Investigation of the South Coast Air Basin Atmospheric Sulfur Budget

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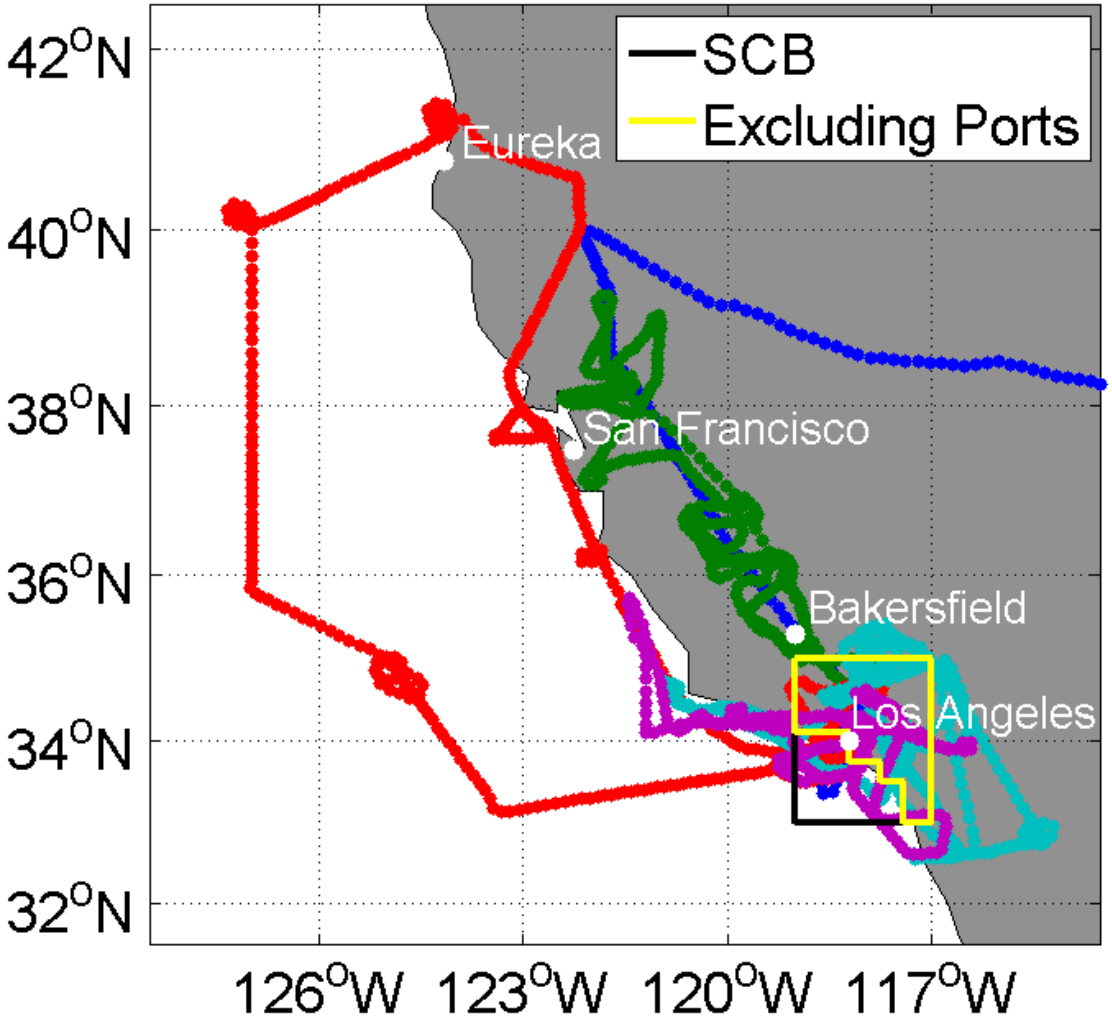
Results of ITCT 2002

- DMS contribution is negligible
- No obvious, significant impact of marine vessel emissions
- South Coast air Basin (SCB) sulfate comes from local point sources with a significant contribution from the on-road vehicle fleet

Preliminary Analysis Report, David Parrish, NOAA, November 8, 2007
Revised April 18, 2008

ARCTAS-CARB Flights

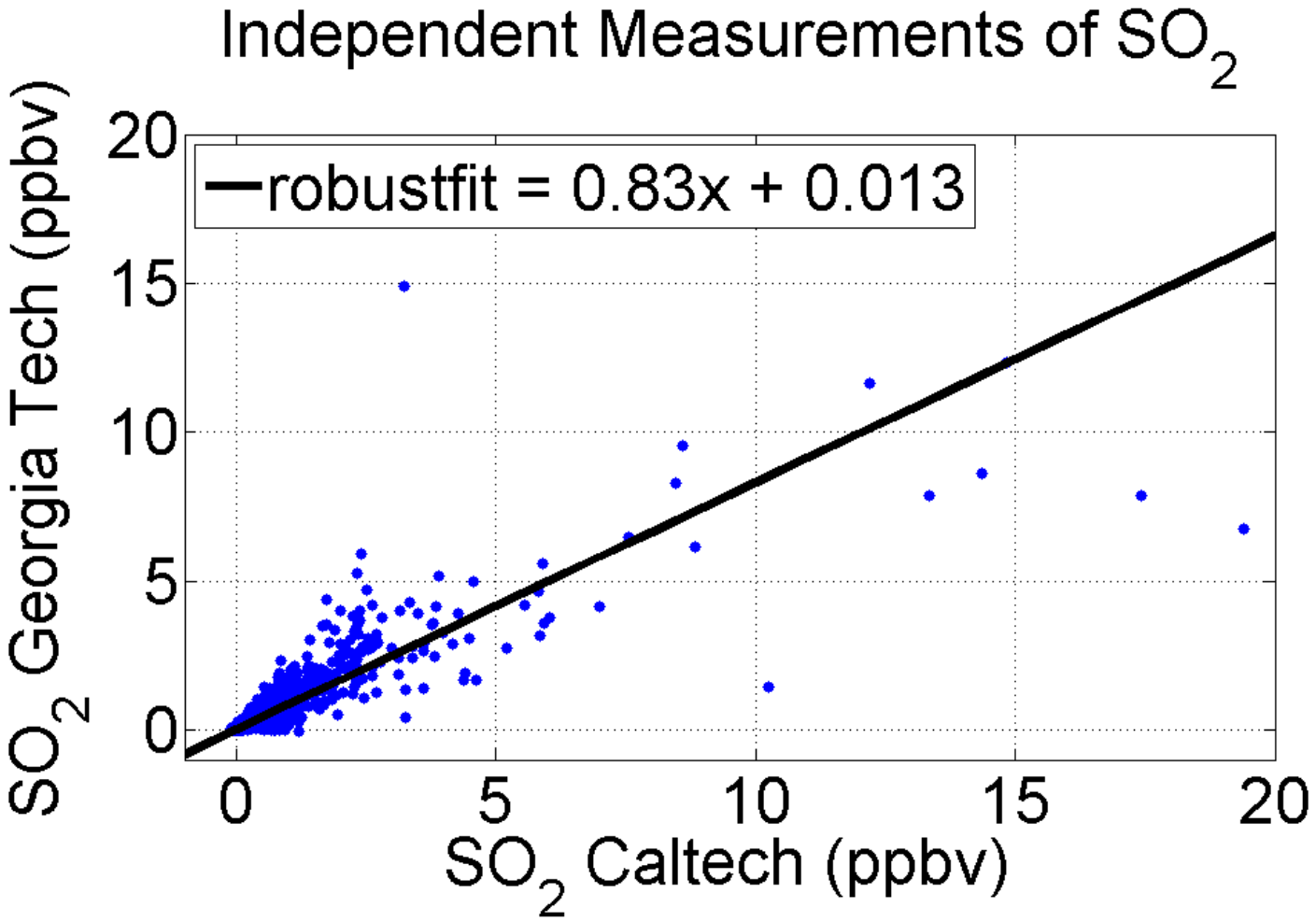


Observations from flights on 18, 20, 22, 24, and 26 June 2008

Observed:
8.8 x 10^{-3} mole CO / mole CO_2

CARB inventory:
8.6 x 10^{-3} mole CO / mole CO_2

ARCTAS-CARB
SO_2 and SO_4^{2-} Measurements



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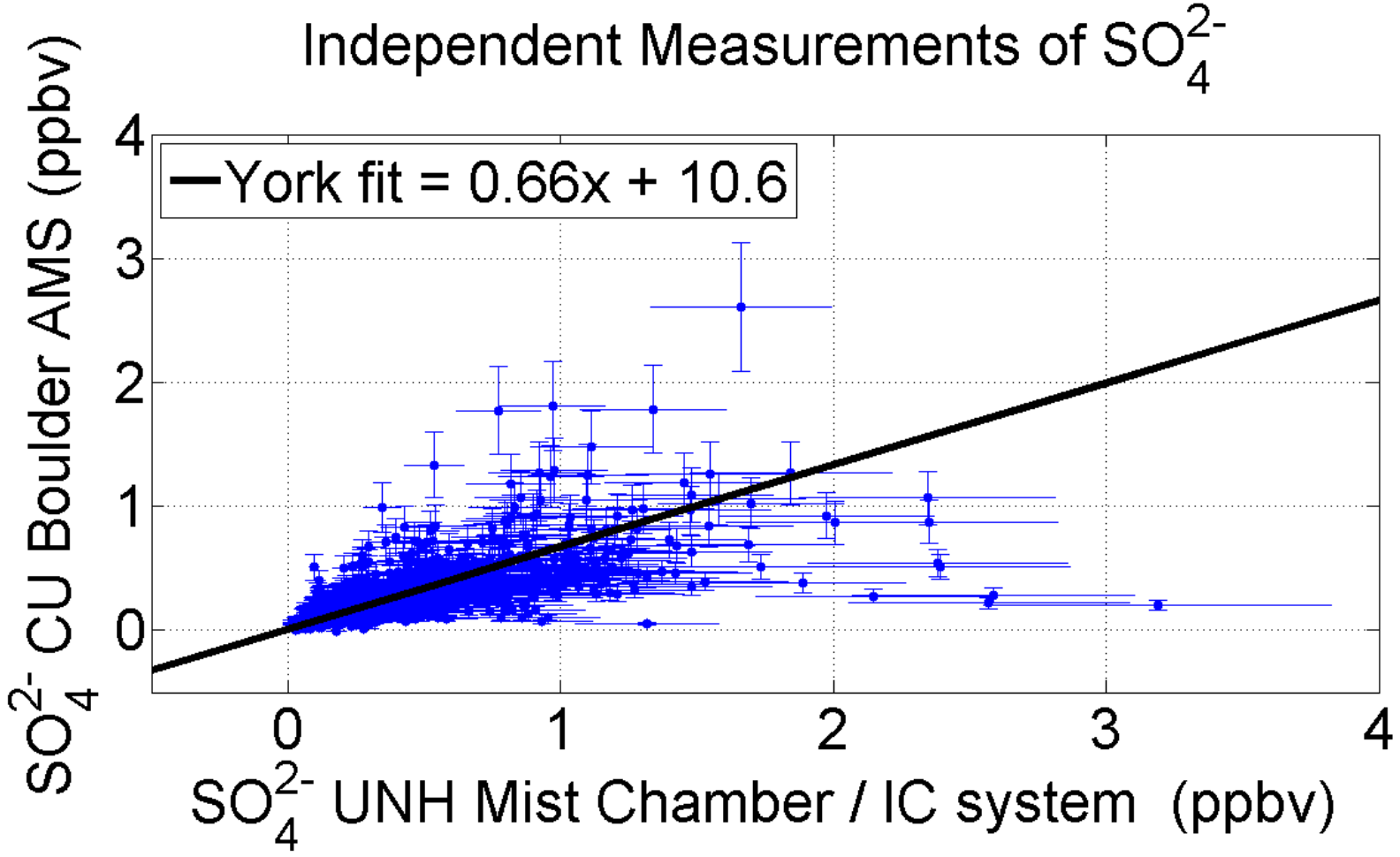
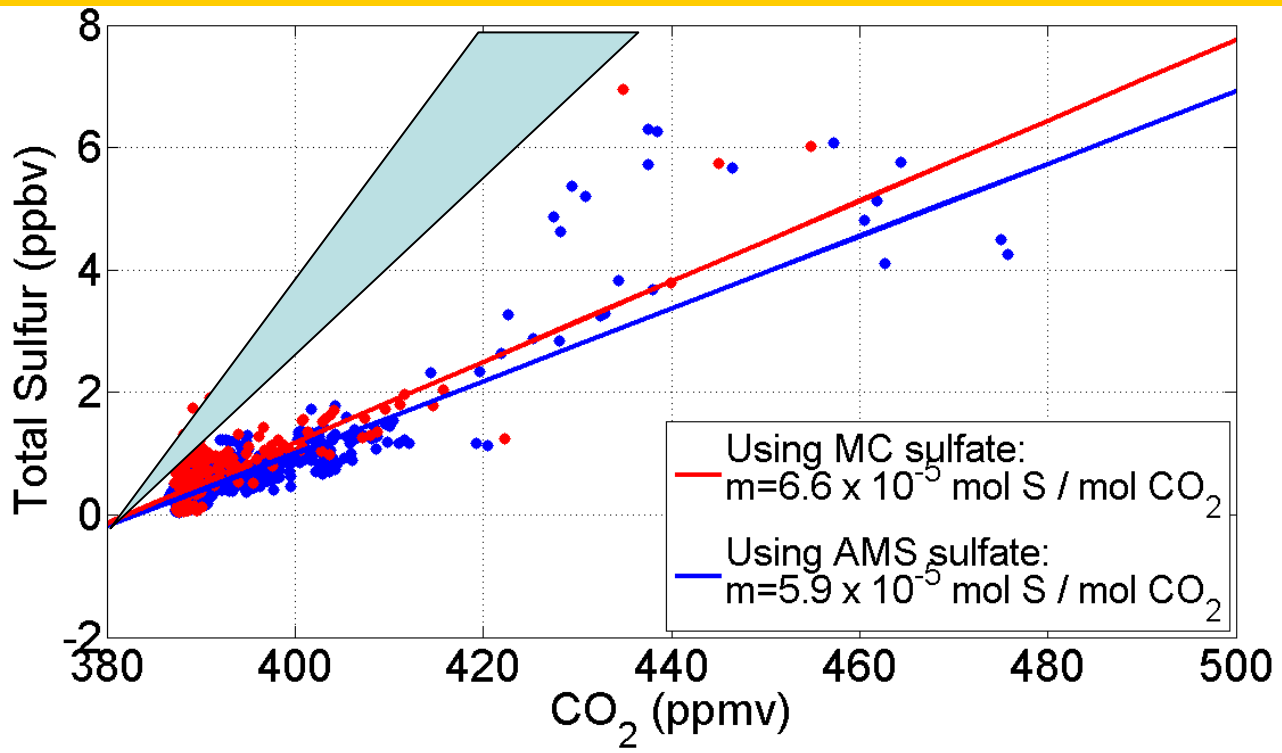


Sulfur Budget

- 2000 CARB inventory: 5.9×10^{-5} mole S / mole CO_2
- 2002 observed: 2.0×10^{-4} mole SO_2 / mole CO_2

- 2008 CARB inventory: 4.7×10^{-5} mole S / mole CO_2
- 2008 observed: $5.5 – 6.9 \times 10^{-5}$ mole S / mole CO_2

Sulfur Budget



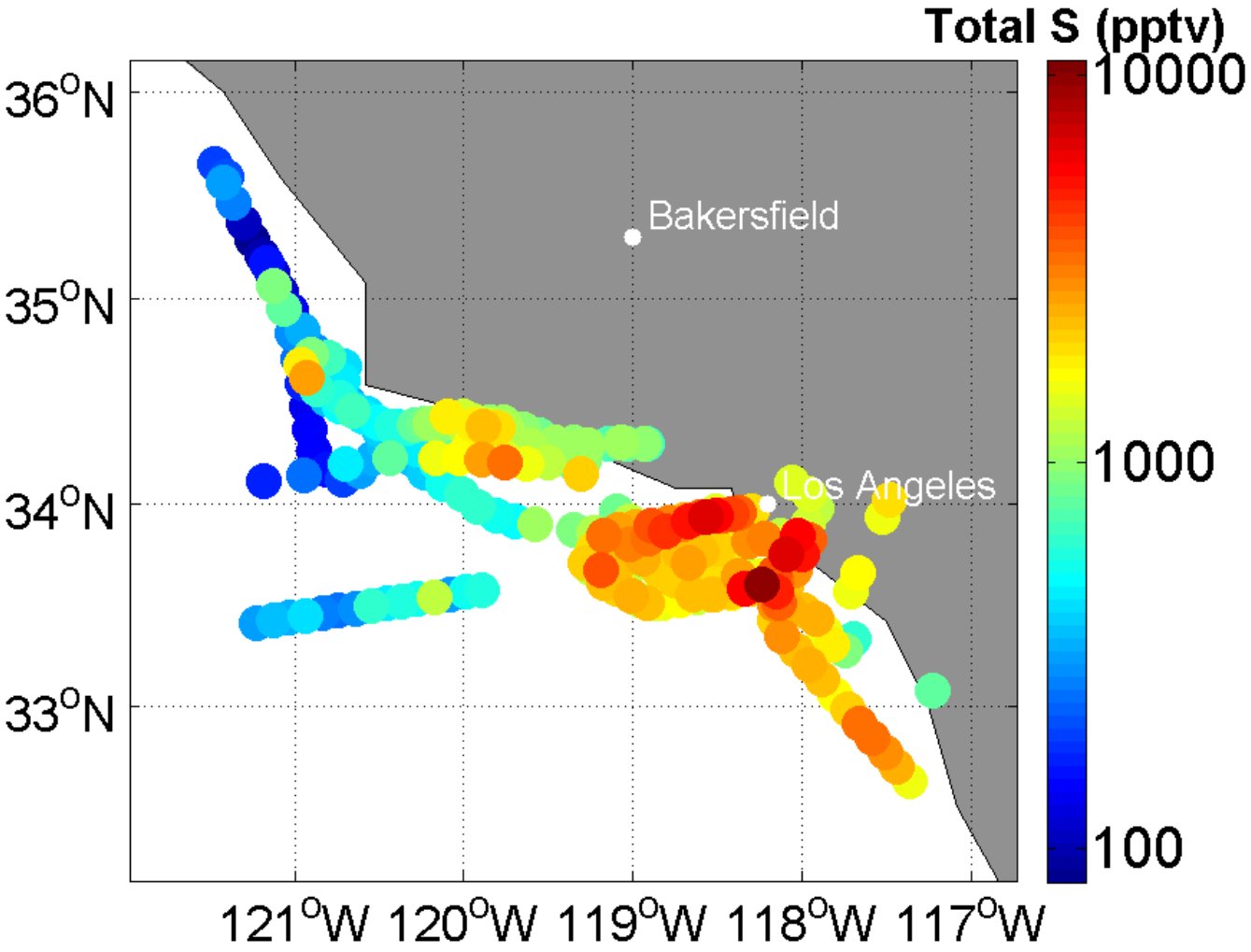
Slope of the 2002 NOAA SO_2 / CO_2 observations is shown in light blue

194 Tg of CO_2 emitted in SCB per year

Sulfur budget of 4.3 – 5.3 x 10^7 g SO_2 per day

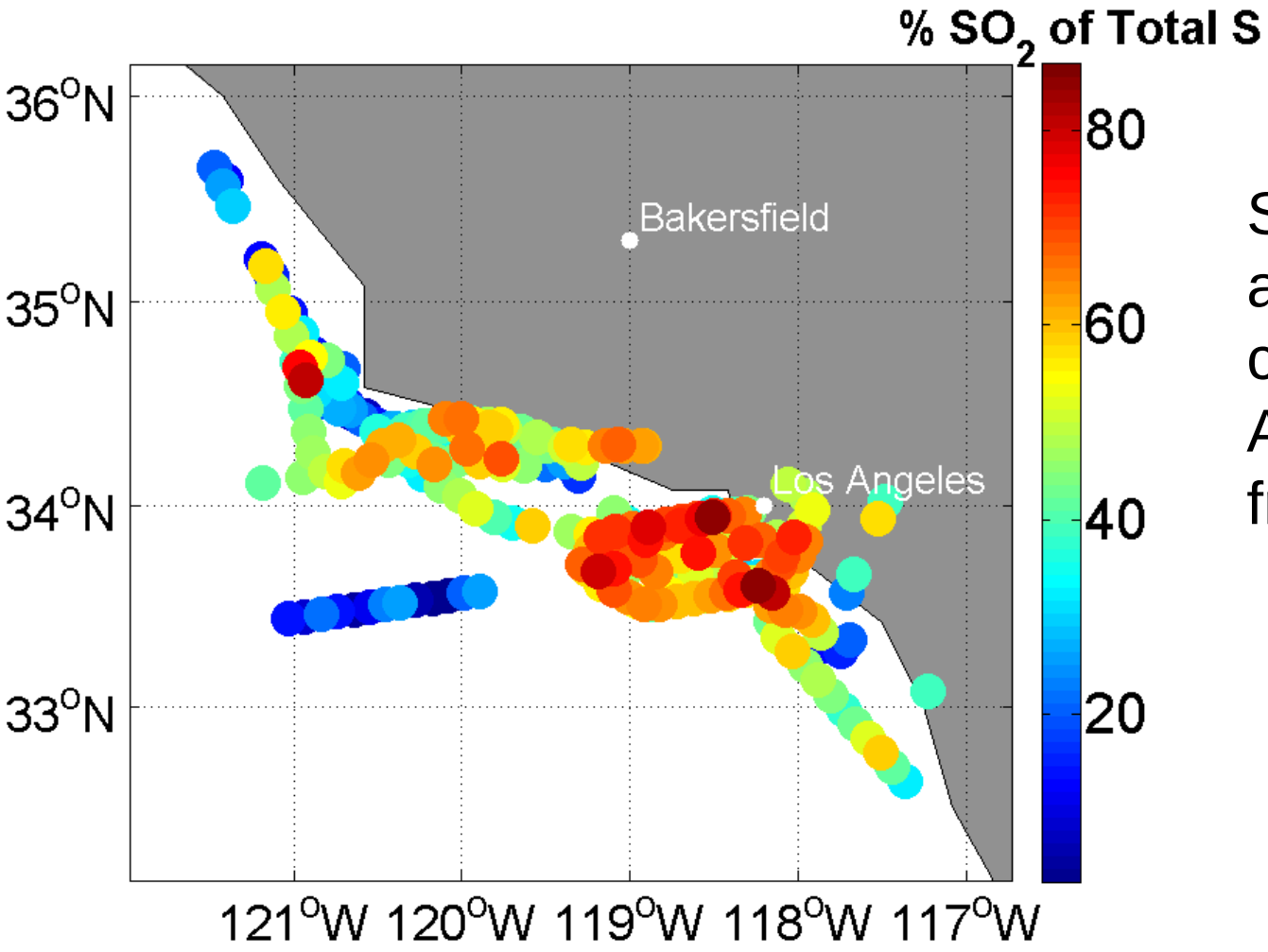
CARB estimated emission 2008: 3.6 x 10^7 g SO_2 per day

Sources of Sulfur



Sources offshore and along the coast of Los Angeles (ships and refineries) dominate. Biogenic emissions are negligible. On-road vehicle emissions appear to be small.

Sources of Sulfur



Sulfur offshore and along the coast of Los Angeles is the freshest.

Results of ARCTAS-CARB 2008

- Sulfur budget of 4.3 – 5.3 x 10^7 g SO_2 per day
- CARB inventory of 3.6 x 10^7 g SO_2 per day
- Biogenic emissions are negligible
- On-road vehicle emissions appear to be small
- Large contributions from sources near and along the coast (ships and refineries)

ARCTAS-CARB (2008) versus ITCT (2002)

2008	2002
Large contributions from sources along the coast and offshore	No clear, large impact of marine vessels
On-road traffic emissions appear to be small (stricter regulations on sulfur content in fuel)	On-road traffic emissions were significant
3.8 x 10^{-5} mole SO_2 / mole CO_2	2.0 x 10^{-4} mole SO_2 / mole CO_2
5.9 – 6.6 x 10^{-5} mole S / mole CO_2	

Are these differences due to different sampling methods and approaches or due to time?

Acknowledgments

- NASA
- California Air Resources Board
- DC-8 colleagues and crew