

# Task 2.4: Boundary and Background Conditions

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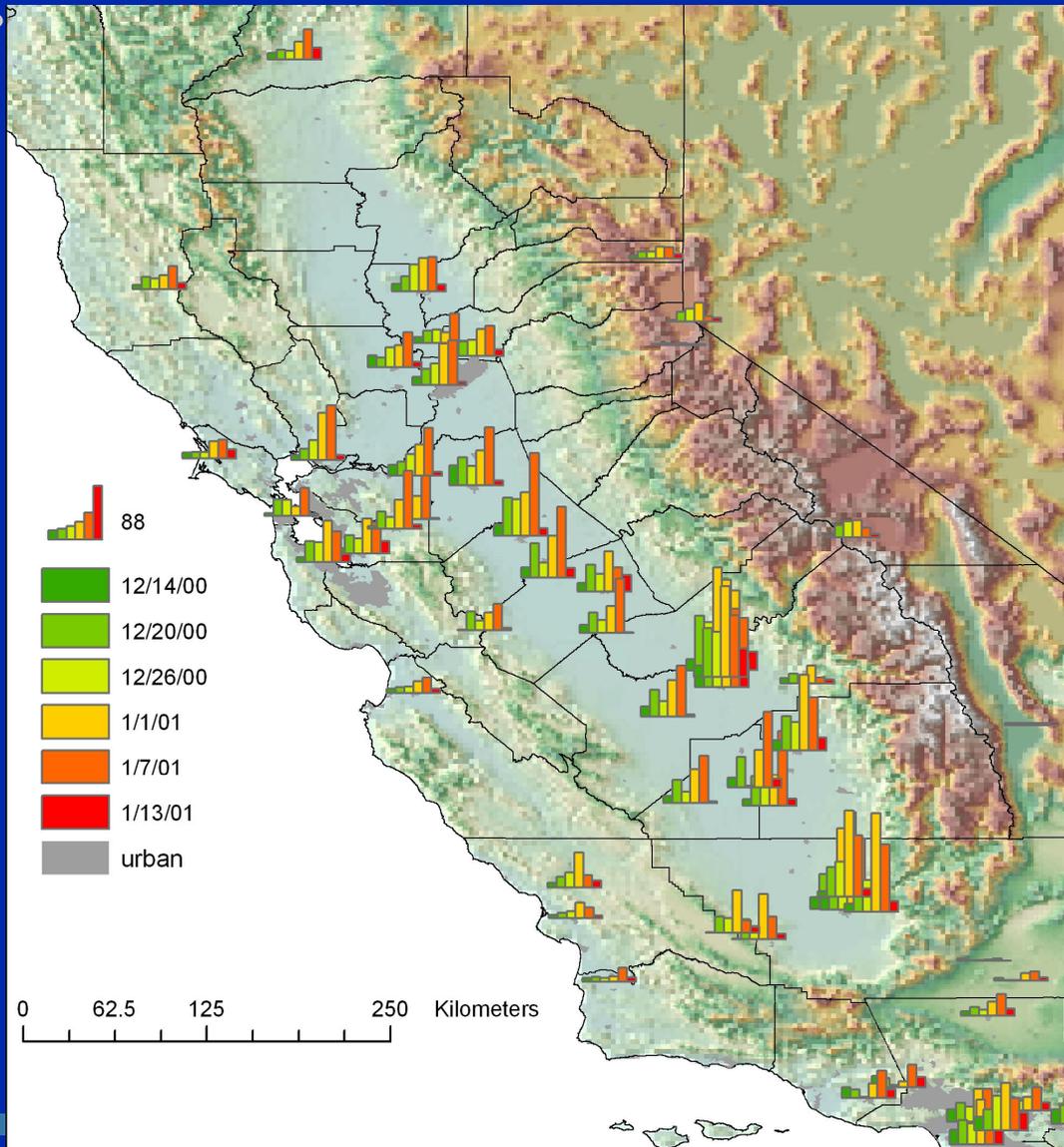
# Goals of Task 2.4

- What are PM and precursor concentrations at boundary and background sites?
- How do concentrations vary temporally and spatially?
- What portion of PM concentrations during episodes are attributable to background concentrations?

# Definitions

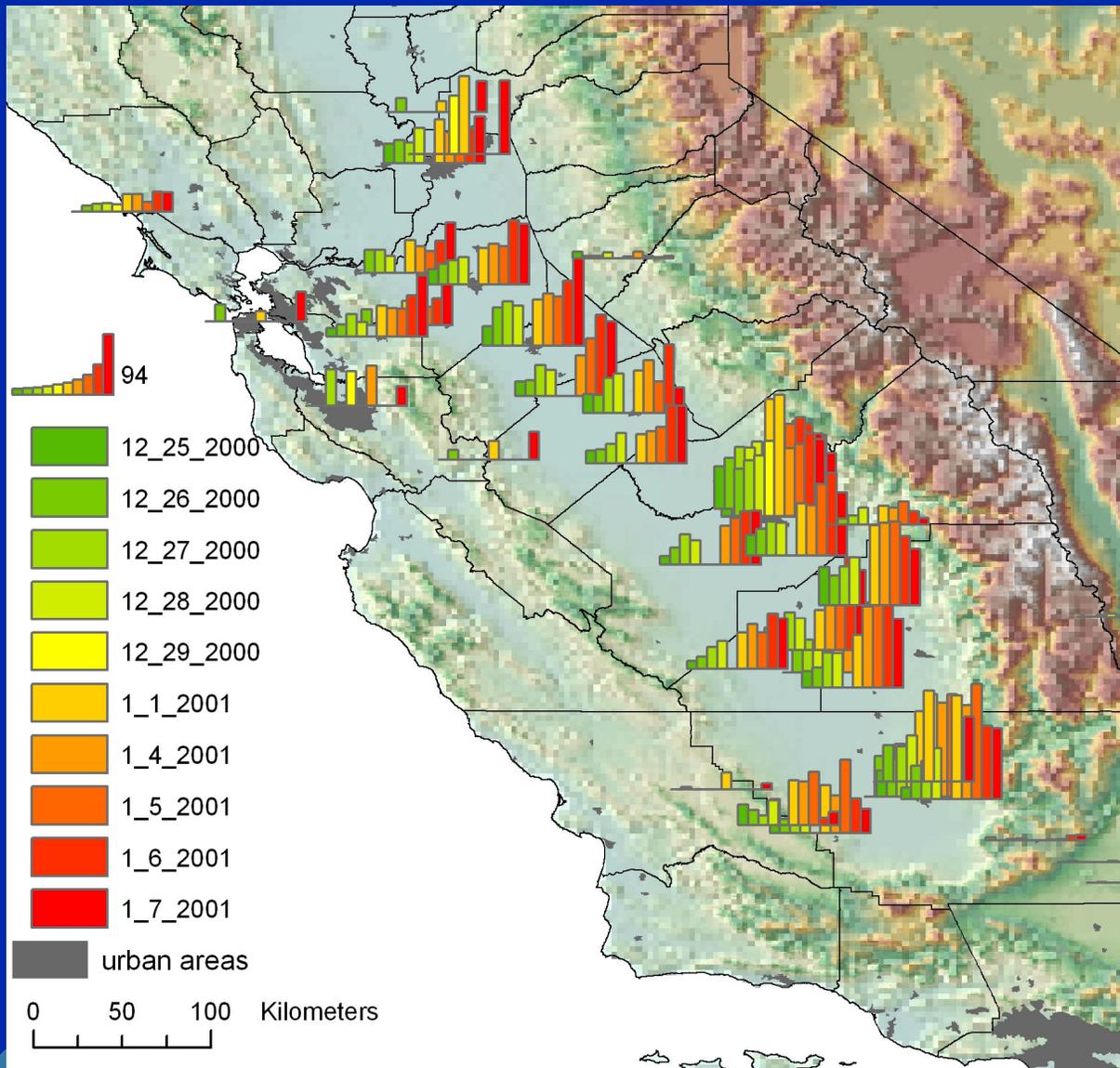
- Backgrounds
  - Clean-air/non-anthropogenic
  - Regional/operational
- Boundaries
  - Determined by horizontal transport and vertical mixing?
  - Flux-plane?
  - Initial conditions?

# PM<sub>2.5</sub> Mass



- PM<sub>2.5</sub> driven episode
- Temporal – highest on January 1 and 7
- Spatial – primarily within the central valley

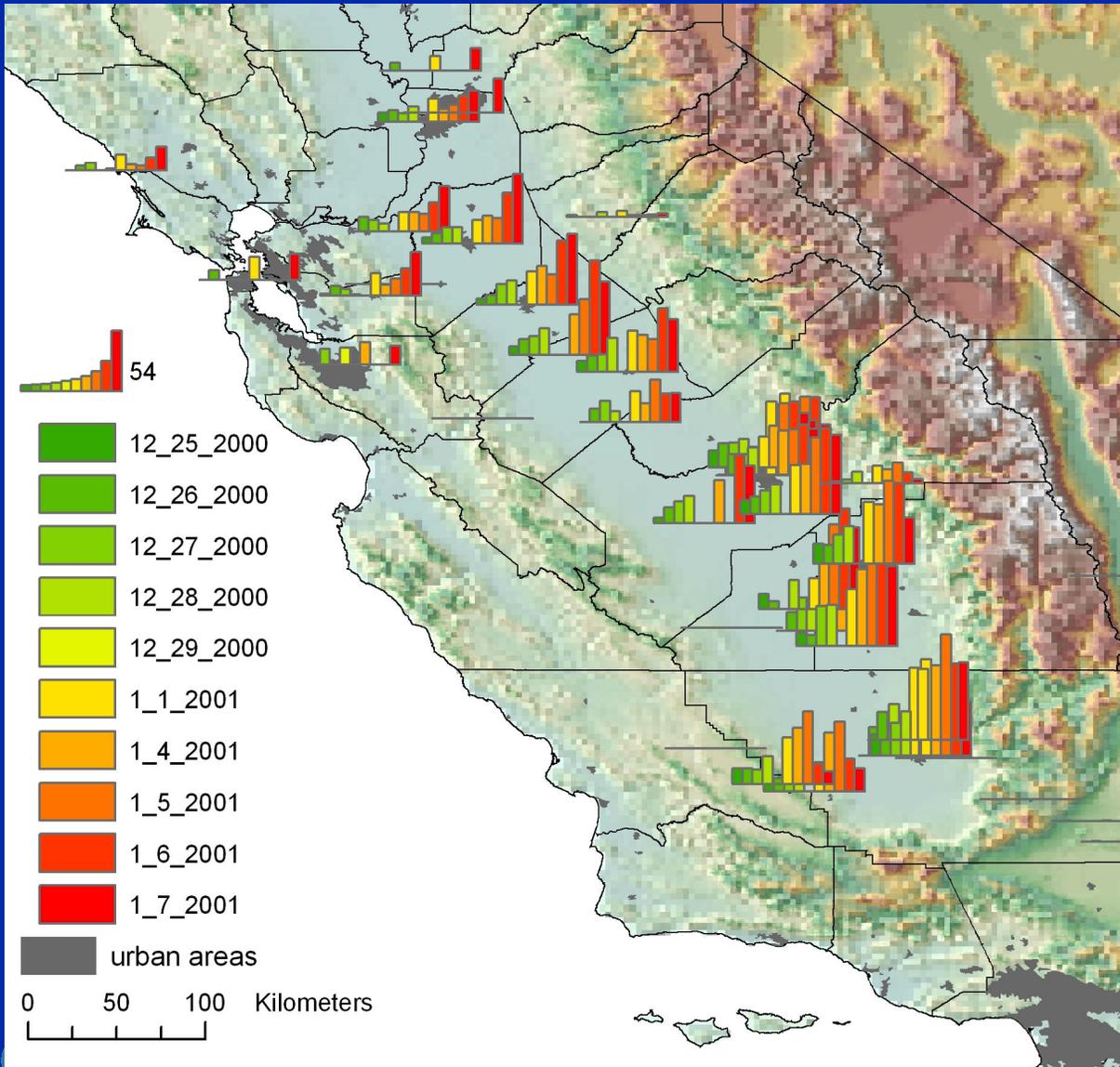
# PM<sub>2.5</sub> Mass: Close-up



Temporal – urban areas highest on January 1; rural areas on January 7

Spatial – South > North > Bay Area

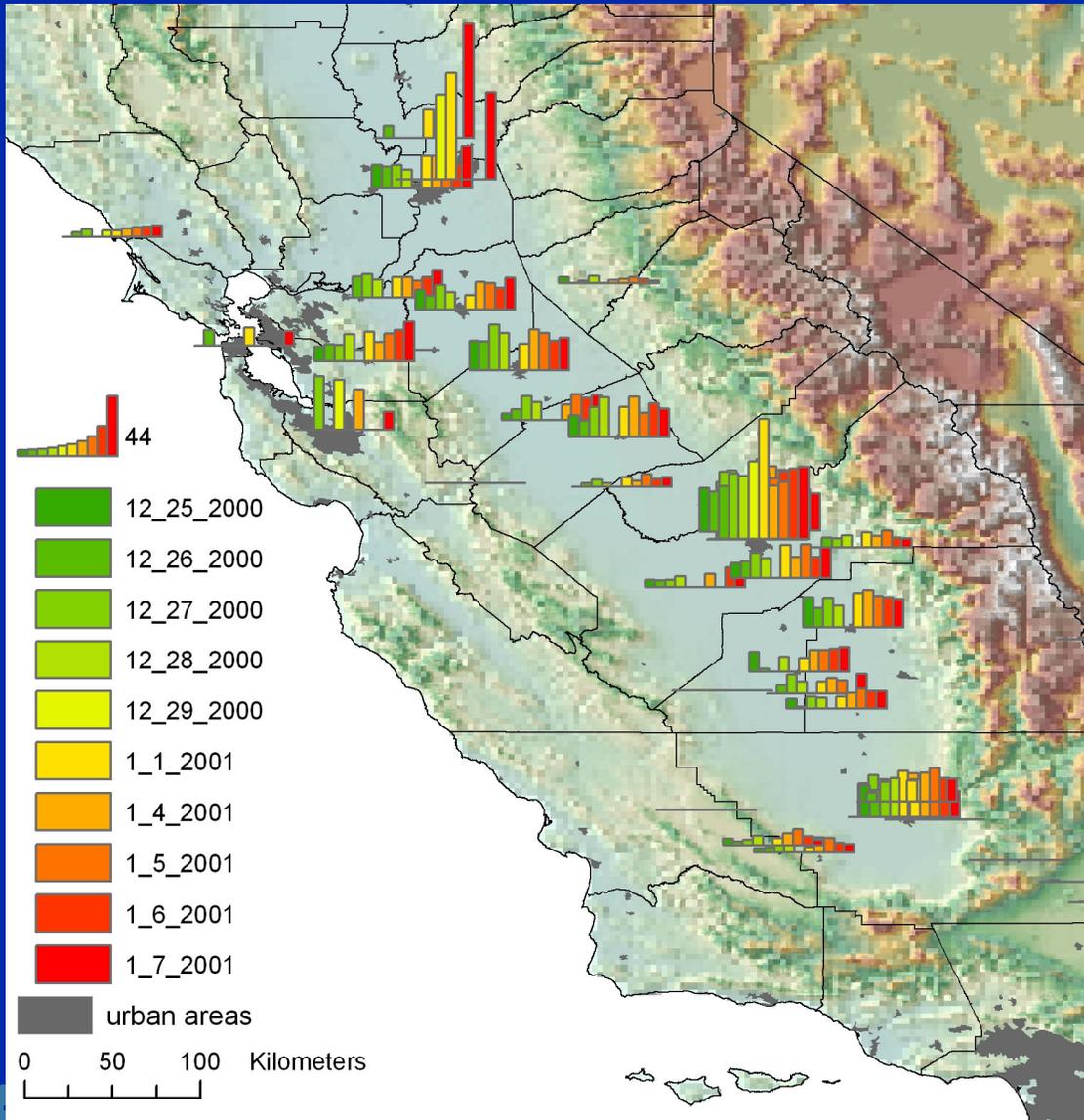
# PM<sub>2.5</sub> Nitrate



Temporal –  
highest on  
January 5 and 6  
in South;  
January 6 and 7  
in the North and  
Bay Area

Spatial – South >  
North > Bay  
Area. Relatively  
homogenous

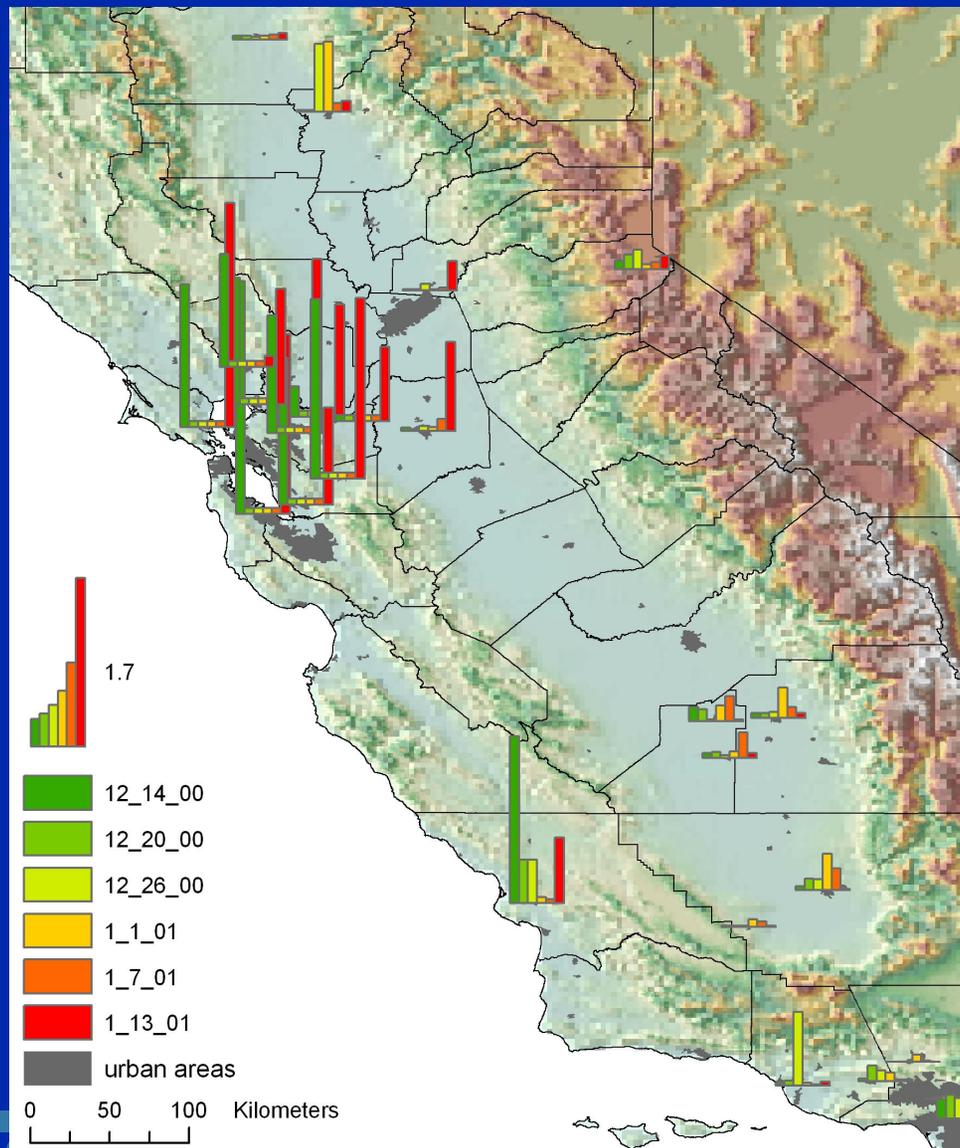
# PM<sub>2.5</sub> Organic Carbon



Temporal – not much variability

Spatial – urban/rural split.  
Does surface production limit transport?

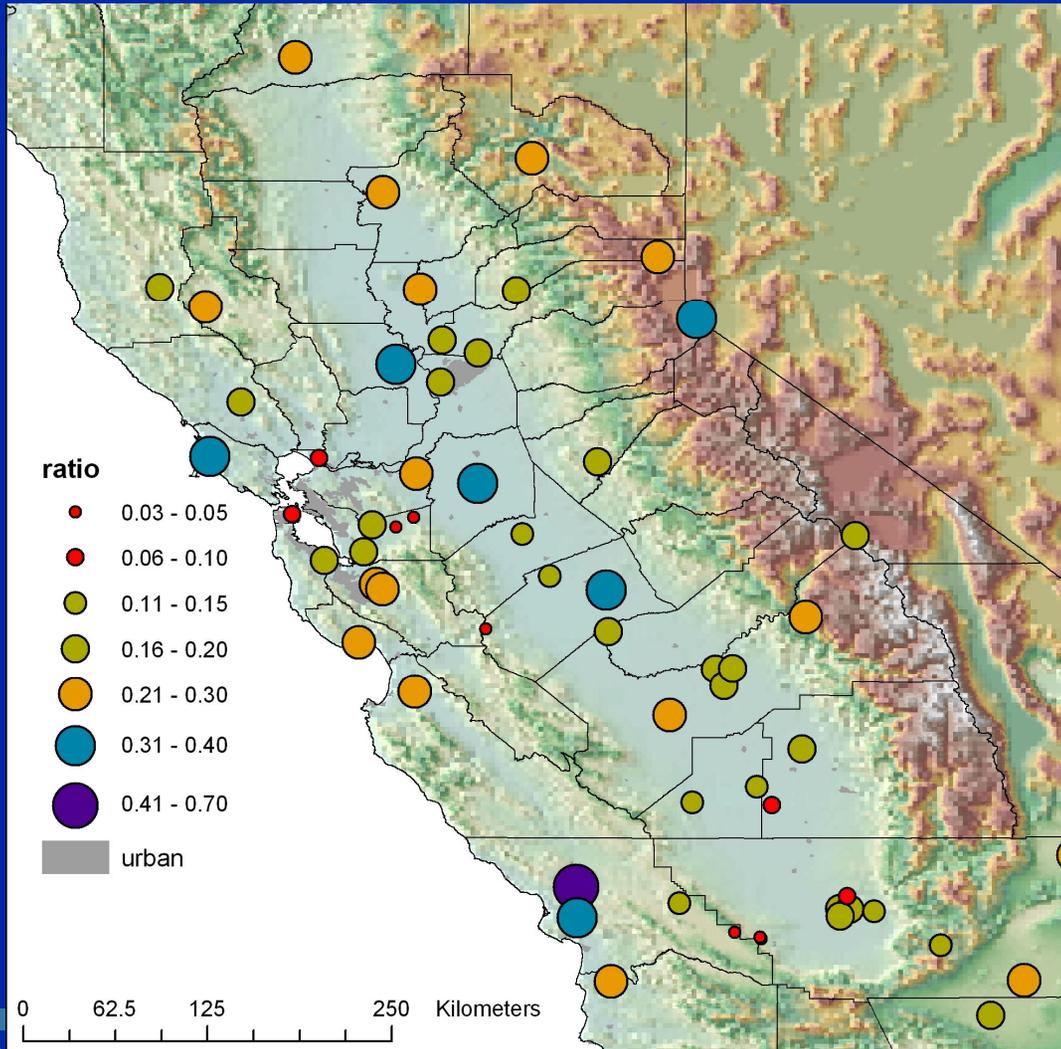
# PM<sub>10</sub> Chloride



Temporal – marine  
Cl<sup>-</sup> not important  
during episode  
(12/25/00 to  
1/7/01)

Spatial – coastal,  
little to no  
transport into  
valley

# Ratio of PM<sub>2.5</sub> mass for clean:dirty days



- Estimate of background contribution to high episode day (12/14/00:1/7/01)
- SJV PM<sub>2.5</sub> background contributes about 10-30% of total on dirty day

# Summary

- Initial analyses indicate little to no transport from the Bay Area to the SJV during winter PM episodes
- Winter background (i.e., initial) concentrations contribute less than 20% of the total mass at urban sites and less than 30% at rural sites.
- Take home message: Winter SJV PM is primarily self-generated/contained. Models should initialize on clean days near the beginning of winter episodes to capture background boundaries.

# Future Work

- Use meteorological data and modeled wind fields to confirm transport patterns during episodes
- Assess vertical boundaries (use products from Task 2.5)
- Compile tables of PM mass and composition for clean and dirty days at representative boundary and/or background sites
- Examine PM precursor concentrations ( $O_3$ ,  $NO_x$ ,  $NO_3$ ,  $SO_x$ , VOCs,  $NH_3$ )
- Analyze summer conditions and contrast with winter episodes