

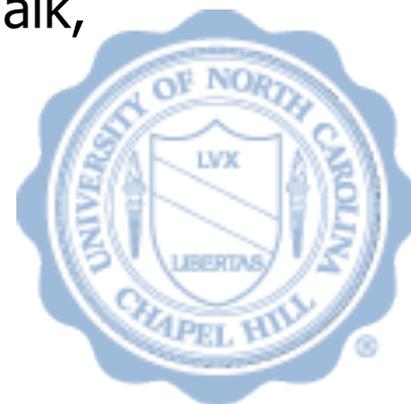
# **Co-benefits of Global Greenhouse Gas Mitigation for Air Quality and Human Health via Two Mechanisms**

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## **Collaborators:**

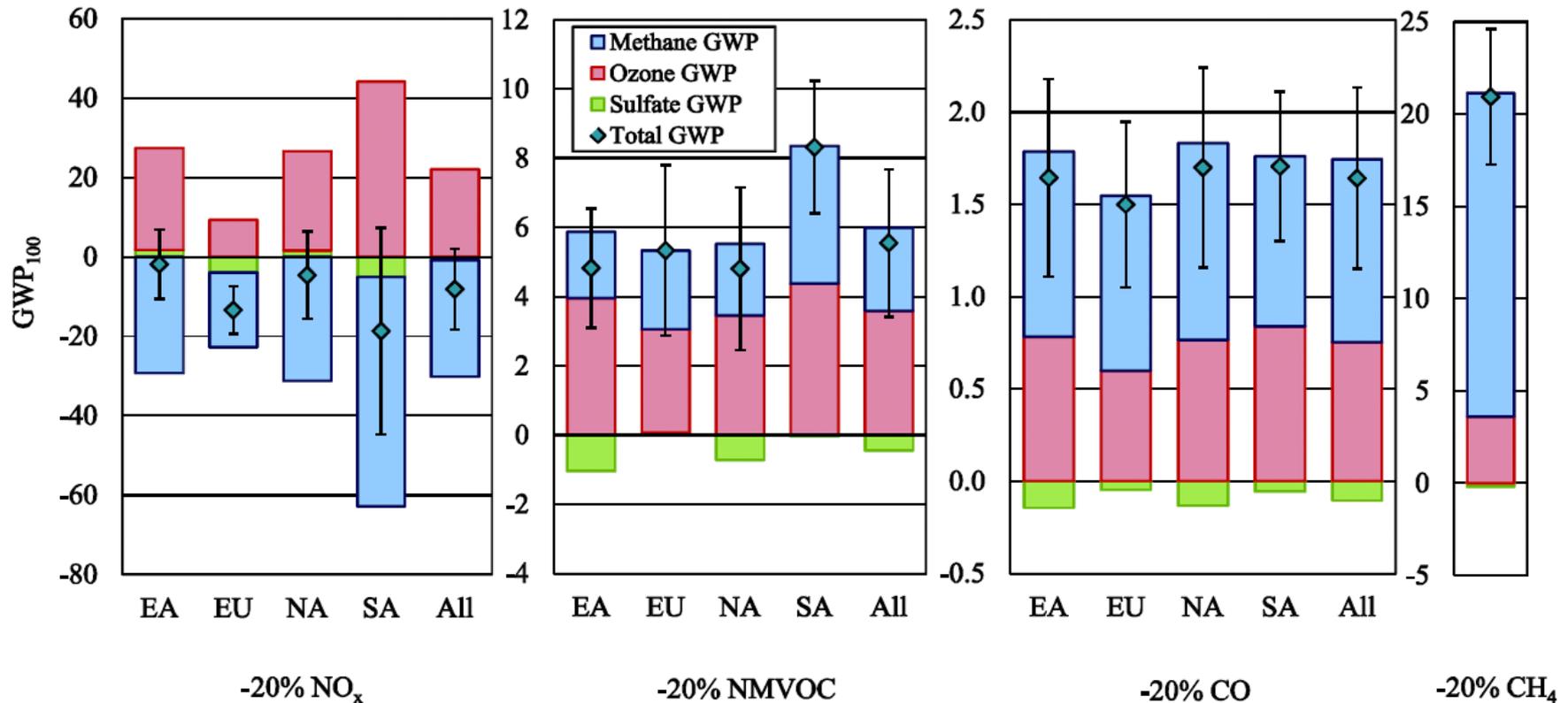
Steven J. Smith, Raquel A. Silva, Zachariah Adelman, Meridith M. Fry,  
Susan C. Anenberg, Larry W. Horowitz, Vaishali Naik,  
Jean-Francois Lamarque, Louisa Emmons

**Snowmass climate workshop**  
**July 2012**



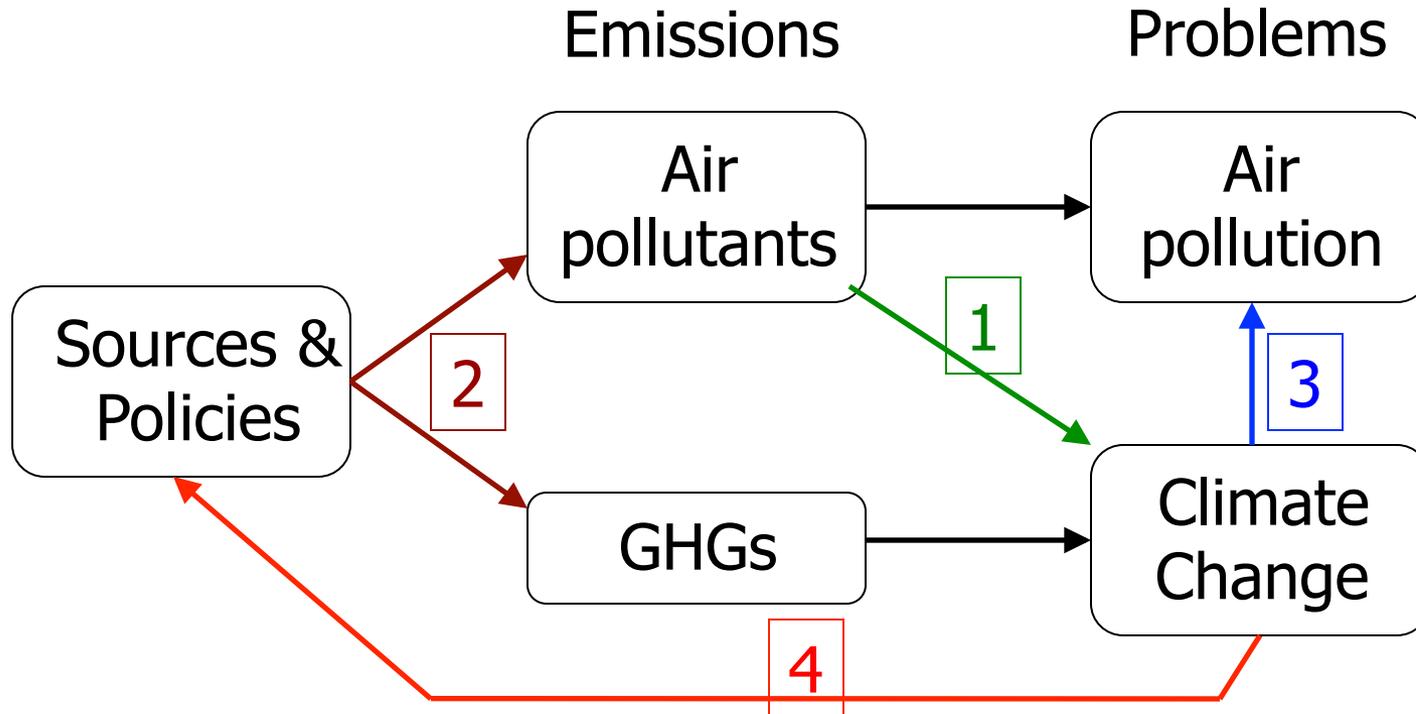
# RF of short-lived ozone precursors

- GWPs from 4 source regions based on the HTAP multi-model ensemble experiments (Fry et al., 2012).



- RF per unit CO emission reduction varies by  $\pm 10\%$  among 10 world regions (Fry et al., in prep.).

# Connections Between Air Pollution and Climate Change



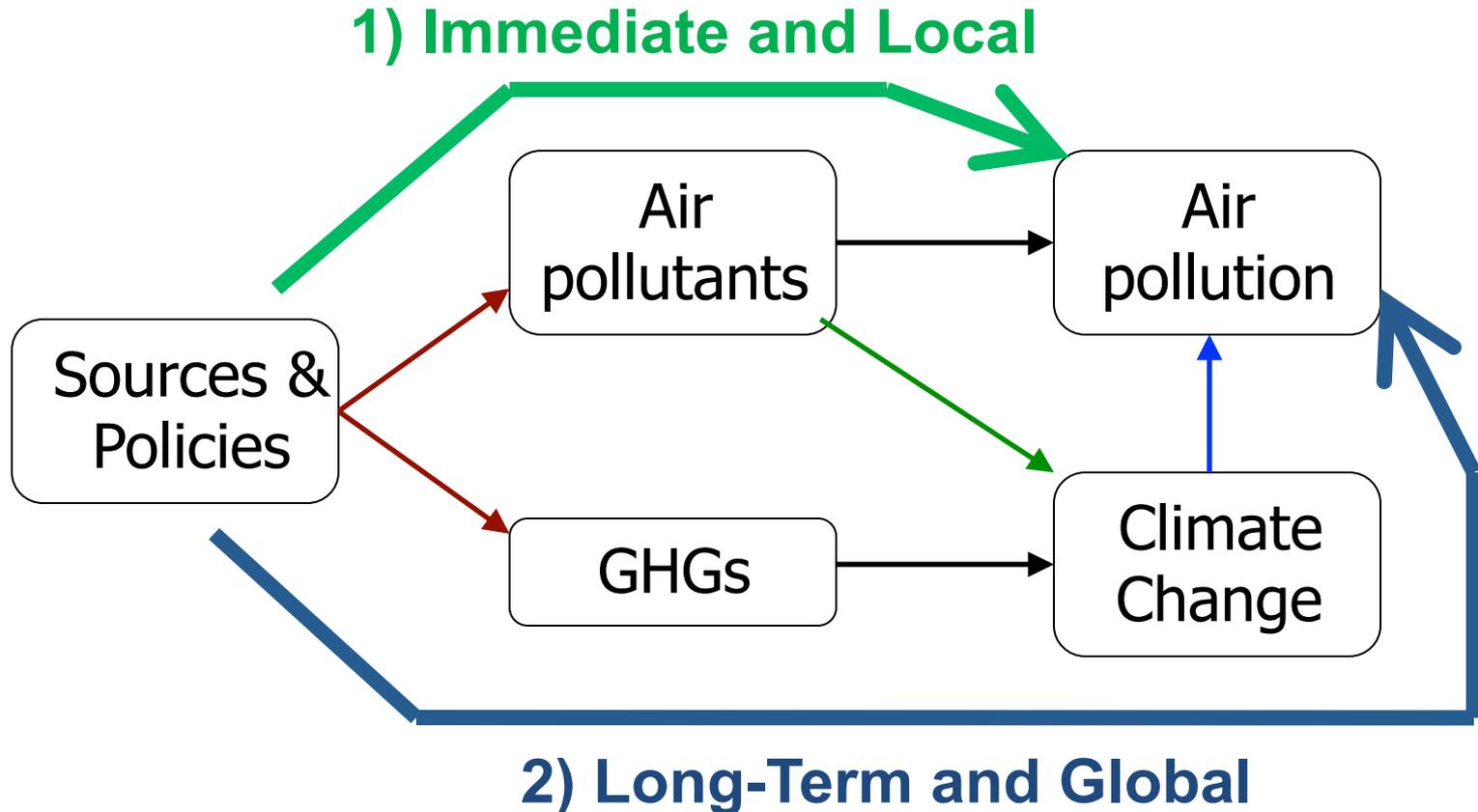
#2 – Co-benefits research.

- has not typically emphasized atmospheric science, global scale, or future scenarios.

#3 – Atmospheric science “Climate on AQ” research.

- needs to be recast as benefits of climate

# Co-benefits of GHG Mitigation for Air Quality



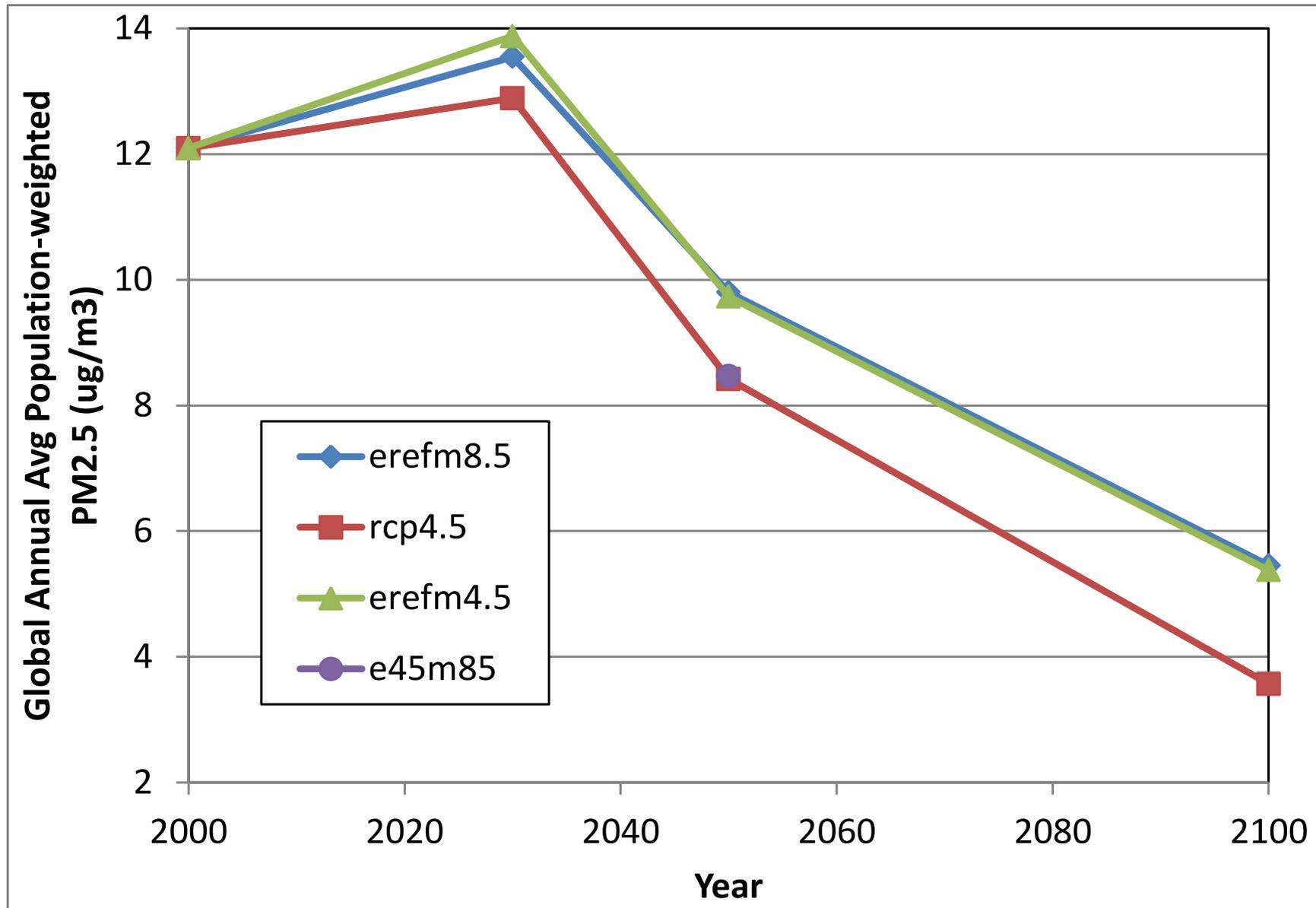
**Objective: Analyze global co-benefits for air quality and human health to 2100 via both mechanisms.**

# Approach

Years	Emissions GCAM	Meteorology GFDL AM3	Name
2000	2000	2000	2000
2030, 2050, 2100	GCAM Reference	RCP8.5	erefm85
	RCP4.5	RCP4.5	rcp45
	GCAM Reference	RCP4.5	erefm45

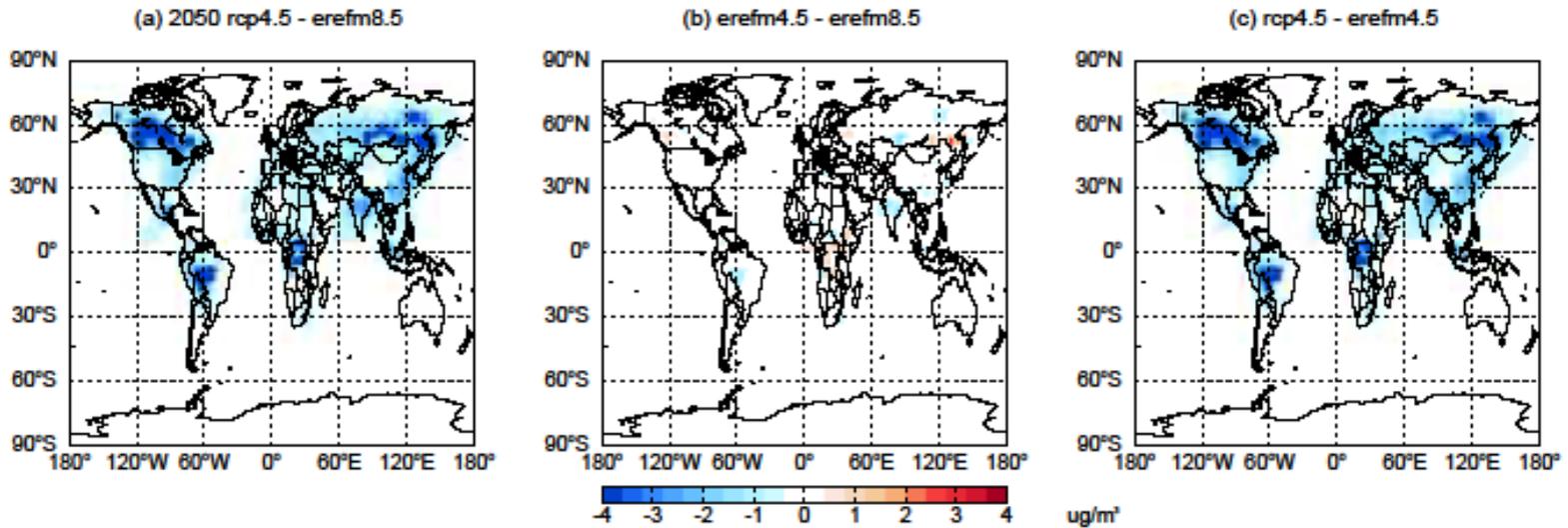
- Use the GCAM reference for emissions rather than RCP8.5 for consistency with RCP4.5.
- Simulations conducted in MOZART-4 global chemical transport model, 5 meteorology years for each case.
  - Global model simulates changes in background pollution (methane on ozone) but poor urban resolution.

# First Results – PM<sub>2.5</sub>



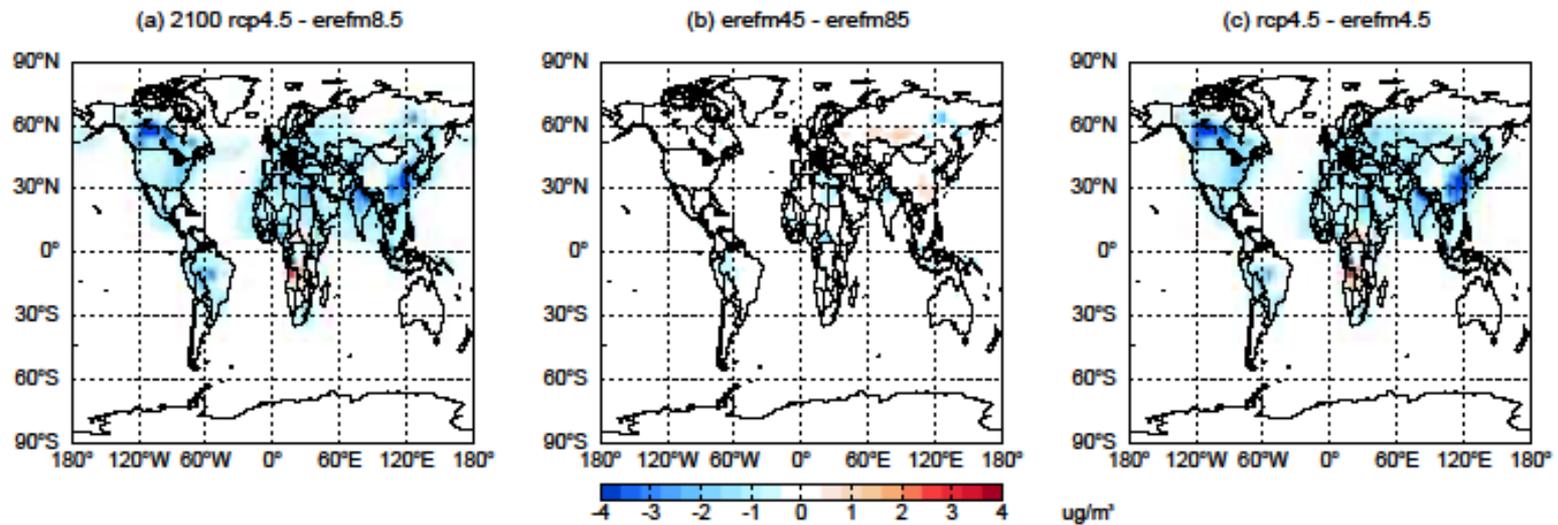
# First Results – PM<sub>2.5</sub>

2050

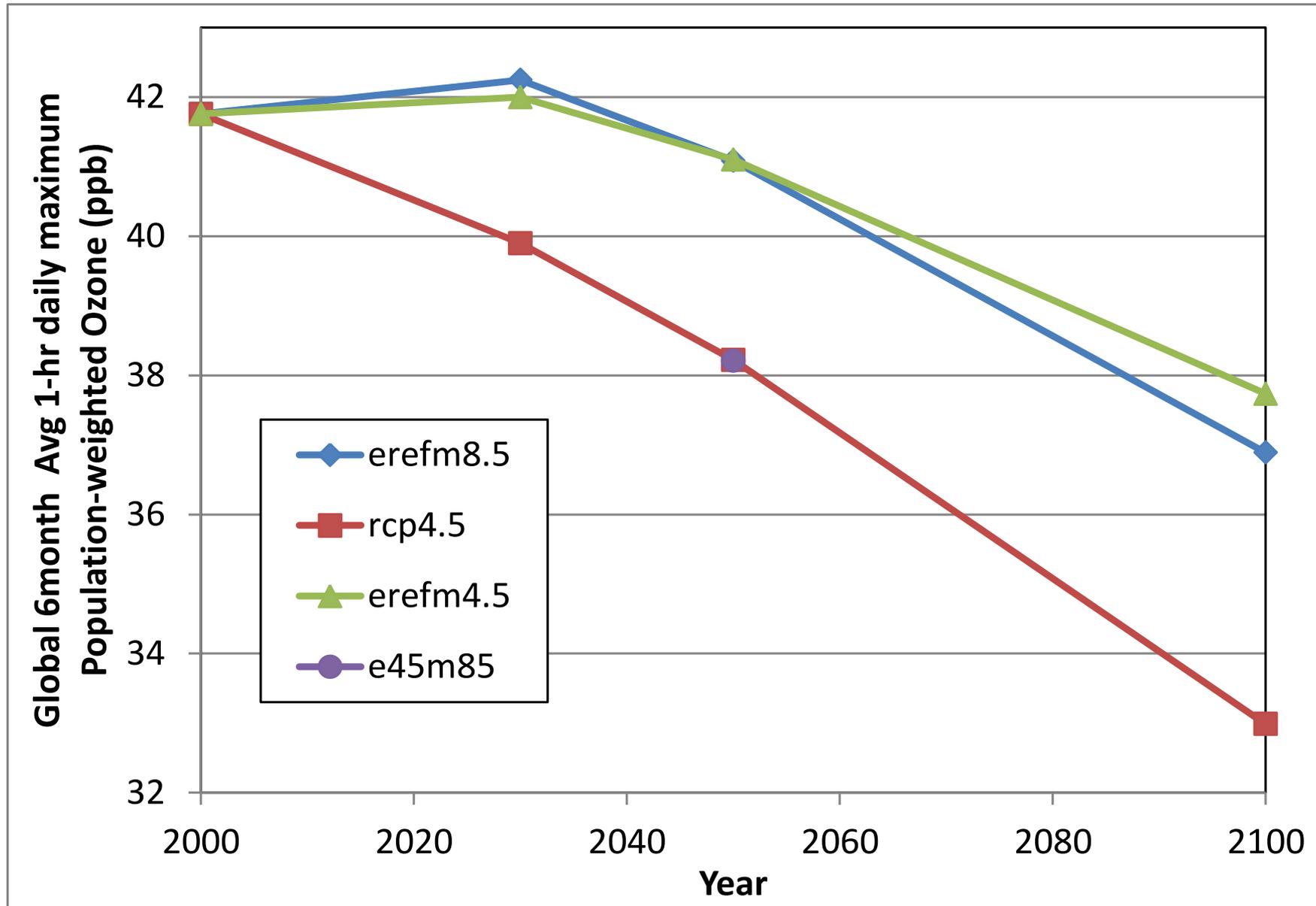


Annual average PM<sub>2.5</sub>

2100

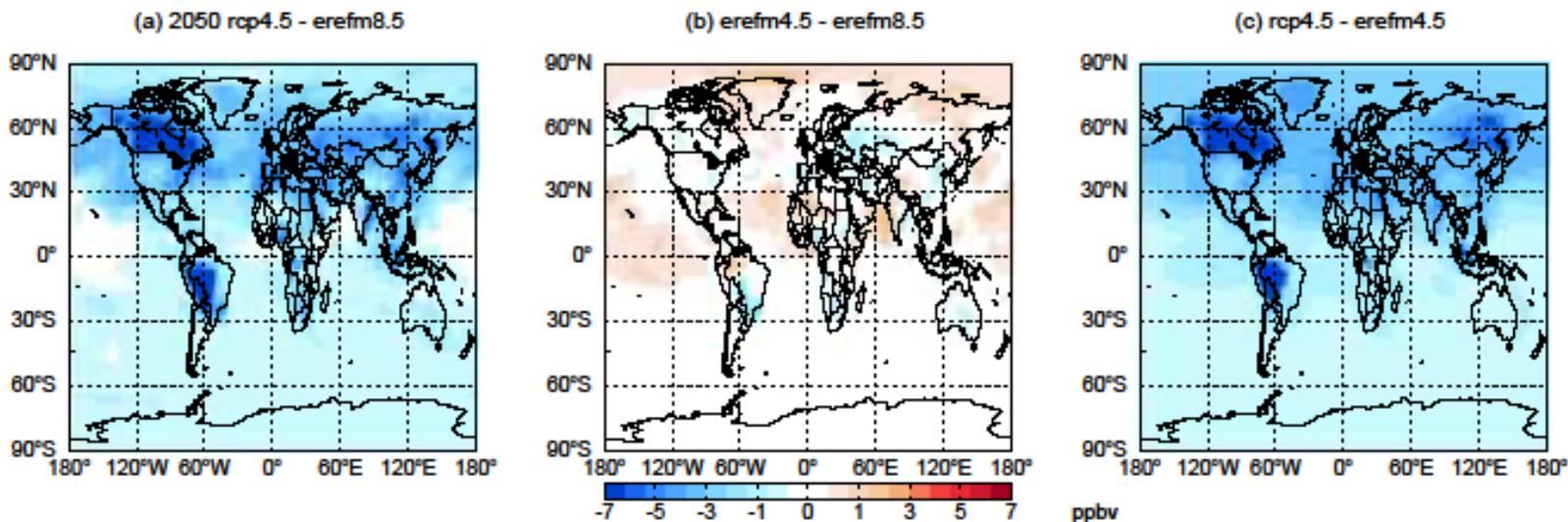


# First Results – Ozone



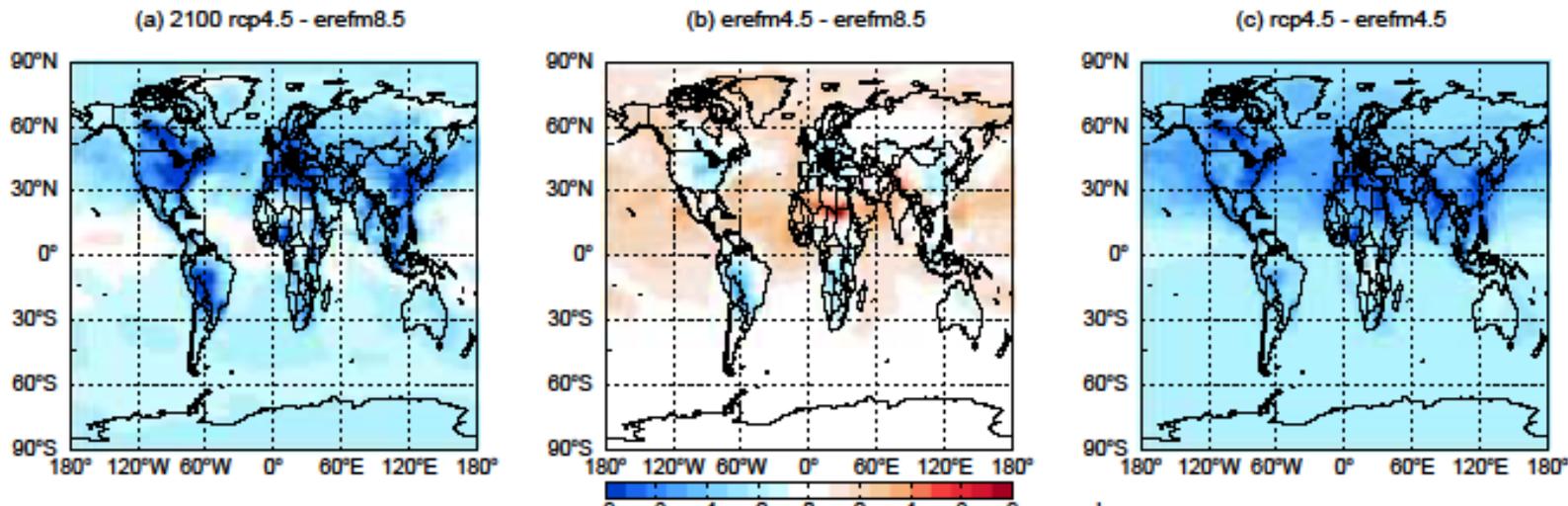
# First Results – Ozone

2050



Max. 6 month average of 1 hr. daily max ozone

2100



# Preliminary conclusions

- Air quality co-benefits of reducing GHGs are substantial.
- Magnitude of co-benefits is reduced far in future by assumptions of future improving air quality baseline.
- The direct co-benefits from air pollutant emission reductions exceed those via slowing climate change.
- Forthcoming: analysis of regional outcomes, health impact analysis, valuation, downscaling to the US.



**The UNC  
Climate, Health and  
Air Quality Lab**

