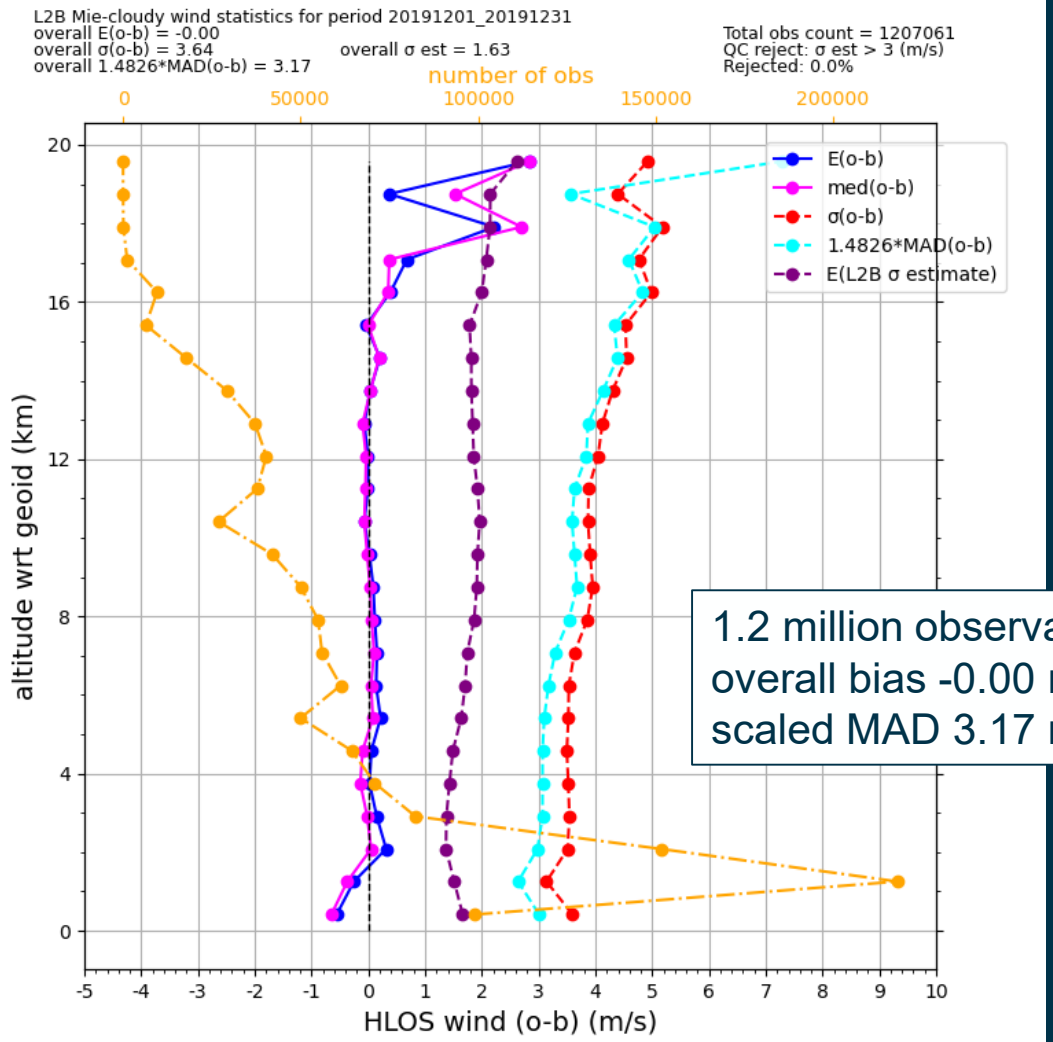
For each Aeolus observation there is an NWP representative!



NWP based Mie Response non-linearity



Aeolus Mie wind statistics – December 2019 (including NWP calibration)



1.2 million observations
overall bias -0.00 m/s (-0.22)
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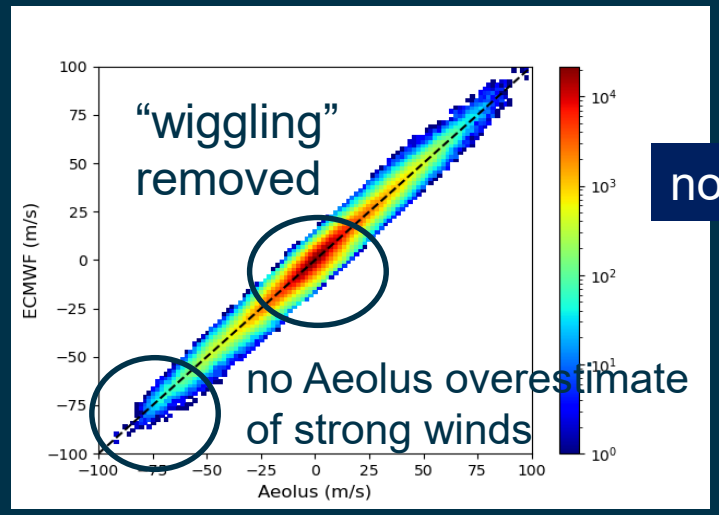
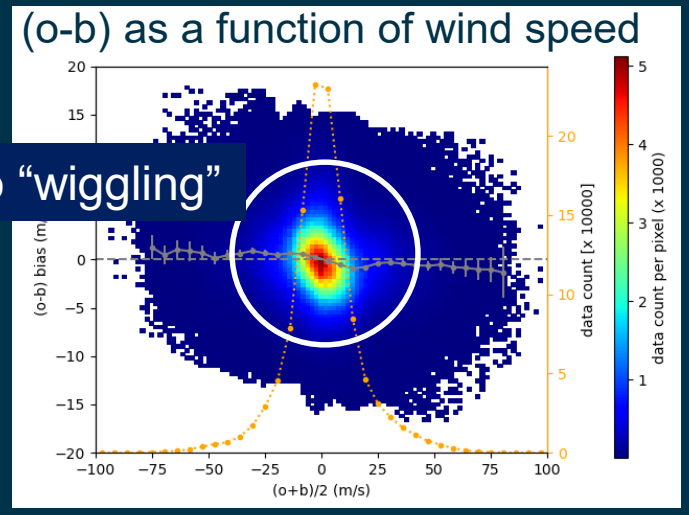




- Artefacts in Mie wind statistics have removed
- No wind speed dependent bias relative to ECMWF model winds

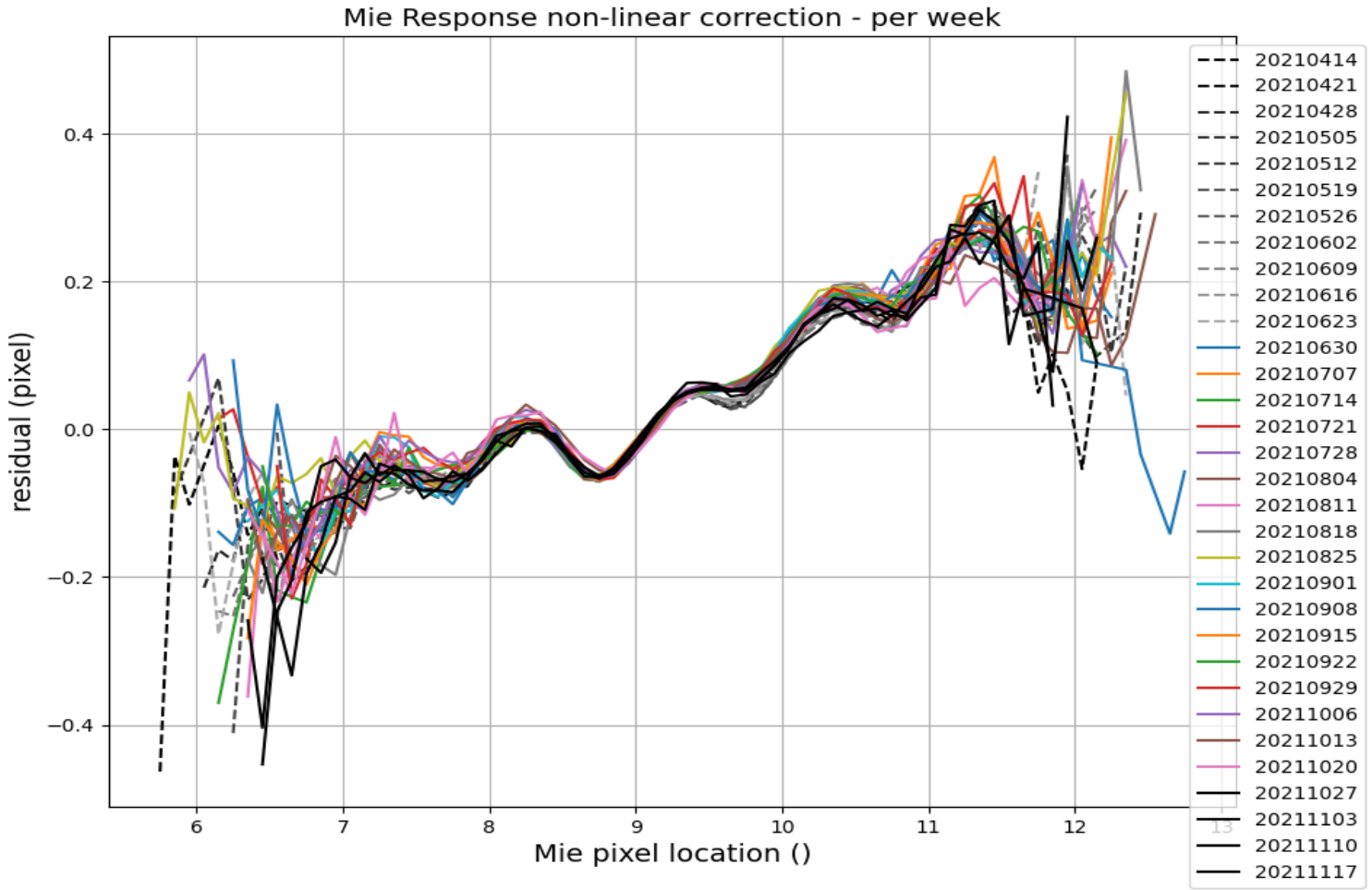
Some remarks

- Independent wind observations from aircraft data (Mode-S EHS) confirms the artefacts in the Mie wind statistics, which were removed after NWP calibration
  - Artefacts are from Mie winds and not the ECMWF model;

- There is no indication that Aeolus Mie winds are tuned toward ECMWF model local winds (and its biases)
  - The ECMWF model is assumed unbiased when averaged over the globe and a large period;

- Mie non-linearity tables based on NWP calibration were introduced in operational L2B processing on 1 July 2021;
- More details are found in the paper submitted to QJRMS (under review)

Mie response non-linearity - monitoring



- Mie non-linearity is very stable over time
  - No need for regular updates in the L2B processing
- Small jump near pixel value 9.5 on 1 July 2021
  - Introduction in operations
- No change after switch down on 22 October 2021 and switch on 1 week later.

Thank you!