Particle Time-of-Flight by Hadamard Transform (ePToF): A new high-duty-cycle approach to size-segregated and total aerosol mass measurements for the Aerodyne Aerosol Mass Spectrometer

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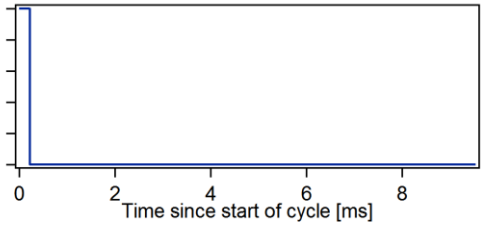
Signal and PToF for both PToF and ePToF

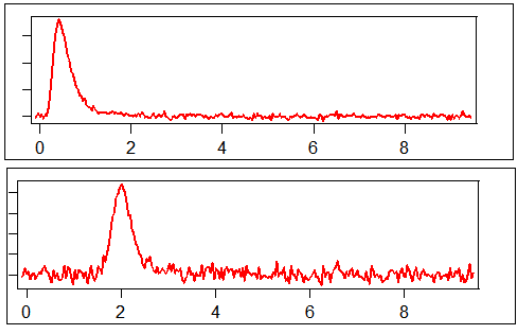
NOTE: traces are not apples to apples S/N comparisons

PToF

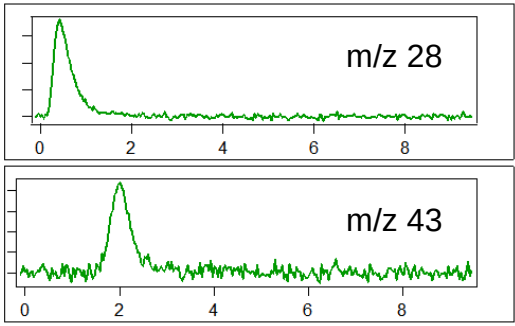
Beam Open/Closed at 104 Hz



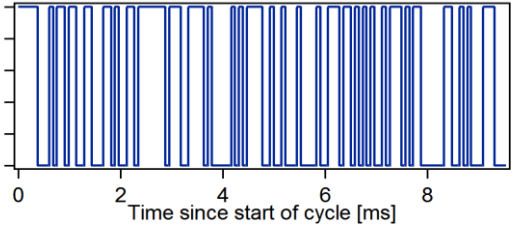
Signal as recorded

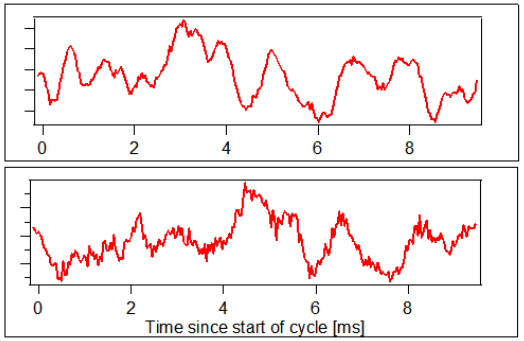


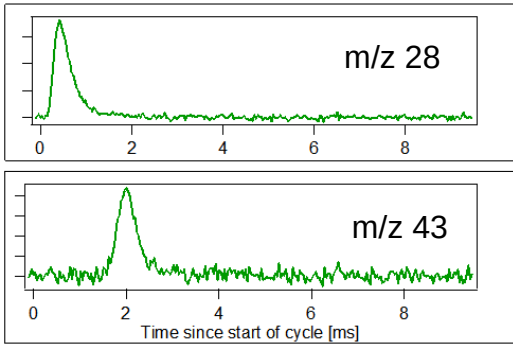
ToF after Transform (ePToF only)



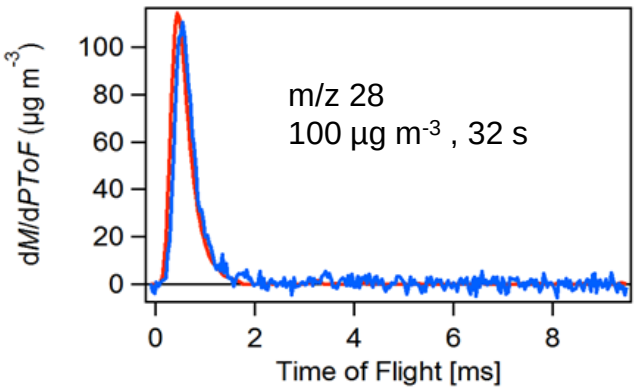
ePToF

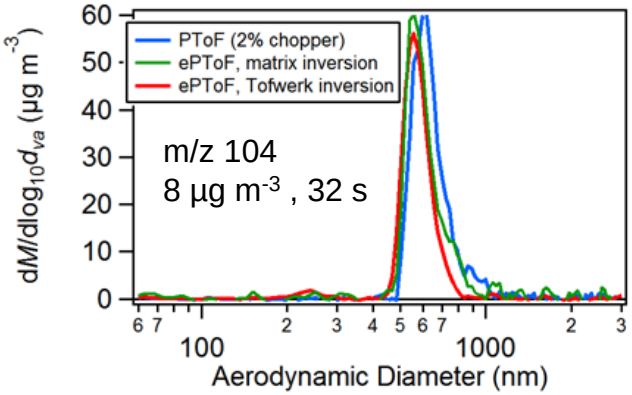


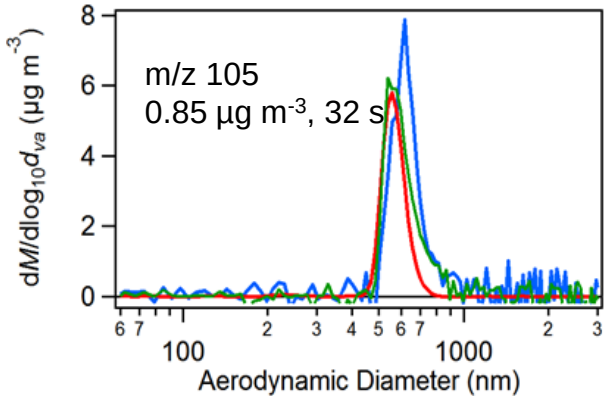


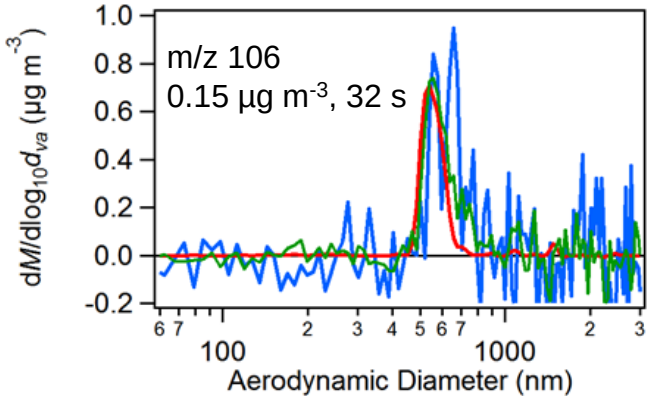


Size distributions at different S/N





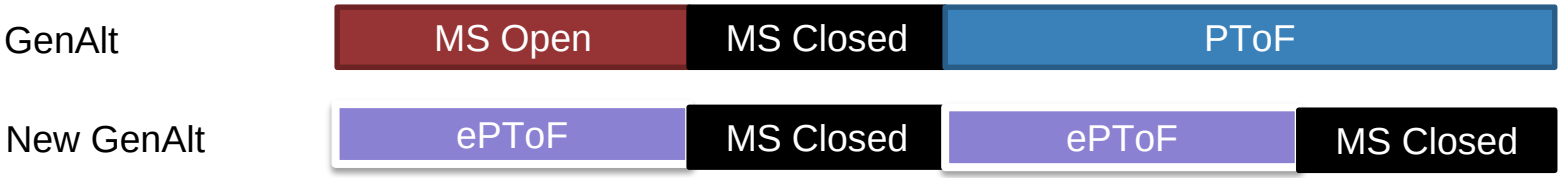




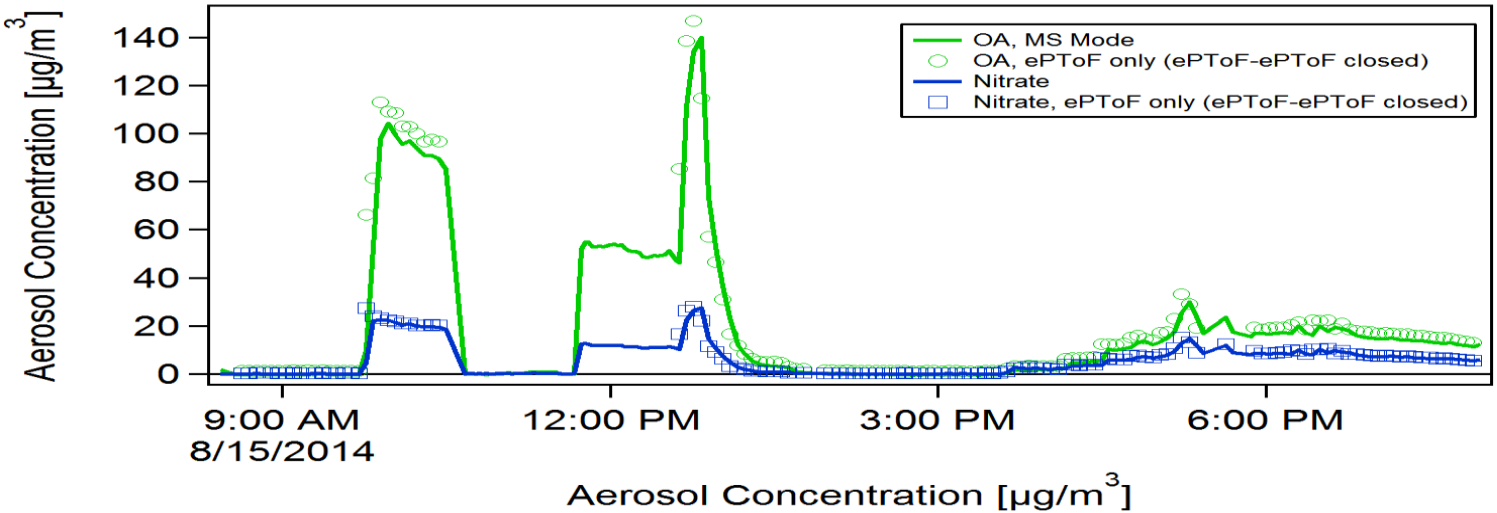
S/N for m/z 106:

PToF: 2
ePToF, Matrix: 7
ePToF, Tofwerk: 100

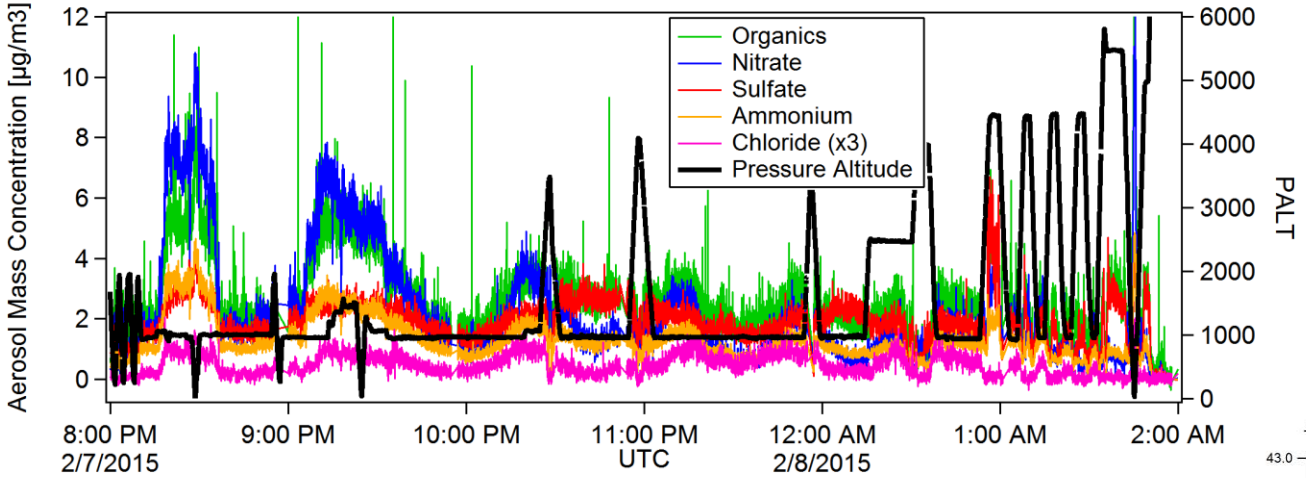
New Acquisition Mode



- Size and total mass are taken simultaneously with similar dutycycle, no normalization factor
- By using size resolved data at high S/N, fragtable becomes mostly superfluous



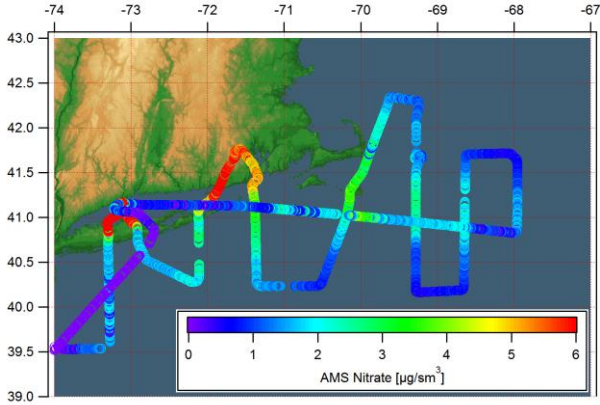
WINTER Campaign, RF03



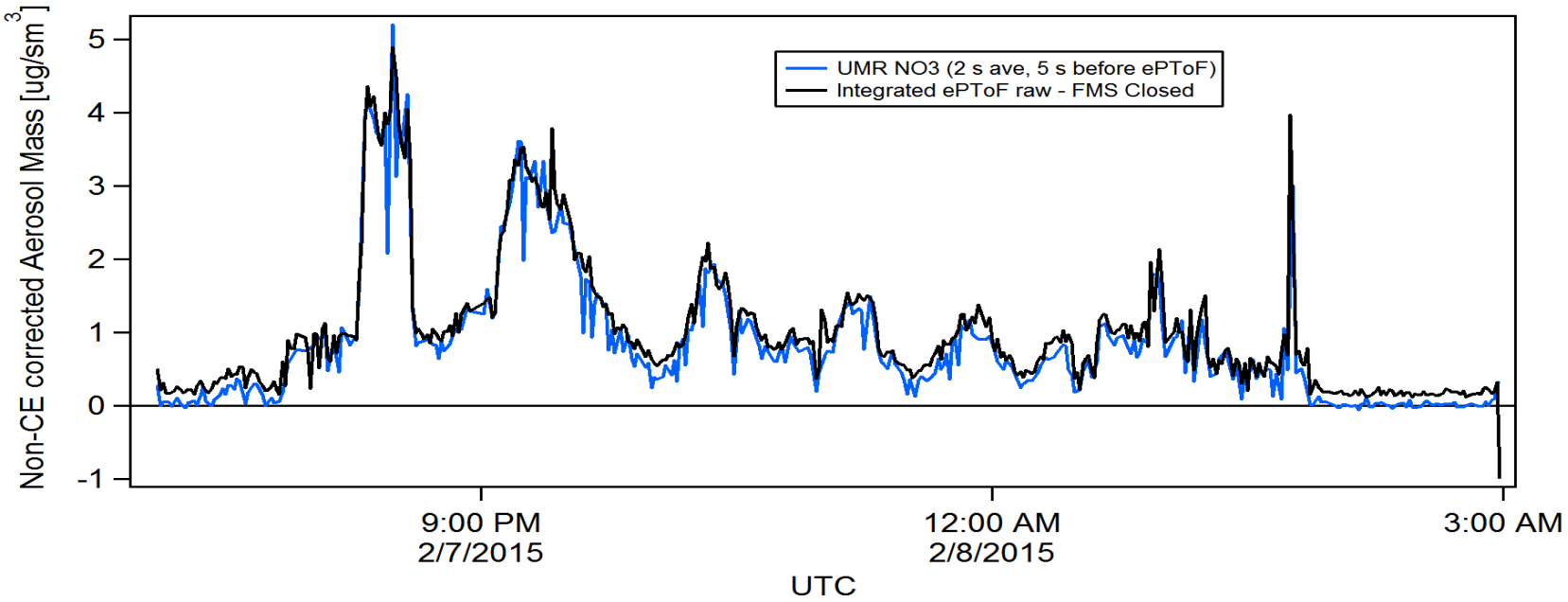
1 min cycles:

6 s FMS Closed
46 s FMS Closed
~5 s ePToF

If everything works, ePToF should have similar S/N as a 2 s average of the MS Data !

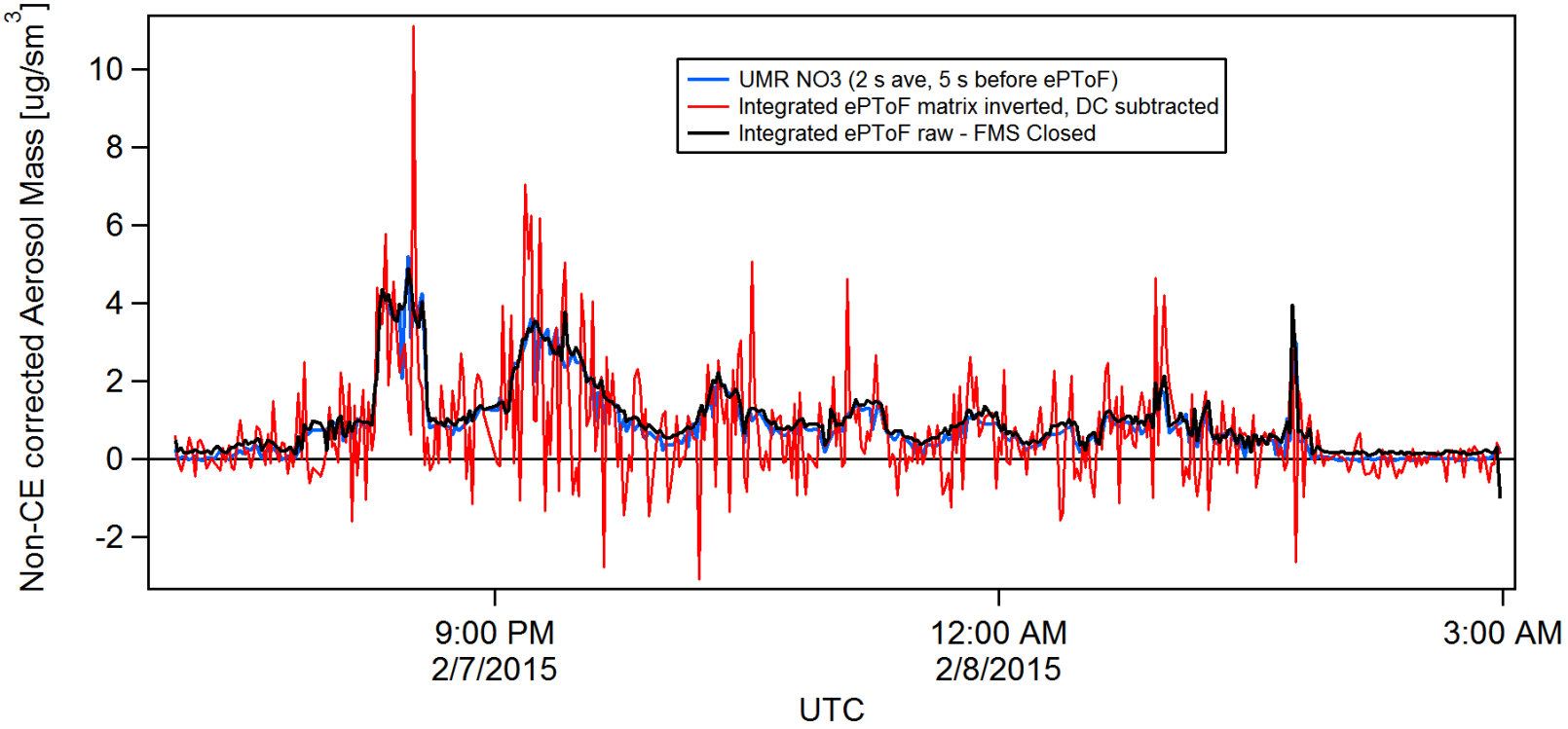


First Test: Nitrate, total ePToF signal



You can normalize PToF with it's own data!

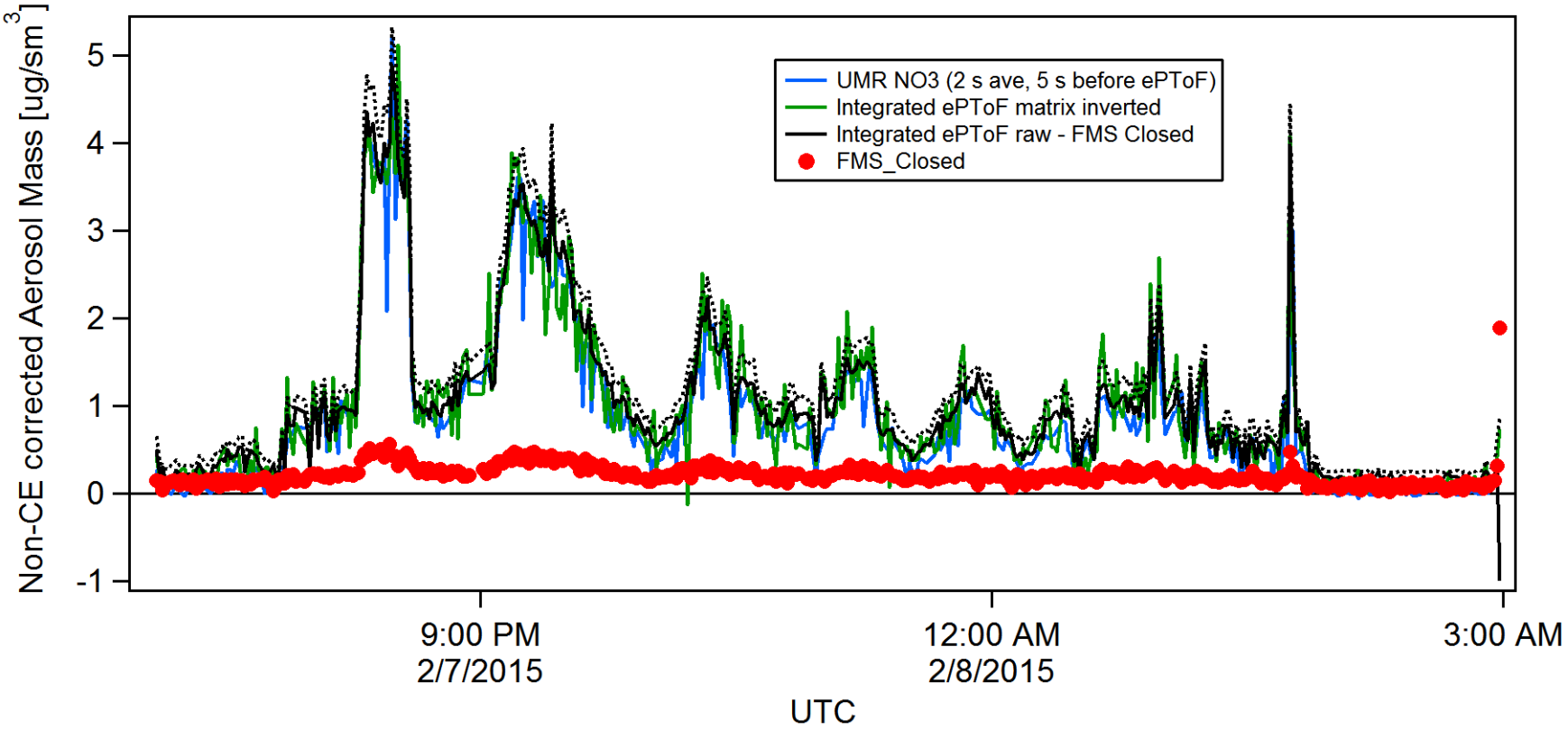
However…



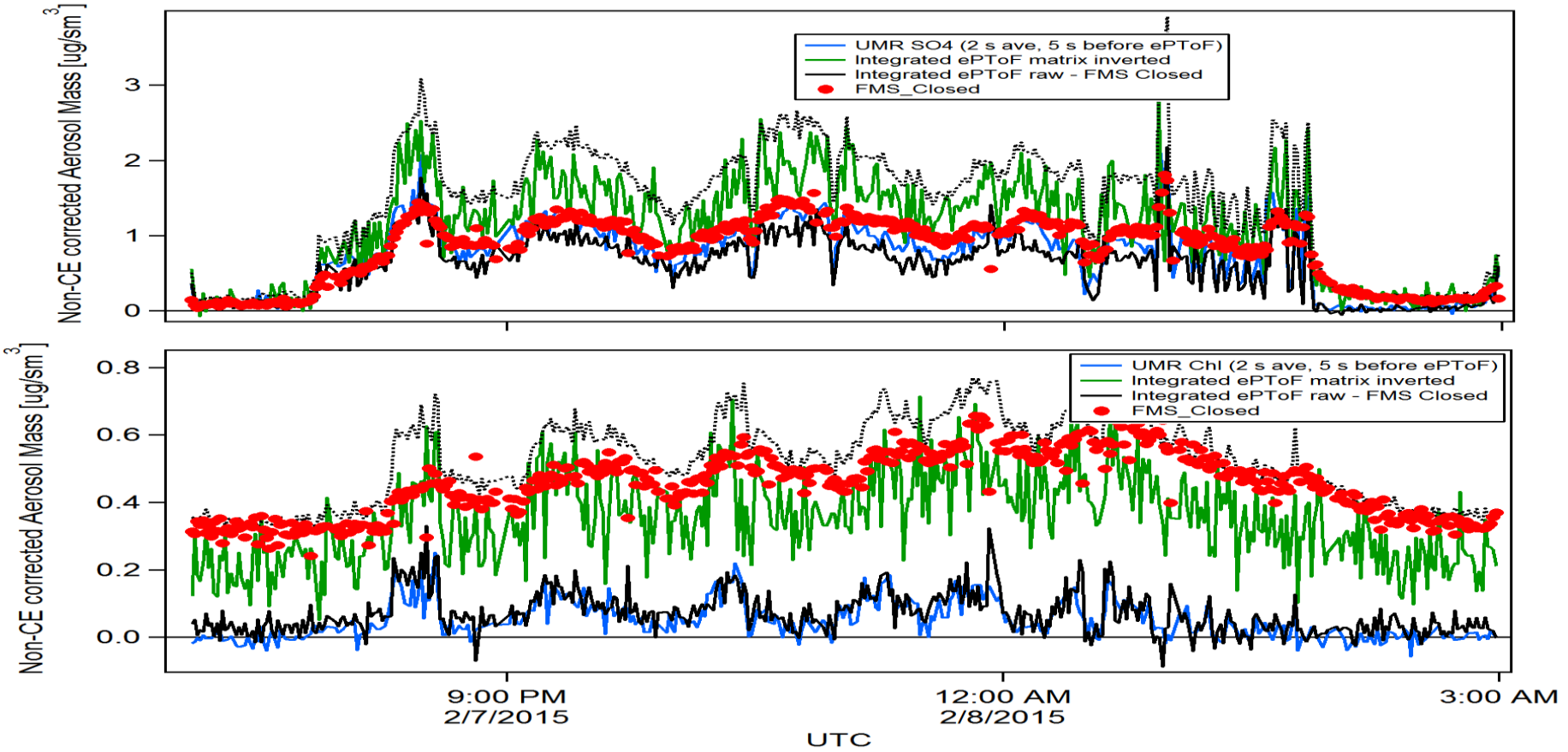
Once DC markers are applied, the ePToF signal becomes much noisier!

NOTE: This does not apply to the advanced inversion algorithm discussed by Leah Williams

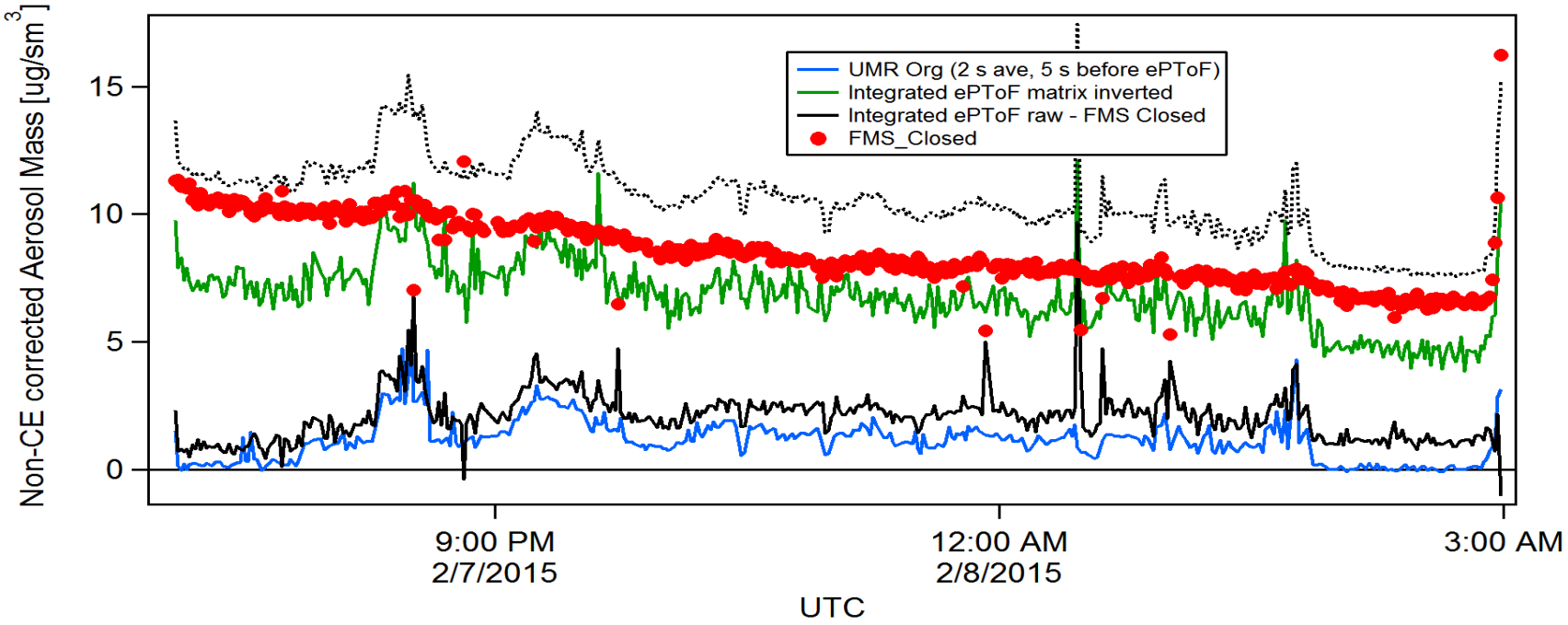
Removing DC Markers solves the problem



Works for other species as well



Some issues still present with OA



Likely software related, stay tuned.