The Effects of Climate Change on Emissions and Ozone in Central California

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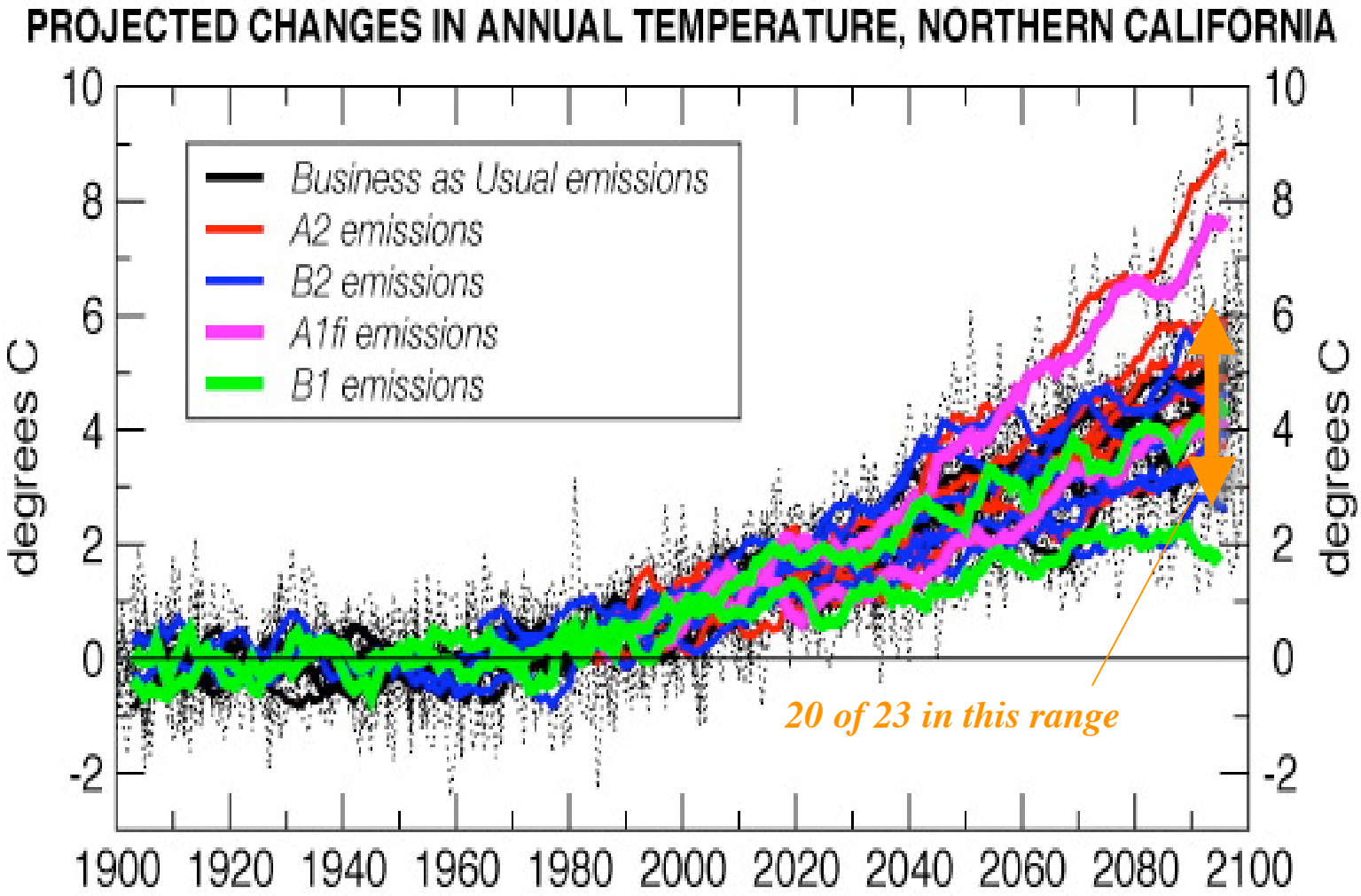

M. D. Dettinger, 2005: "From climate-change spaghetti to climate-change distributions for 21st century California", March 2005.

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Purpose

- What would be the effect of temperature increase on emissions?
- What would be the effect of temperature increase on ozone levels?

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Study Methods

A combination of:

- Numerical modeling
- Observational data verification

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Numerical Modeling

- Biogenic Volatile Organic Compound (BVOC) computed using BEIS2 (Biogenic Emission Inventory System 2).
- Ozone computed using CAMx (Comprehensive Air Quality Model with Extensions)

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Episode Selection

Episode Selected: July 31 – August 2, 2000 (A multi-day ozone episode during the Central California Ozone Study)

During this episode, 1-hr ozone exceeded:

- in San Francisco Bay (SFB) Area on July 31
- in Sacramento (SAC) area on August 1
- in the San Joaquin Valley (SJV) on August 2

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Modeling domain

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Meteorological Inputs

Generated by: Wilczak et al. 2004 using MM5

- 36, 12, 4 km nested grids
- Analysis FDDA on the 36 and 12 km grids
- Observation FDDA on the 4 km grid
- NOAH land surface scheme
- Eta PBL scheme

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Effects of Temperature on BVOC Emissions

Scenario	SFB	SAC	SJV	CCOS Total
Base case (tons/day)	317	642	1080	9136
2C increase	378 (+19%)	737 (+15%)	1265 (+17%)	10425 (14%)
4C increase	445 (+40%)	828 (+29%)	1458 (+35%)	11738 (28%)

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CAMx Simulations

Runs	Temperature	BVOC
Run B	Base	Base
Run 2T	2C increase	Base
Run 2V	Base	2C increase
Run 2TV	2C increase	2C increase

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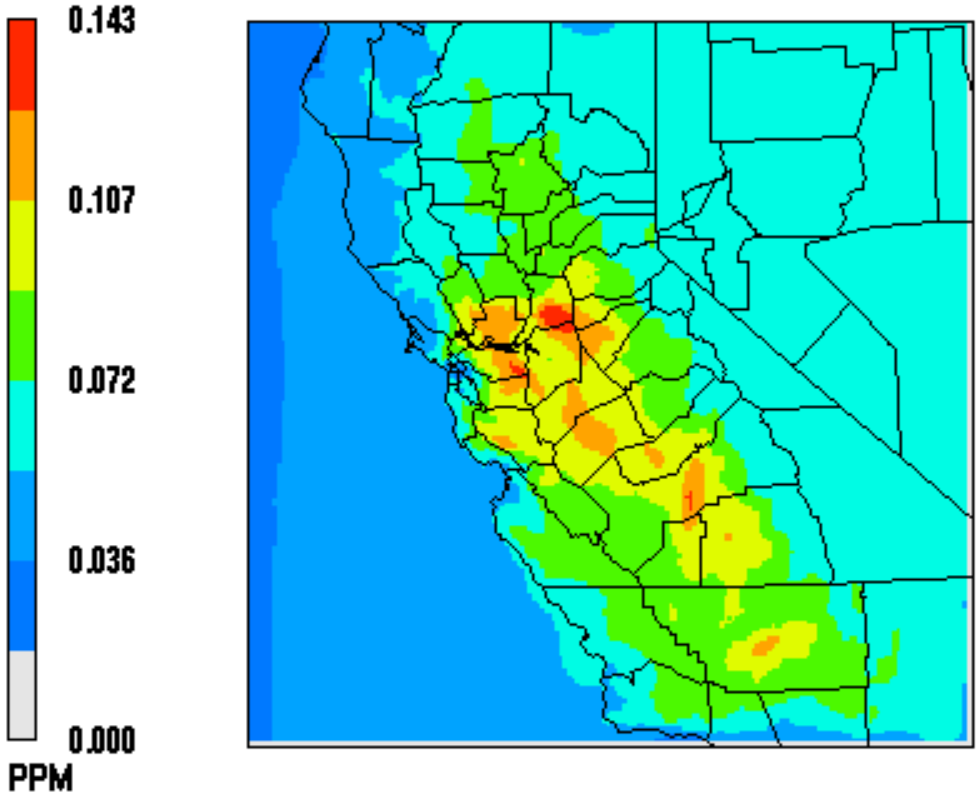
Simulated Ozone (Run B)



1500 PDT July 31, 2000

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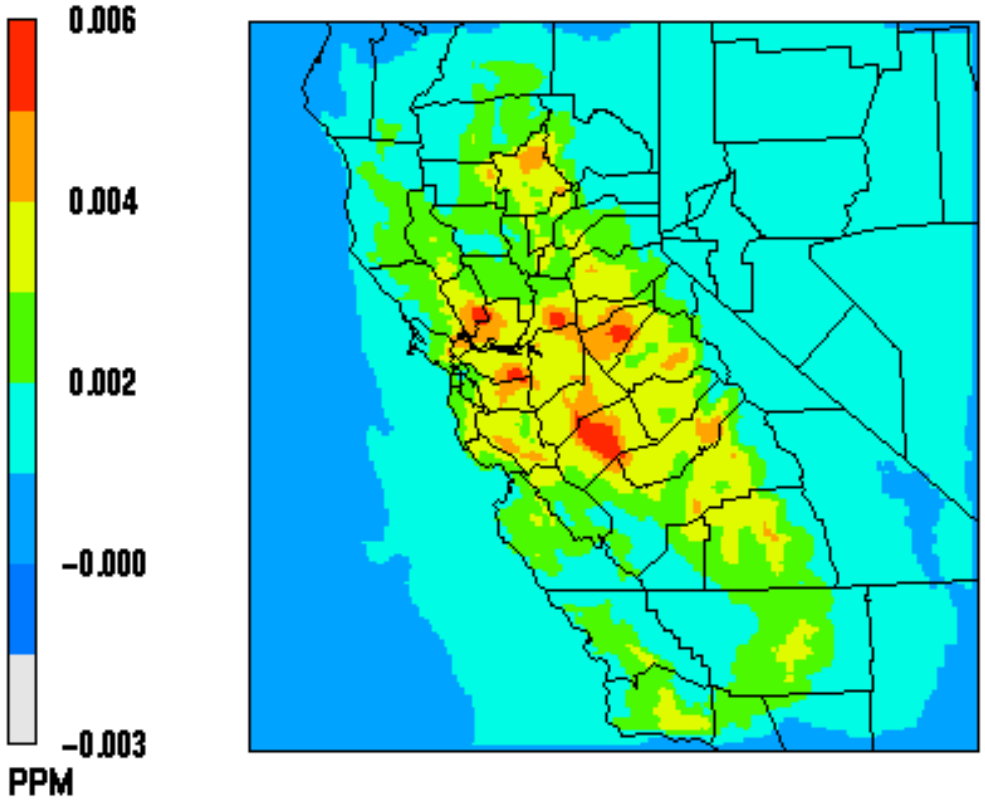
Change in Ozone
(Run 2T – Run B)



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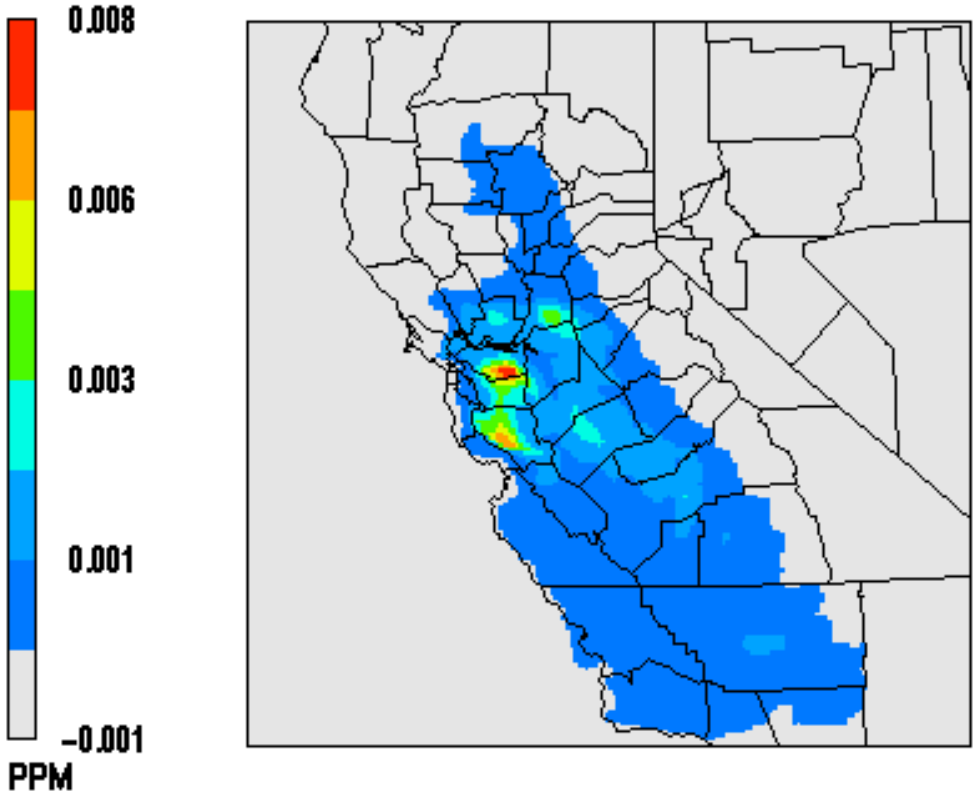
Change in Ozone
(Run 2V – Run B)



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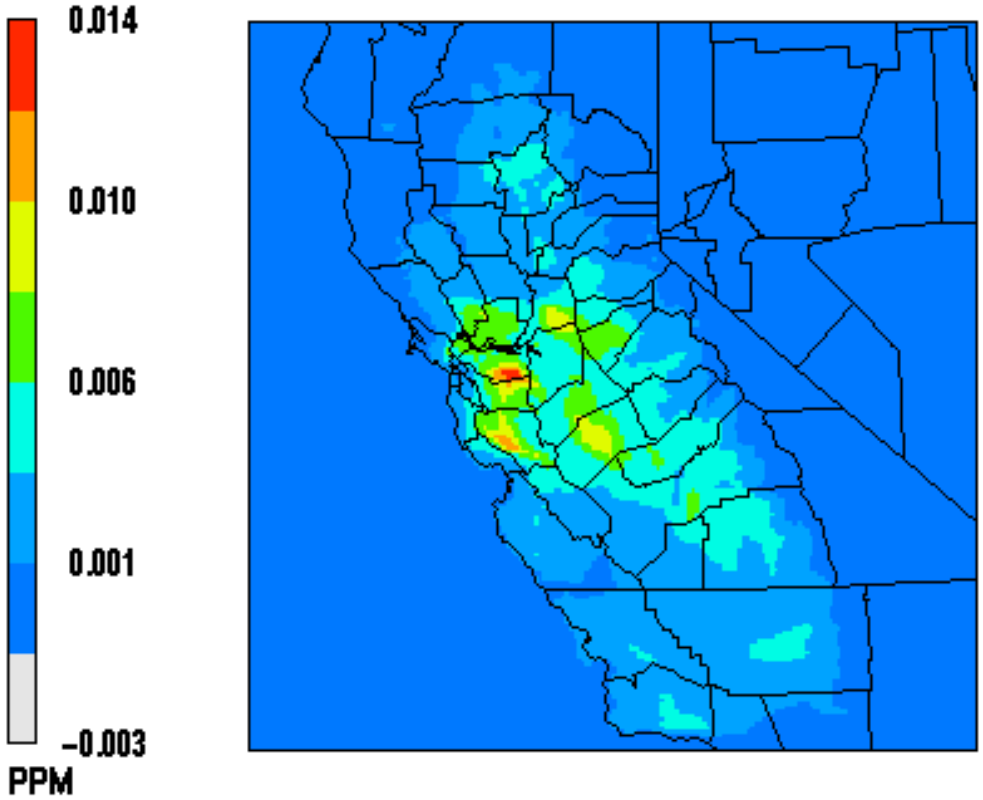
Change in Ozone
(Run 2TV – Run B)



1500 PDT July 31, 2000

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Maximum 1-hr Ozone (ppb)

Runs	SFB (Jul 31)	SAC (Aug 1)	S SJV (Aug 2)
Run B	132	152	110
Run 2T	137	156	112
Run 2V	137	156	112
Run 2TV	143	160	114

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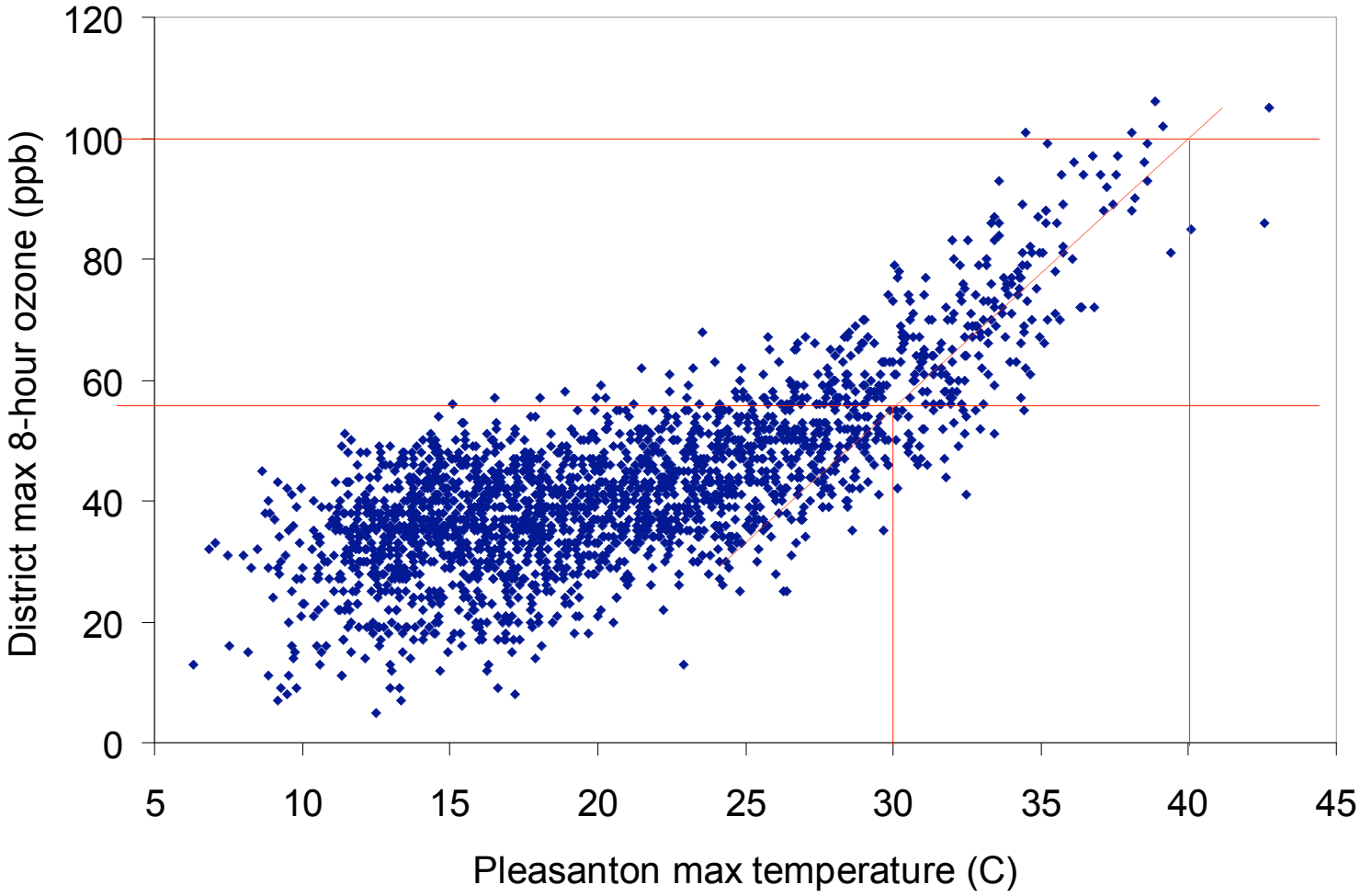
Maximum 8-hr Ozone (ppb)

Runs	SFB (Jul 31)	SAC (Aug 1)	S SJV (Aug 2)
Run B	109	117	100
Run 2T	113	120	102
Run 2V	113	119	103
Run 2TV	117	123	104

Observed Ozone and Temperature



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