



**Hans-Ertel-Zentrum**  
für Wetterforschung



# New flexible retrieval for gusts and mean winds from Doppler wind lidars

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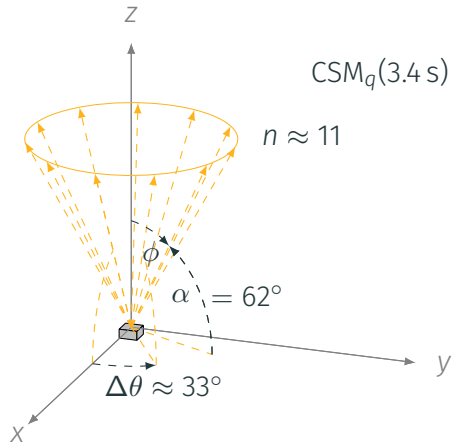


# Can we measure wind gusts with a Doppler wind lidar?

The 'gust mode' at FESSTVaL  
(see FESSTVaL.de):

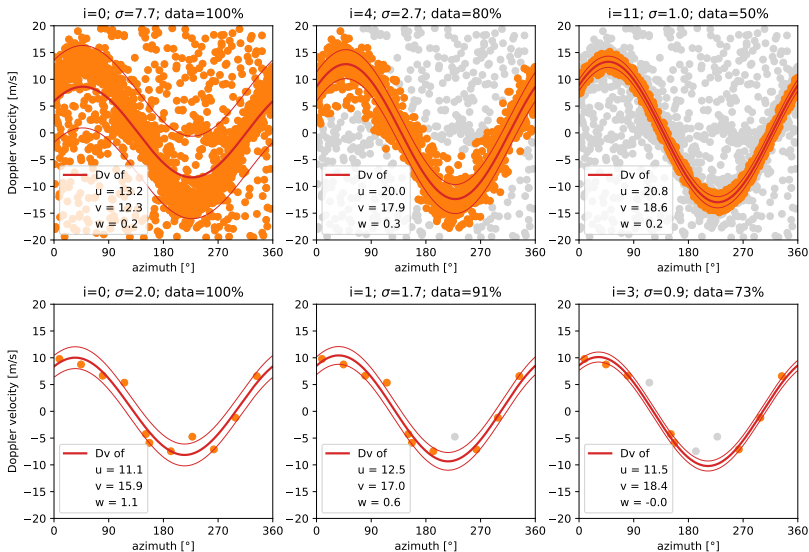
quick continuous conical  
scanning mode ( $\text{CSM}_q$ )

- only 3000 pulses/ray
- 10 – 12 inclined beams
- $t \sim 3.4$  s per circulation



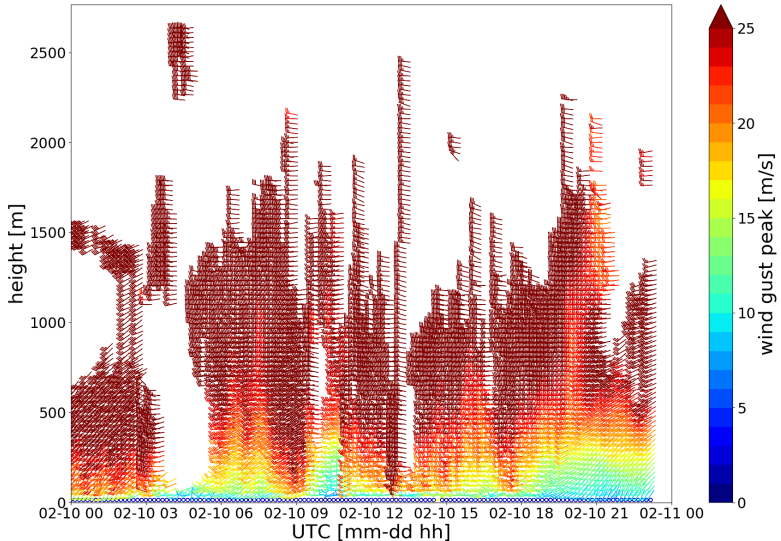
**Figure 1:** Doppler wind lidar in  $\text{CSM}_q$ .

# Retrieval: Iterative update of wind fit



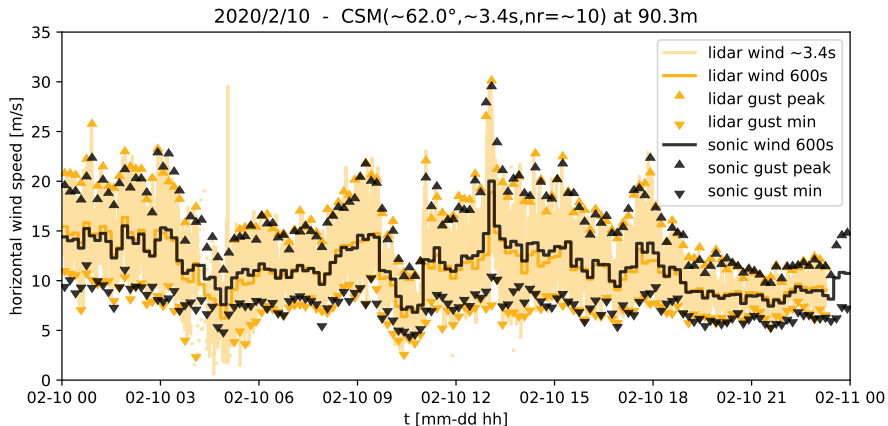
**Figure 2:** Different steps (i) of the retrieval for 600 s mean wind (top) and for one circulation wind (below). Used observations are orange and omitted are grey.

## Example: Storm Sabine February, 2020

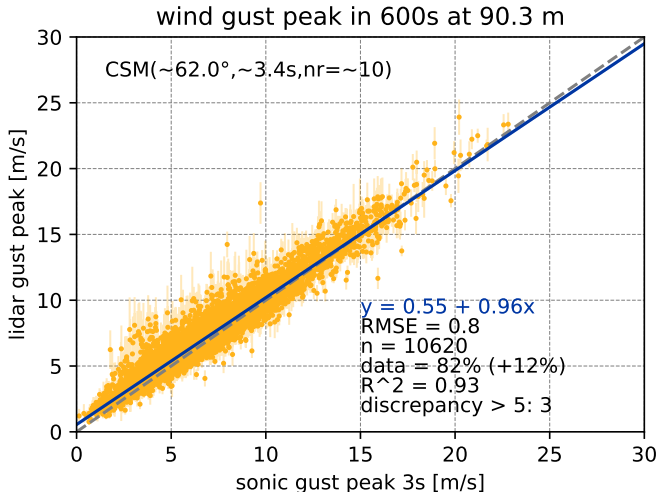


**Figure 3:** Gust peaks of 600 s at February 10th, 2020. The gust peaks are only displayed if at least 50 % of circulations in the 600 s window are calculated.

## Example: Storm Sabine February, 2020



**Figure 4:** Comparison of lidar wind with sonic anemometer measurements at 90,3 m at the Falkenberg weather mast on February 10th, 2020.

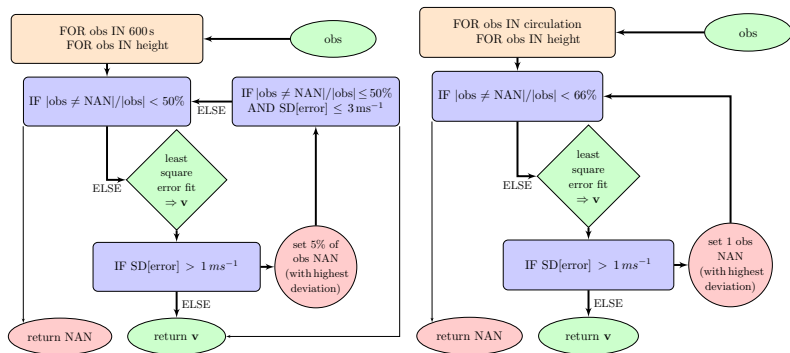


**Figure 5:** Scatterplot of lidar and sonic anemometer wind gusts at 90,3 m at the Falkenberg weather mast. The measurements are from summer 2020 (JJA). Data in parentheses correspond to cases where no comparison is appropriate due to shadowing effects on the sonic anemometer, although lidar data are available.

# Conclusion

- new flexible retrieval does not need prior filtering
- quick continuous conical scanning mode performs very well compared to sonic anemometer in 90.3 m
- summer 2021:  
Can we see gust patterns evolution by operation three lidars at different locations ( $\sim 5$  km triangle) parallel?

# Appendix: Retrieval scheme



**Figure 6:** Retrieval scheme for mean wind of 600 s (left) and for small-scale circulation based wind (right). Instead of prior filtering (e.g. by SNR) an iteration process is included: omit non-matching values and update fit).