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# Preliminary Photochemical Air-Quality Simulations in California during CalNex

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Planning and Technical Support Division

Air Resources Board

California Environmental Protection Agency

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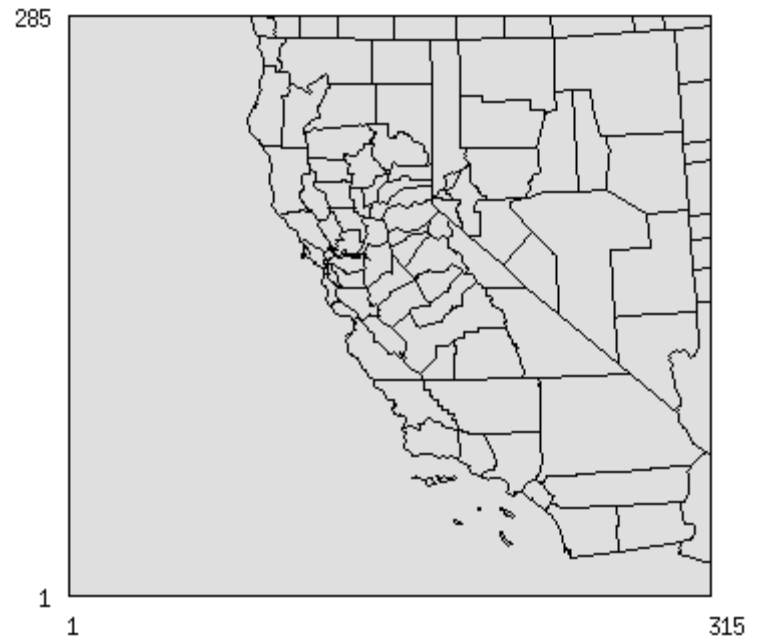
# Acknowledgements

- Rainer Volkamer, Hilke Oetjen, Sunil Baidar (Univ. of Colorado)
  - Thomas Ryerson, Ilana Pollack, John Holloway (NOAA)
  - Barry Lefer (Univ. of Houston)
  - Dazhong Yin, Kemal Gurer, Bruce Jackson, Jeremy Avise (CARB)
  - Louisa Emmons (NCAR)
  - James Kelly (EPA)
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# Model Application

- CMAQ4.7 with SAPRC99
- 4 km × 4 km horizontal resolution; 30 vertical layers from surface to ~100mb with the lowest layer nominally 30-m deep ; 315×285×30 total grid points.
- MM5 Meteorological fields
- “2008 June” weekday/weekend emissions
- Boundary conditions from MOZART-4

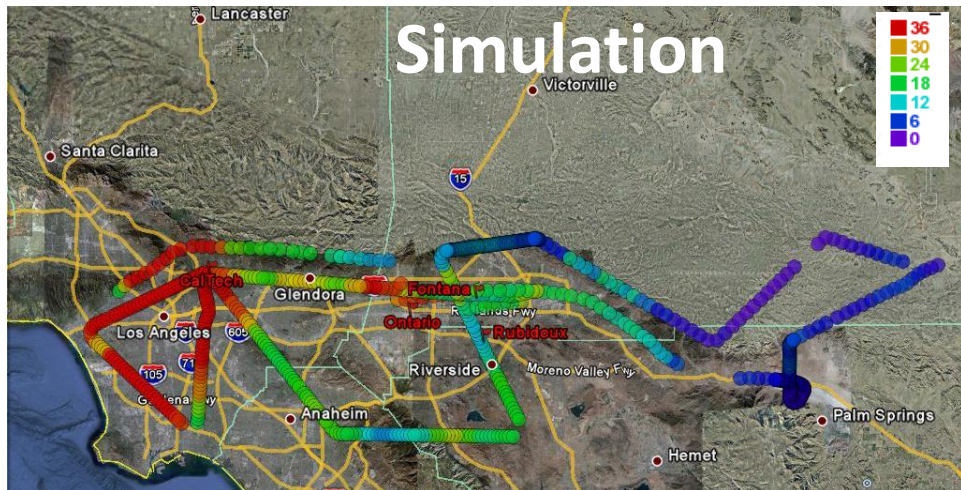
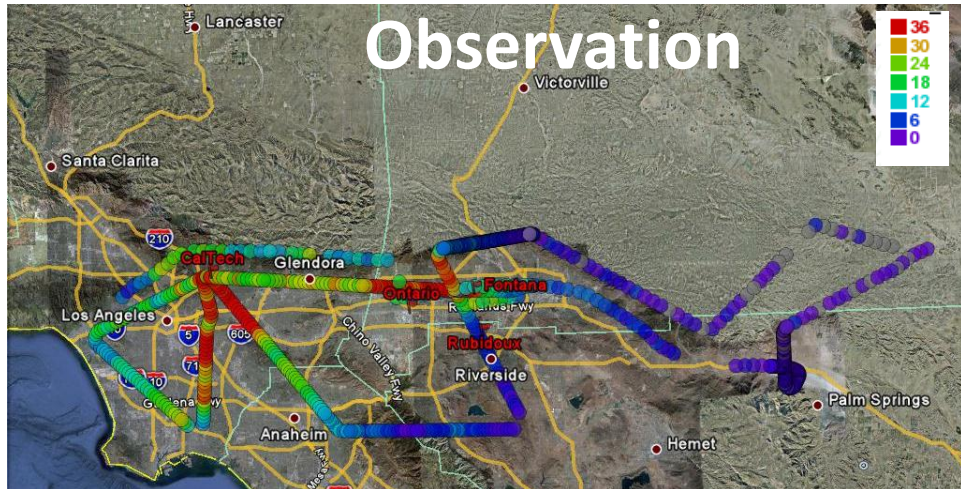
## State-wide Modeling Domain



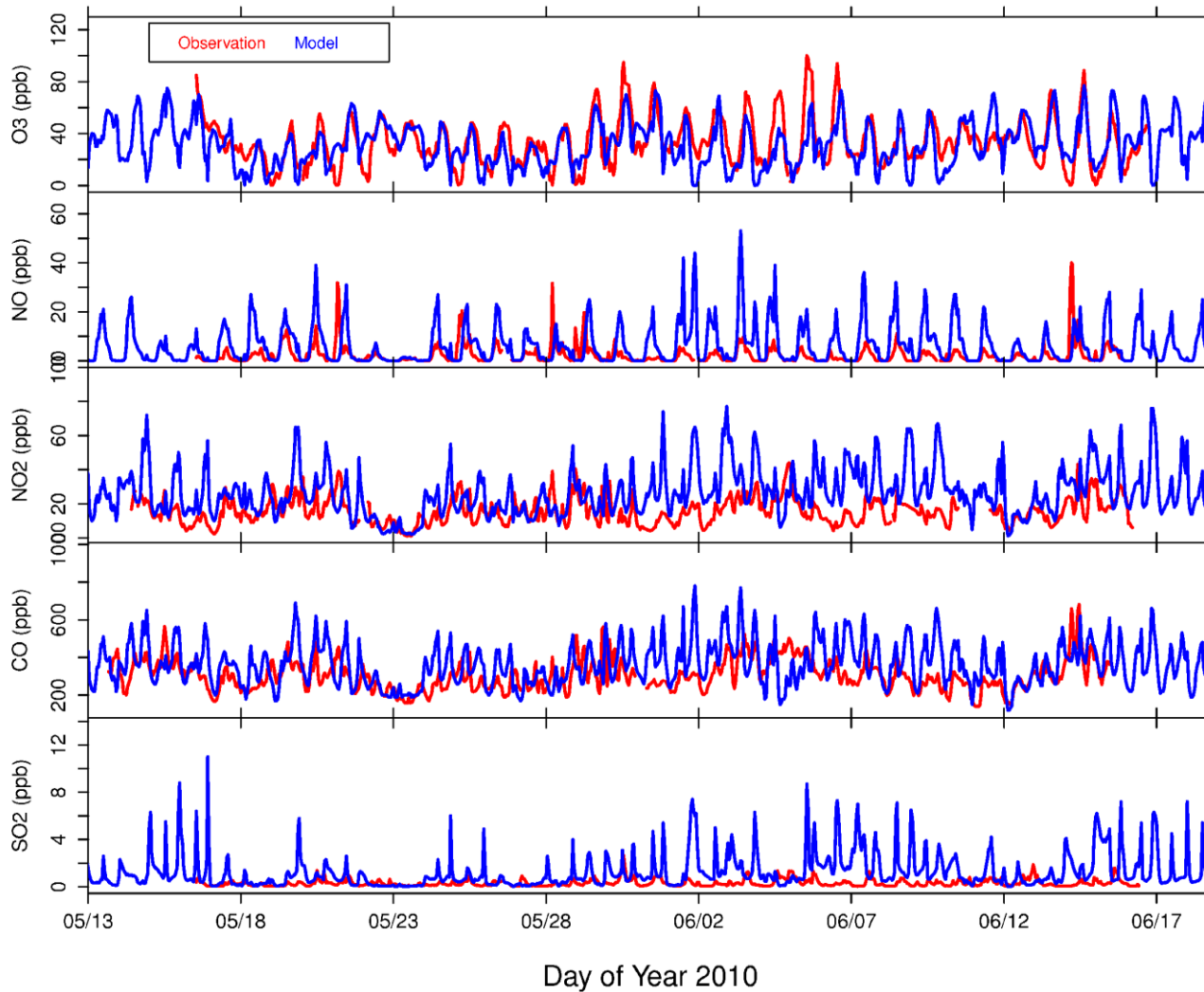
# NO<sub>2</sub> Vertical Column Below Aircraft

[Unit:  $1 \times 10^{15}$  molec cm<sup>-2</sup>]

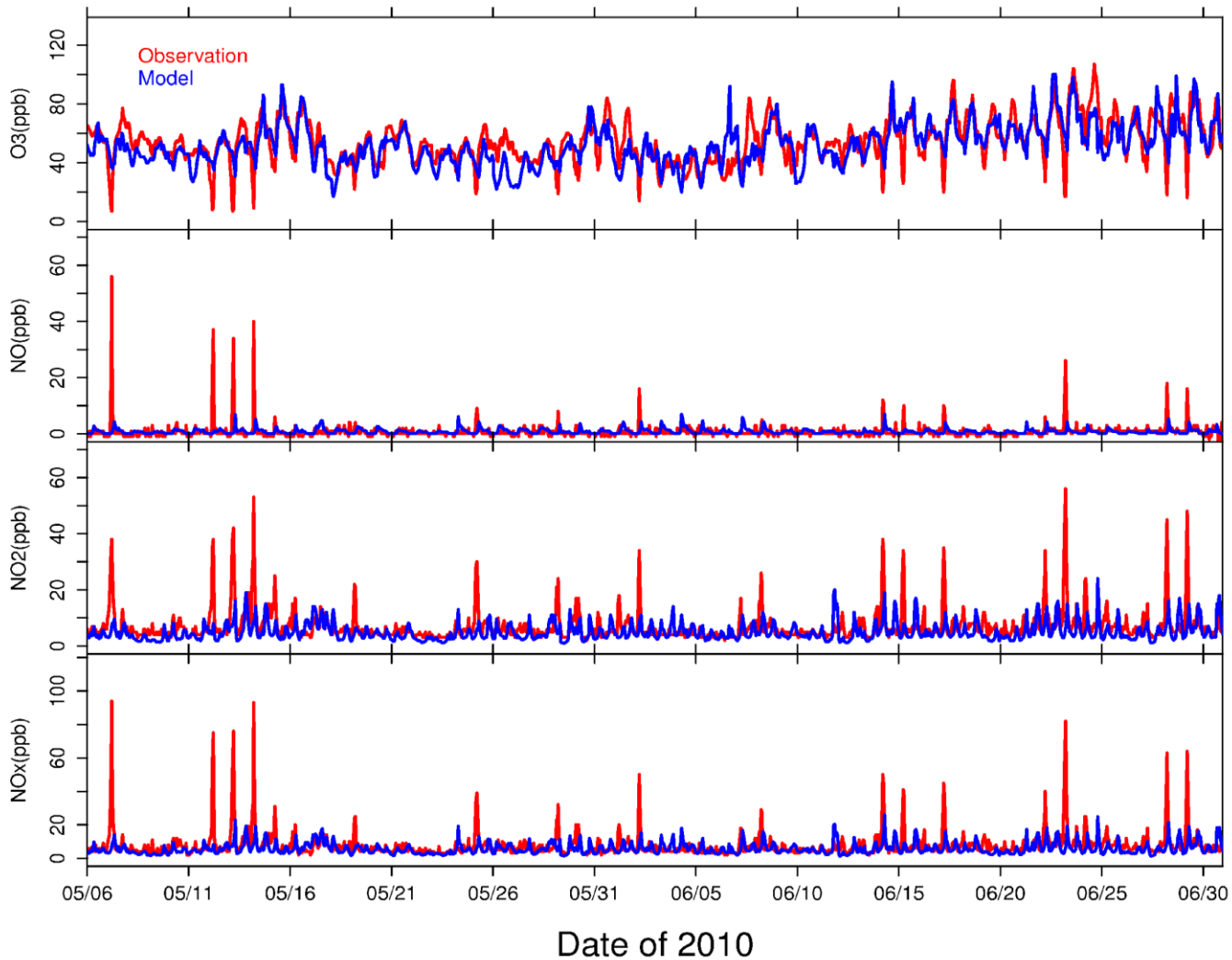
Twin Otter  
07/16/2010  
Wednesday  
Morning flight



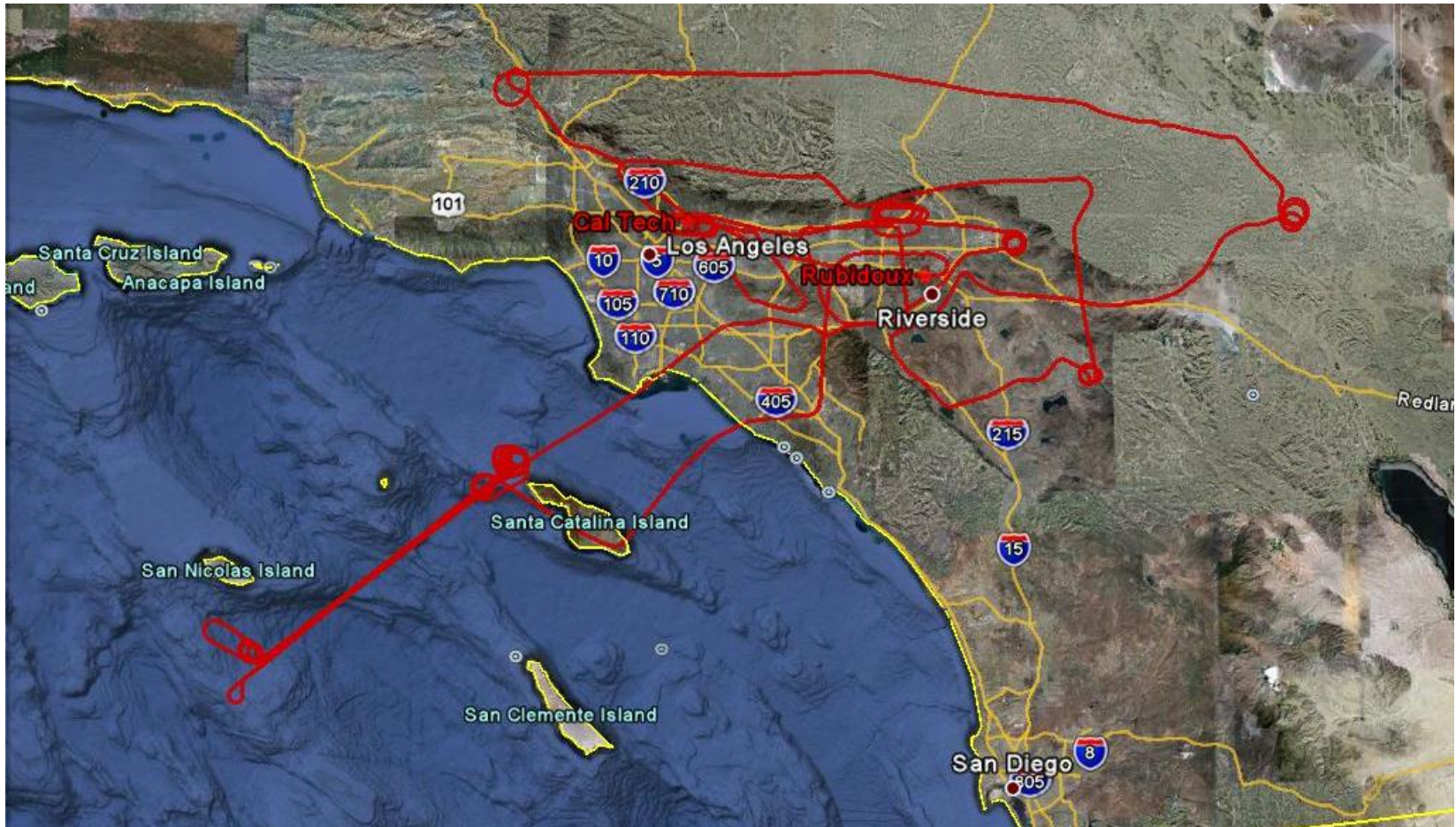
# CalTech Surface Site (LA Supersite)



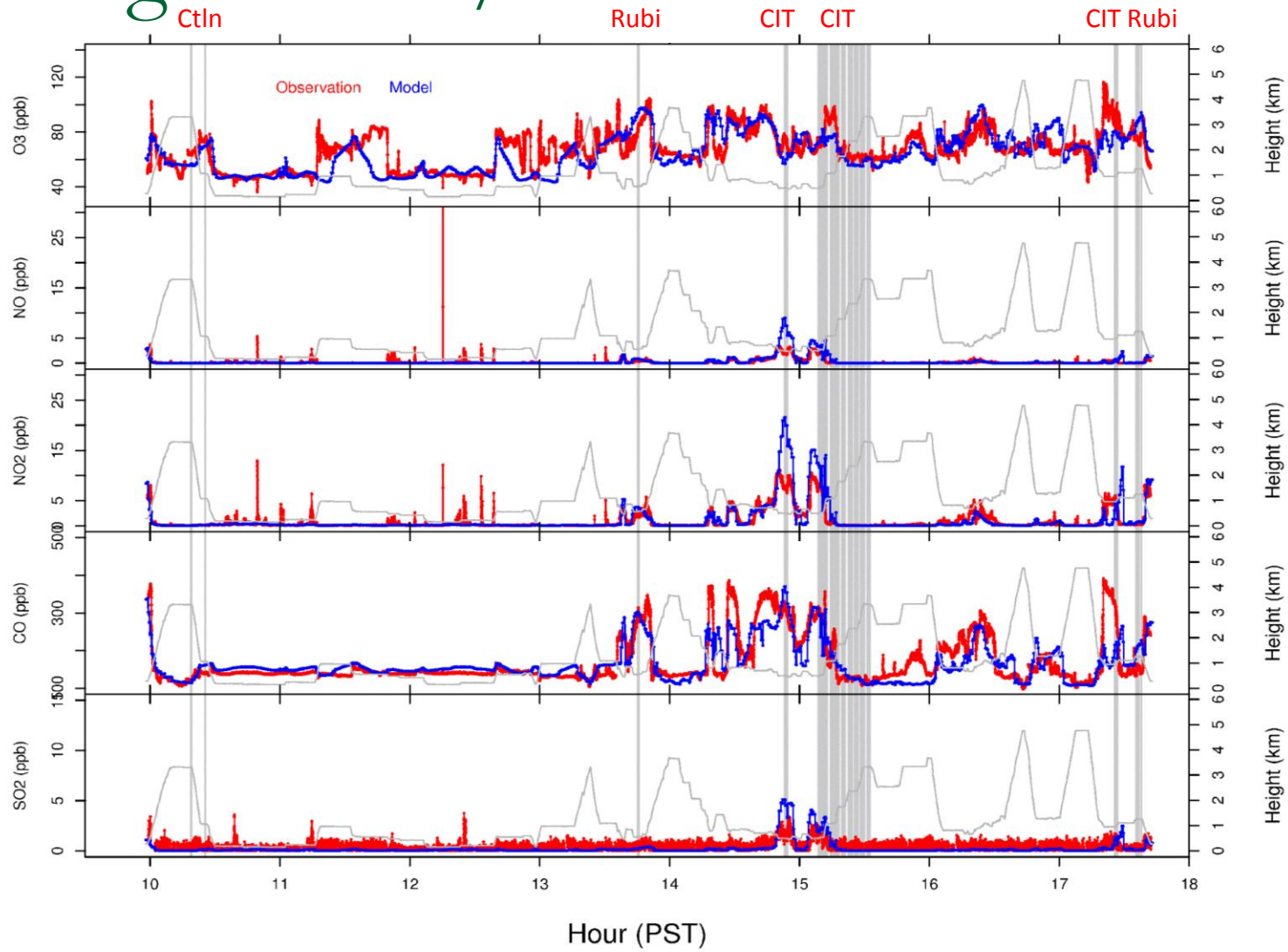
# Lancaster Surface Site



# P3 Flight on 05/16/2010 (Sunday)



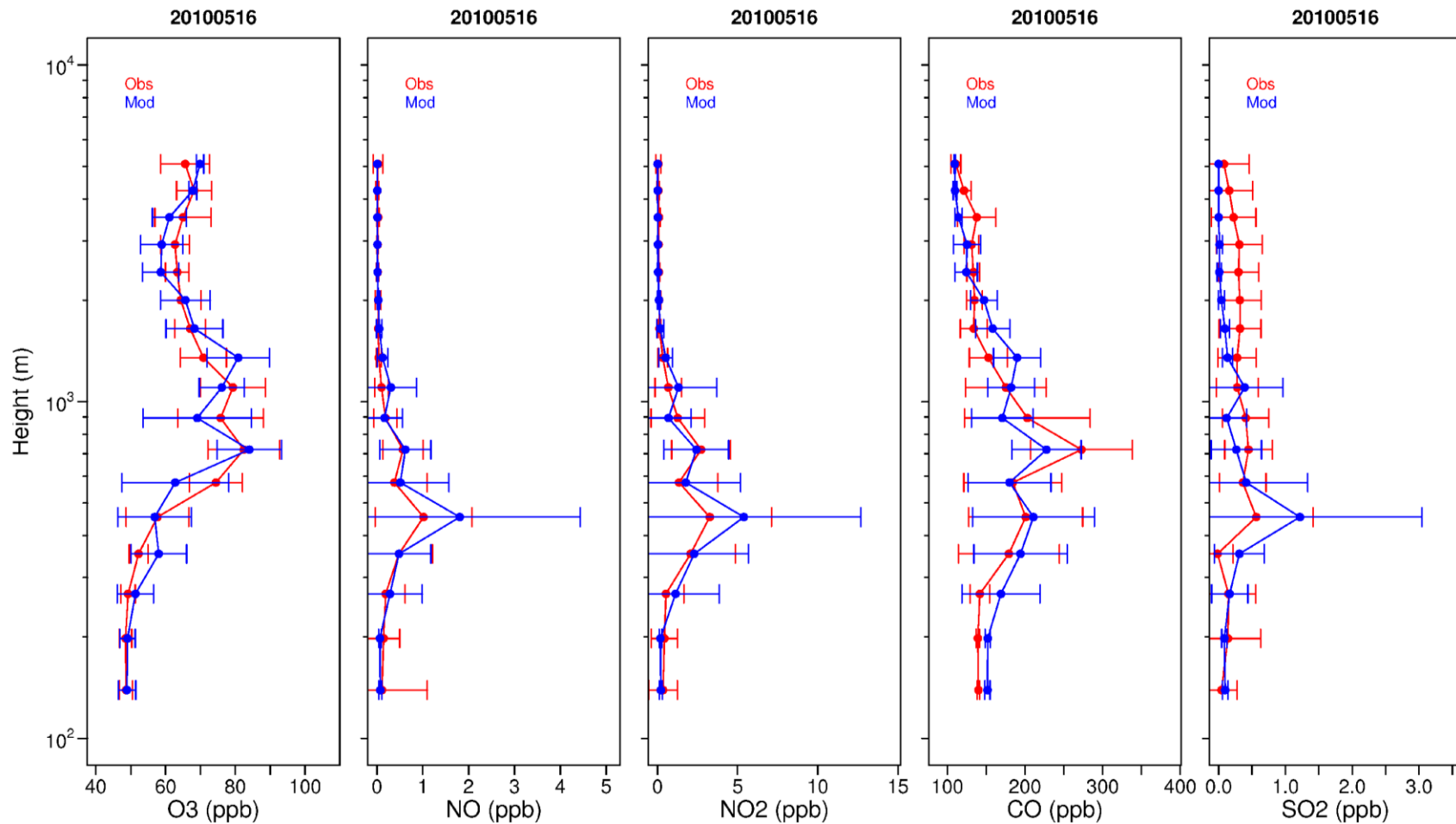
# P3 Flight on 05/16/2010





# Vertical Comparison on 05/16/2010

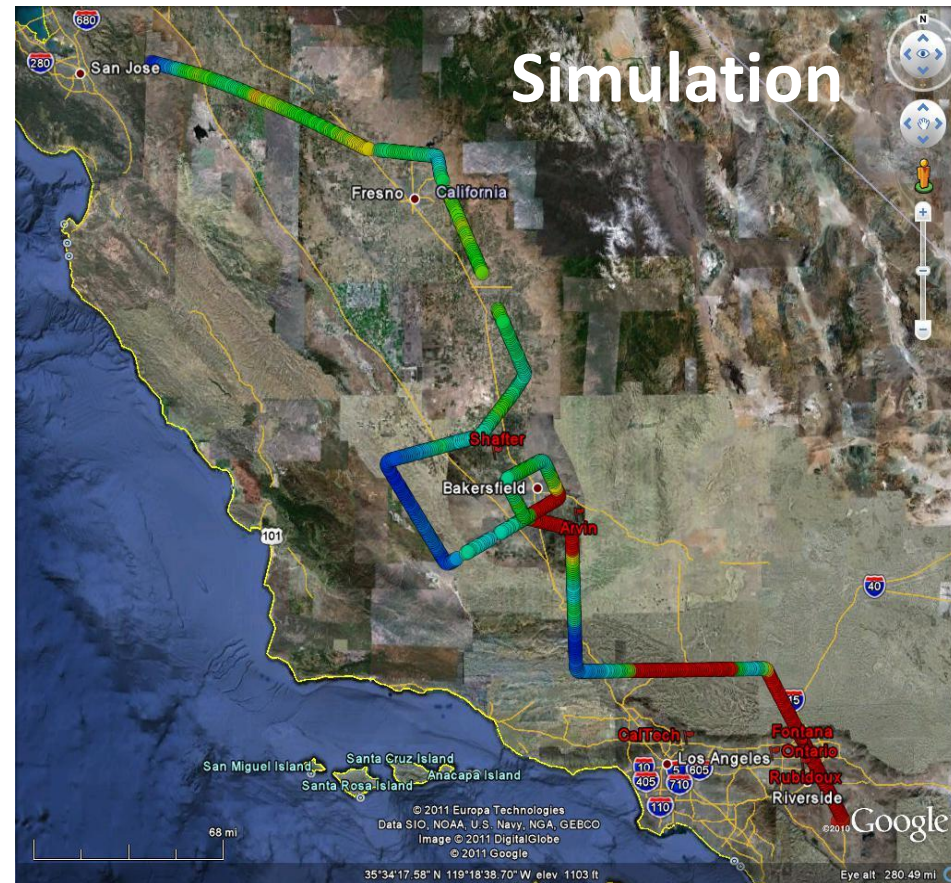
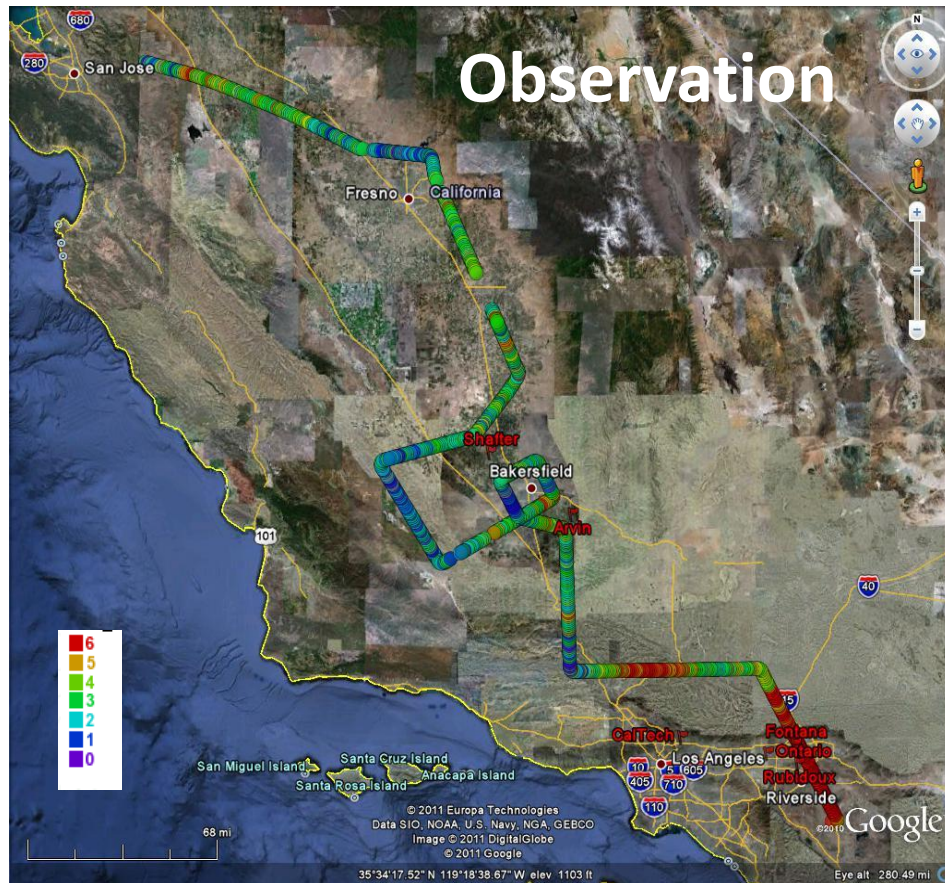
(Data are grouped to each model layer, solid dot: **mean**, error bar:  $\pm 1\sigma$ )



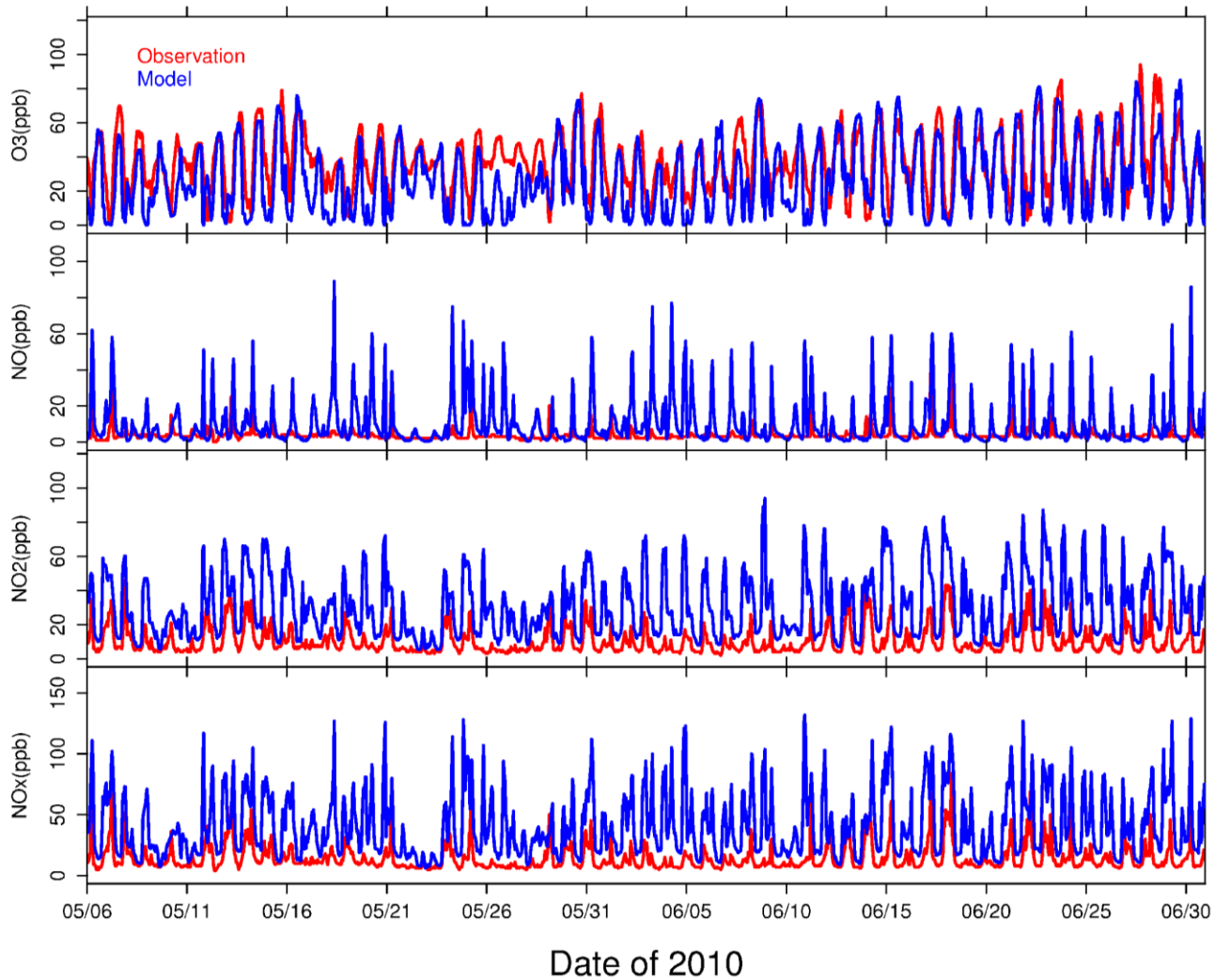
# NO<sub>2</sub> Vertical Column Below Aircraft

[Unit:  $1 \times 10^{15}$  molec cm<sup>-2</sup>]

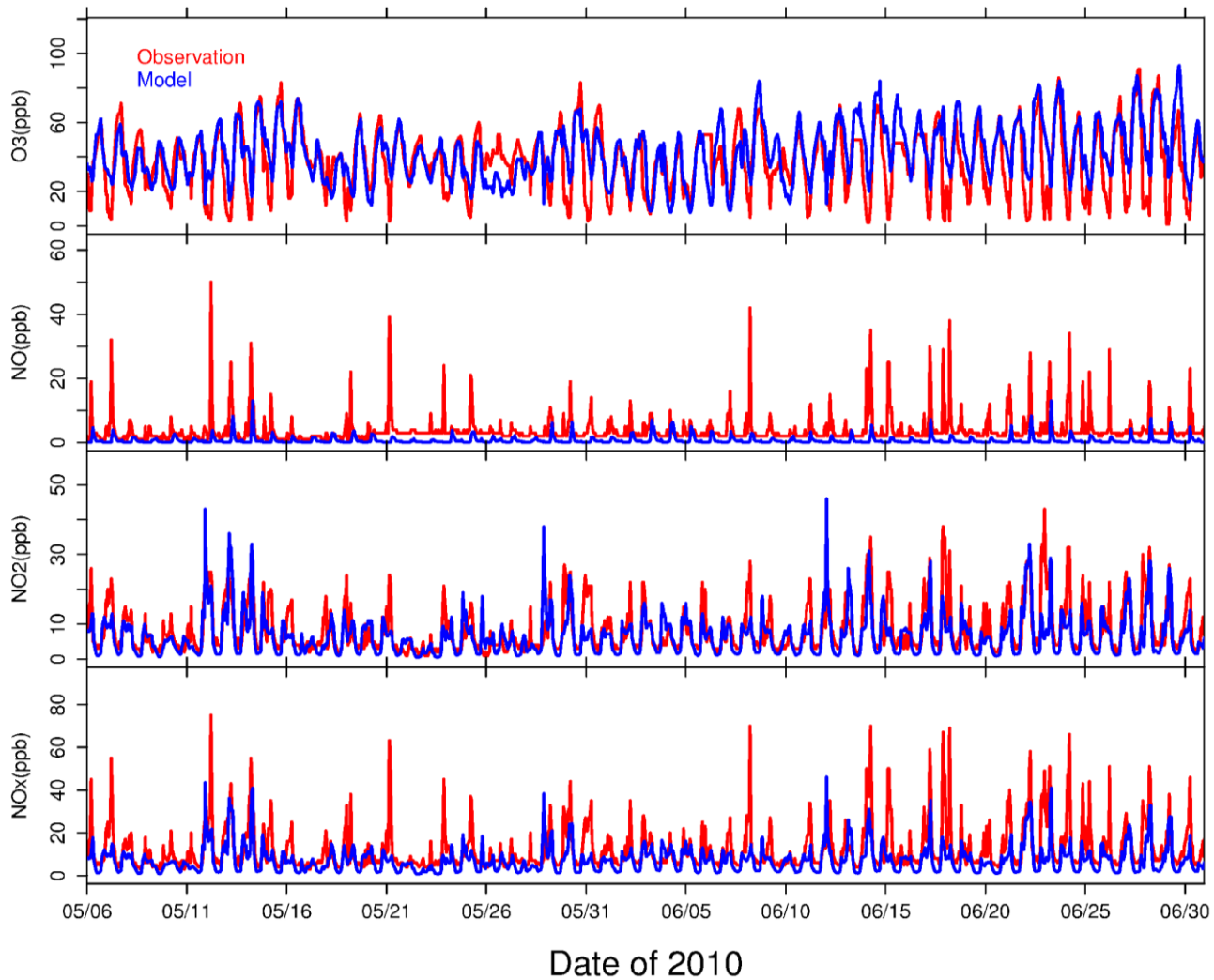
Twin Otter 06/29/2010 (Tuesday) Flight



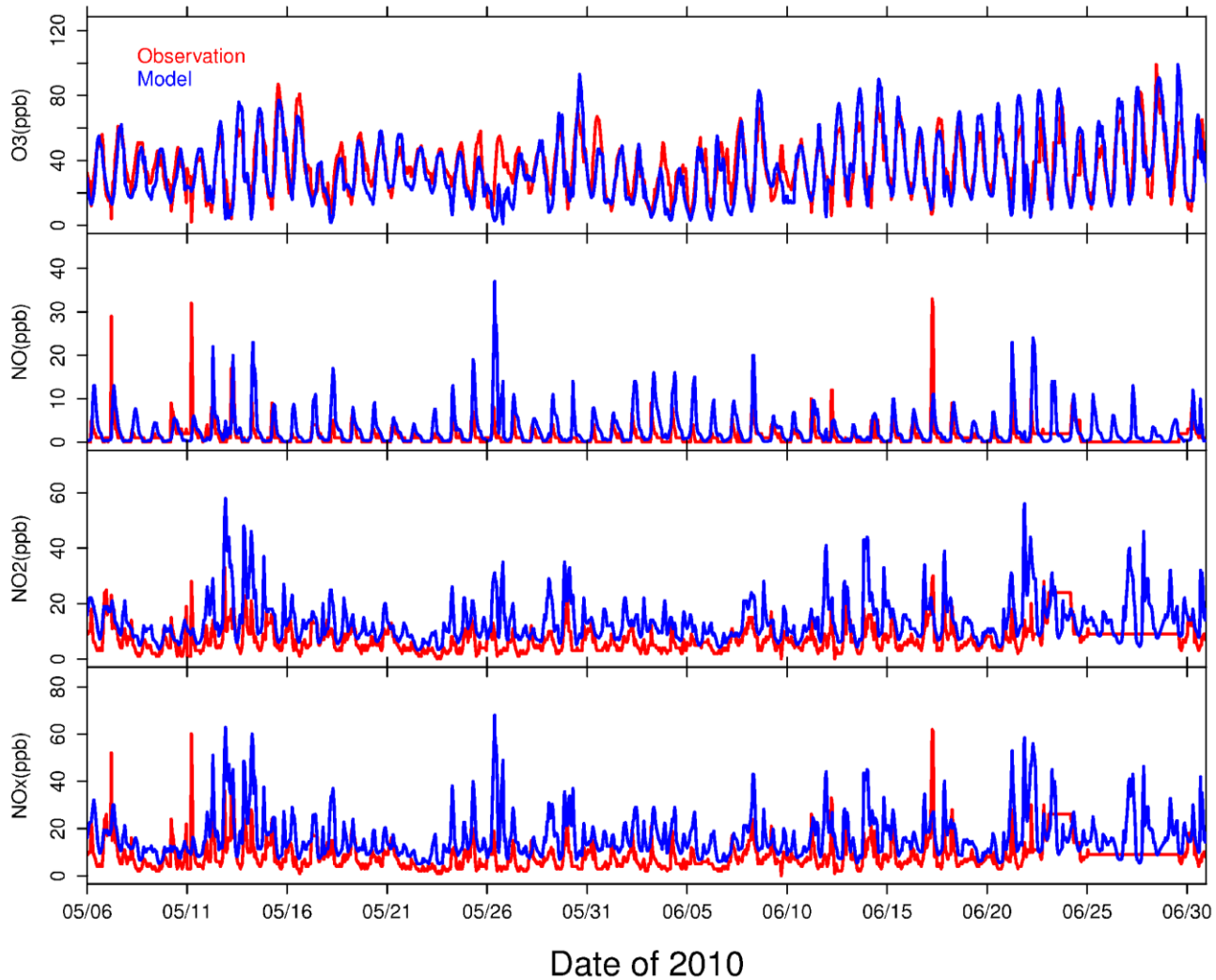
# Bakersfield Surface Site



# Shafter Surface Site



# Fresno Surface Site



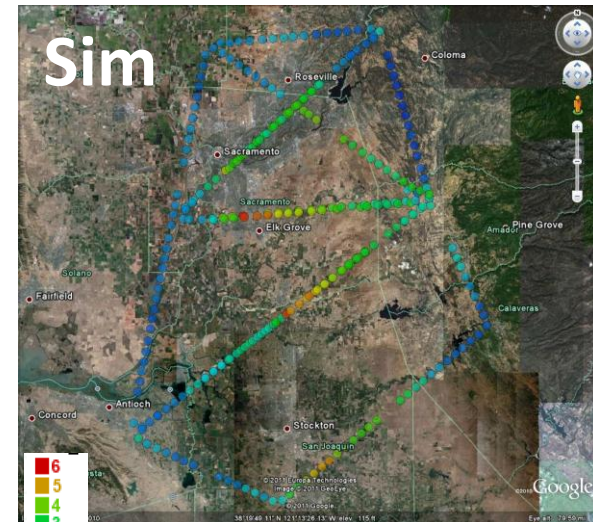
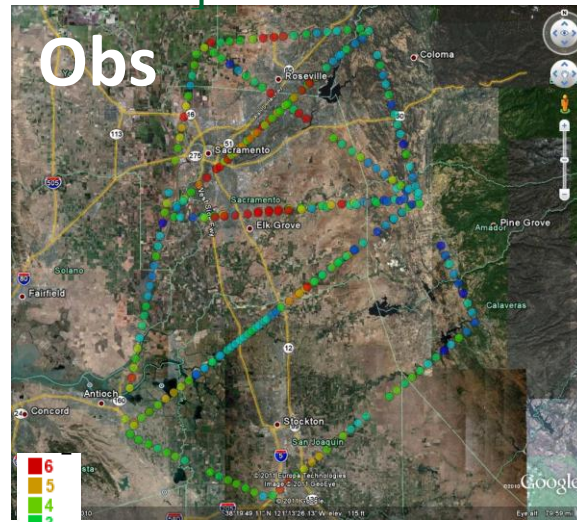
# NO<sub>2</sub> Vertical Column Below Aircraft

[Unit:  $1 \times 10^{15}$  molec cm<sup>-2</sup>]

06/21/2010

Monday

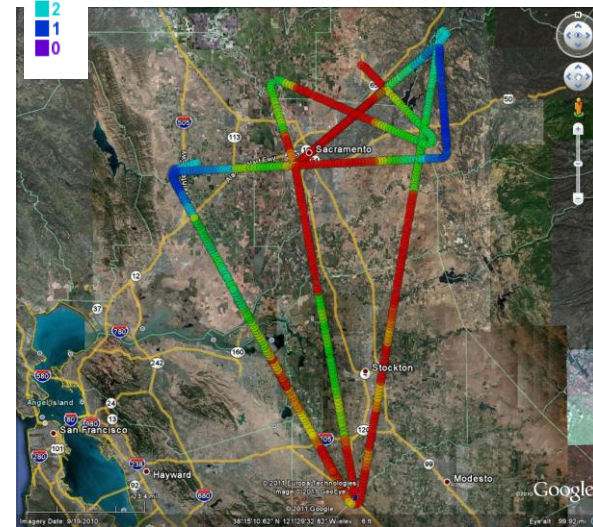
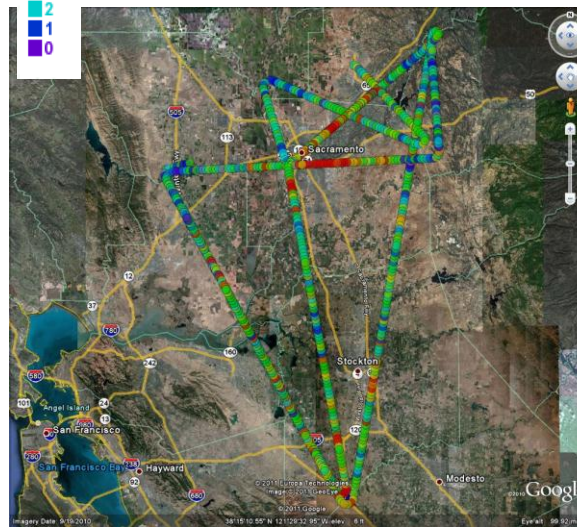
Flight ~2km



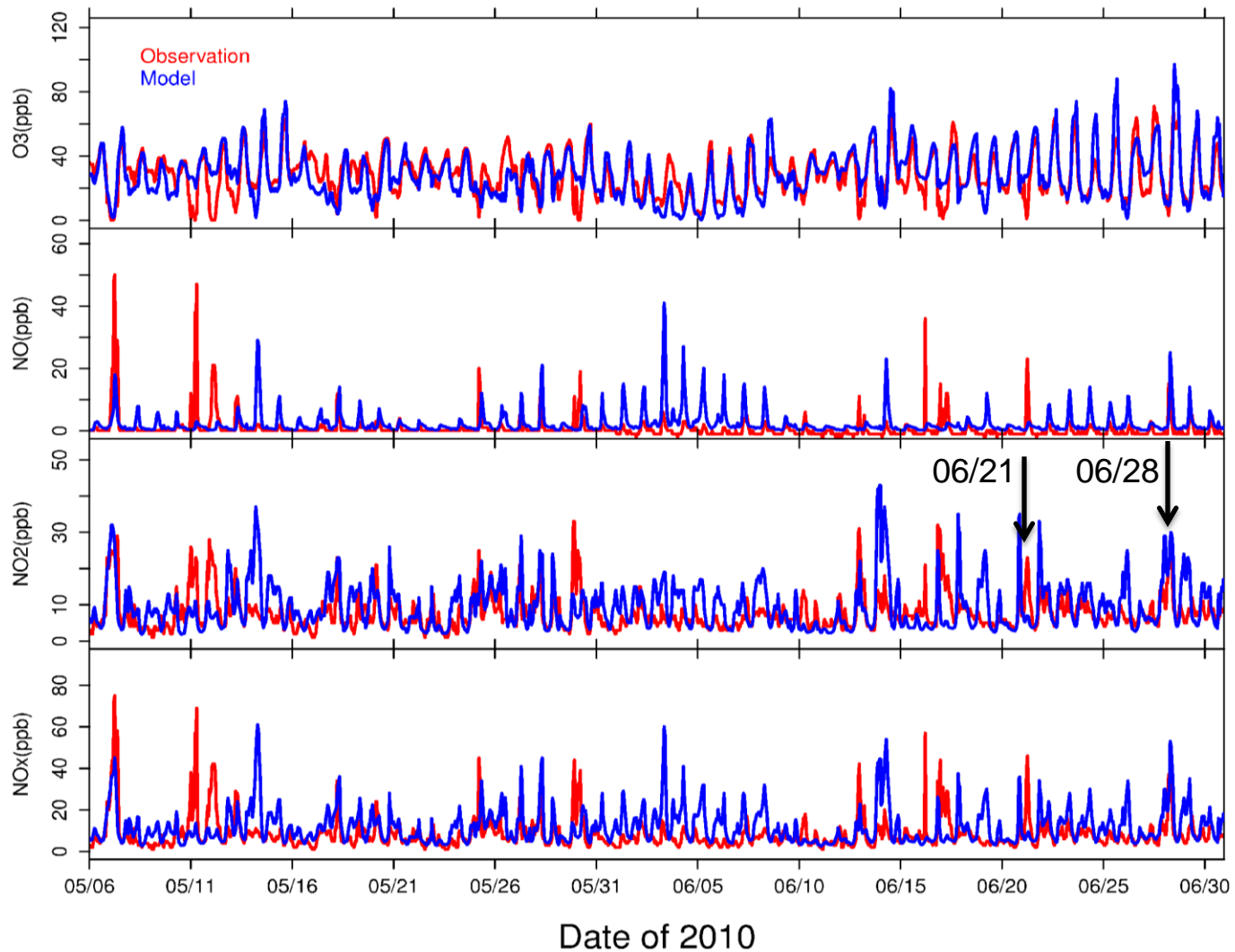
06/28/2010

Monday

Flight ~2km



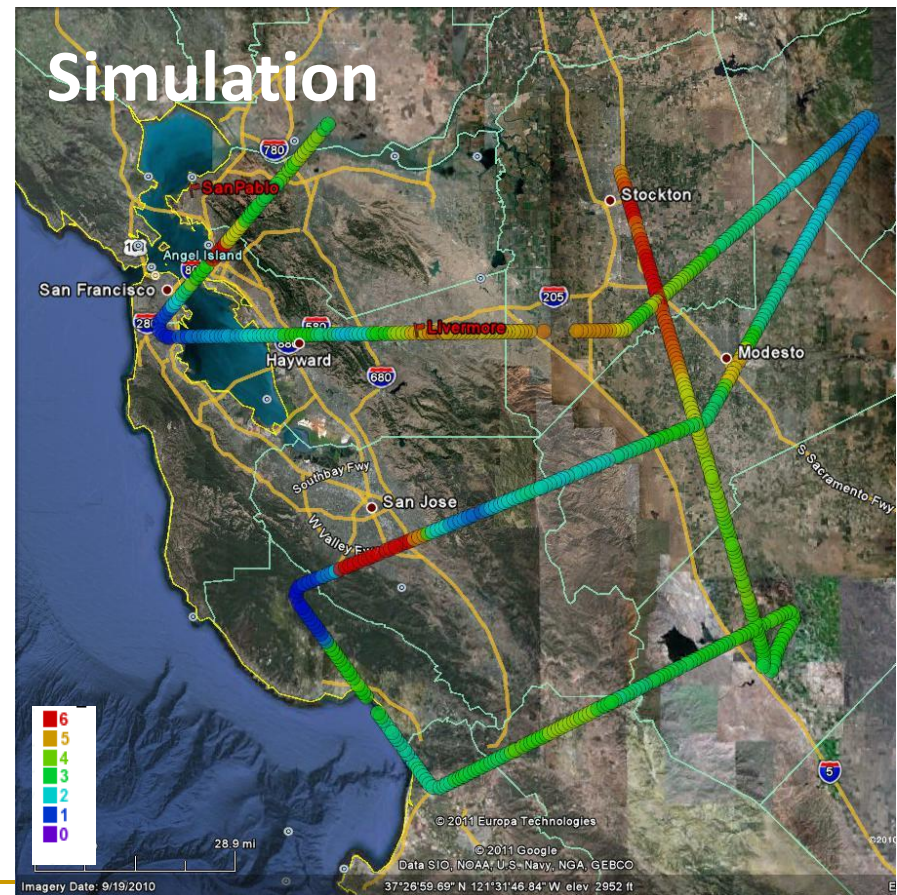
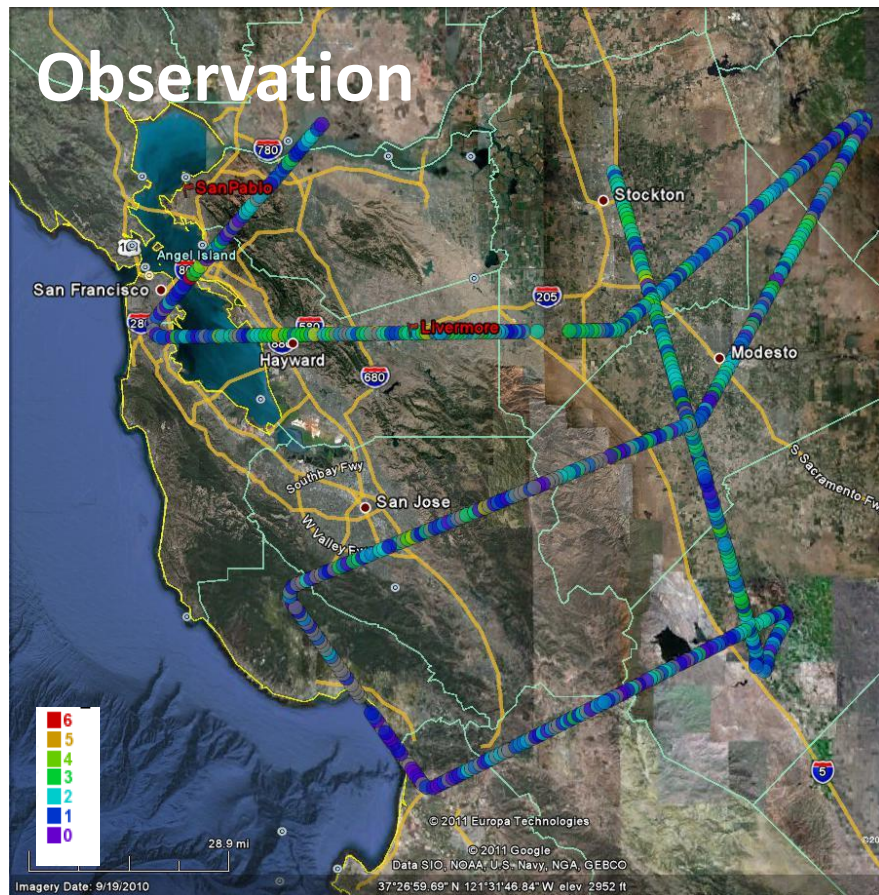
# Sacramento Surface Site



# NO<sub>2</sub> Vertical Column Below Aircraft

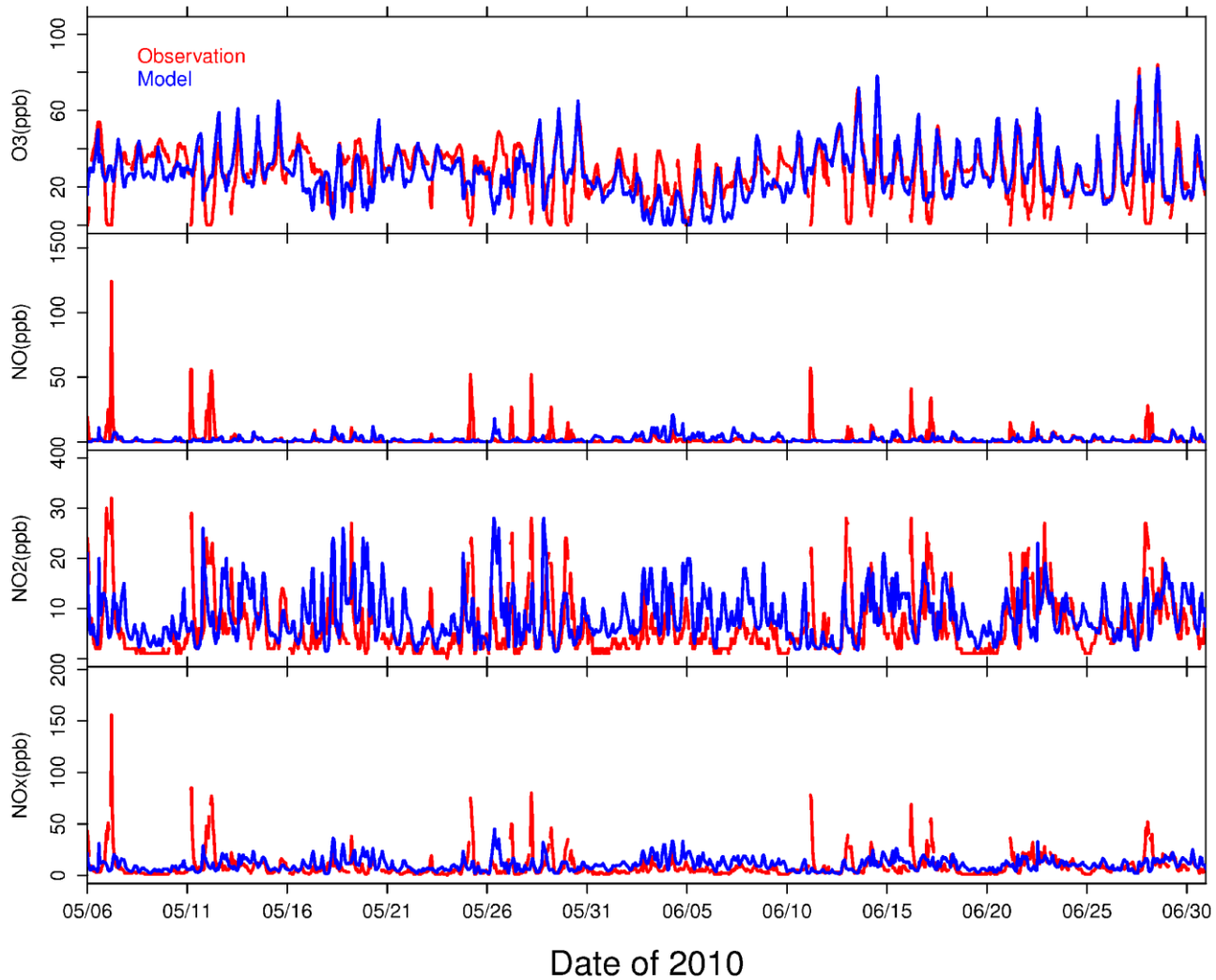
[Unit:  $1 \times 10^{15}$  molec cm<sup>-2</sup>]

Twin Otter 06/26/2010 Saturday (Flight ~4-5.5km)





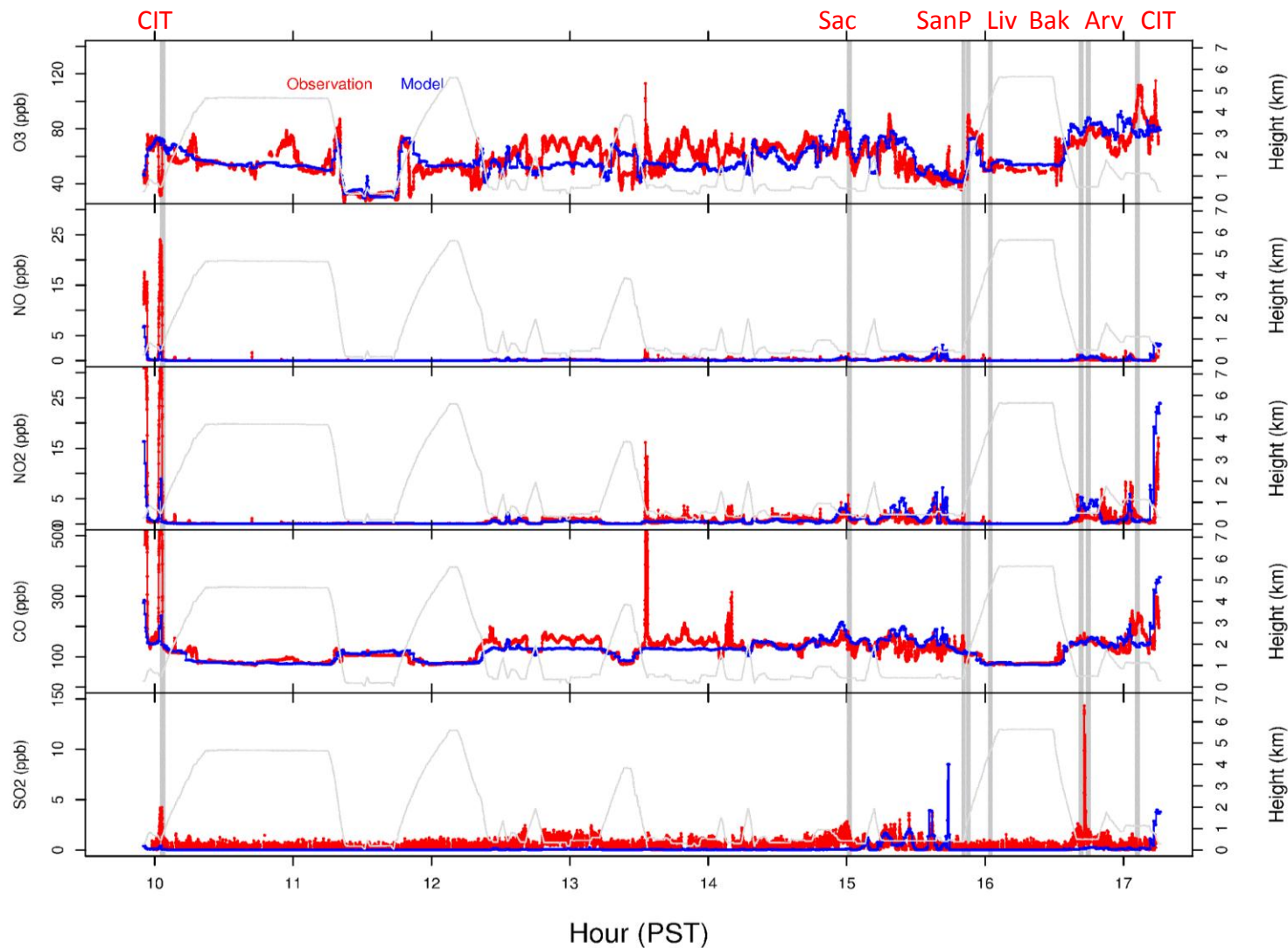
# Livermore Surface Site



# CalNex P3 06/14/2010 (Monday)

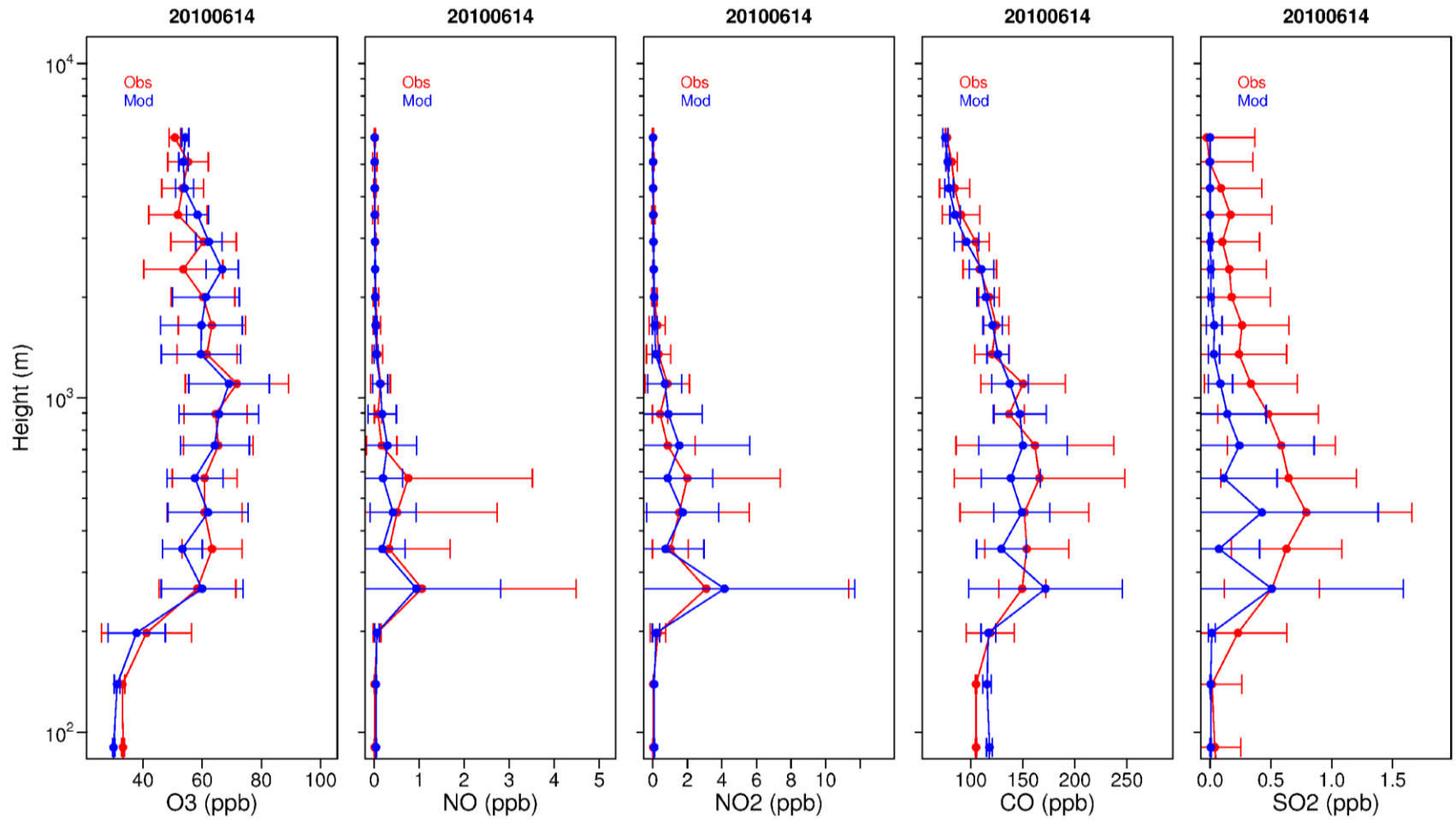


# CalNex P3 Flight on 06/14/2011



# Vertical Comparison on 06/14/2011

(Data are grouped to each model layer, solid dot: **mean**, error bar:  $\pm 1\sigma$ )



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# Future Work

- “True 2010” emissions inventories with appropriate adjustments for recession
  - Compare with additional measurements
    - Collaborations with CalNex experimentalists
    - Routine surface/space based measurements
  - Model performance evaluation (Met/AQ)
  - Model inter-comparison (Met/AQ)
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*Further Questions and Comments?*

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