



WRF-Chem Model simulations for the UWFPS 2017 field study

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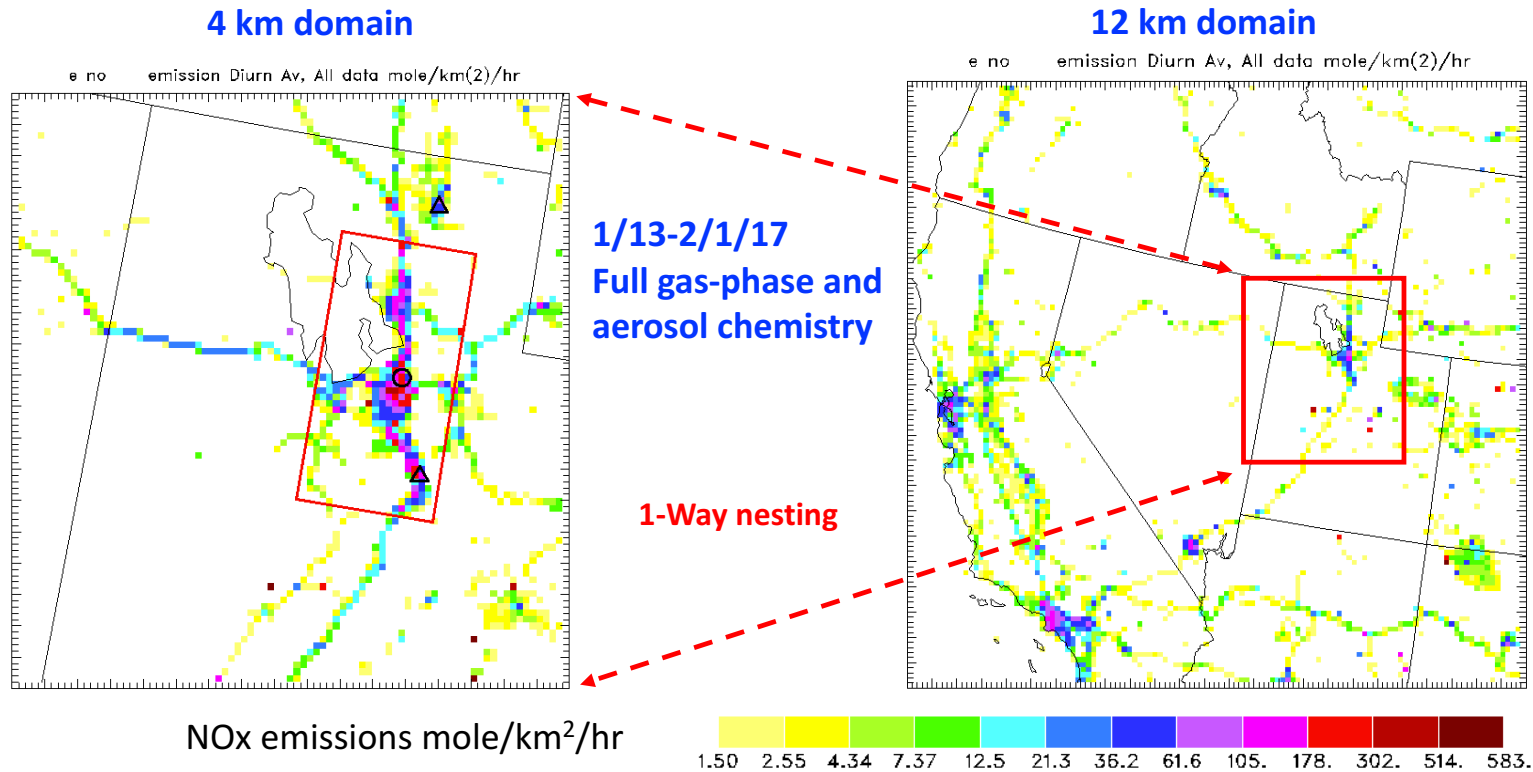
Motivation and background

- Provide 3-D model platform for Twin-Otter data interpretation
- Complex topography, cold-pool meteorology require 3-D model
- Evaluation of model meteorology, emissions, gas/aerosol partitioning

Considerations

- Model/Measurements in Evaluations focus on Twin-Otter data
- Only Revision-0 data used (available March, 2017)
- Awaiting "final" data sets

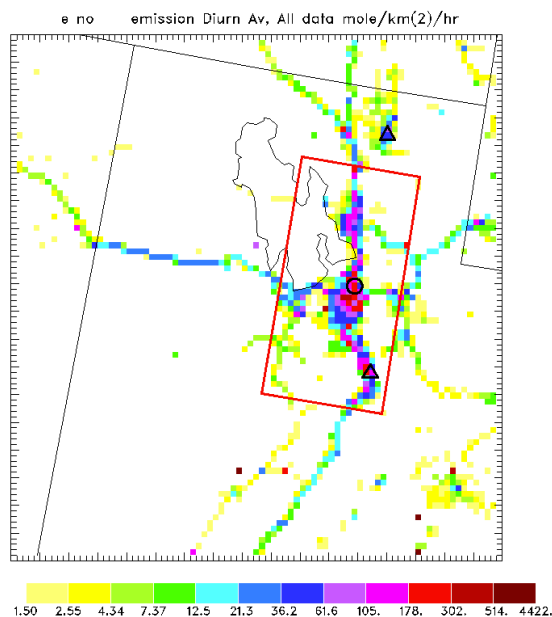
WRF/Chem model details



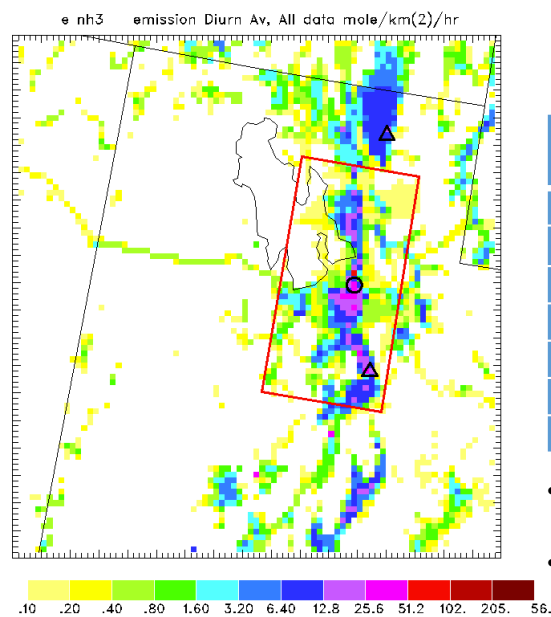
- NEI-2011 emissions (January, weekday)
- NO SURFACE DEPOSITION
- WRF/Chem version 3.9, Met. Boundary Conditions from NCEP's RAP analysis
- Initially, no heterogeneous chemistry

NEI-2011 Emissions

NO_x emissions



NH₃ emissions



NEI-2011 NO_x and NH₃ emissions (ton/dy)

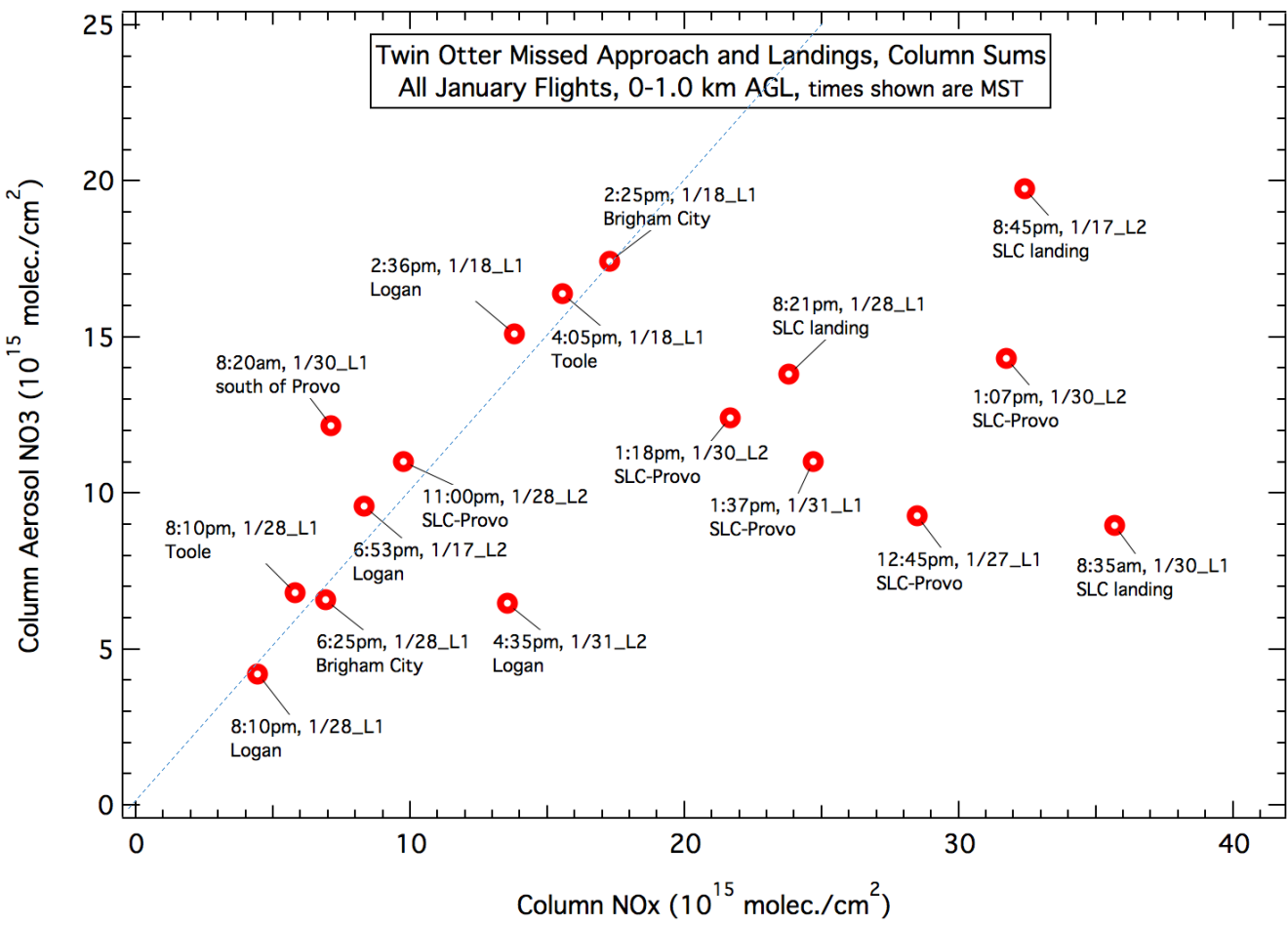
County	Total NO _x	Onroad NO _x	Total NH ₃	Onroad NH ₃	Area NH ₃
Salt Lake	96.86	52.19	5.06	1.23	3.61
Cache	10.13	6.15	7.14	0.11	7.02
Utah	44.23	31.11	6.39	0.54	5.65
Weber	19.82	11.73	1.58	0.24	1.33
Davis	26.58	16.76	1.89	0.34	1.17
Morgan	5.69	1.56	0.51	0.02	0.48
Total	203.31	119.5	22.57	2.48	19.26

- All Area NH₃ sources dominated by agriculture, except Salt Lake County
- Salt Lake County, Area NH₃ sources dominated by NG Home Heating

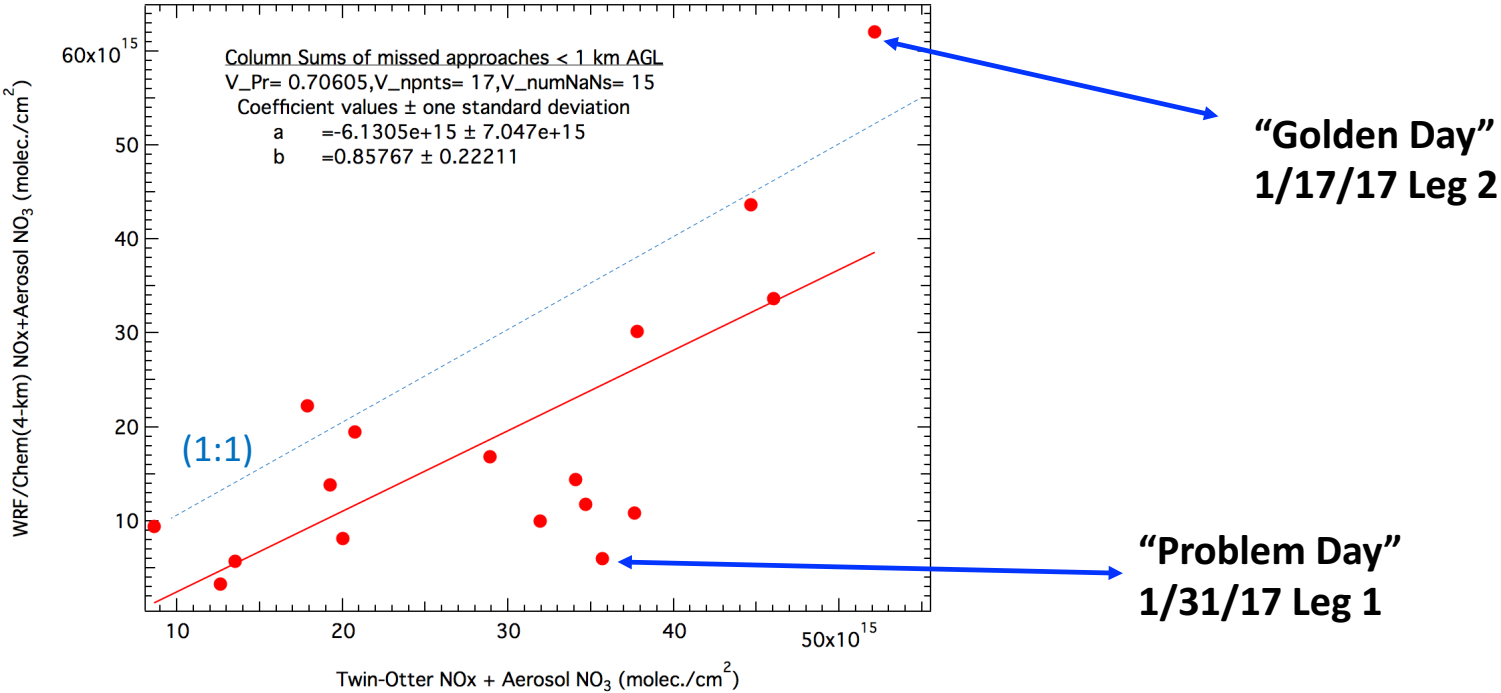
Emissions Modifications – Based on model biases of column sums, 0-300m statistics

- All NH₃ emissions multiplied by 4
- Onroad NO_x emissions multiplied by 2
- HONO/NO_x onroad emission ratio = 2.5% (based on nighttime measurements)

Column Sums of NO₃ and NOx from Twin Otter Profiles

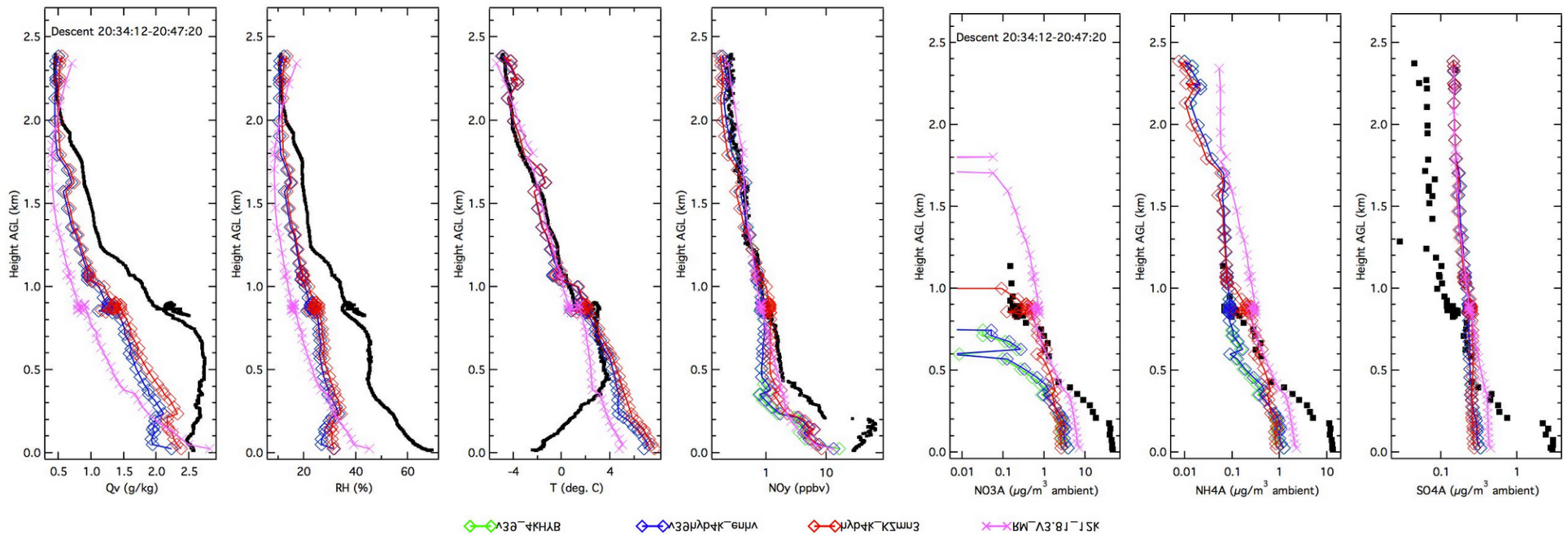


Column Sums: Model versus Observations



Model – Twin Otter Comparisons on CSD website

“Problem Day” 1/31/17 Leg 1



- Model missed sharp shallow inversion layer

Model Nitrate Biases – Incremental Improvements

Model/Obs. Aerosol NO₃ Median Ratios
All January Data, 0 – 300 meter (AGL), (~3200 points)

Base:	0.1
Snow Albedo = 0.85	0.16
4 X NH ₃ emissions	0.23
NO ₂ + NO ₃ → 2HNO ₃	0.46
2 X Onroad NO _x emissions	0.60
NO ₂ deposition → HONO:	0.75