South American Smoke Coverage and Flux Estimations from the Fire Locating and Modeling of Burning Emissions (FLAMBÉ) System

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SPAWAR Systems Center San Diego

This is what we are up against:
Art Rangno, University of Washington 1995

FLAMBÉ Method:

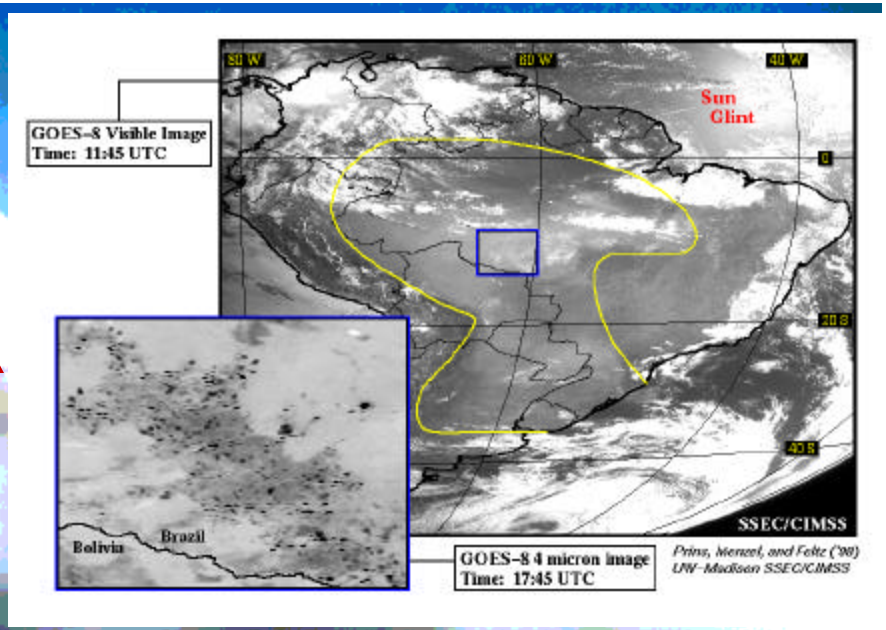
Remote Sensing Fire Detection (ABBA)

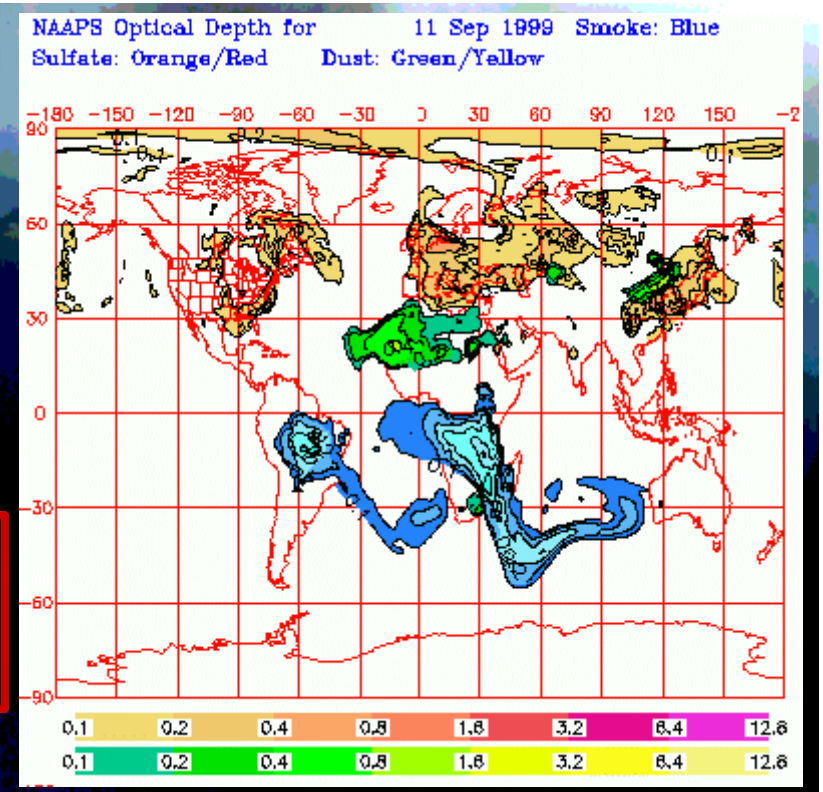
Emission Product

NAAPS Transport

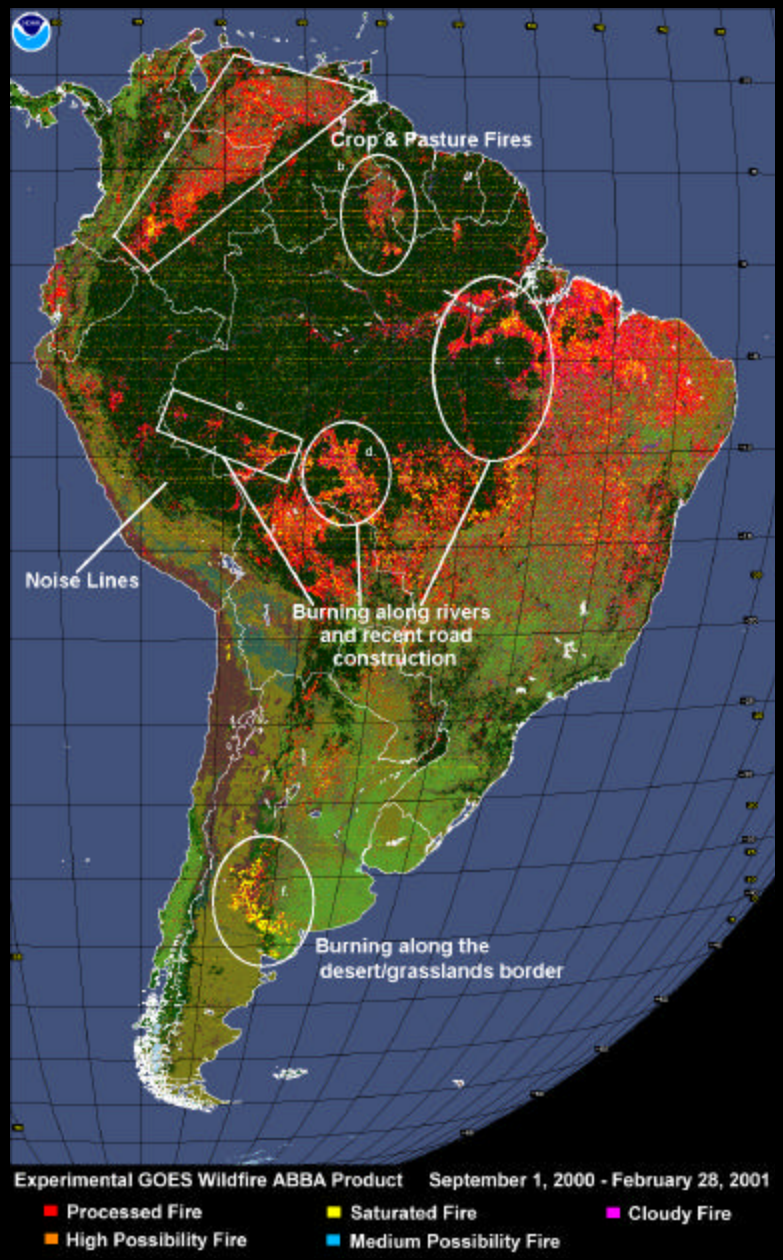
4D-Data Assimilation?

Microphysics and Radiation Routines





Current FLAMBÉ Status

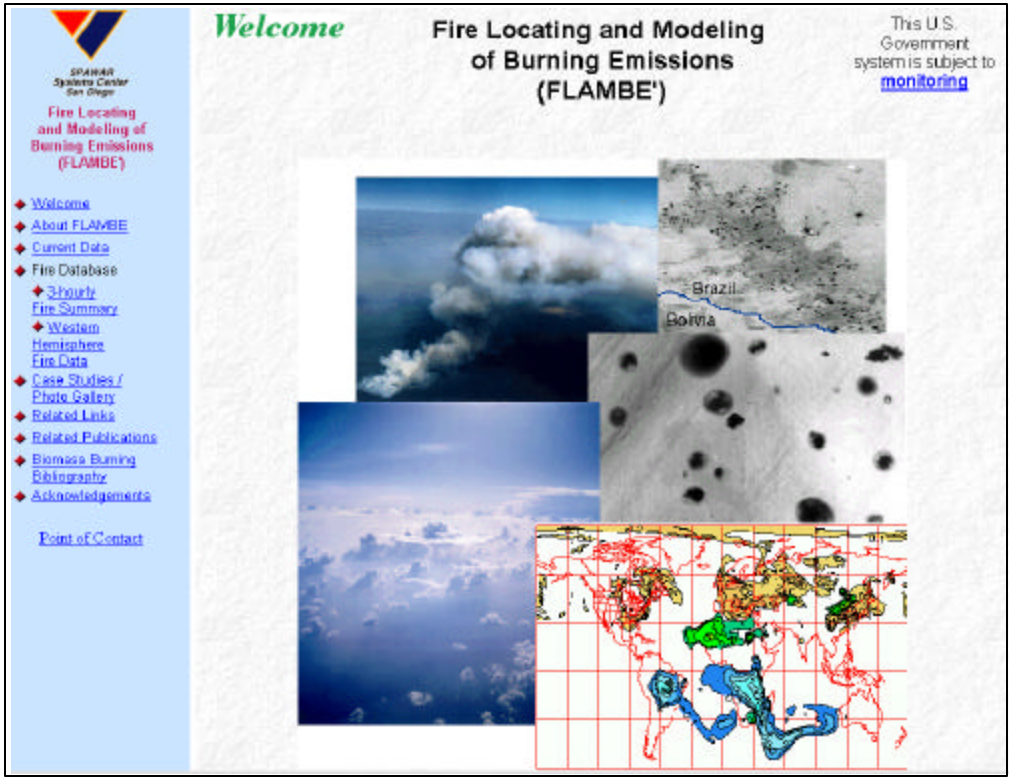


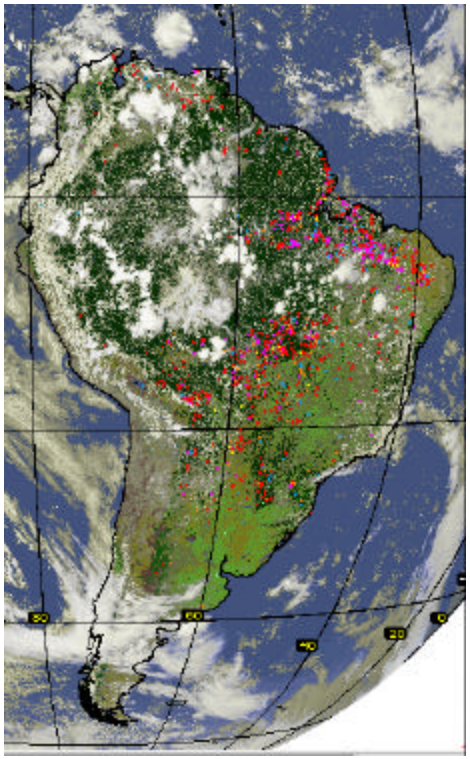
- Real-time fire products every half-hour for Western Hemisphere (GOES ABBA).
- Working to integrate daily MODIS fire products for rest of the globe.
- Continued emission function development and real time filtering.
- Real-time integration of fire products into global meteorology and aerosol models: OPERATIONAL.
- Real time over ocean forcing calculations currently being integrated.

FLAMBÉ Web Pages

http://aerosol.spawar.navy.mil/flambe

http://cimss.ssec.wisc.edu/goes/burn/wfabba.html





Date-Time Range:	Min: 09-OCT-2001 1645 Max: 24-OCT-2001 1945	from	23-OCT-2001	0000	to 24-OCT-2001	0000
Satellite:	◉ GOES-8 (Eastern U. S. and South America) ○ GOES-10 (Western U. S. and Central America)					
Longitude:	from -131	to -35				
Latitude:	from -55	to 62				
Filtering:	◉ All data ○ Filtered and noise-reduced data					Submit

Consider the First Step:Source Characteristics

$$Net\ Emission\ for\ fire\ i = (Area)\cdot(FuelLoad)\cdot(CombustionFraction)\cdot\langle EF\rangle_{ni}$$

Implemented Fuel Type and Fuel Load (Kauffman, Guild, etc…)

a. Grass-Pasture

-Agriculture, savanna, etc…

b. Forest

-Boreal, tropical broadleaf, scrub etc…

Questions:

1. CLOUDS AND OUTAGES!-Factor of 2

2. Fire Detection Fraction-Factor of 2

3. Fuel statistics/ Upper or lower story

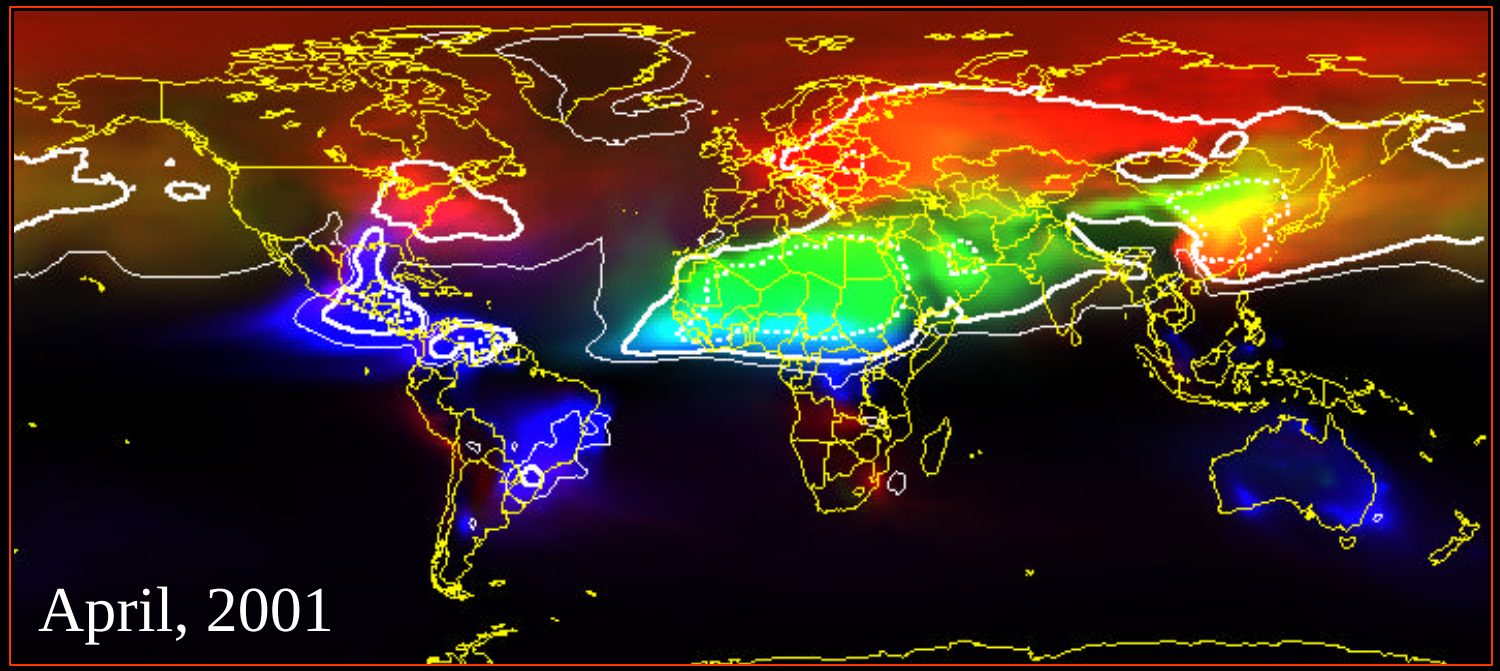
4. Combustion efficiency /Fire intensity/Fire temperature

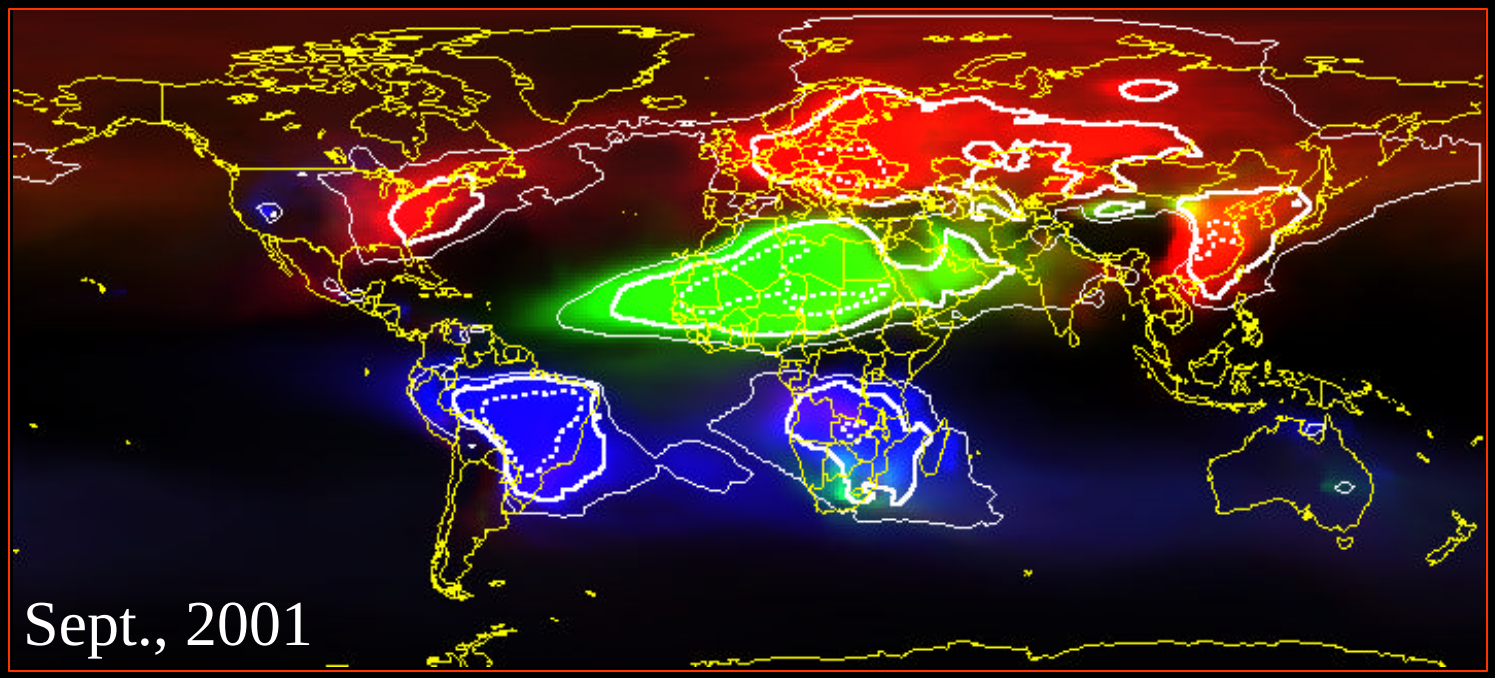
NAAPS

Urban

Dust

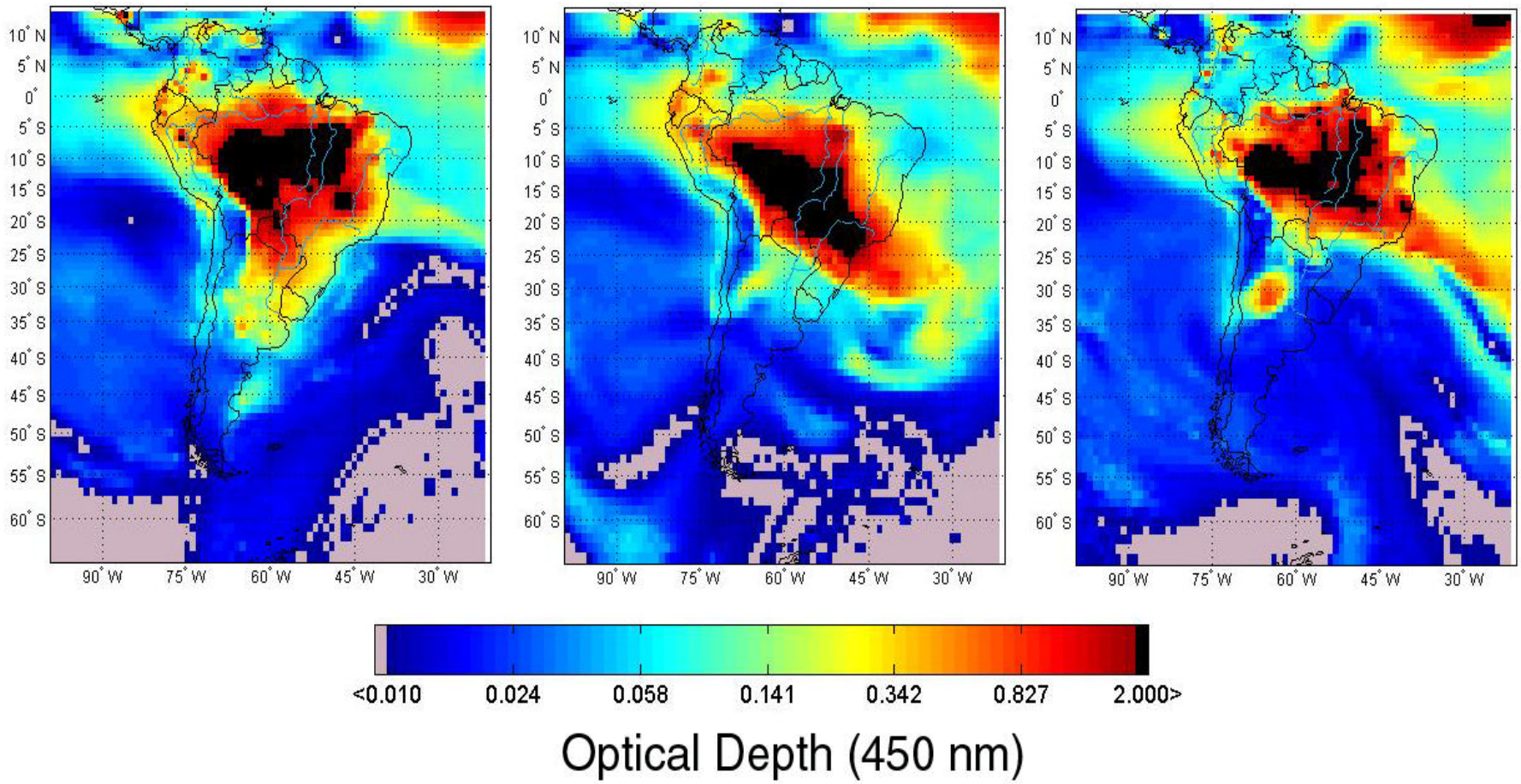
Smoke





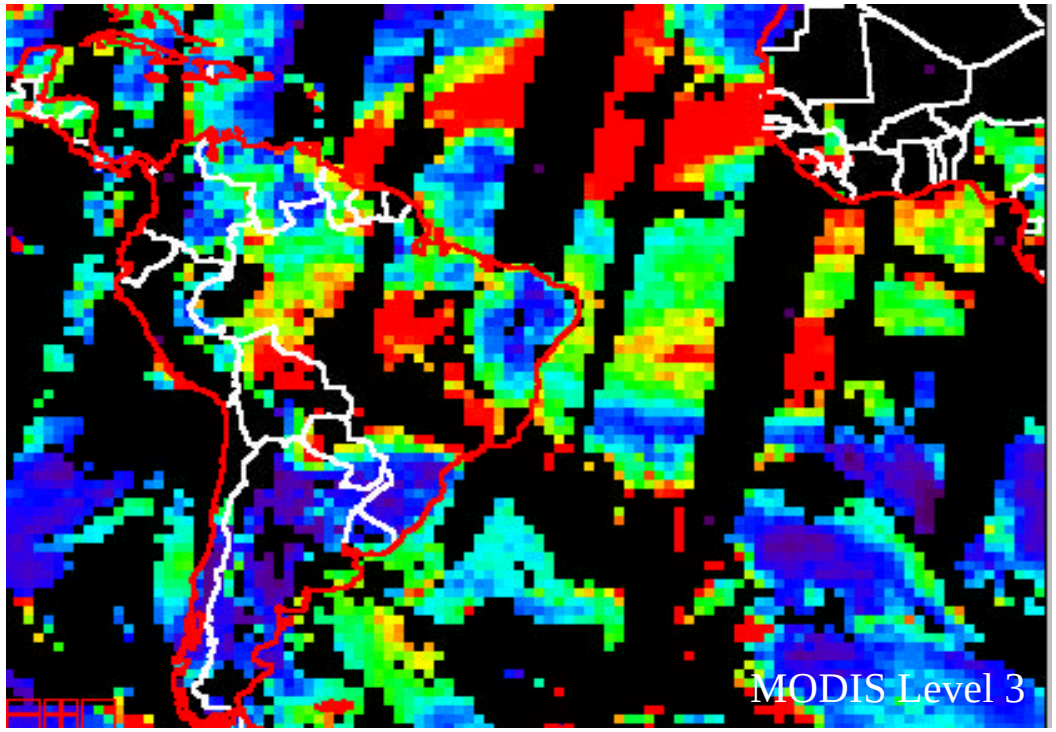
AOT	
0.1	———
0.2	———
0.5	.....

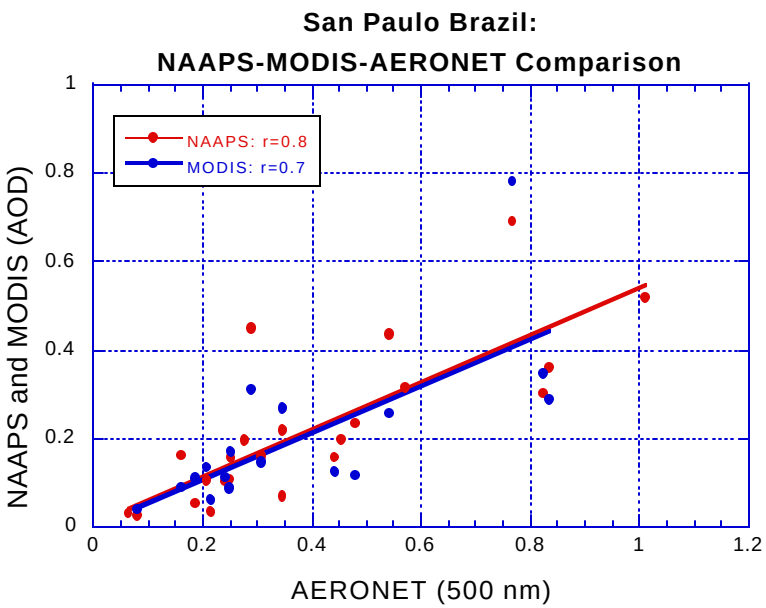
South America Dry Season Transport Patterns: Sept. 14-16, 2001

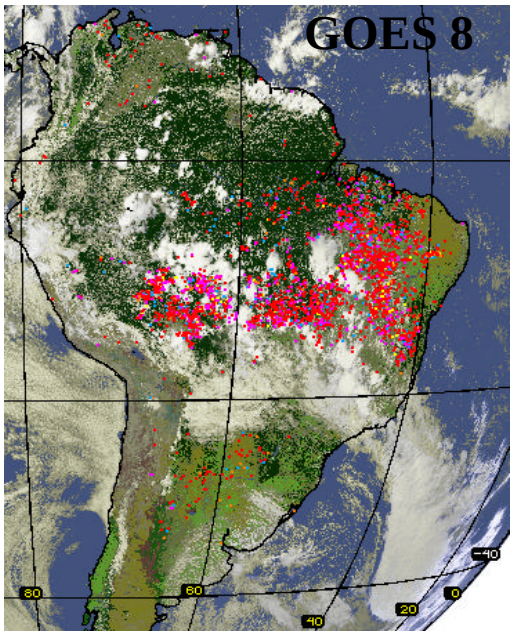


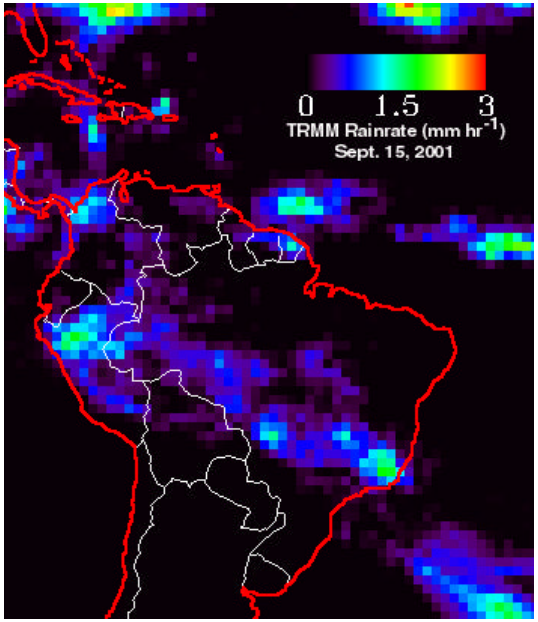
Sept 15: A case study

- Cold front transports smoke into the S. Atlantic Ocean.
- Moderate rainfall in isolated cells.
- Clouds prevent monitoring by satellite.
- In clear air areas MODIS and NAAPS qualitatively agree.
- Events such as these occur every 5-7 days.

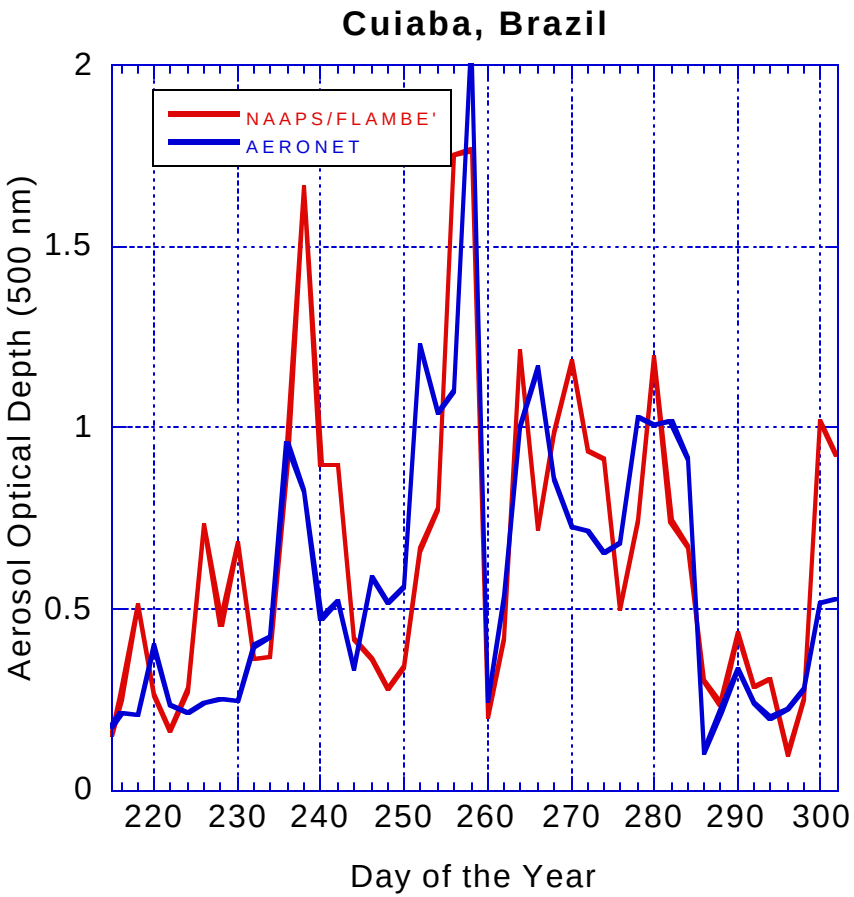


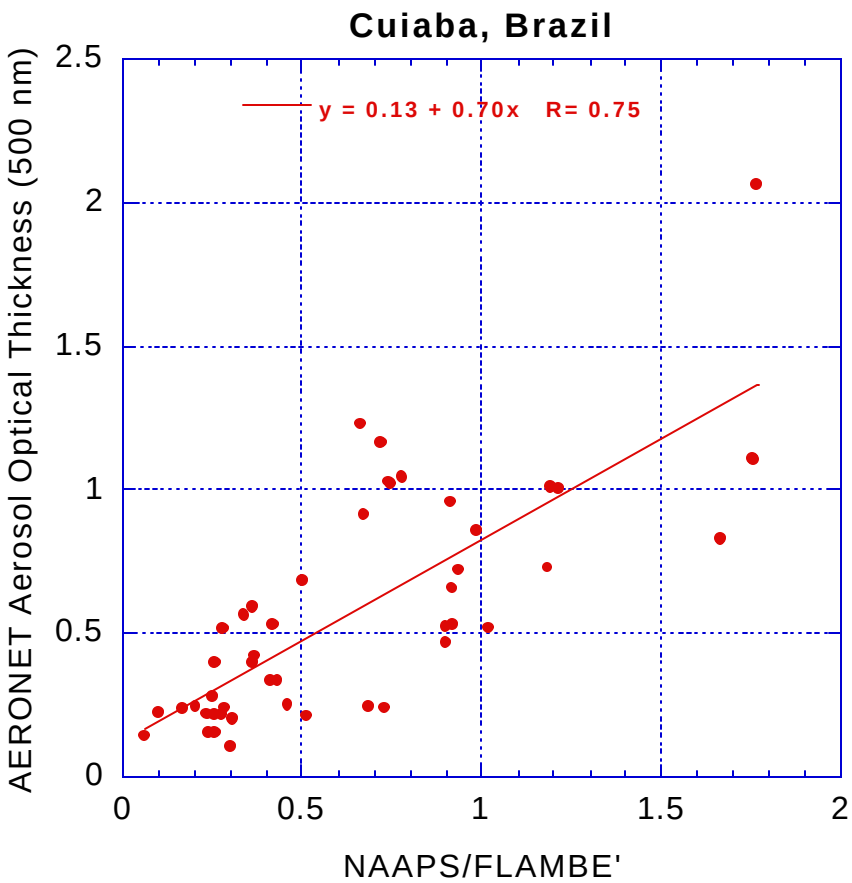




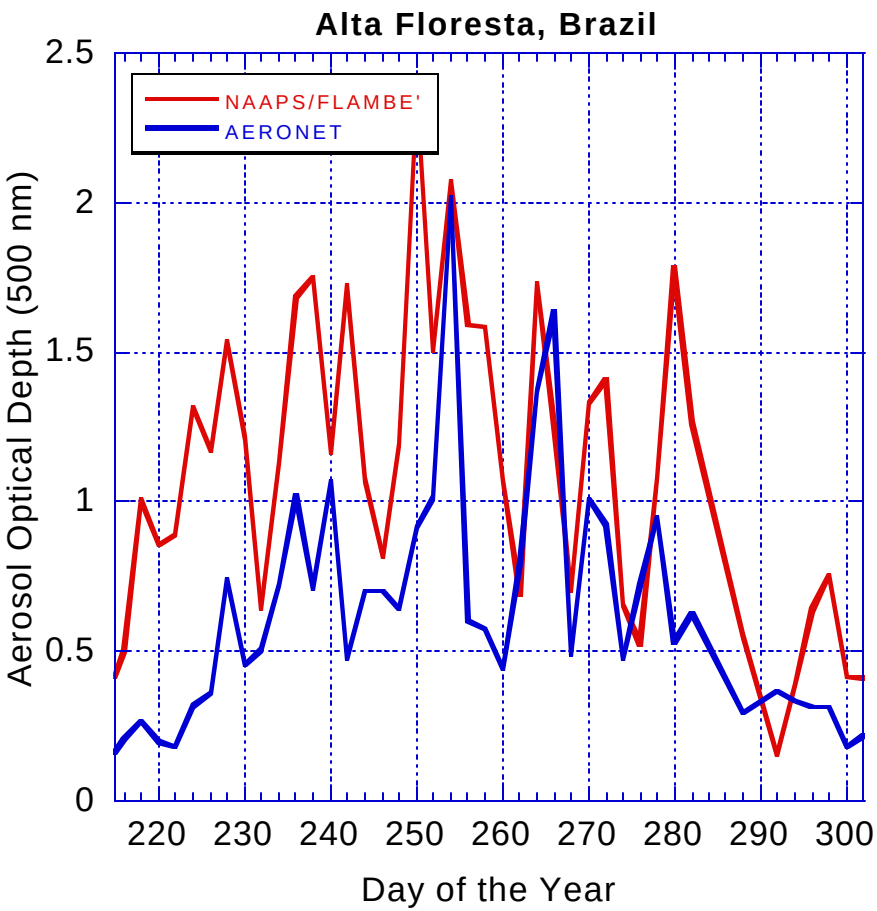


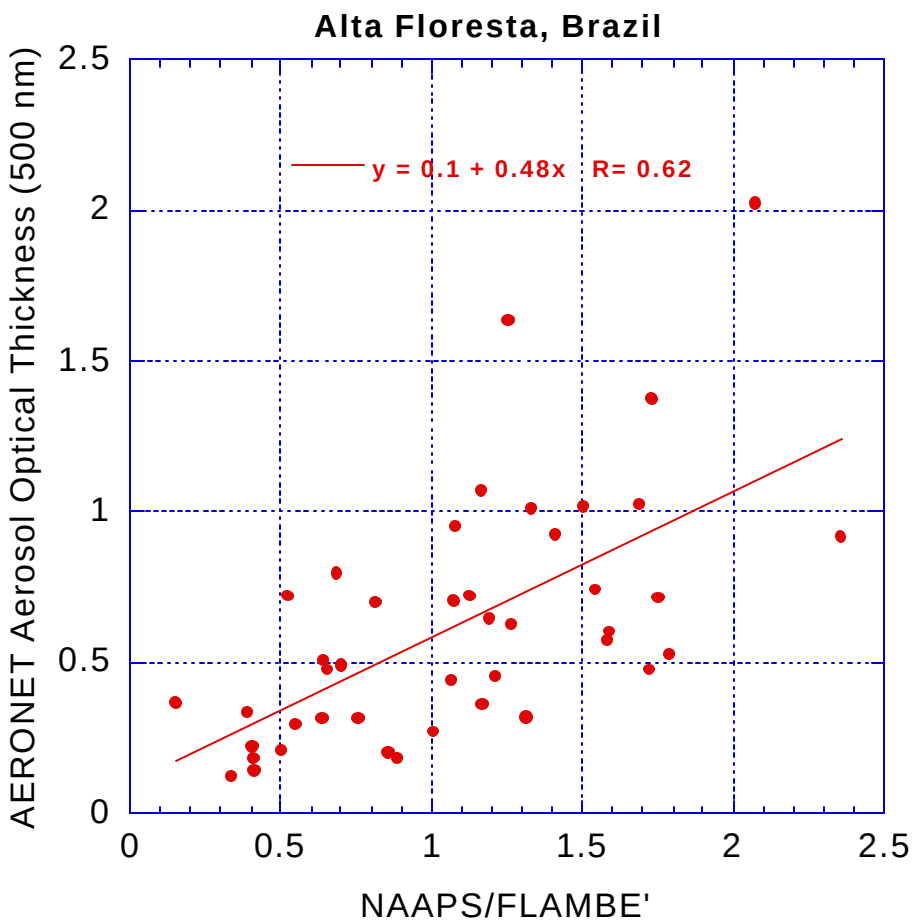
NAAPS-AERONET 48 hr. Comparison
Cuiaba, Aug-Oct. 2001
Mean Bias: ~30%





NAAPS-AERONET 48 hr. Comparison
Alta Floresta, Aug-Oct. 2001
Mean Bias ~50%





FLAMBE' Direct Calculation
Particle Flux Uncertainties

<u>Extensive:</u>

Fire Sampling: Factor of 2-4

Burn Area: Factor of 2

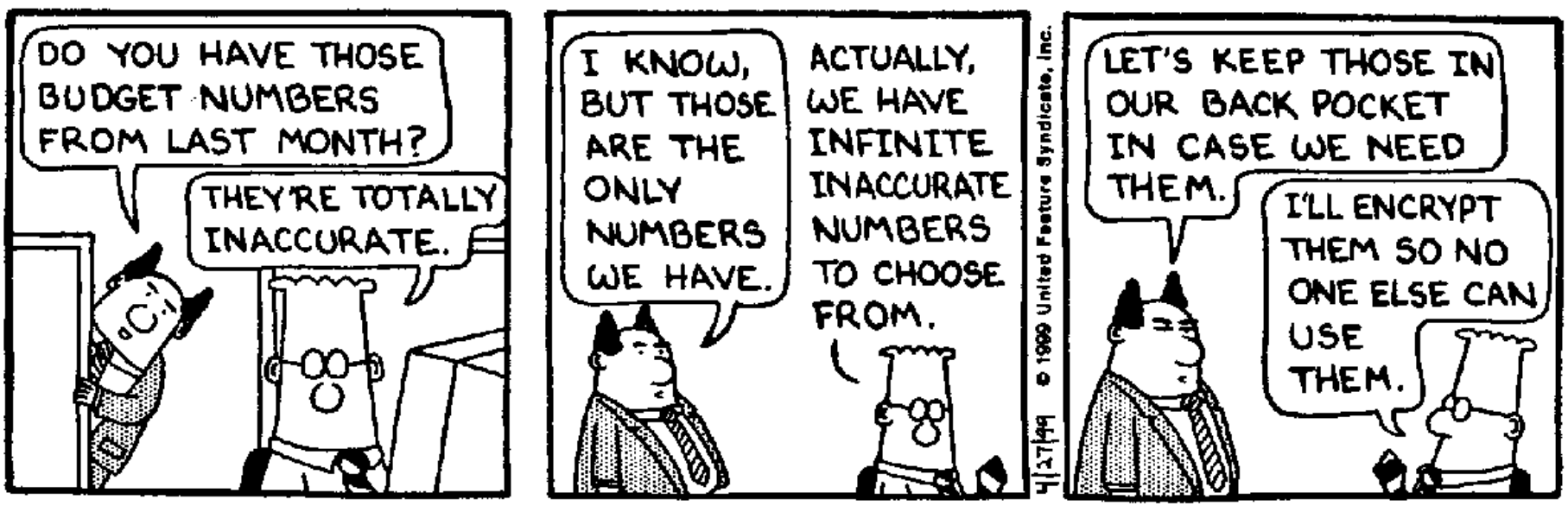
Navigation/Ecosystem: ?

<u>Intensive:</u>

Fuel Load: Factor of 2-3

Emission Factors: 30-60%

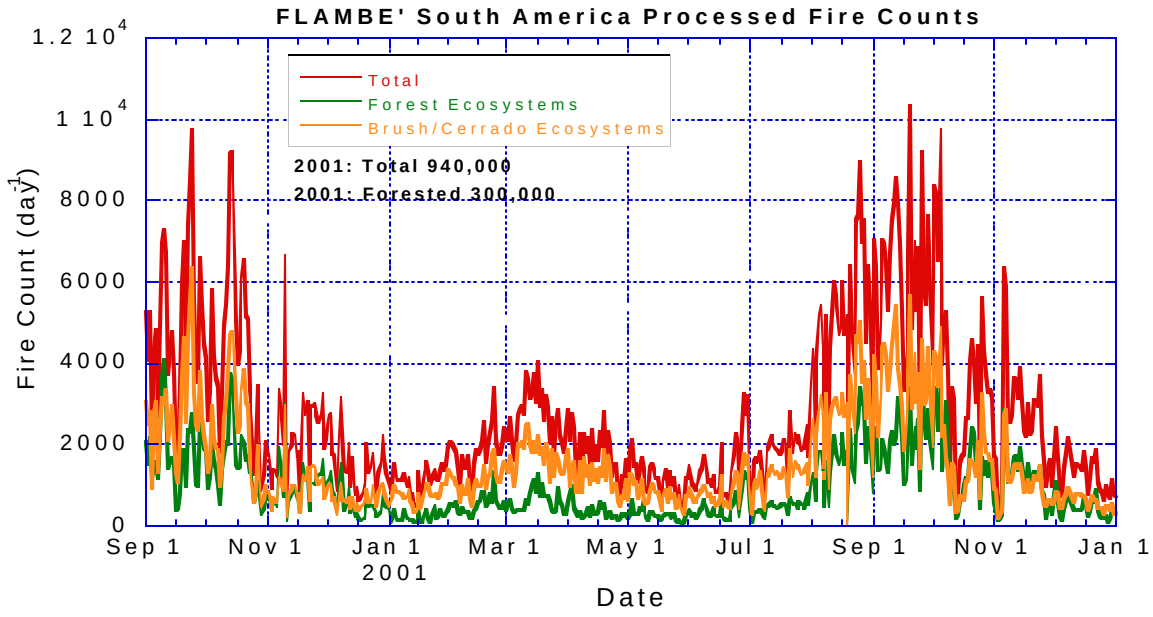
Combustion factor:20%



FLAMBE' Flux Estimates:

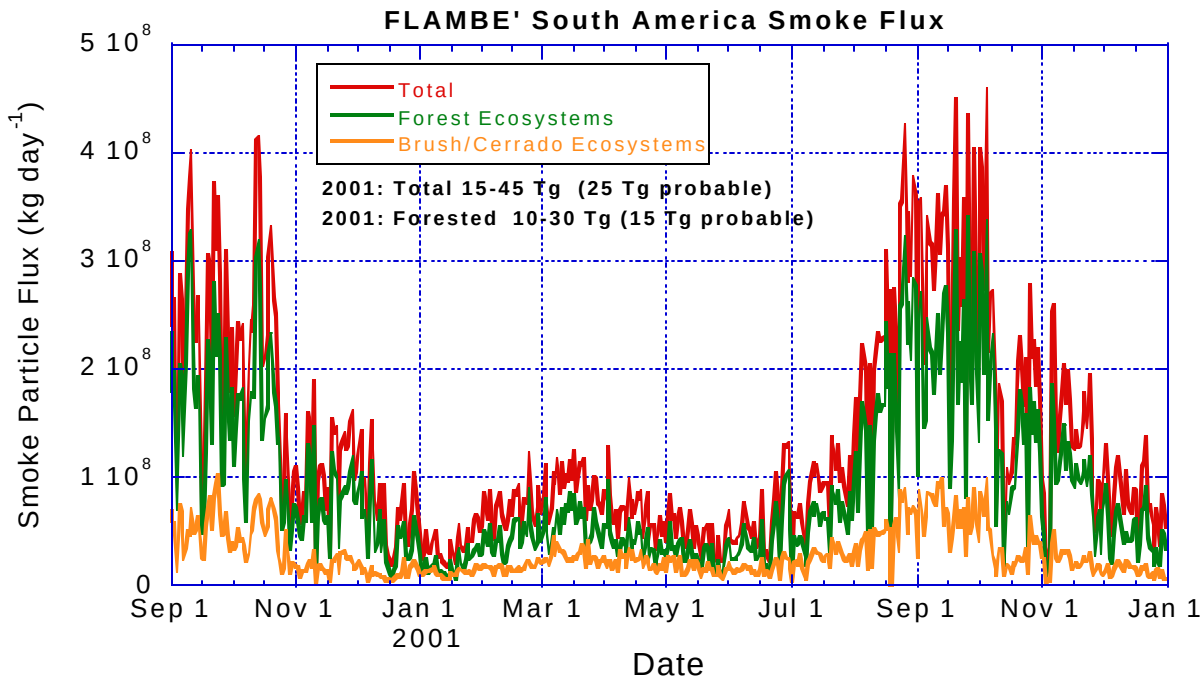
<u>Processed+Saturated Fires:</u>

South America: 940,000
Forested Regions: 35%
Cerrado: 30%
Grass and Shrub 20%
Other: 15%

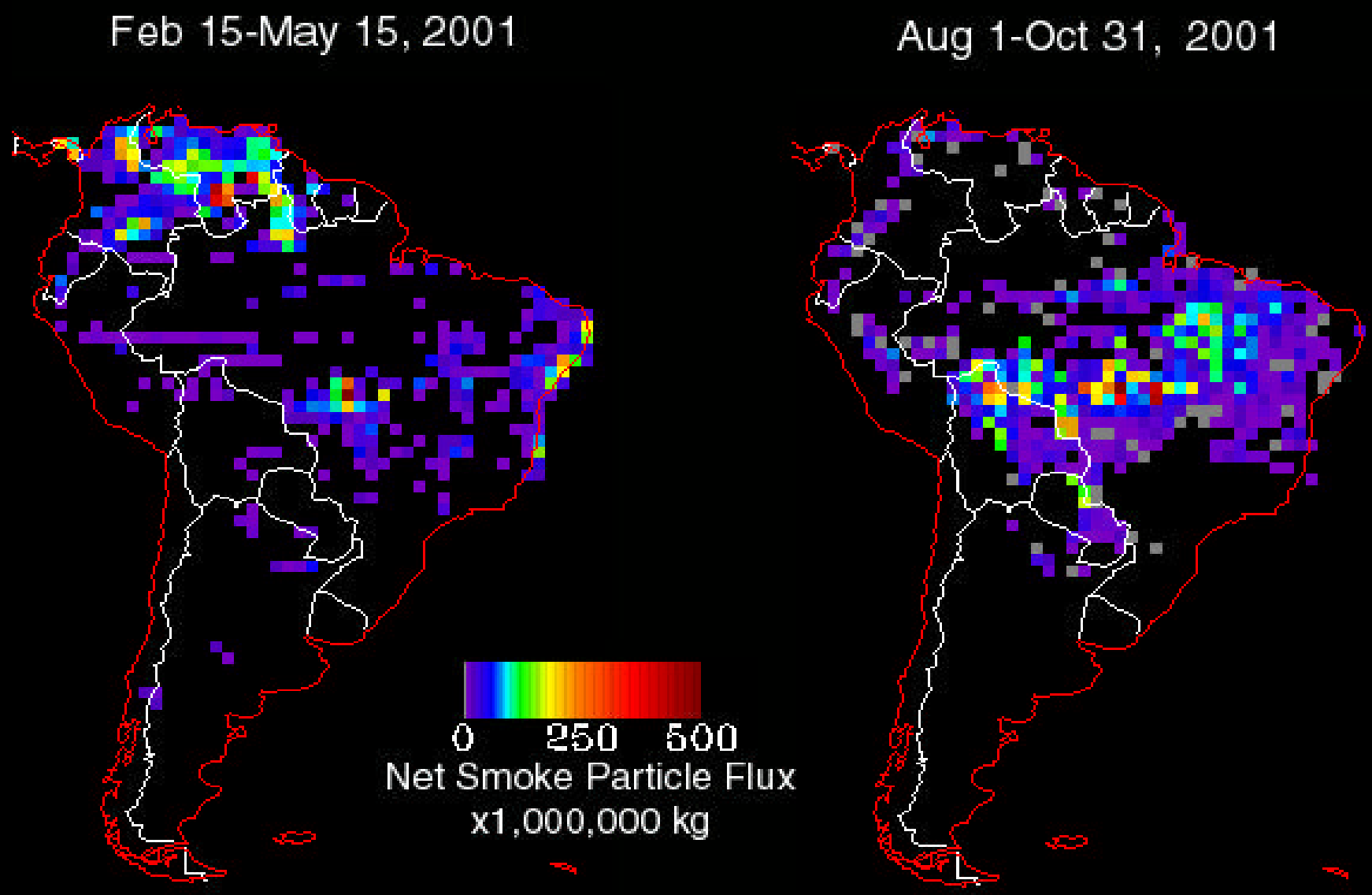


<u>Smoke Particle Fluxes:</u>

South America: 25 Tg
Forested Regions: 70%
Cerrado: 13%
Grass/Shrub: 7%
Other: 5%



Regional Flux Estimates



Future...

1. Modify flux algorithm.
2. Radiative flux algorithm in real time.
2. Start reanalysis of Sept. 2000-2001.
3. Incorporate MODIS products.
4. Make grid products available online.
5. COAMPS simulations.
6. Incorporate GOES 9/MSG/MTSAT as they comes online.