Analysis of Houston & SE Texas Ozonesonde Data

Gary A. Morris & Stephen Holcomb
Valparaiso University

Scott Hersey
California Institute of Technology

Anne Thompson & John Yorks
Penn State University

TCEQ/GoMACCS Meeting
May 29 - June 1, 2007

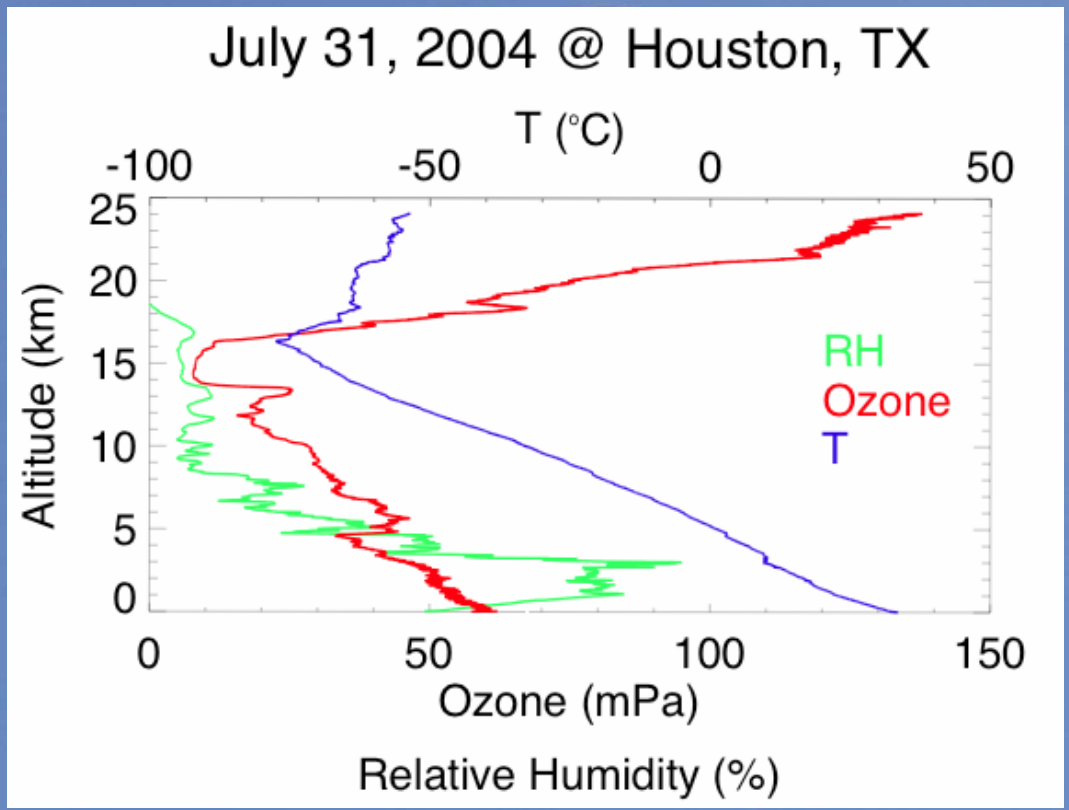
Houston suffers from frequently poor air quality.

TexAQS measurements provide pollution insights.

2005
2006

The Texas Air Quality Study II

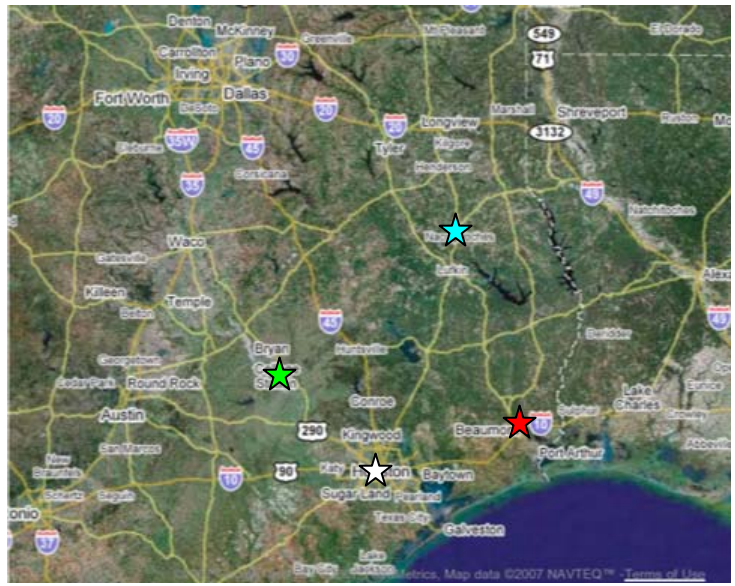
Ozone profile data lacking outside of campaign periods.




The Tropospheric Ozone Pollution Project launches 170 balloons.

Ozonesonde launches provide insights in SE Texas pollution.

- Geographic variability
- Diurnal variability
- Seasonal variability
- Annual variability



Copyright Googlemaps

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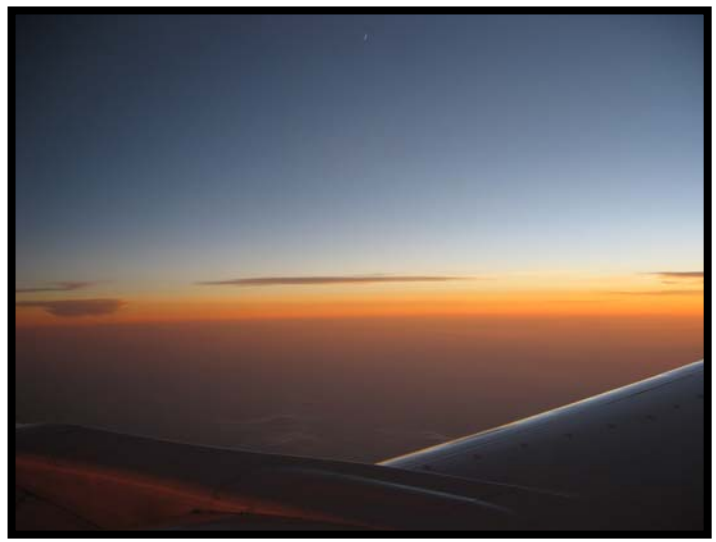

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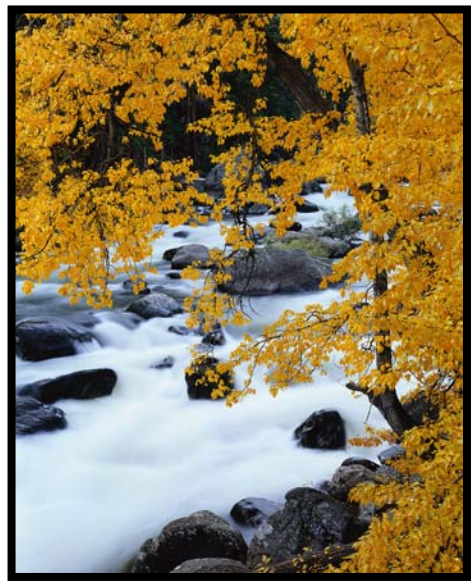

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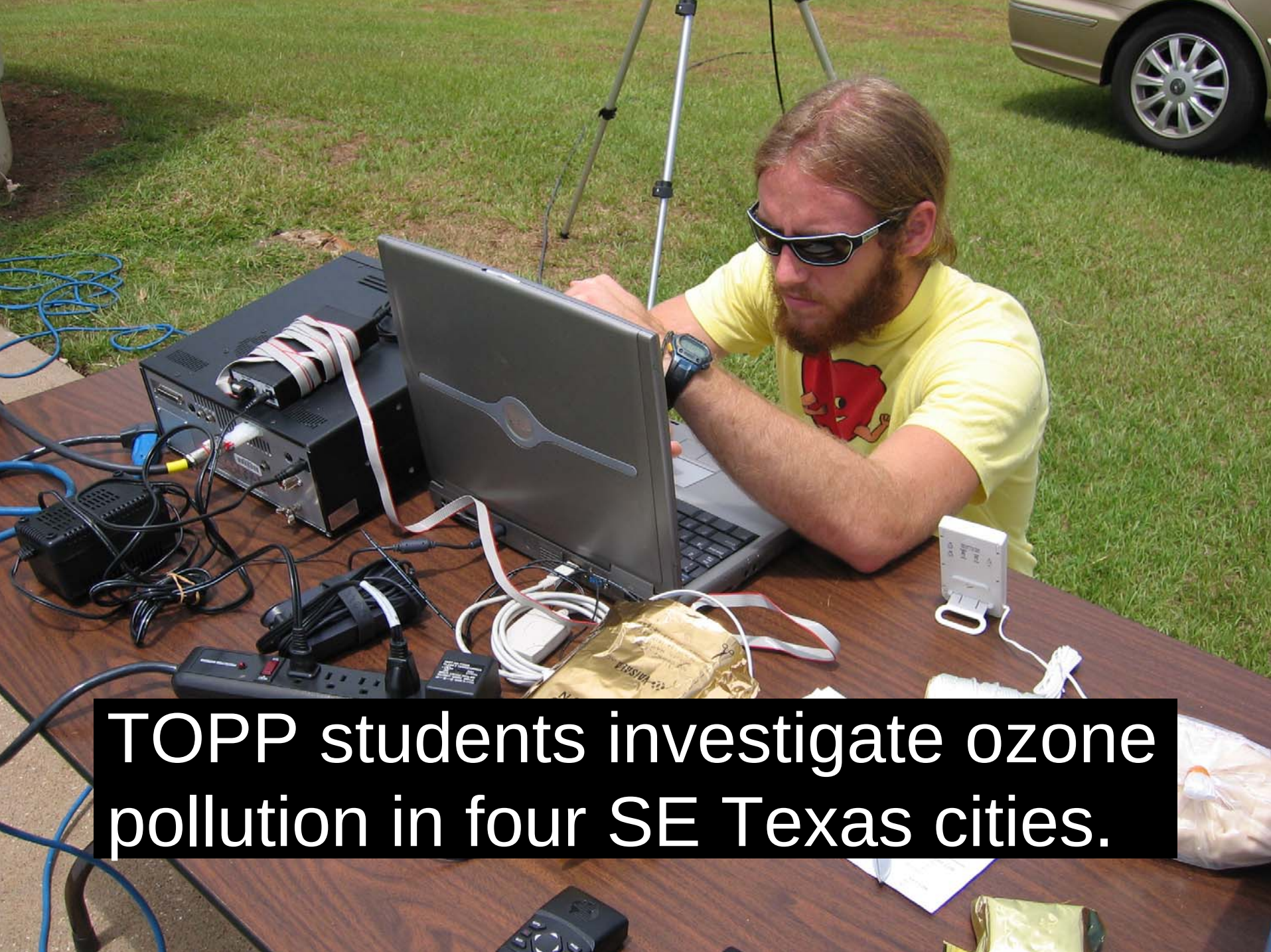
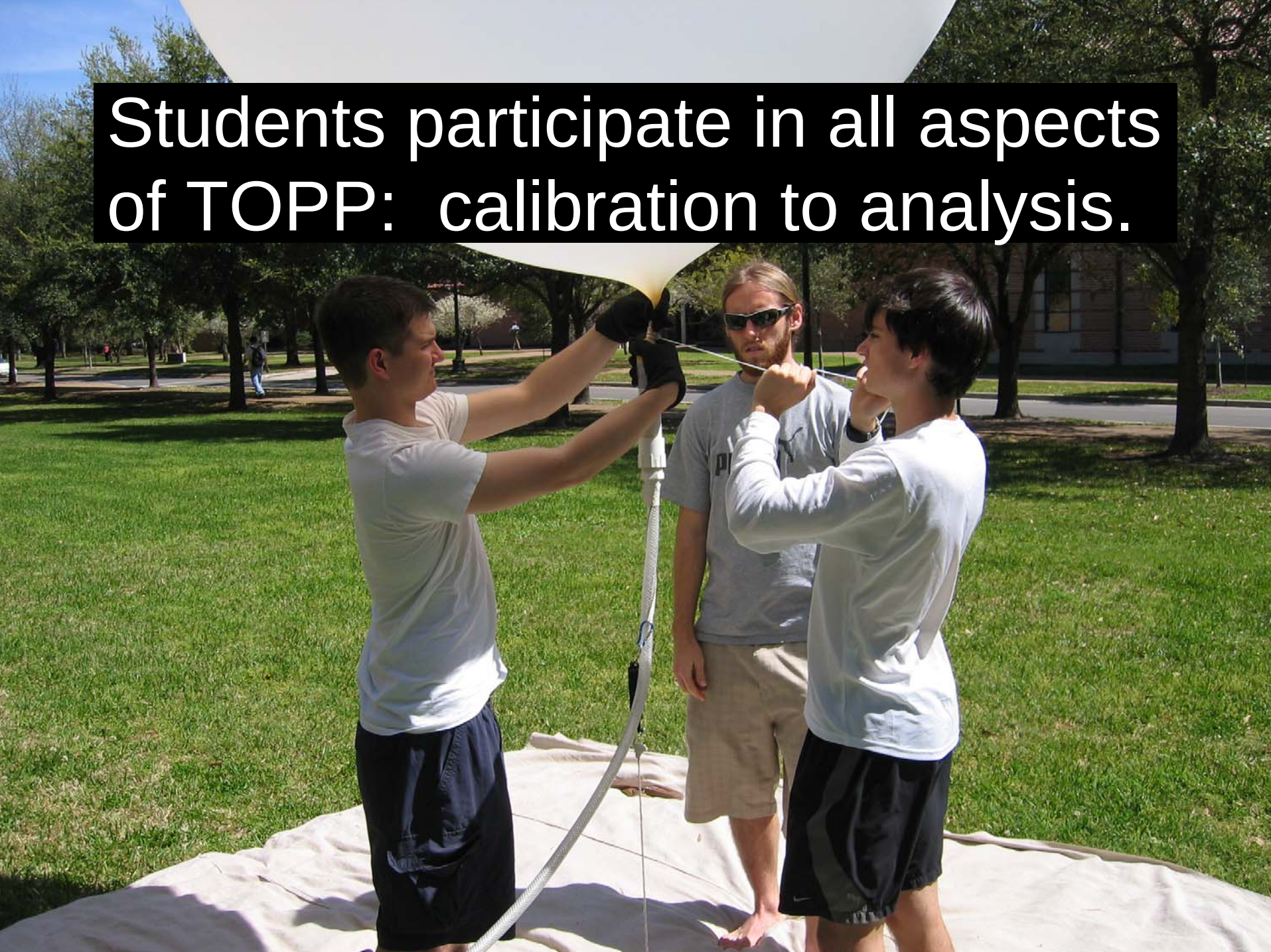
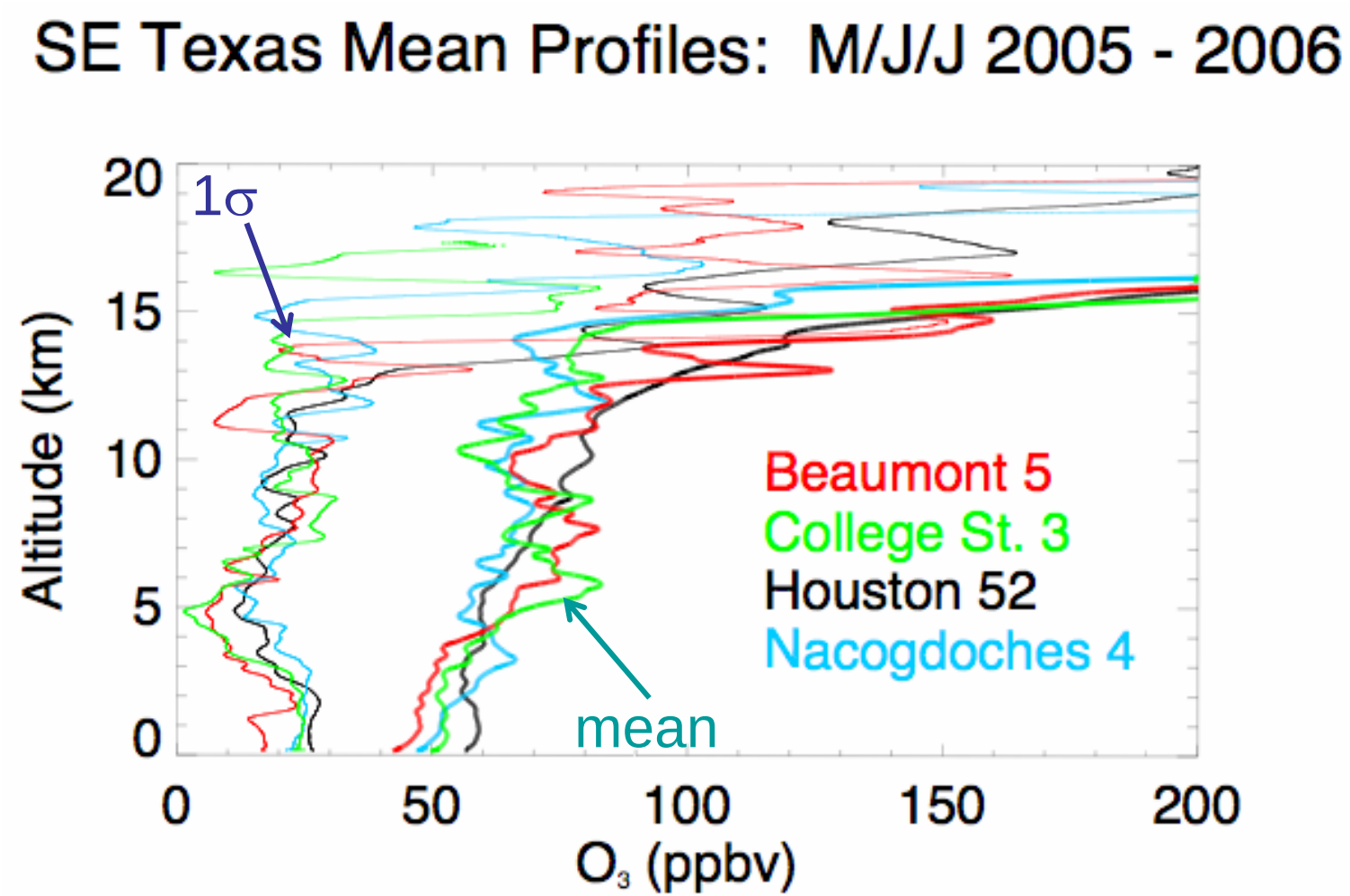

TOPP students investigate ozone pollution in four SE Texas cities.


Students participate in all aspects of TOPP: calibration to analysis.

TOPP: 170 balloon launches in Texas from July ‘04 to Nov. ‘06.

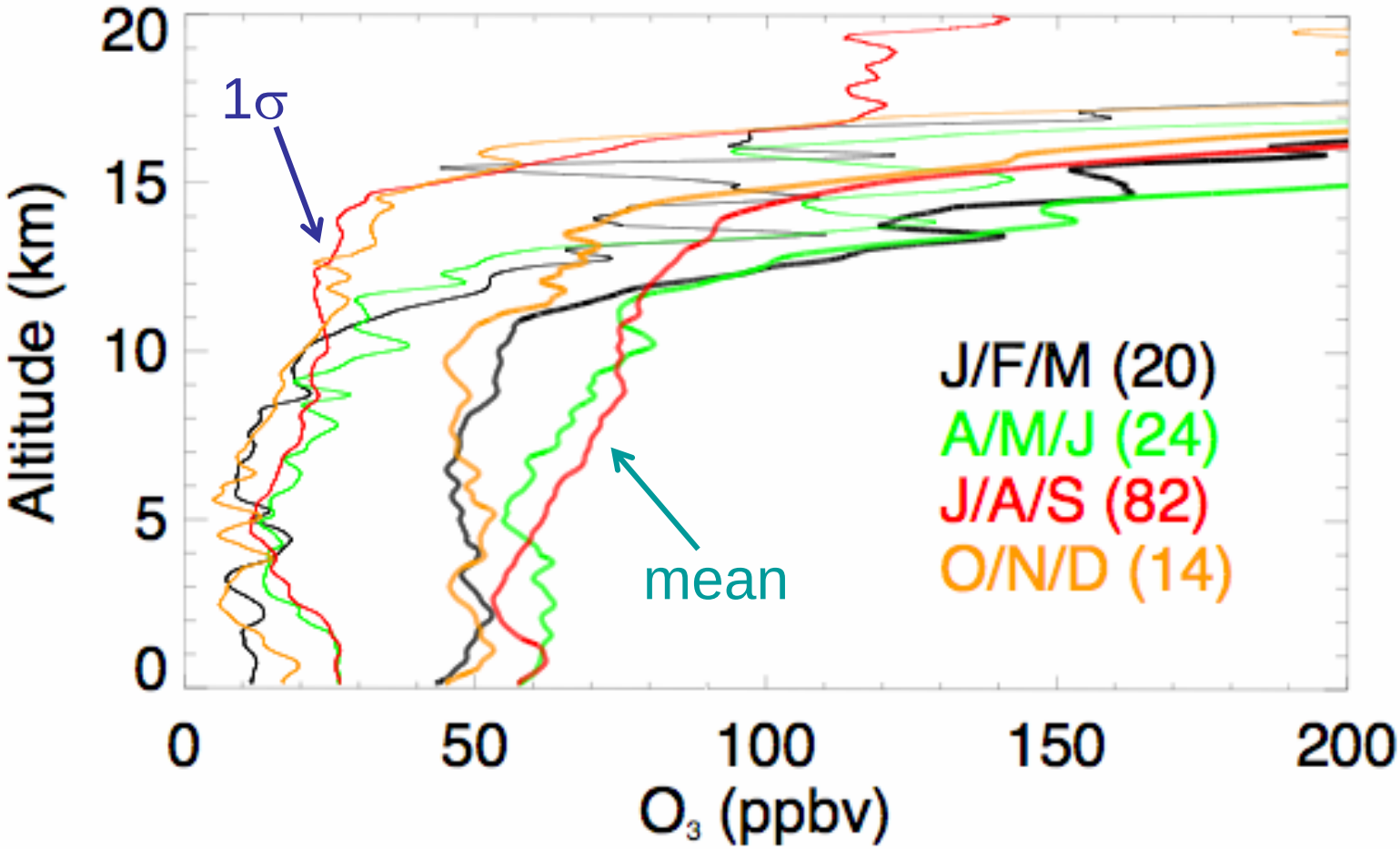
	Houston			Beaumont		College St.		Nacogdoches	
	‘04	‘05	‘06	‘05	‘06	‘05	‘06	‘05	‘06
Jan	0	0	1	0	0	0	0	0	0
Feb	0	0	2	0	0	0	0	0	0
Mar	0	0	17	0	0	0	0	0	0
Apr	0	1	3	0	0	0	0	0	0
May	0	2	4	0	2	0	0	0	0
June	0	9	5	0	0	0	1	0	1
July	17	6	7	1	1	1	1	2	1
Aug	10	8	22	1	0	0	0	0	0
Sept	2	3	17	0	0	0	0	0	0
Oct	2	2	2	0	0	0	0	0	0
Nov	5	2	4	0	0	0	0	0	0
Dec	0	0	0	0	0	0	0	0	0

Geographic differences seen in profiles, but we need more data.

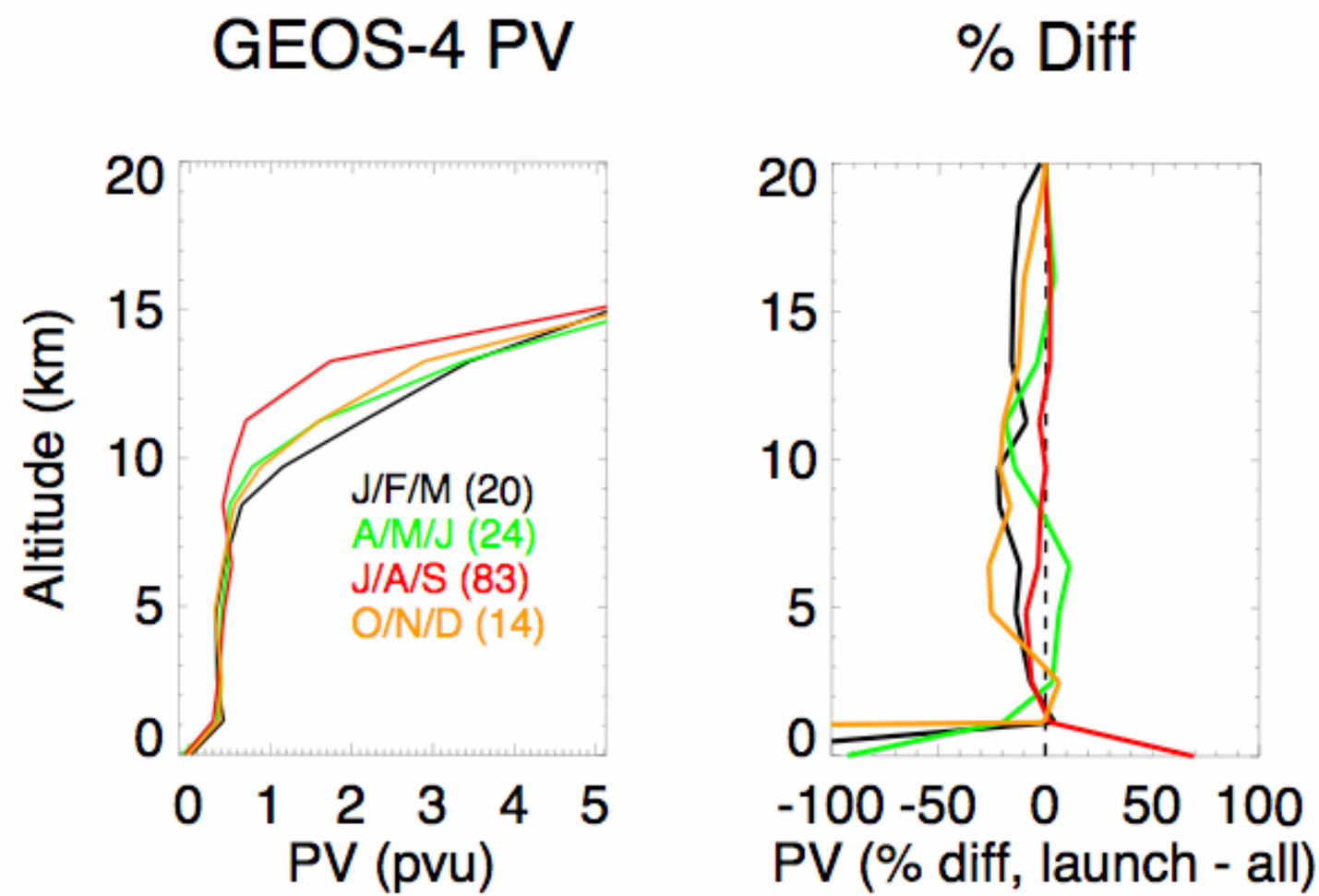



Seasonal analyses provide insights into pollution sources.

Houston profiles reveal seasonal variability in ozone.



Met data indicates TOPP data set is a representative sample.



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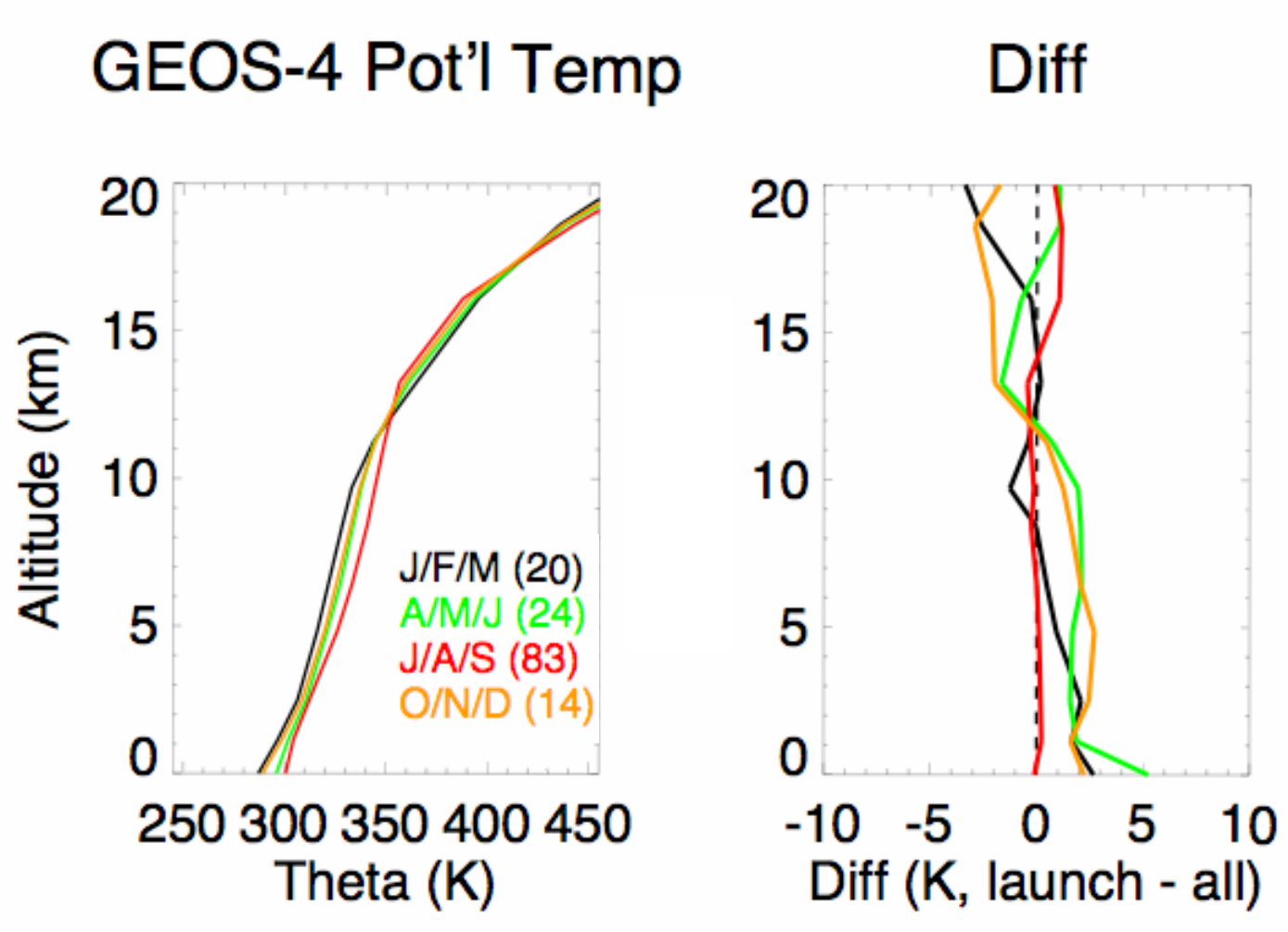
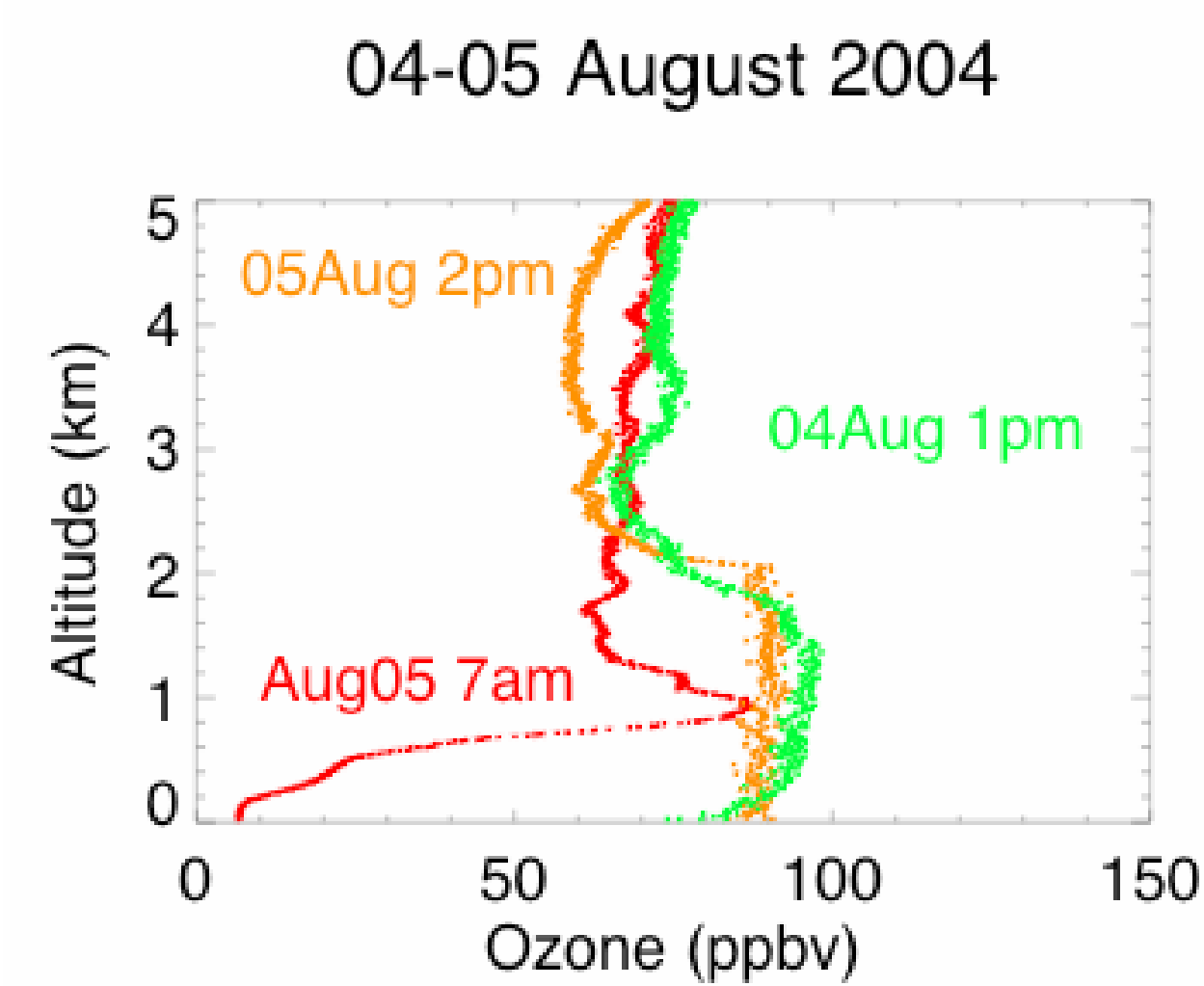
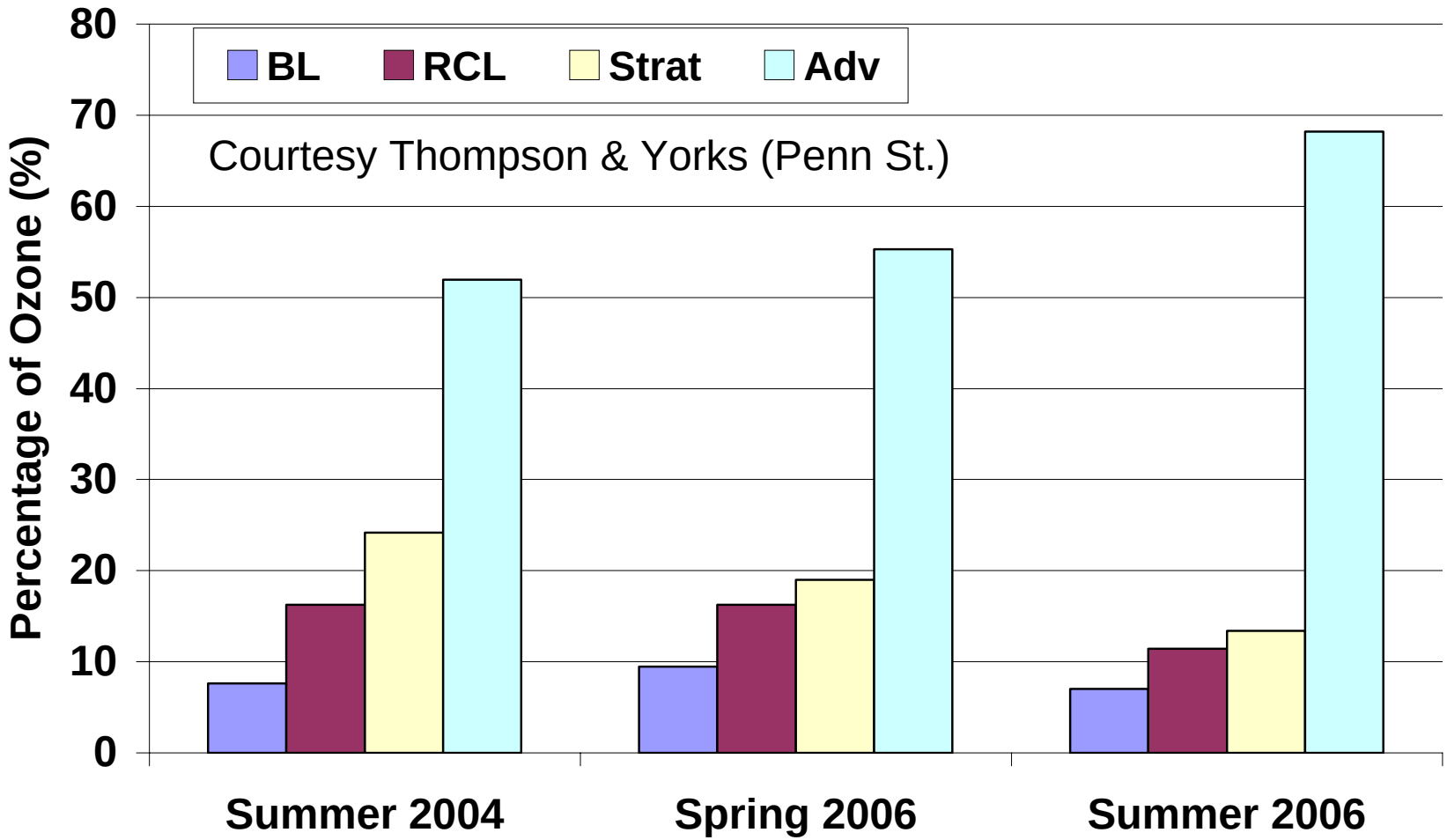


Intensive, multi-launch days examine local ozone production.



Preliminary trop. ozone budgets suggest source partitioning.



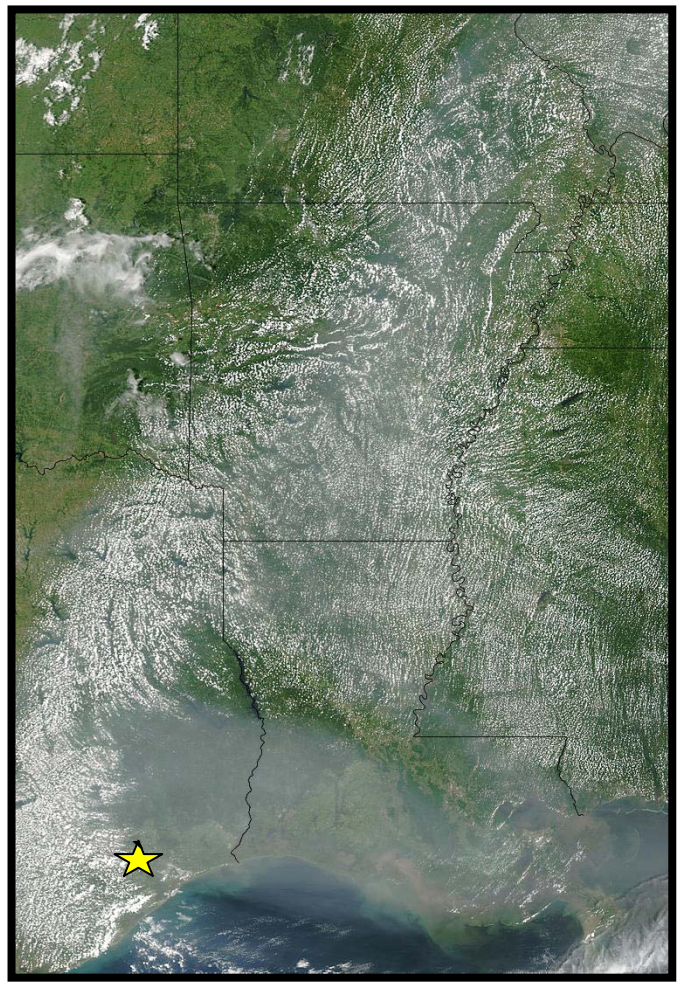
Annual variability influenced by wind direction & transport events.

GEOS-4

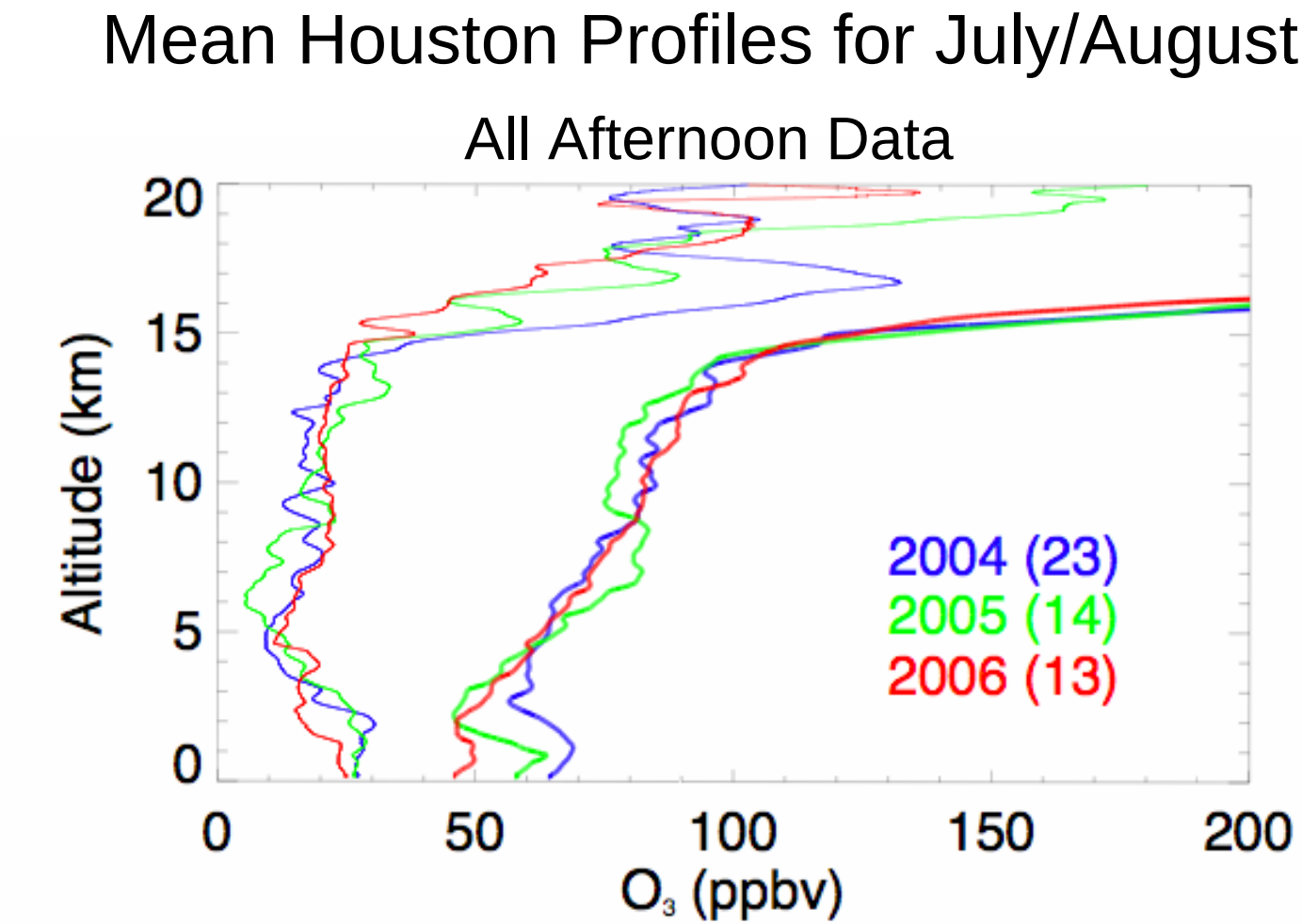
1^0 X 1.25^0 Analyses

NASA GSFC

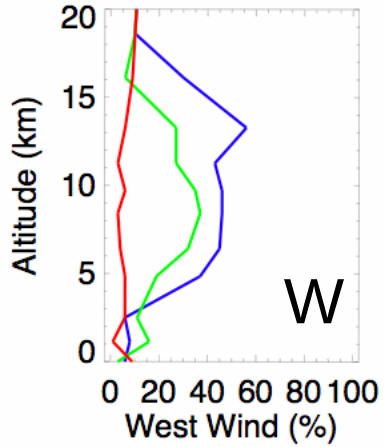
- Potential Vorticity
- Potential Temperature
- Wind direction
- Wind speed

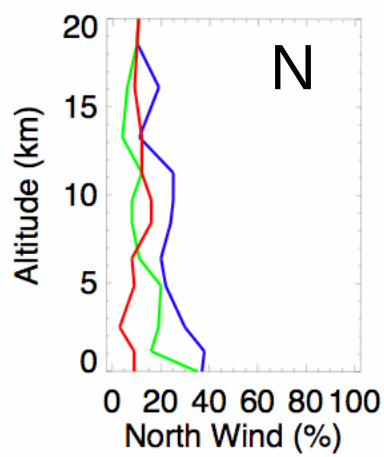


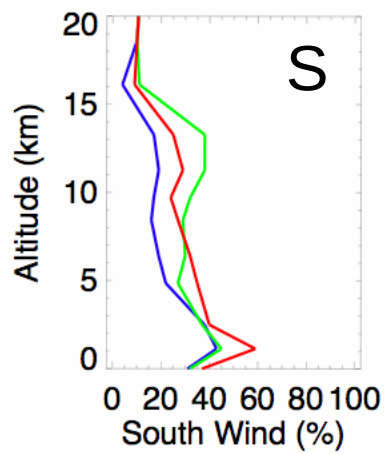
July/August ozonesonde data show annual variability.

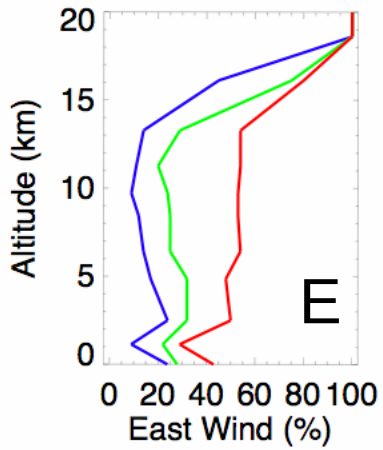


Met data review finds wind dir. differences: 04 - N while 06 - E



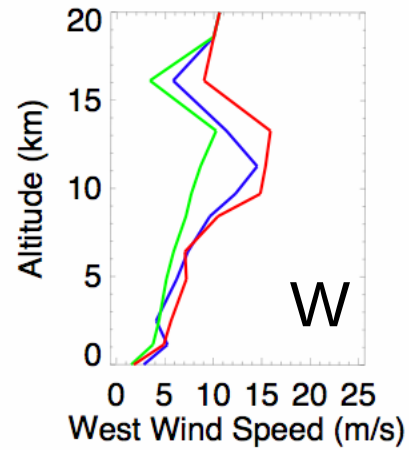


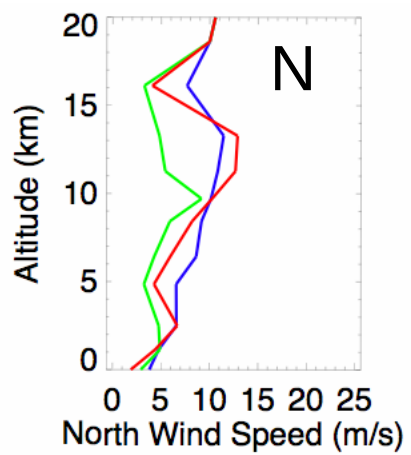


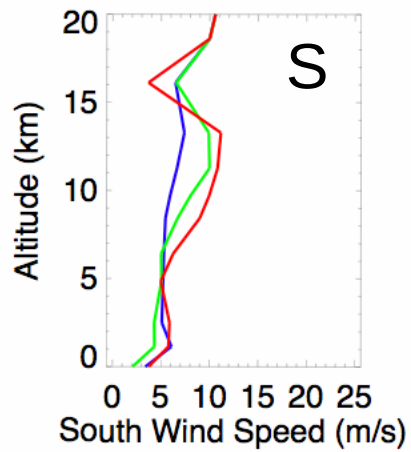


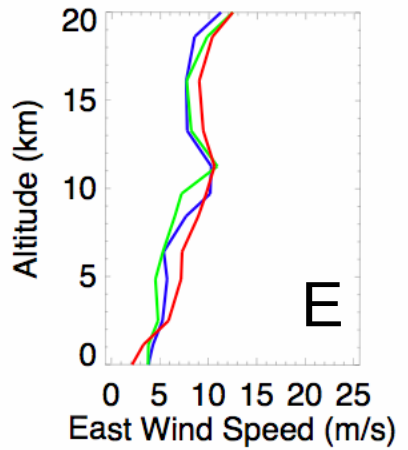
2004 (24)
2005 (13)
2006 (29)

…but other met variables, like wind speed, show little variation.









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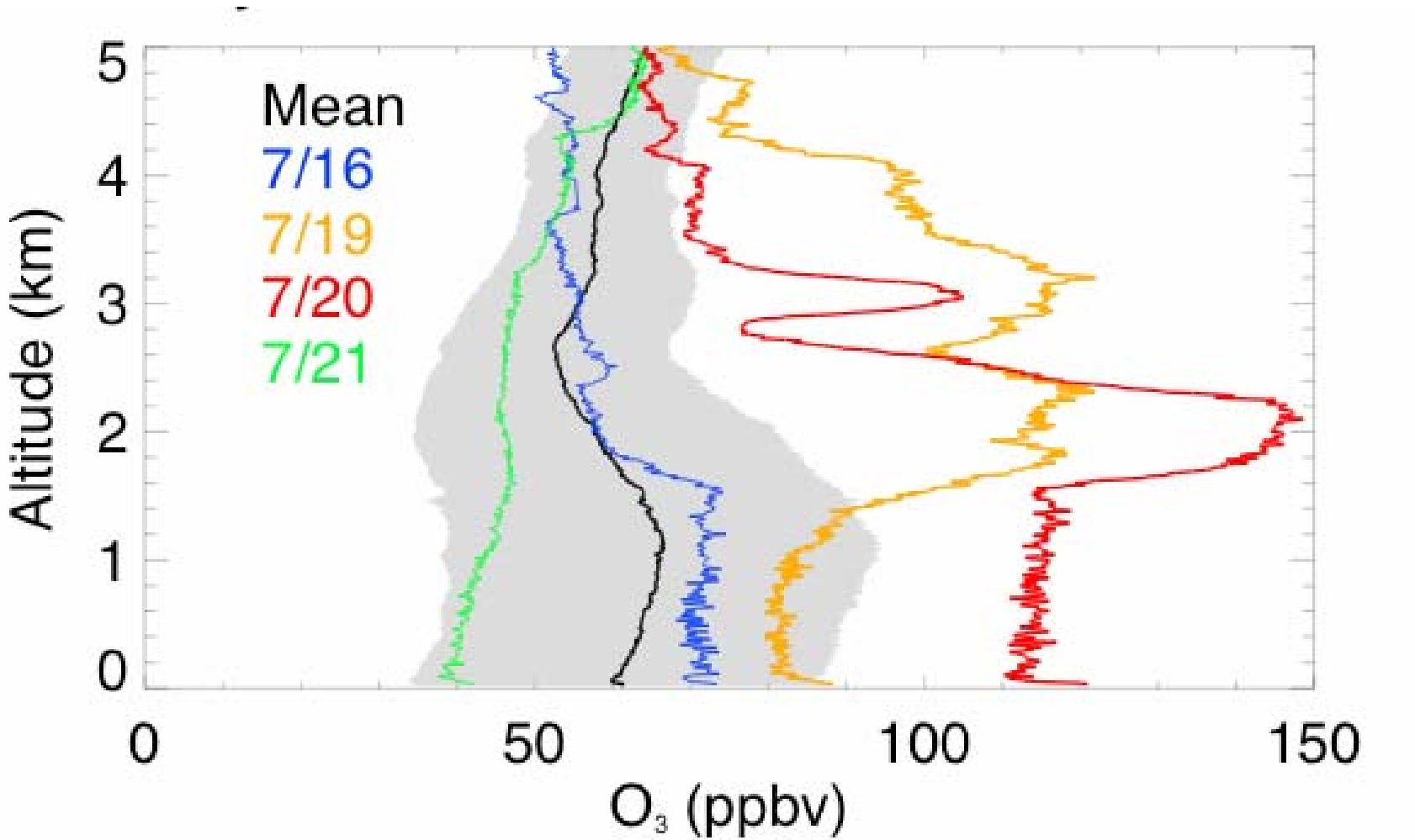
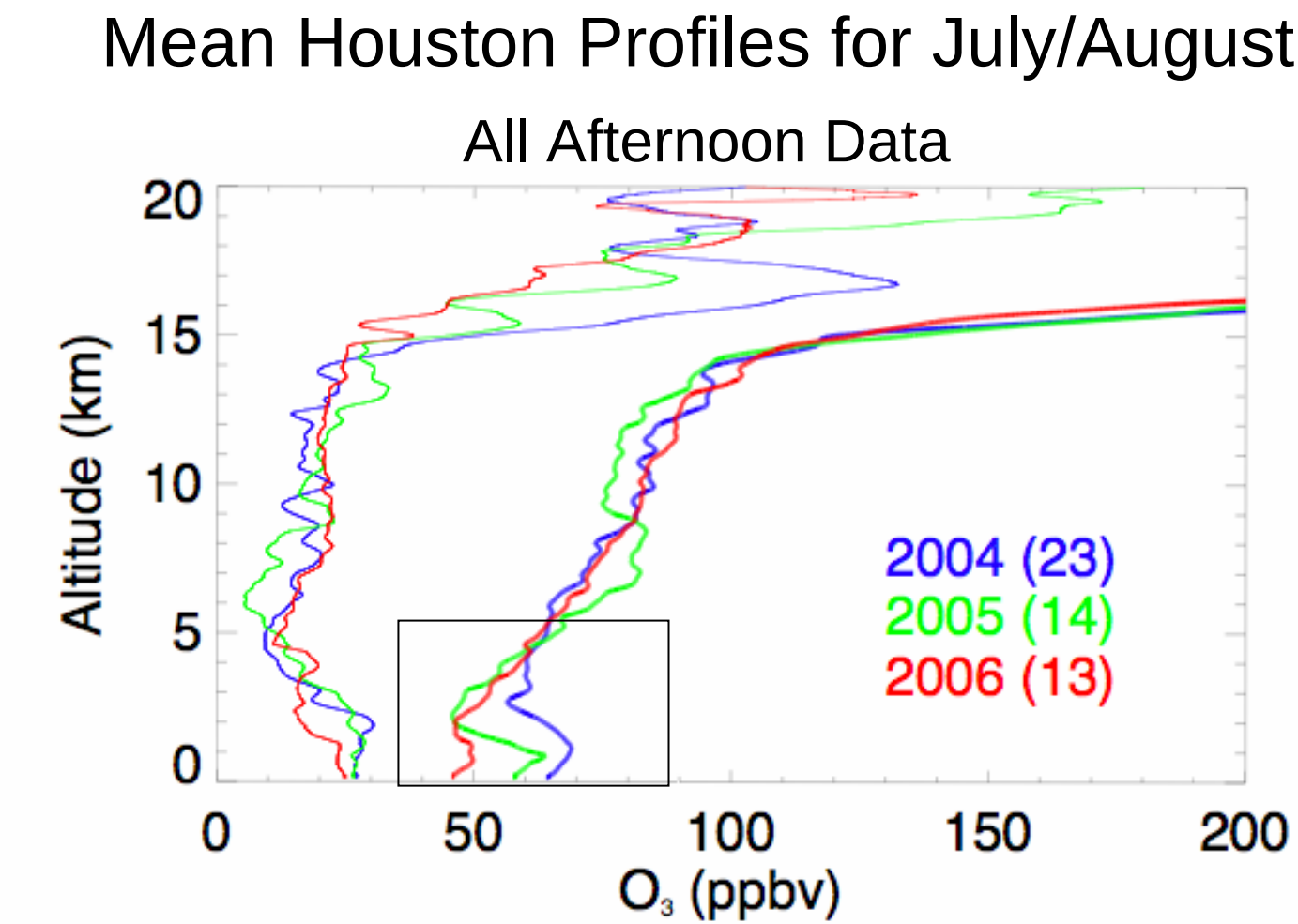
Alaskan fires (July ‘04) impact Houston ozone levels.



Mean profiles below 5 km also impacted by the ‘04 fires.



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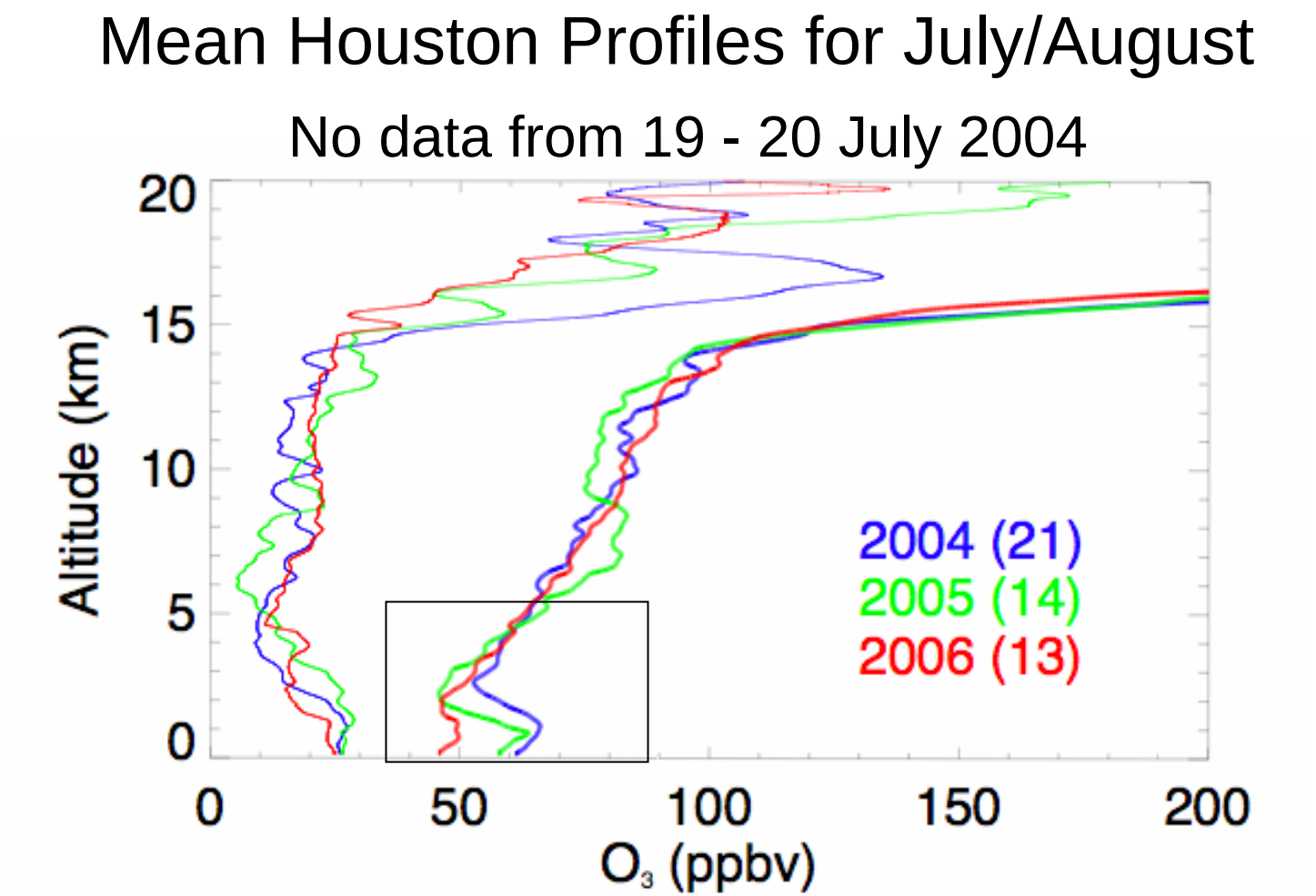
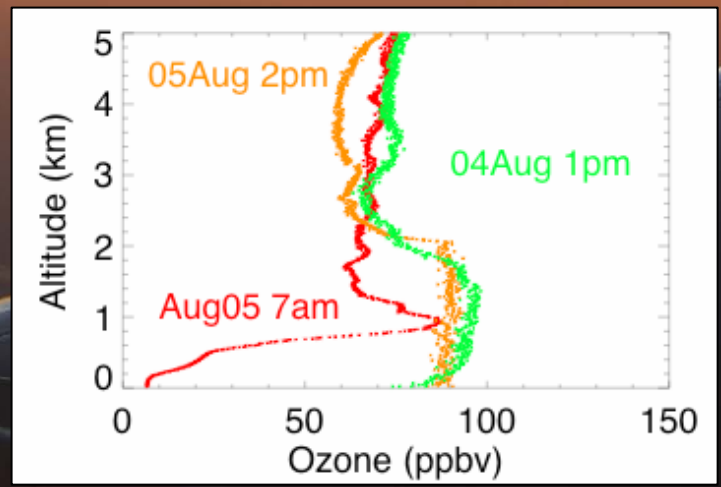


A lack of profile data inhibits our understanding of air pollution.



Regular ozonesonde profiles enhance our understanding.

- Geographic variability
  - sharp boundary layers in Houston & Beaumont
  - enhancements above BL in Nacogdoches
- Diurnal variability
  - high daytime production over Houston
- Seasonal variability
  - Spring & Summer enhancements in Houston
- Annual variability
  - wind direction changes are an import factor

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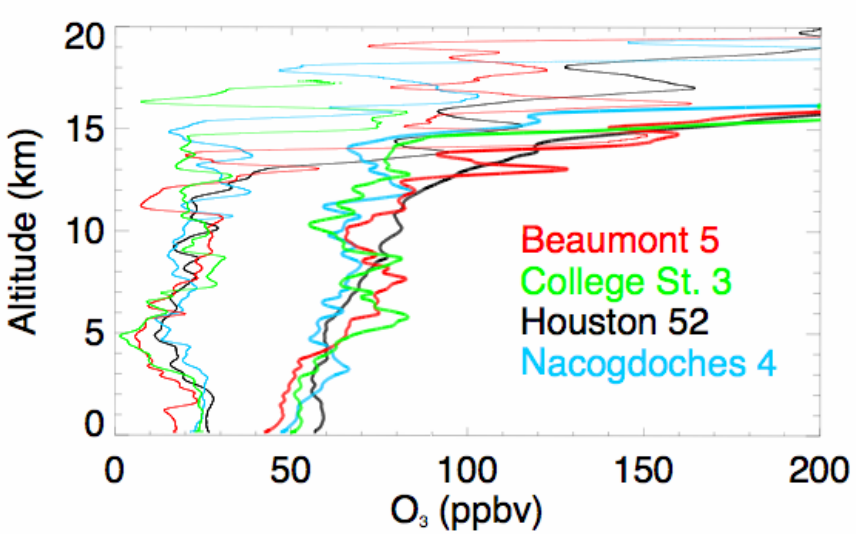
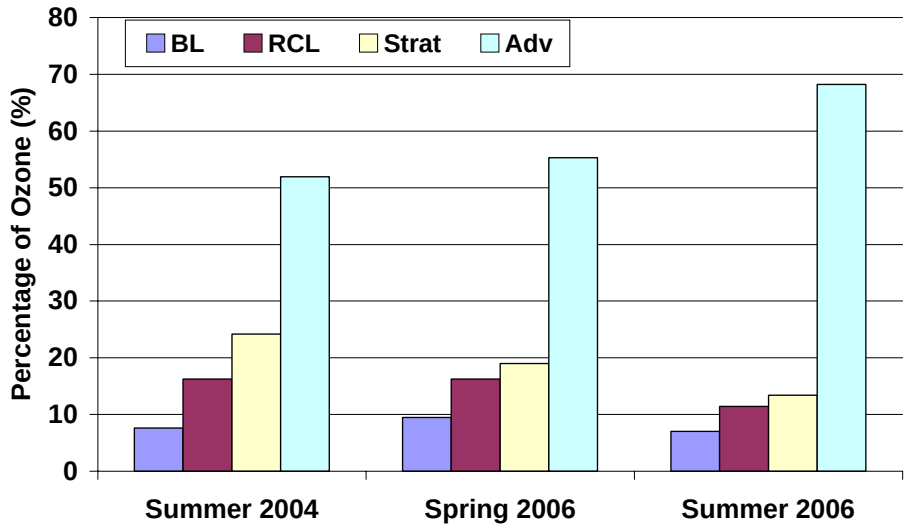
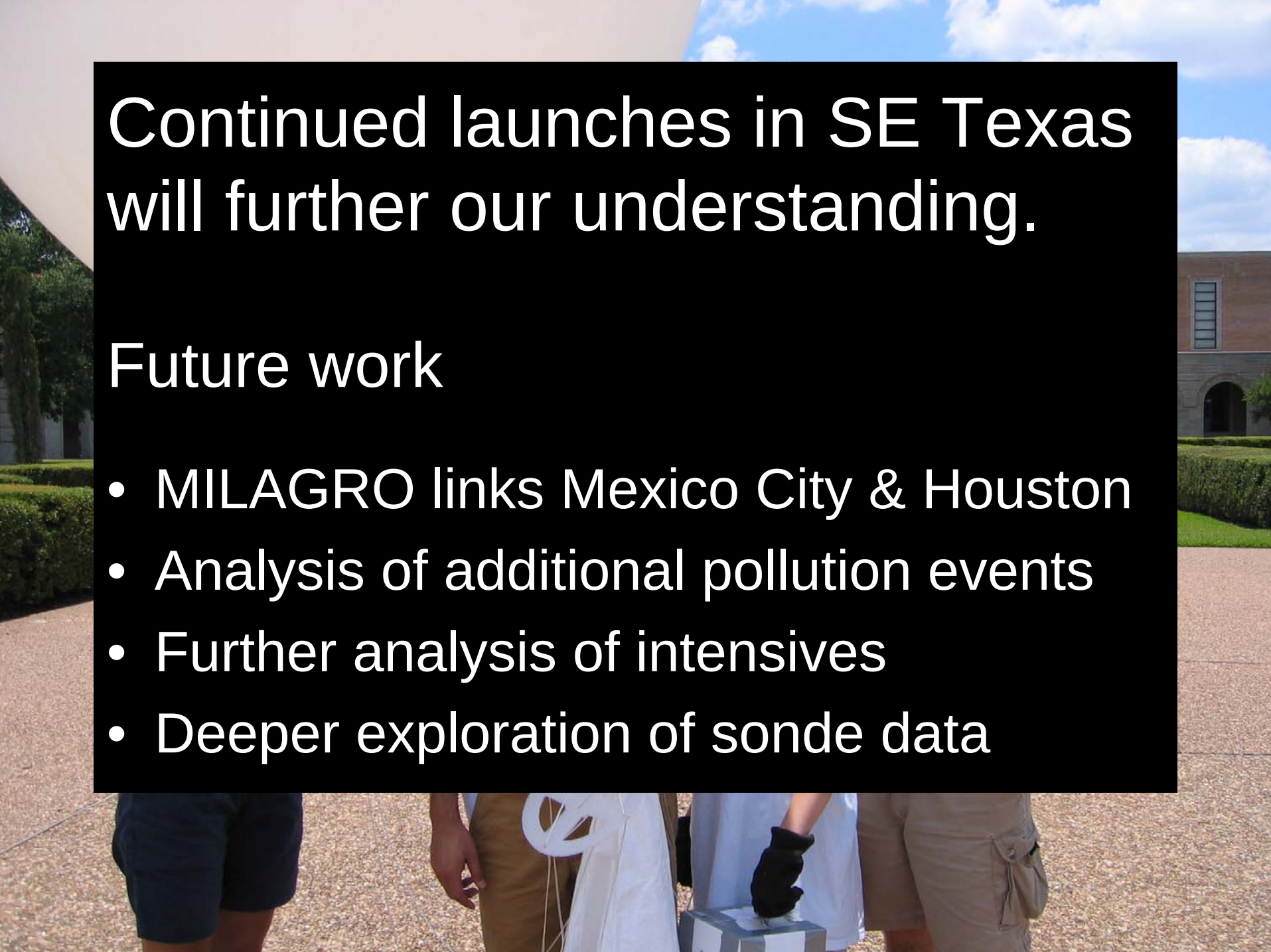
TOPP data provide ozone profile climateology & suggest sources.







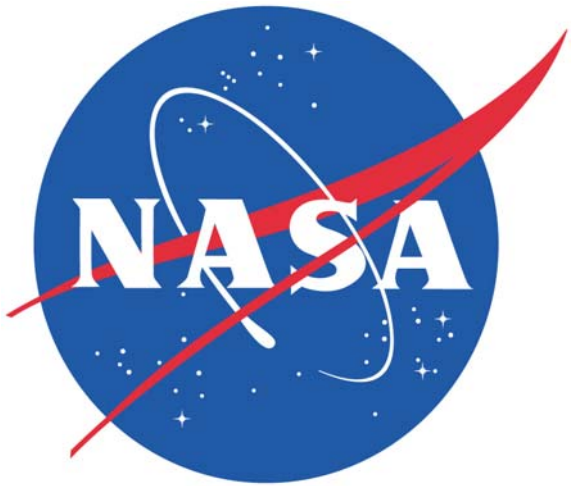
Continued launches in SE Texas will further our understanding.

Future work

- MILAGRO links Mexico City & Houston
- Analysis of additional pollution events
- Further analysis of intensives
- Deeper exploration of sonde data

Shell, NASA, & TCEQ fund program at Rice U. & U. of H.

Shell Center for Sustainability at Rice University



www.rice.edu/ozone