Evaluating Regional Emission Estimates Using Field Observations

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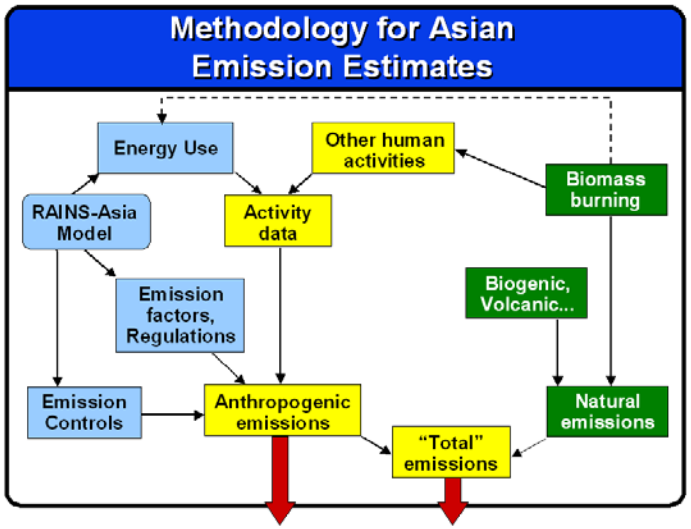
What Do The Observations and Models Tell Us About Emissions?



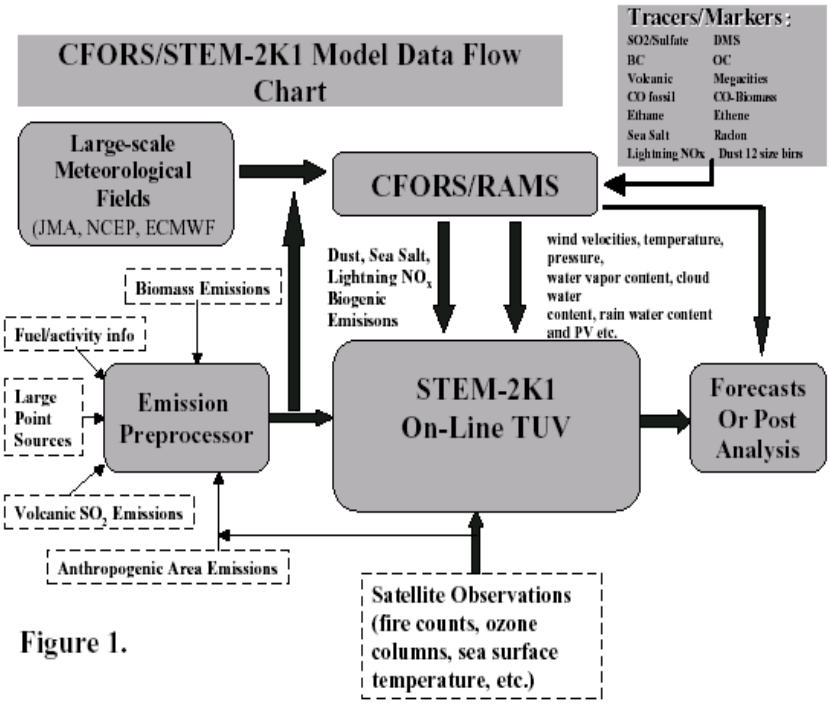
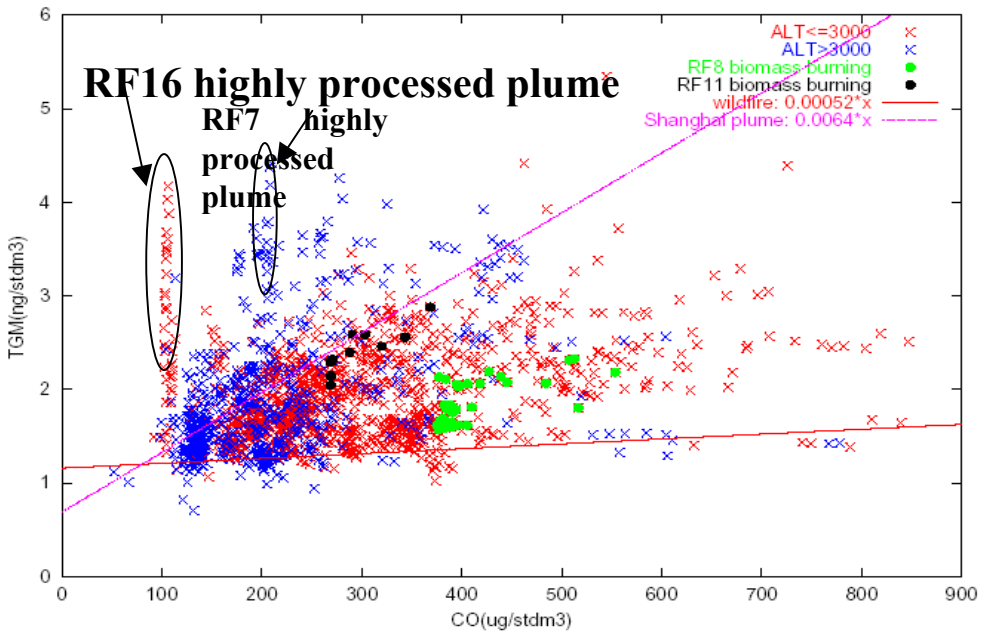
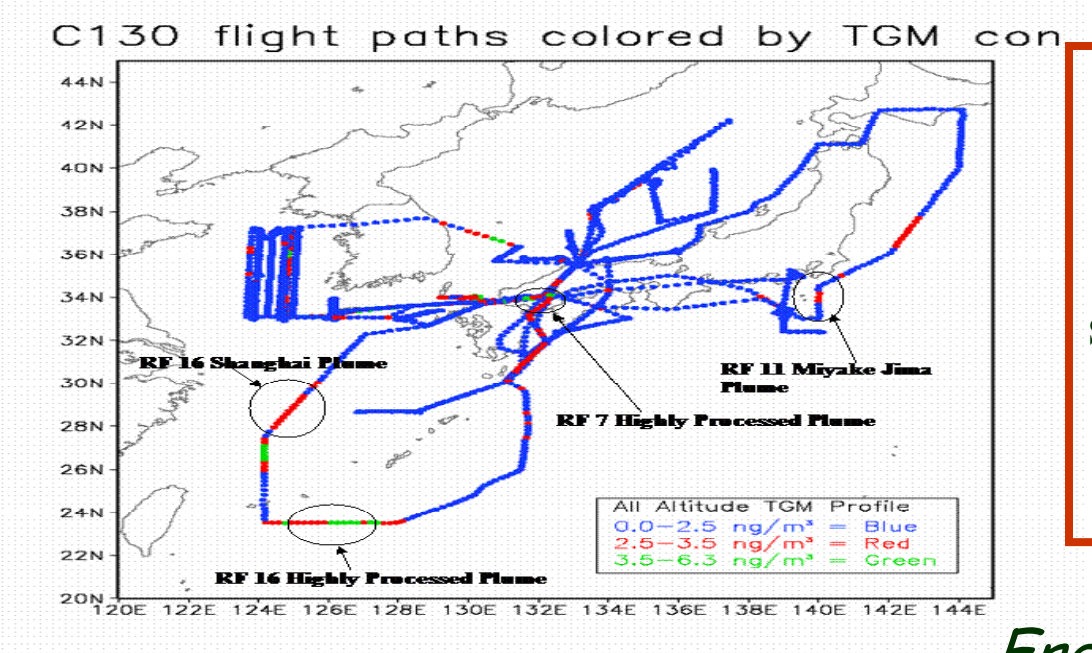


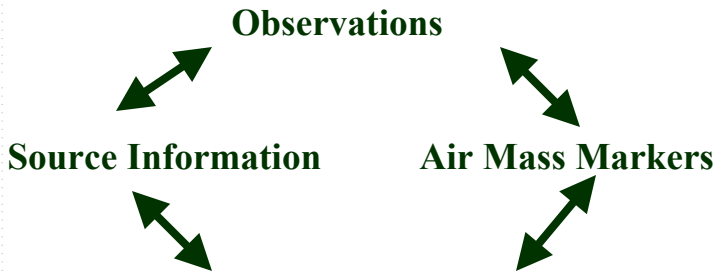
Figure 1.



Field Experiments Employ Mobile "Super-Sites" & Provide Opportunities to Characterize Emissions

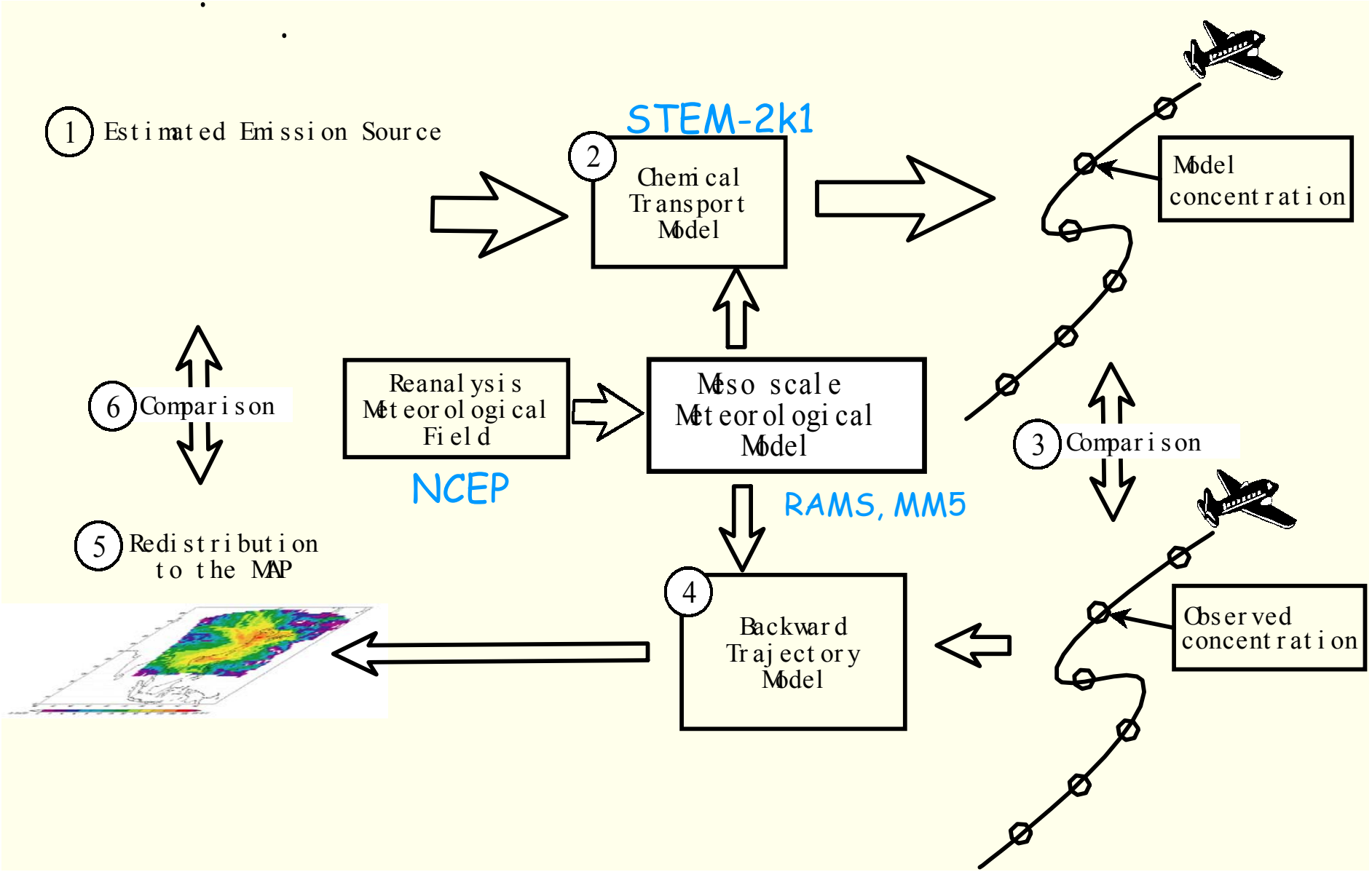


The Informatics Problem:

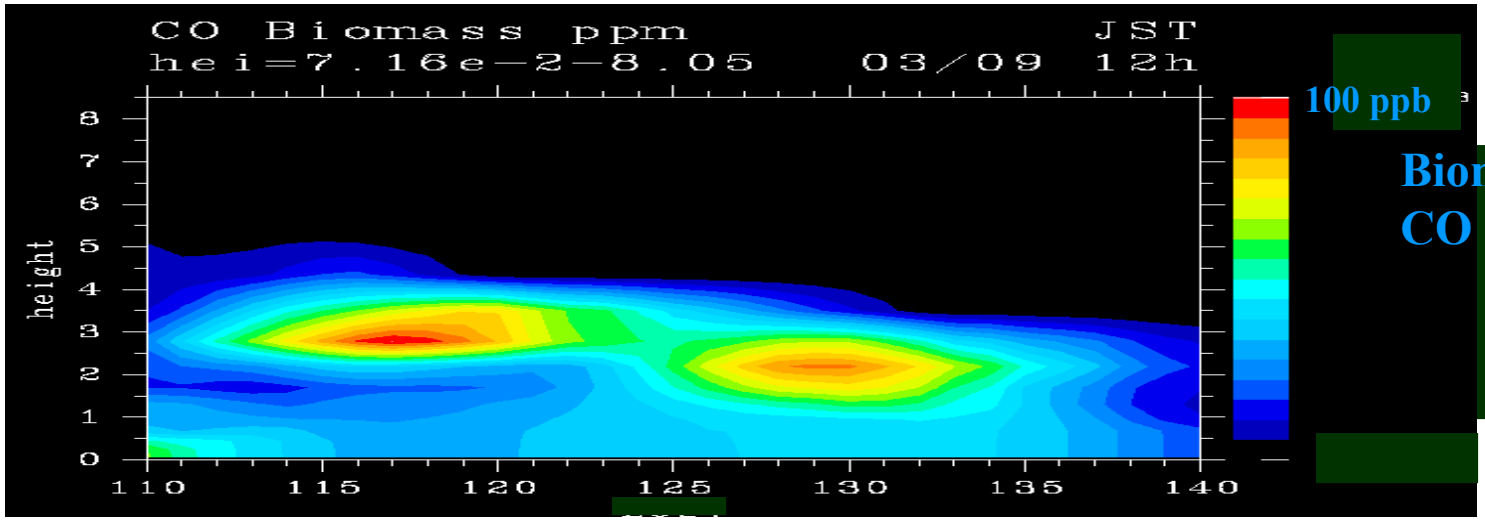


Freidli et al., JGR submitted

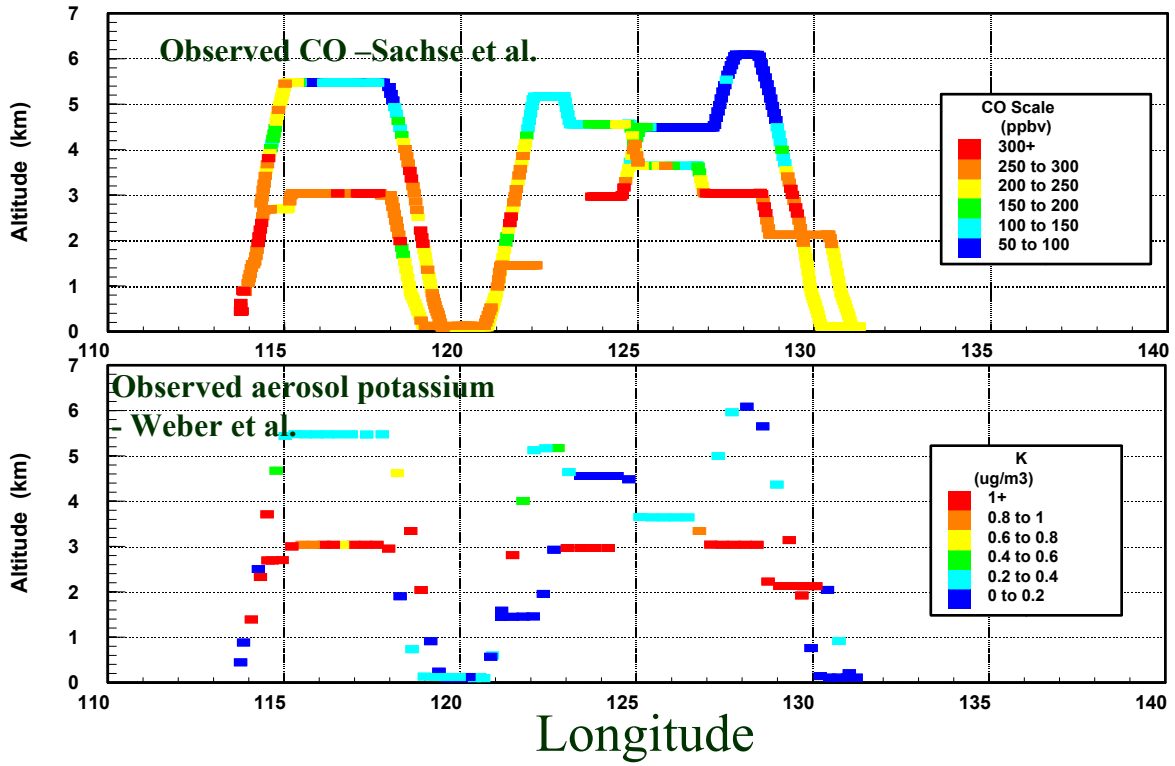
Schematic of Analysis

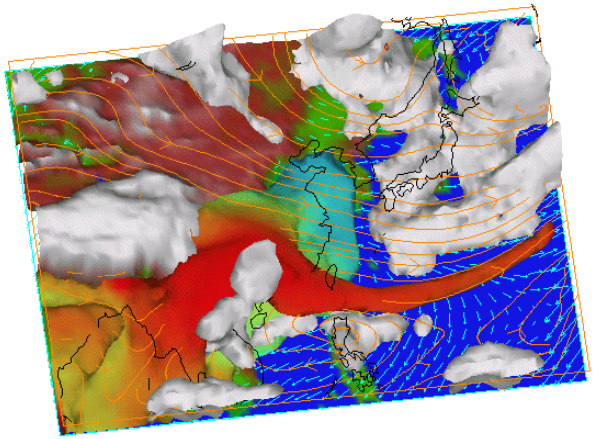


Example of Use of Model with Emission Markers
Frontal outflow of biomass burning plumes east of Hong Kong

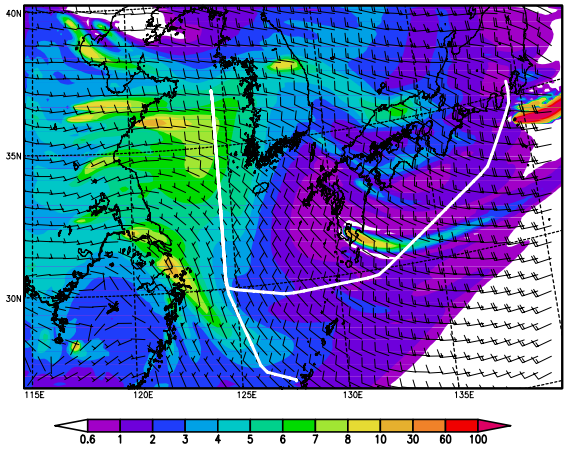


Biomass burning CO forecast



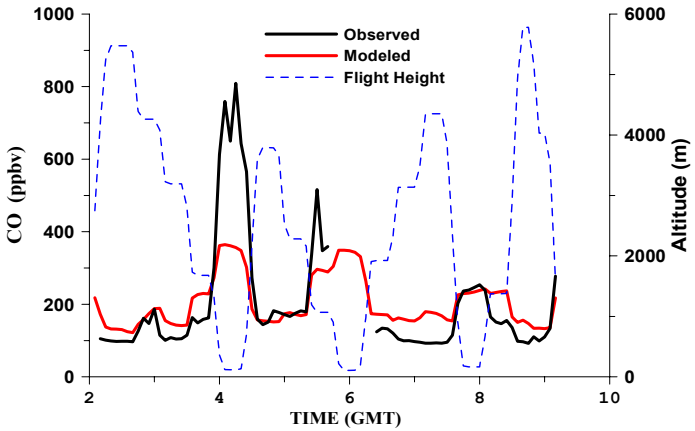


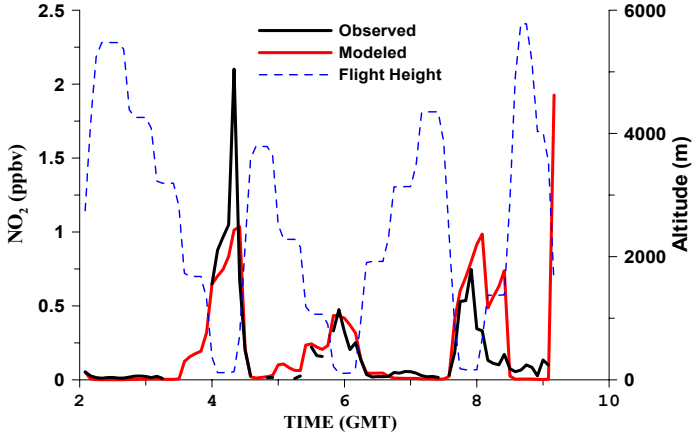
SO2

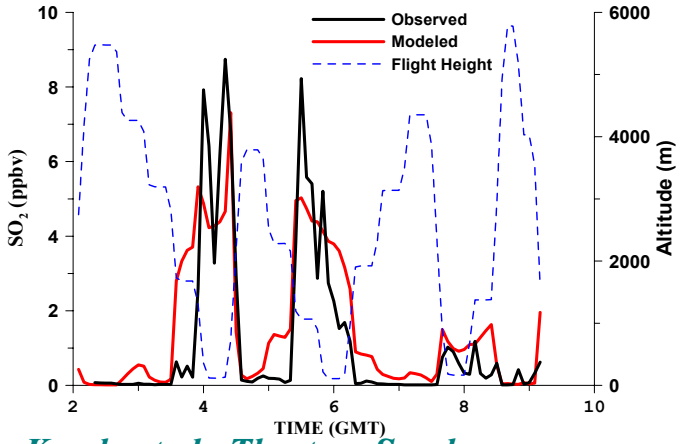


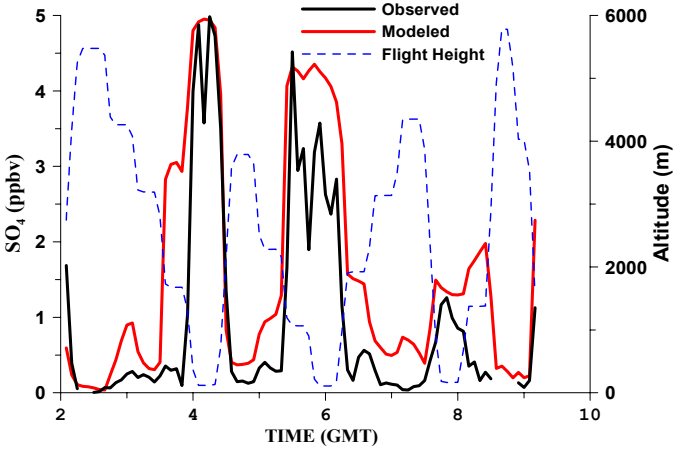
P-3B

Large-Scale Structure is Captured by Model – but Peaks are Underestimated



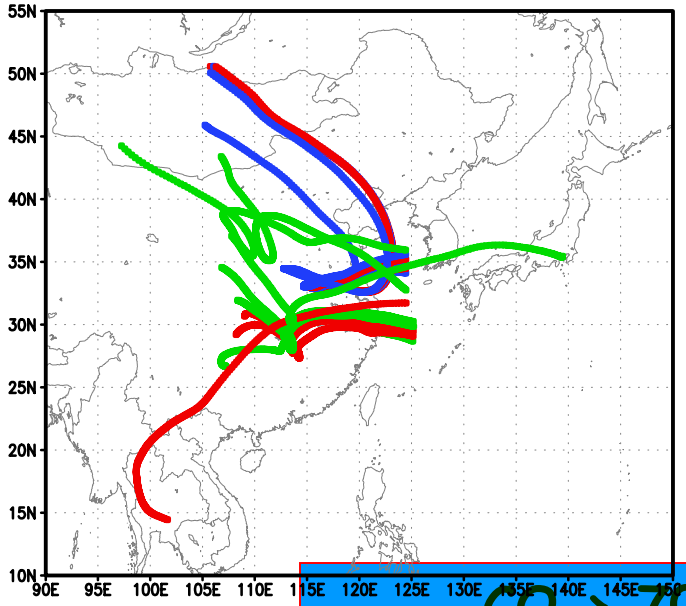


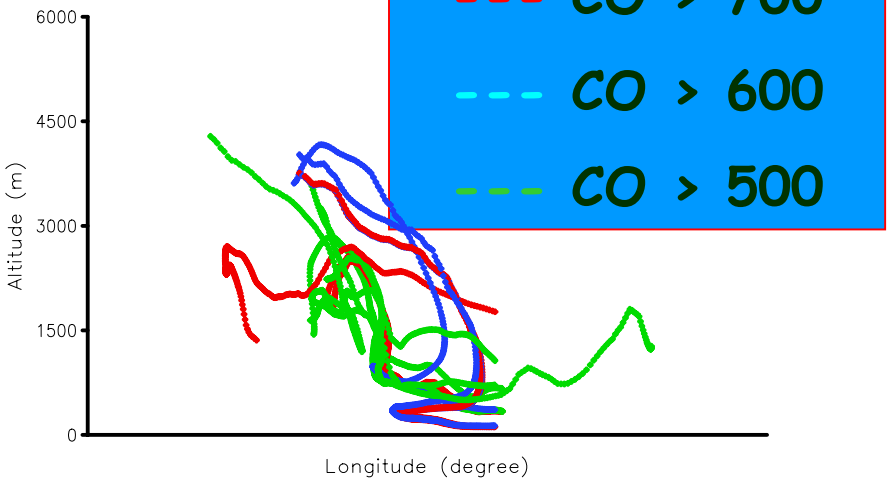




Data: Kondo et al., Thorton, Sacshe

Under-predicted Points Are in the Yellow Sea

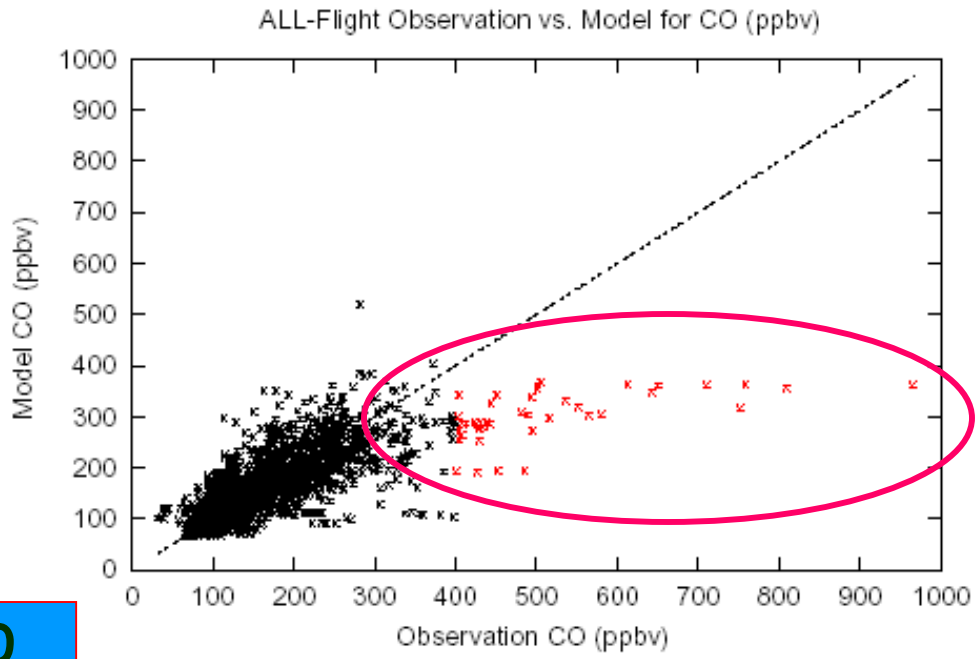




CO > 700

CO > 600

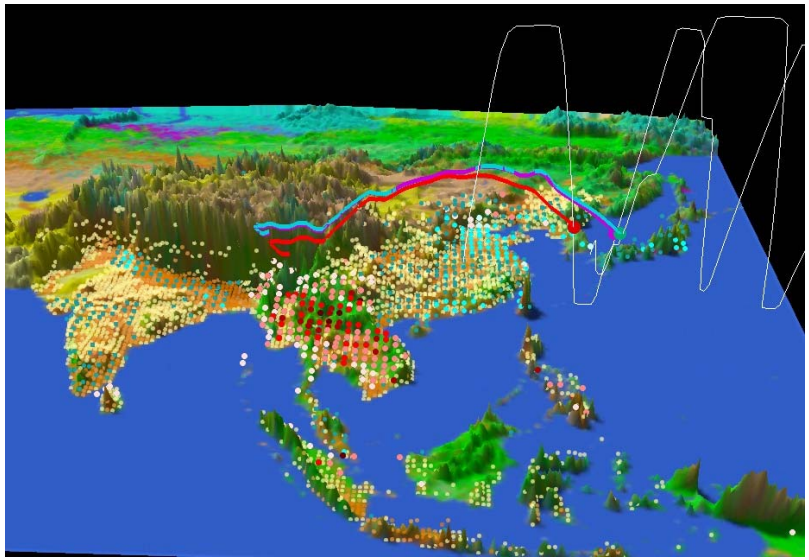
CO > 500



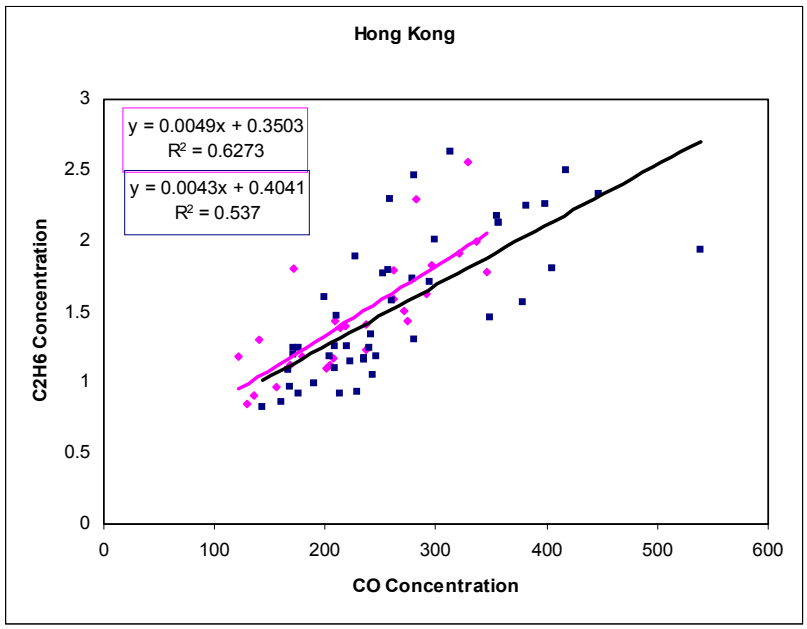
What does this tell us about the model?

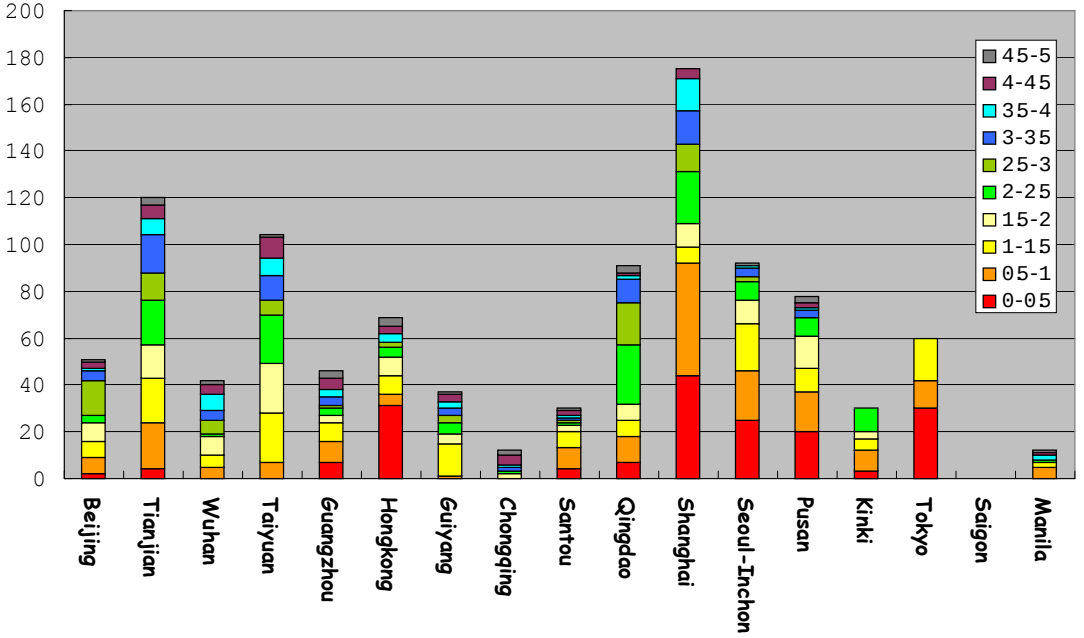
-Model deficiency?

-Emissions problem?

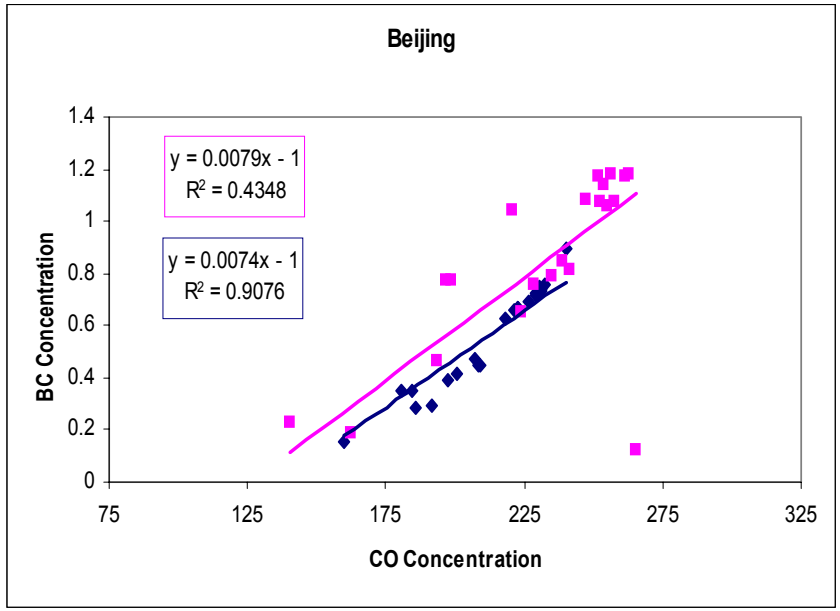


Observed and Modeled Ratios Can Be Classified By Source Region Using Trajectories - Age Can Also Be Estimated





The BC and CO Concentrations are Under-predicted – but the Ratios are Accurately Captured

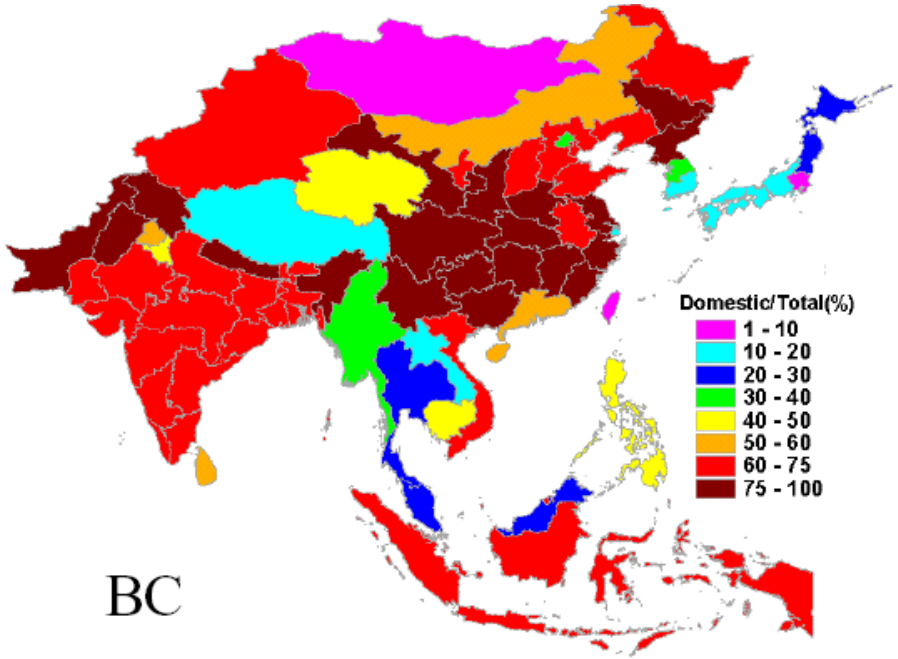


ΔBC/ΔCO

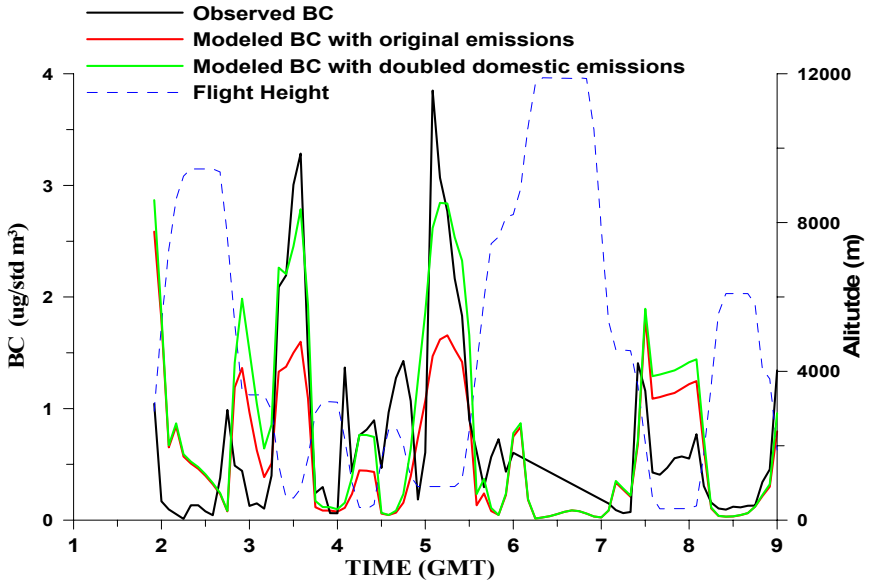
		Ratio	R-square
Shanghai	Obs	0.0107	0.9556
	Model	0.0092	0.8772
	Emission	0.0083	
Tianjian	Obs	0.0102	0.8266
	Model	0.0084	0.6412
	Emission	0.014	
Tokyo	Obs	0.0226	0.8793
	Model	0.0205	0.9412
	Emission	0.0193	
Pusan	Obs	-0.016	0.06351
	Model	0.0072	0.3258
	Emission	0.0159	
Qingdao	Obs	0.0186	0.02618
	Model	0.0076	0.7707
	Emission	0.0148	

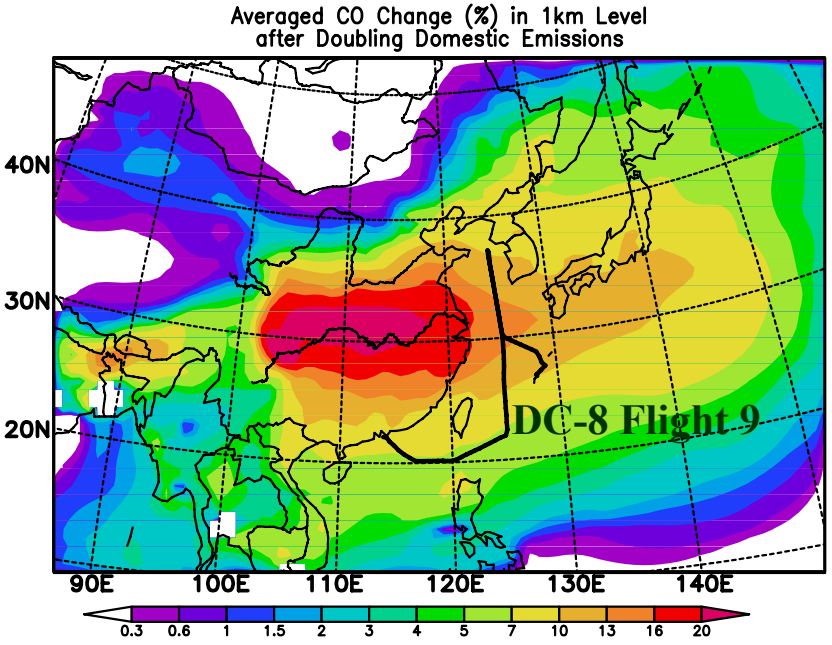
This analysis suggests we need to look for improvements in a specific sector

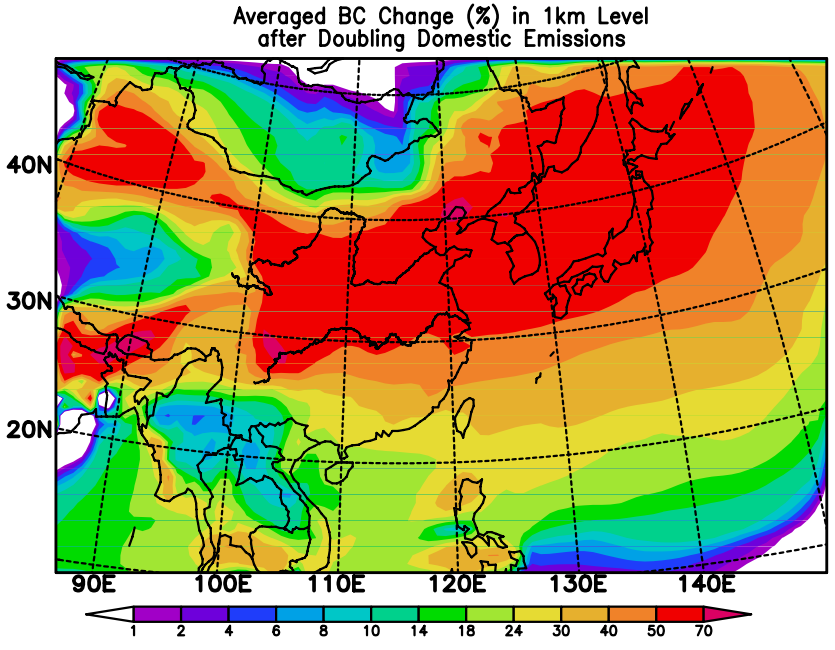
Domestic Sector??



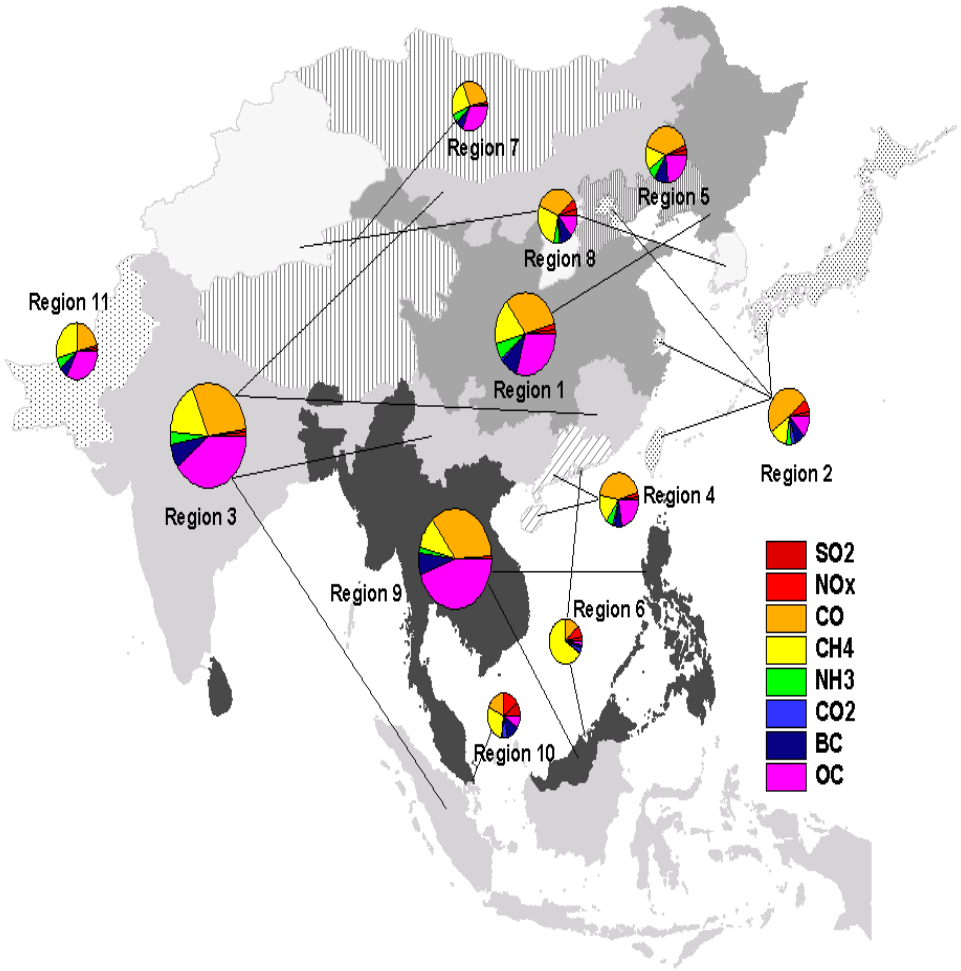
Simulated and Observed BC during DC-8 Flight #9 (03/10/2001)

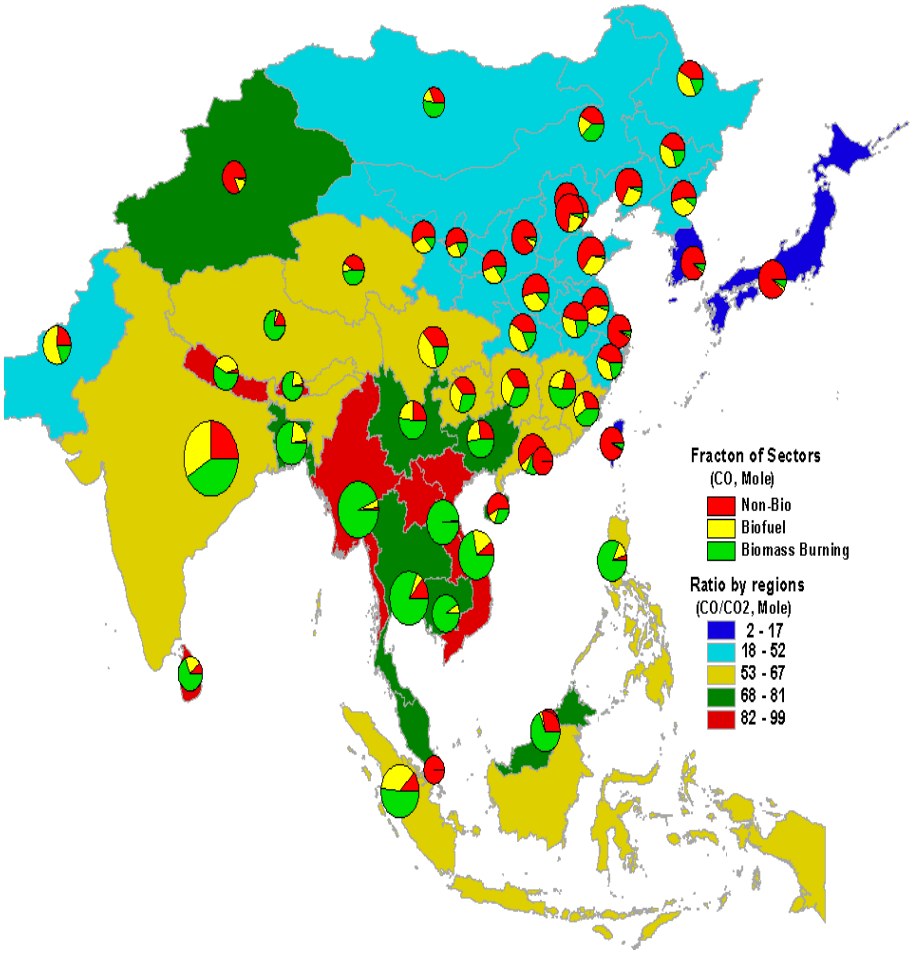




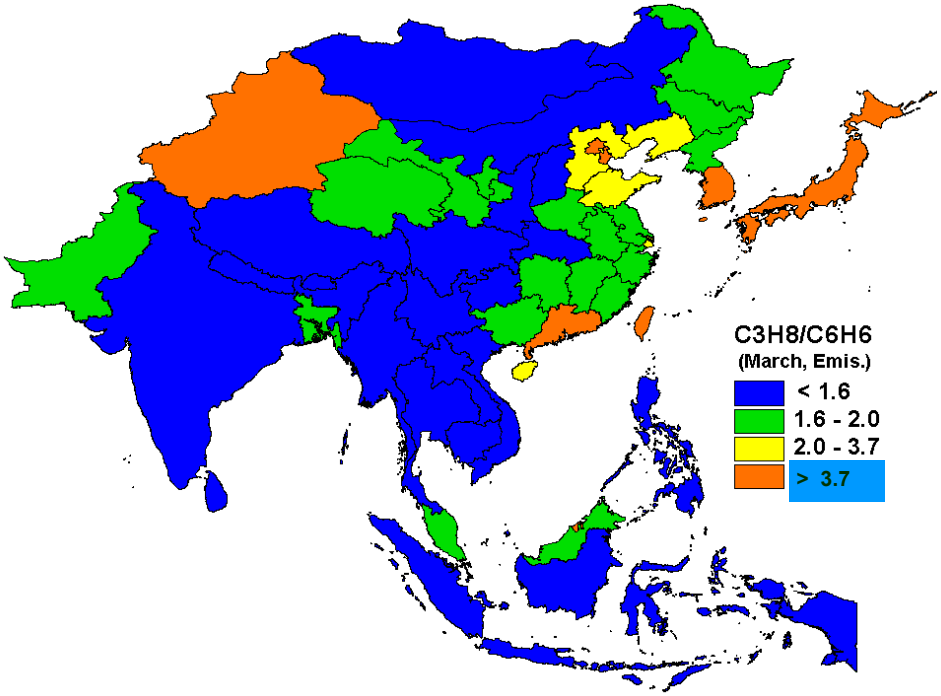


The Importance of Fossil, Biofuels and Open Burning Varies by Region -- Richness of Emissions Data Base Can be Exploited



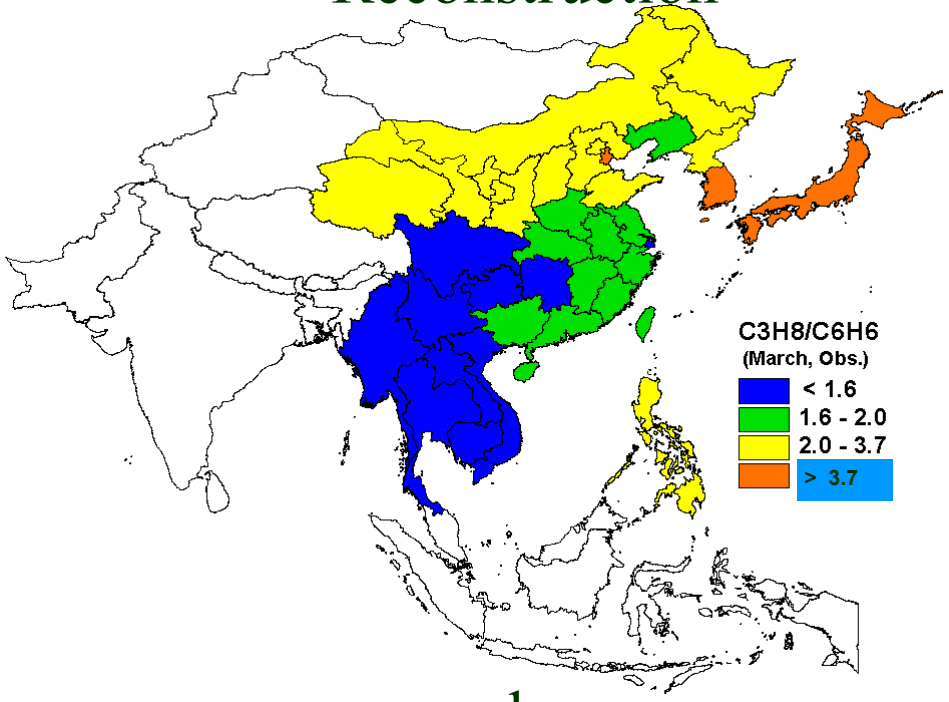


Estimated Emissions



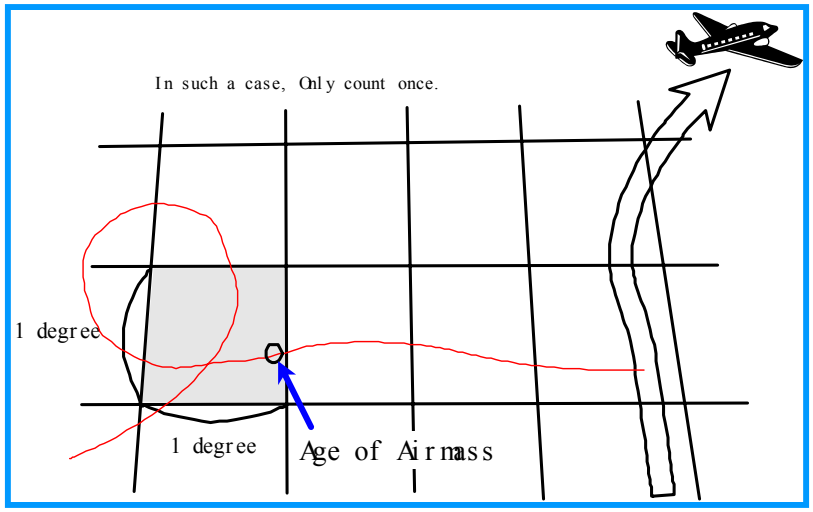
a

Observation Based Reconstruction

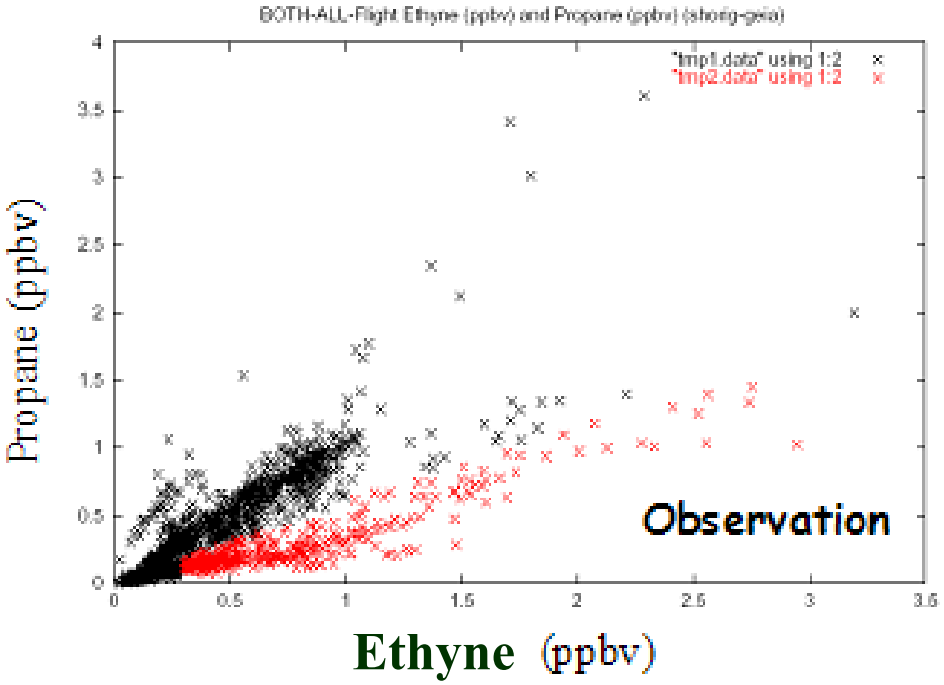


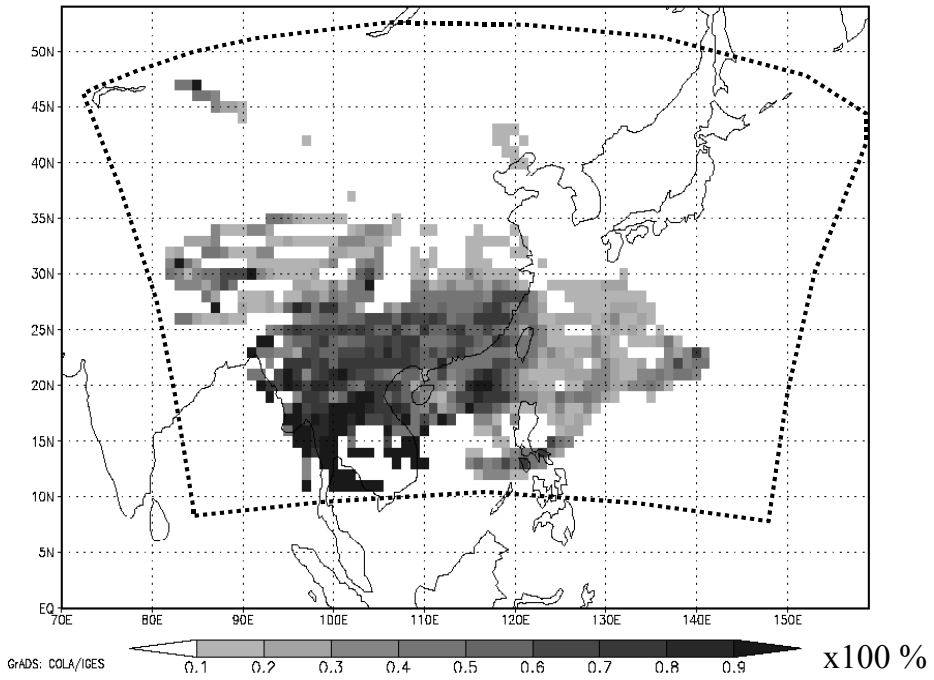
b

Can Useful Emissions Information Be Reconstructed Using Observed Ratios (or Concentrations)?



Regional Emission Signals Can be Identified and Tested

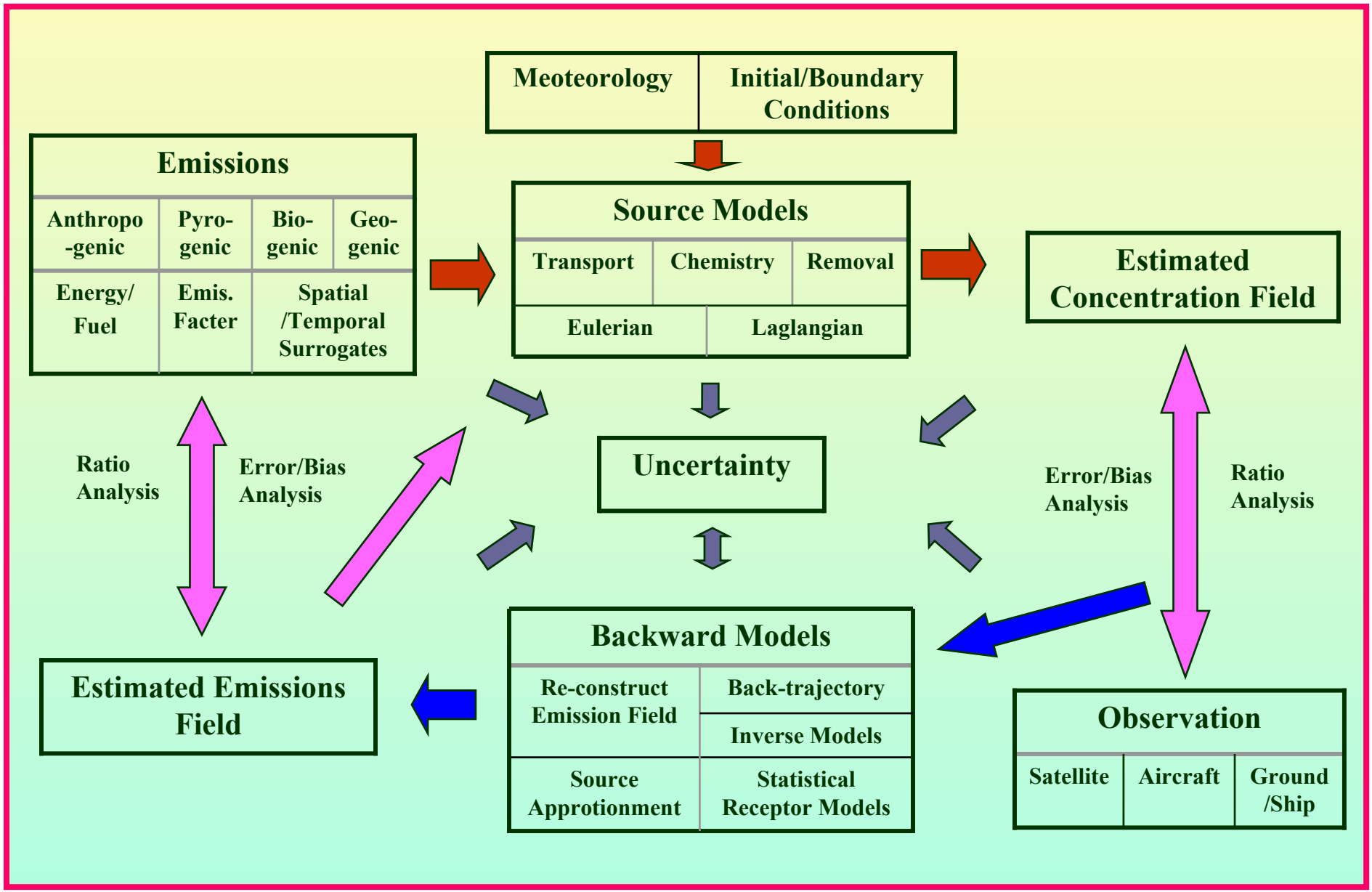




Two Relationships Are Observed

Red Points Come From SE Asia –With Heavy Influence From Biomass Burning

Improvements in Emissions Require Creative Combination of Bottom-Up and Top-Down Approaches



U. Iowa/Kyushu/Argonne/GFDL

FORS ASIA

Chemical weather FORecast System

With support from NSF, NASA (ACMAP,GTE), NOAA, DOE, JST