Regional transport of biomass burning products to Buenos Aires by the South American Low Level Jet

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General objectives:

- Assess the air quality in Buenos Aires
  - Source of urban air pollution
  - Receptor of regional pollution
  - Atmospheric circulation patterns
    - dispersion mechanisms

Specific objectives:

- Study the contribution of biomass burning to the regional pollution in BA

- Analyze the role of the South American Low Level Jet (SALLJ) as transport mechanism

Questions:

- How often do the regional plumes reach Buenos Aires?
- Do they significantly affect the air quality in the city?
- Is there any particular circulation pattern that contributes to the transport?.

Data and Methodology

- ***Fire spots in the "source region"***

  CPTEC (http://www.cptec.inpe.br)

- ***South American Low Level Jet***

  GDAS (NCEP) analyses and Bonner's criterion

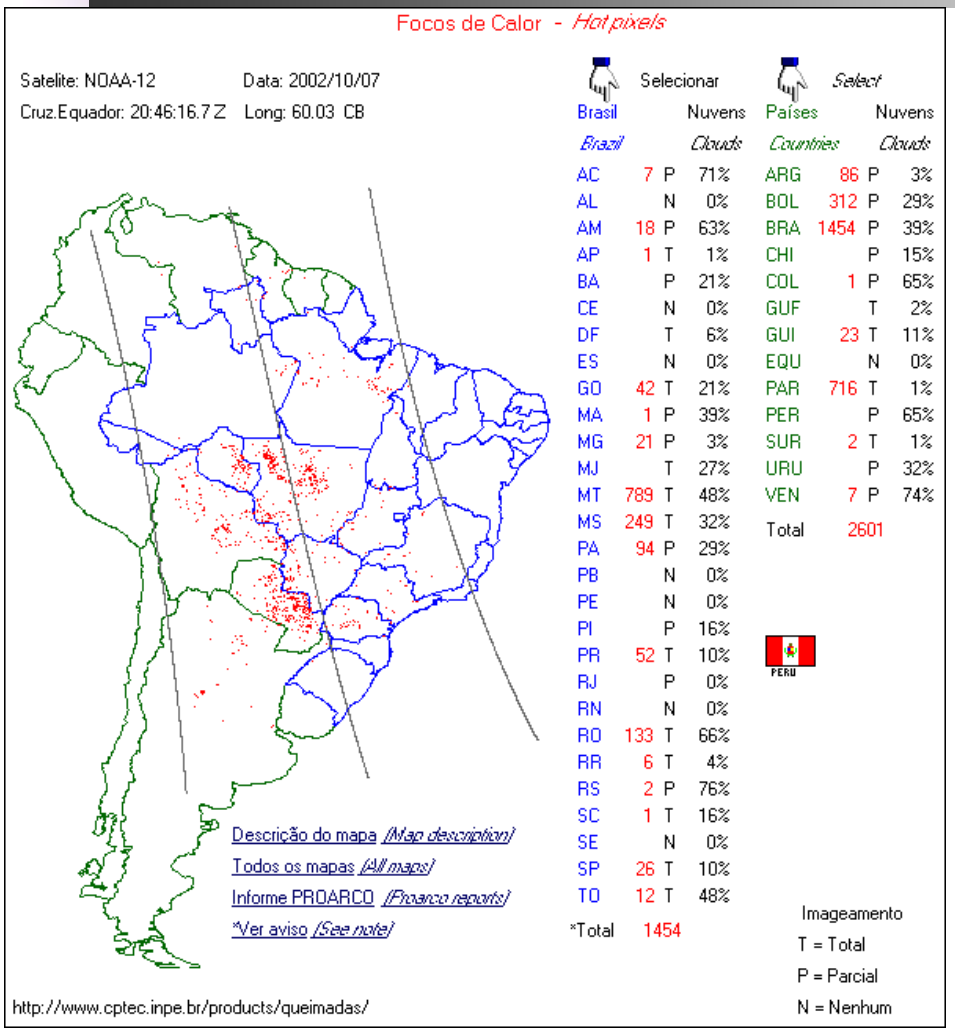
- ***Aerosol Optical Thickness (AOT)***

  AERONET CEILAP BA (34° 34' S ,58°30'W)
  (http://aeronet.gsfc.nasa.gov)

Climatology **Period: 2001 - 2005**

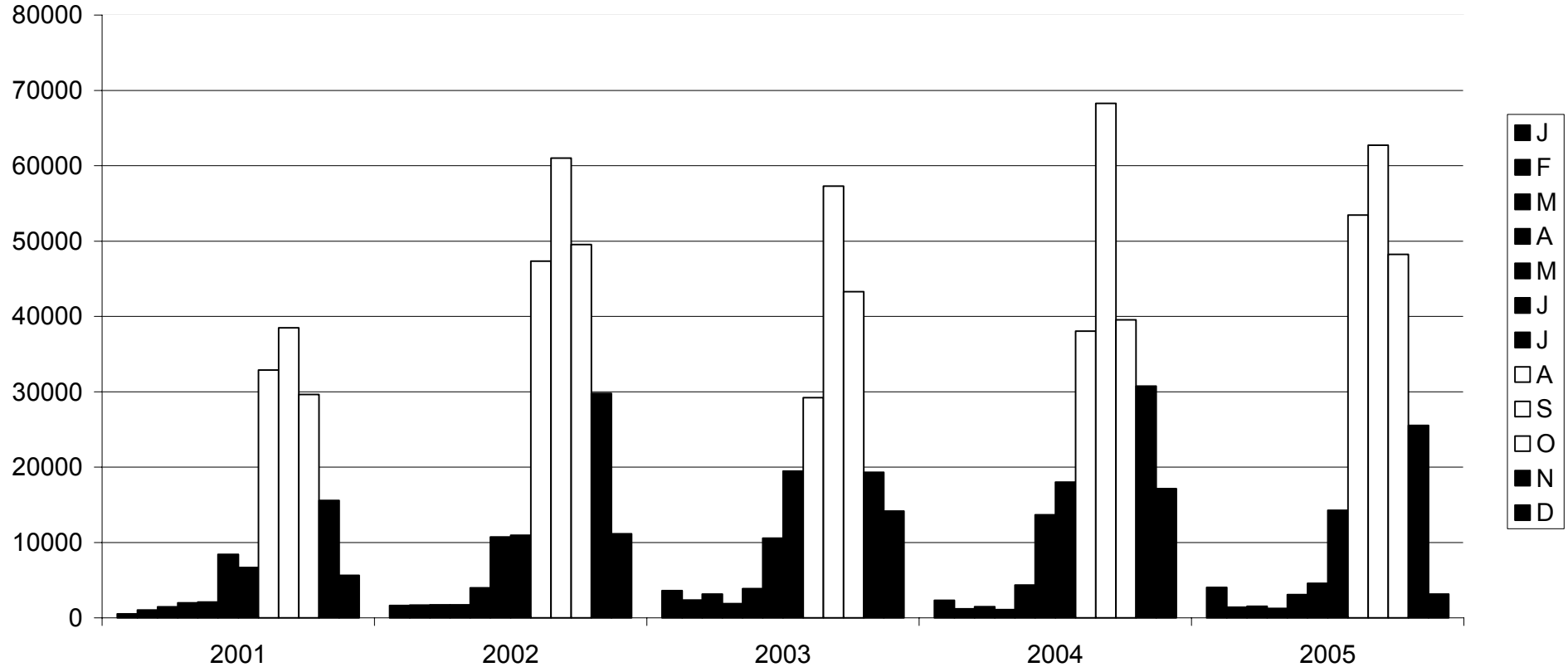
Fires in the "source region"

http://www.cptec.inpe.br



Number of fires and seasonal variation 2001- 2005

http://www.cptec.inpe.br

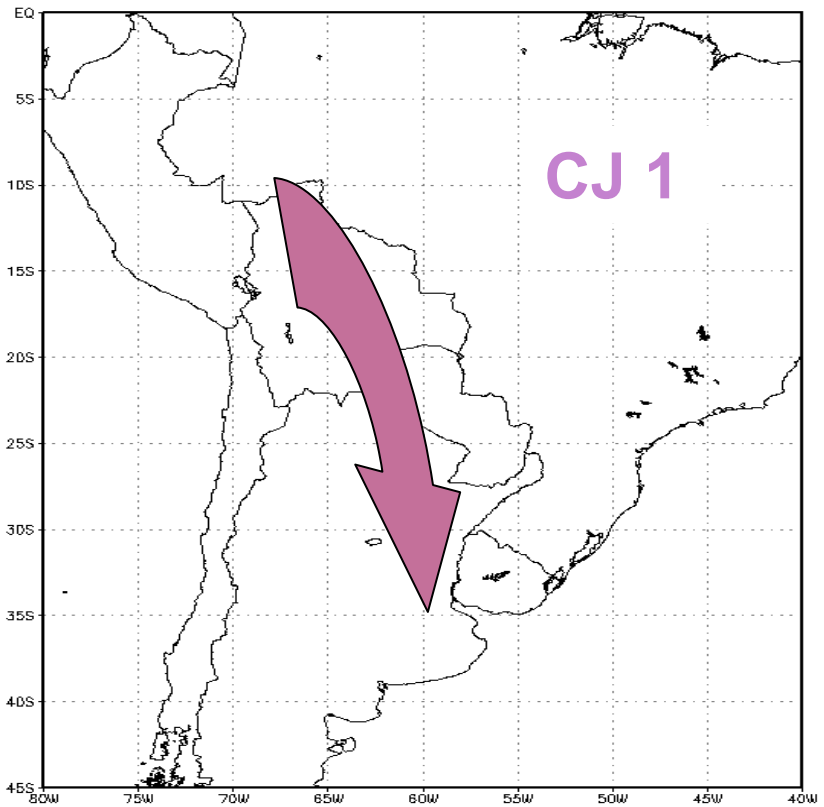


Biomass Burning : August to October

Period: 2001 - 2005

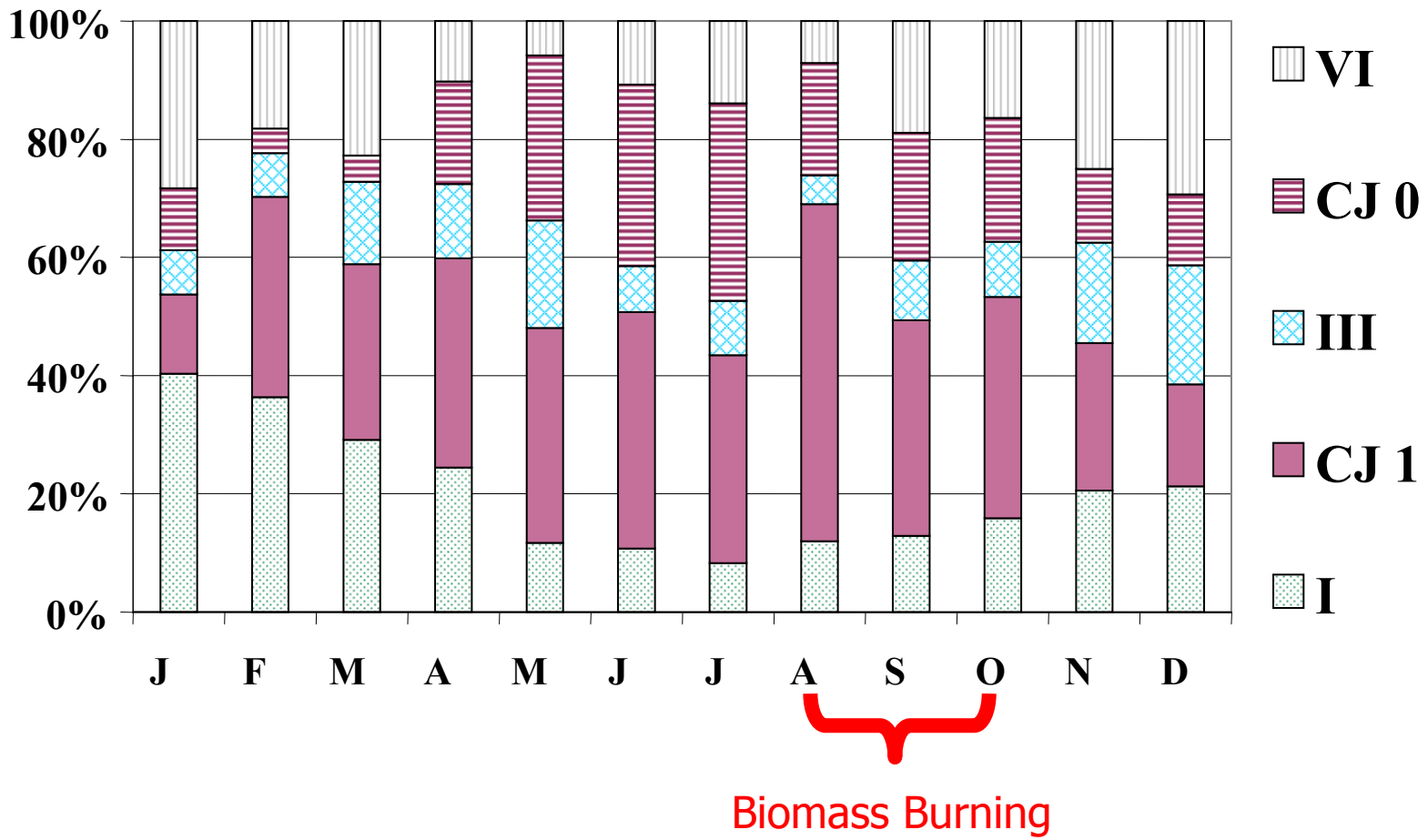
30% LLJ events

6 Categories

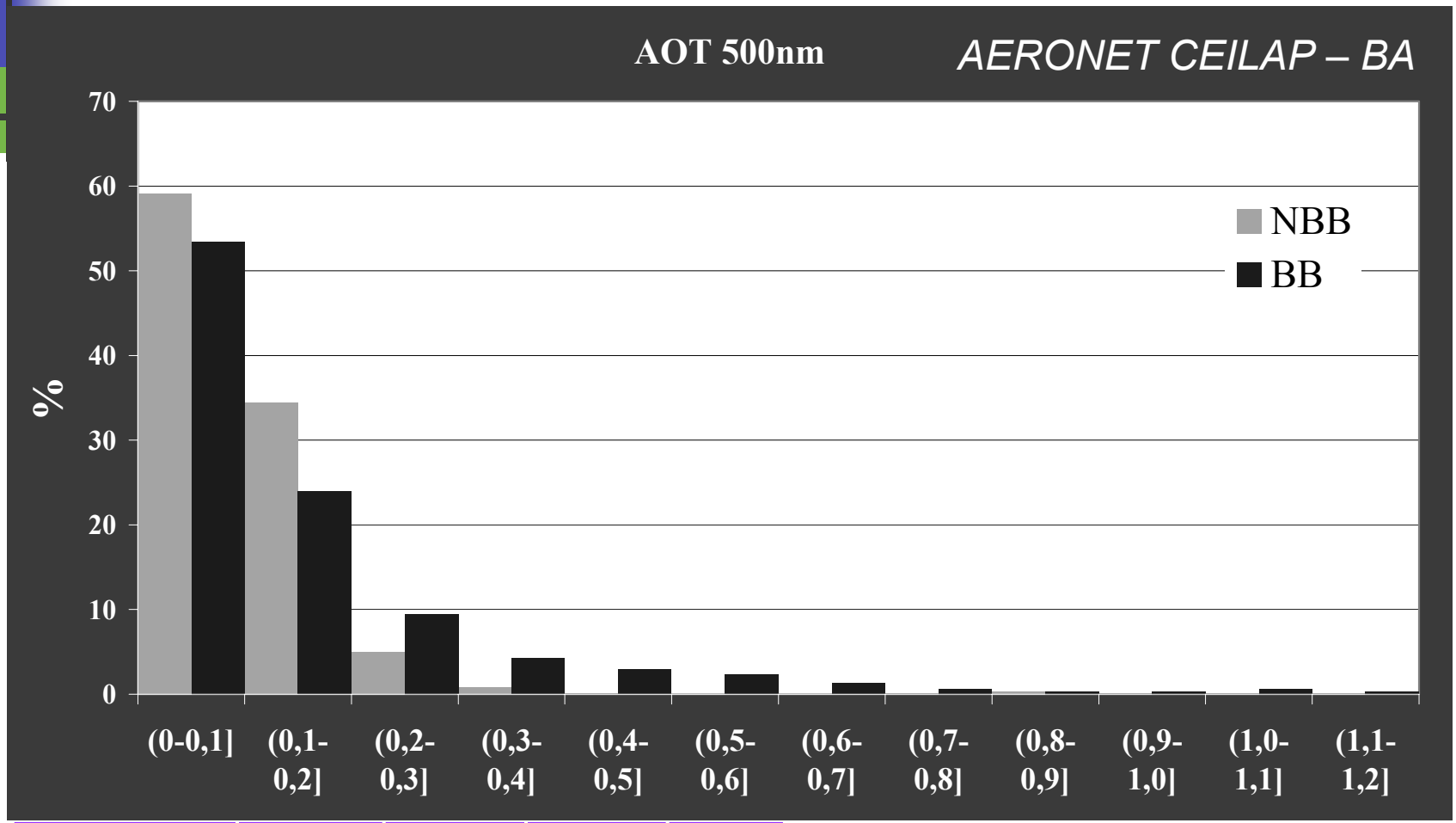


~35%

Frequencies of occurrence of LLJ categories and seasonal variation in 2001-2005



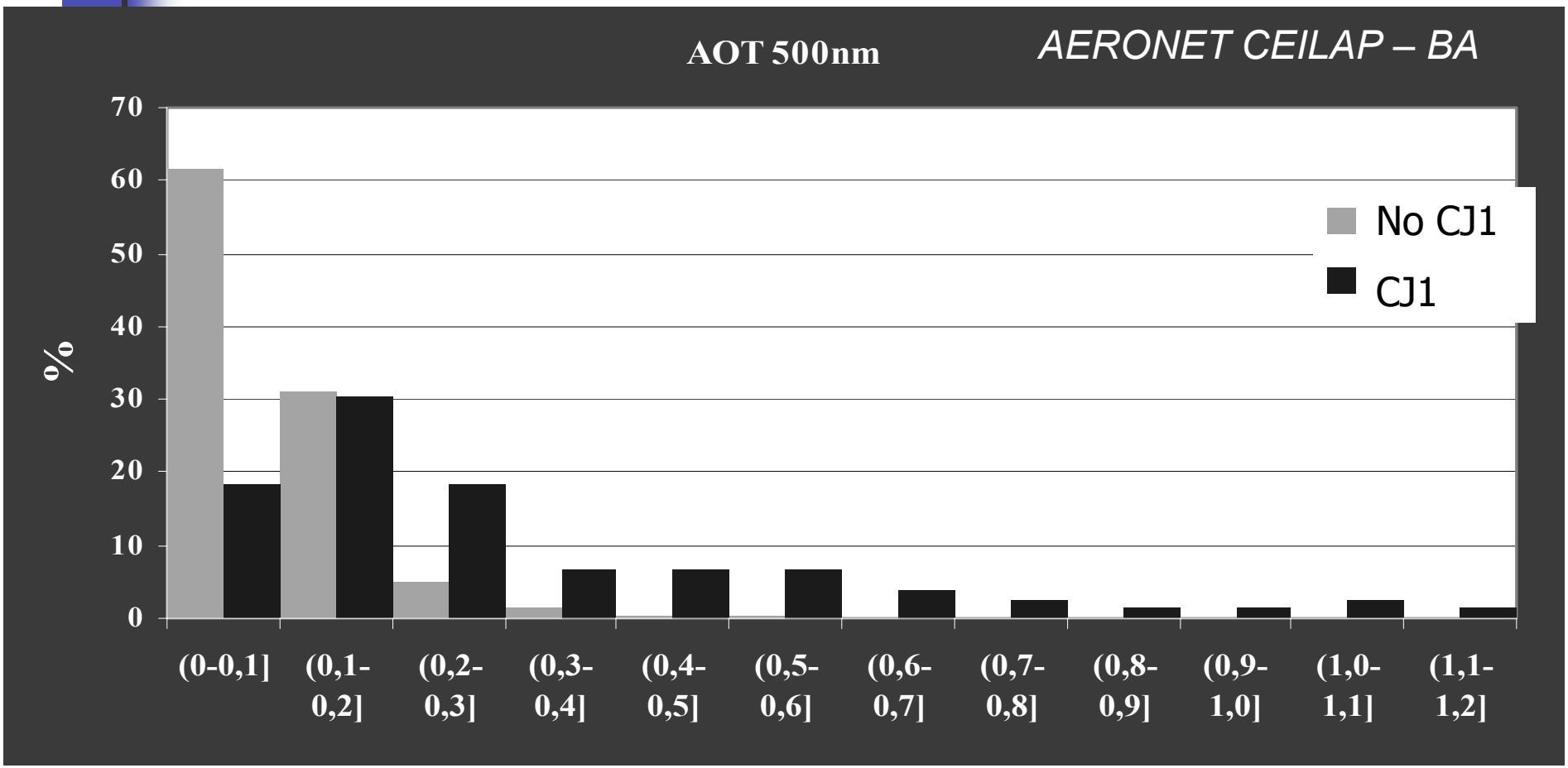
AOT 500nm frequency distributions for sub-samples BB and No BB in 2001-2005



	Mean	Min	Max	SD
No BB	0.10	0.02	0.89	0.07
BB	0.16	0.02	1.12	0.18

no significant difference between the means

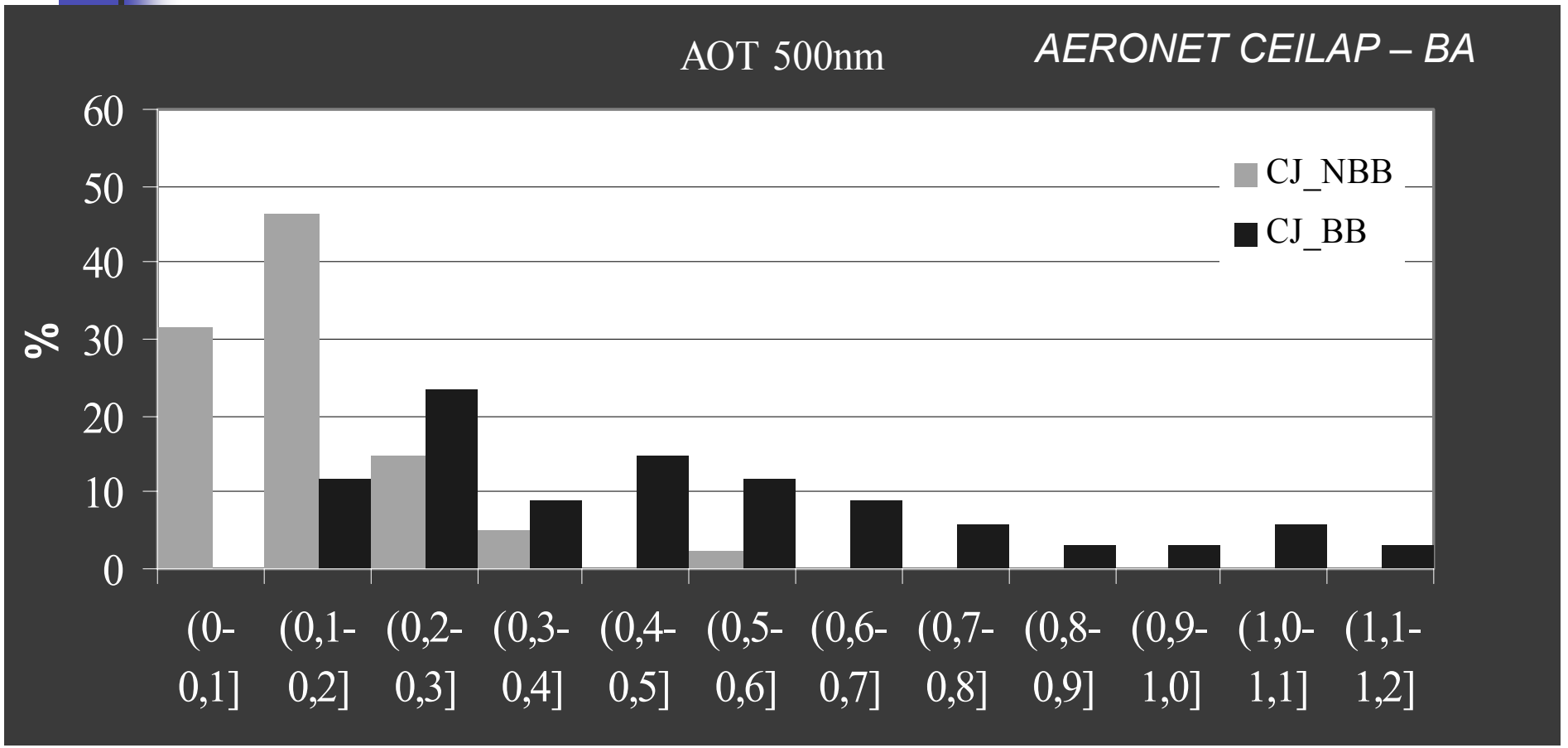
AOT 500nm frequency distributions for sub-samples CJ1 and no CJ1 in 2001-2005



	Mean	Min	Max	SD
No CJ1	0.088	0.016	1	0.096
CJ1	0.23	0.03	1.12	0.22

significant difference between the means

AOT 500nm frequency distributions for sub-samples CJ1_BB and CJ1_NBB

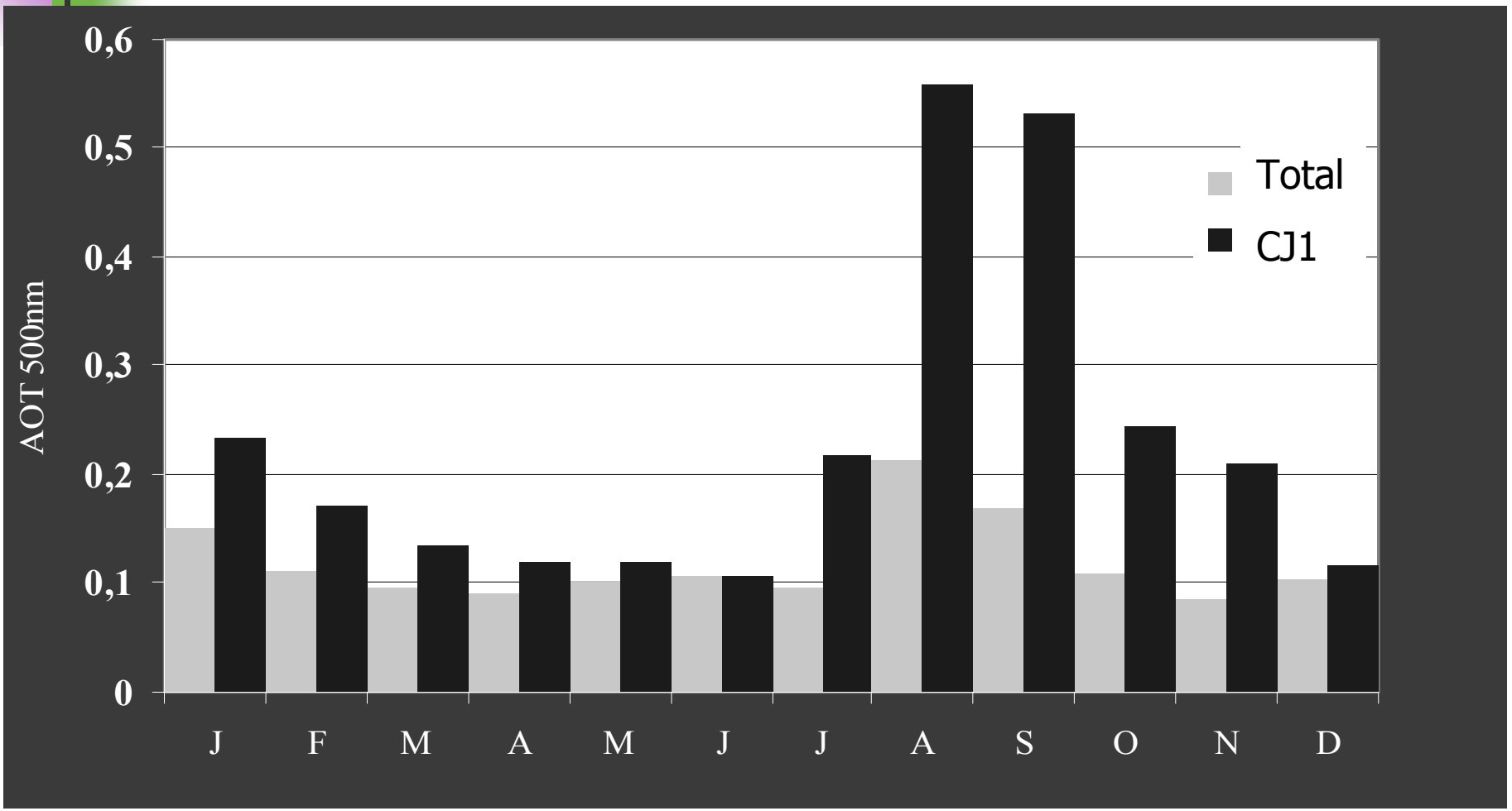


	Mean	Min	Max	SD
CJ1_NBB	0.13	0.03	0.55	0.08
CJ1_BB	0.35	0.03	1.12	0.27

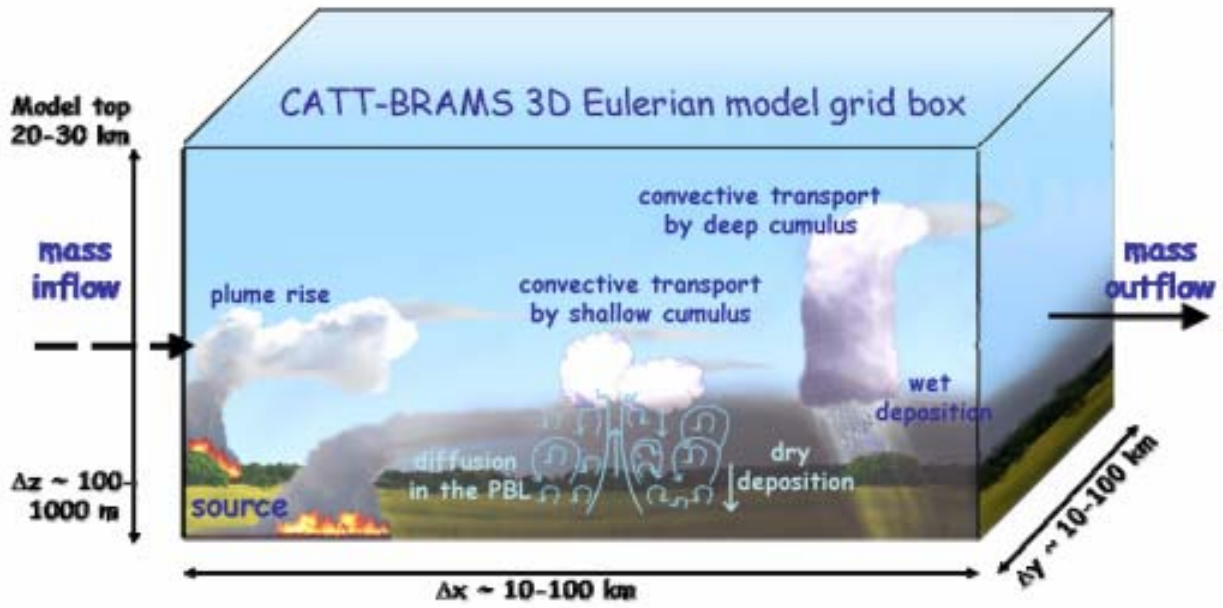
significant difference between the means

AOT 500 nm monthly means for the whole data and the CJ1 sub-sample in 2001- 2005

AERONET CEILAP – BA



CATT-BRAMS: Coupled Aerosol and Tracer Transport to BRAMS

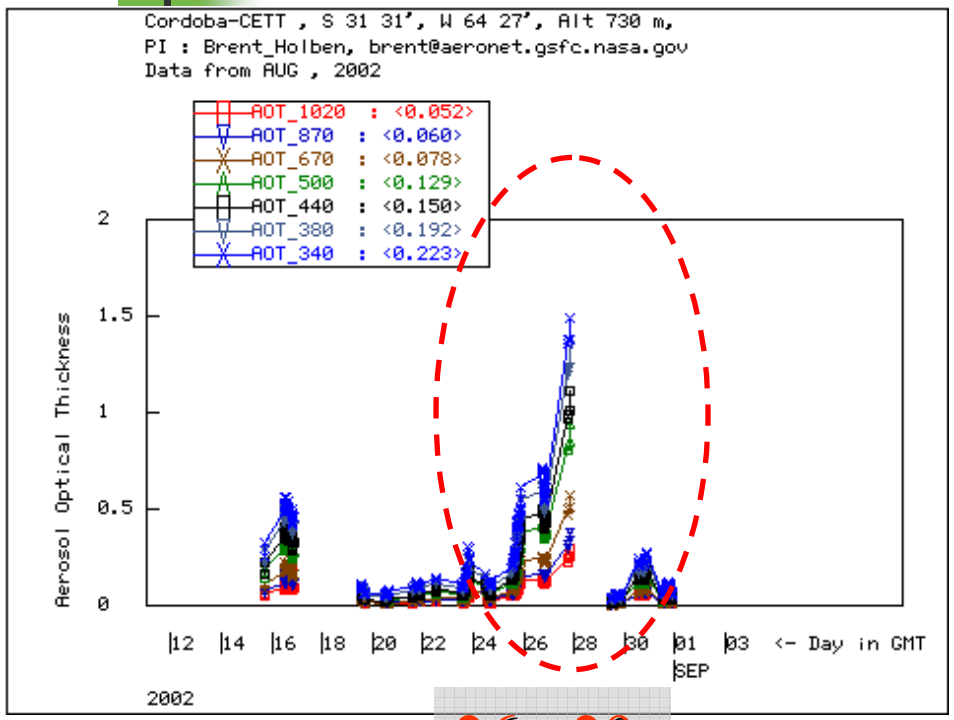


$$\frac{\partial \bar{s}}{\partial t} = \underbrace{\left(\frac{\partial \bar{s}}{\partial t}\right)_{adv}}_{I} + \underbrace{\left(\frac{\partial \bar{s}}{\partial t}\right)_{\substack{dif \\ CL}}}_{II} + \underbrace{\left(\frac{\partial \bar{s}}{\partial t}\right)_{\substack{deep \\ conv.}}}_{III} + \underbrace{\left(\frac{\partial \bar{s}}{\partial t}\right)_{\substack{shallow \\ conv.}}}_{IV} + \underbrace{W_{PM\,2.5}}_{V} + \underbrace{R}_{VI} + \underbrace{Q_{pr}}_{VII}$$

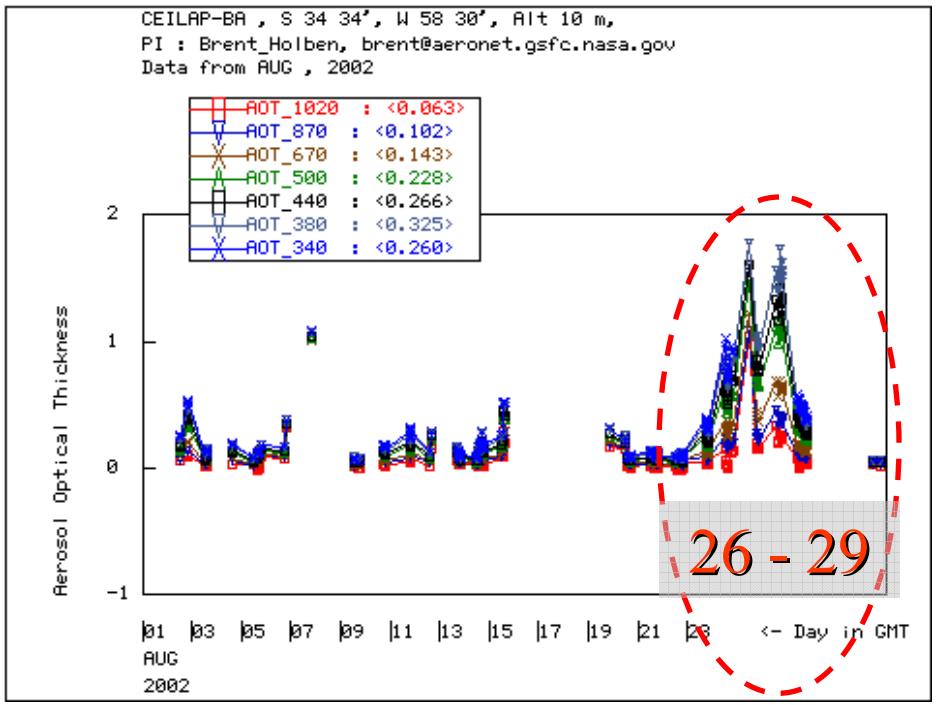
Freitas S.R., Longo, K.M.

http://www.cptec.inpe.br

Cordoba - AOT August 2002



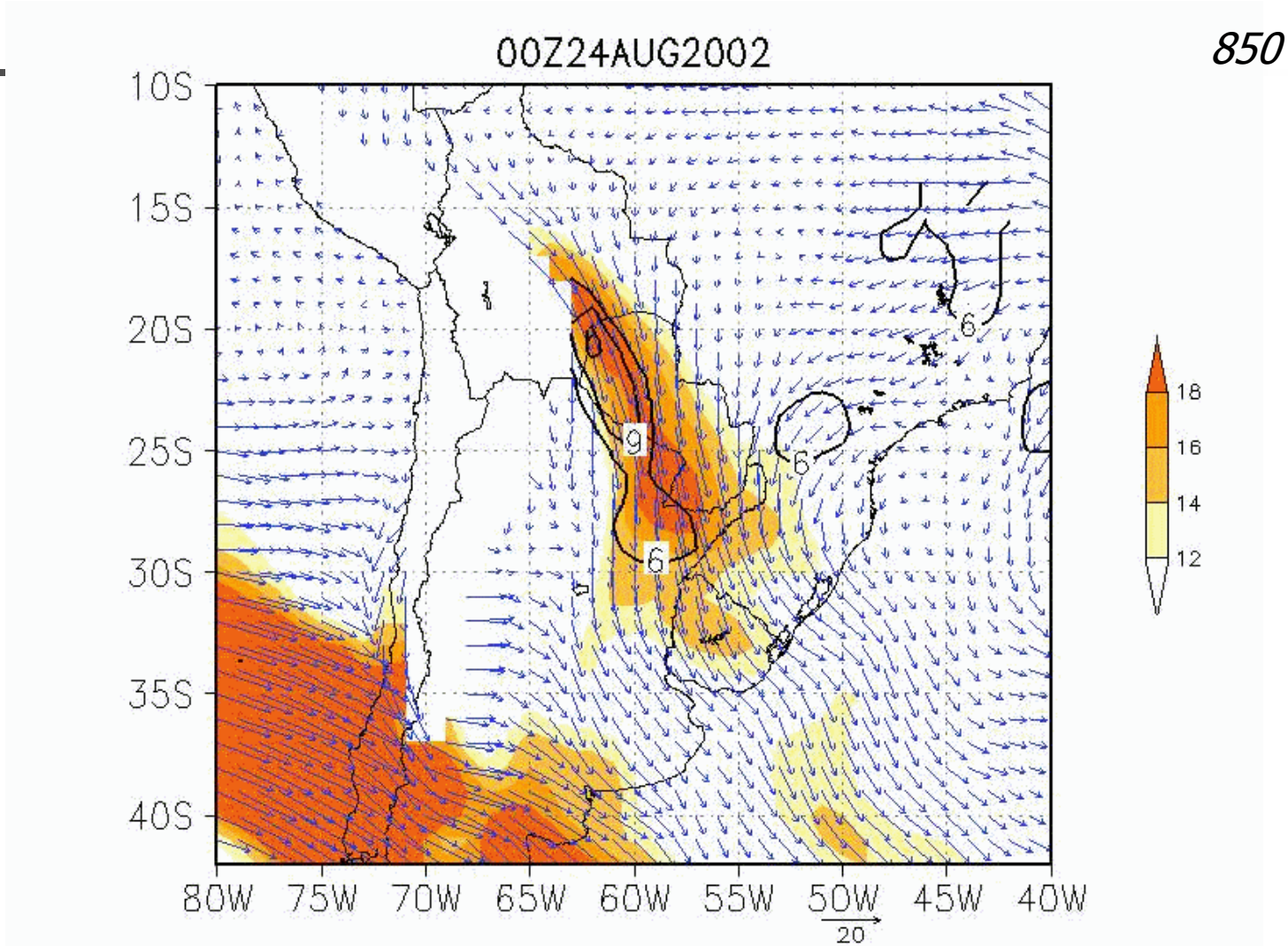
Buenos Aires - AOT August 2002



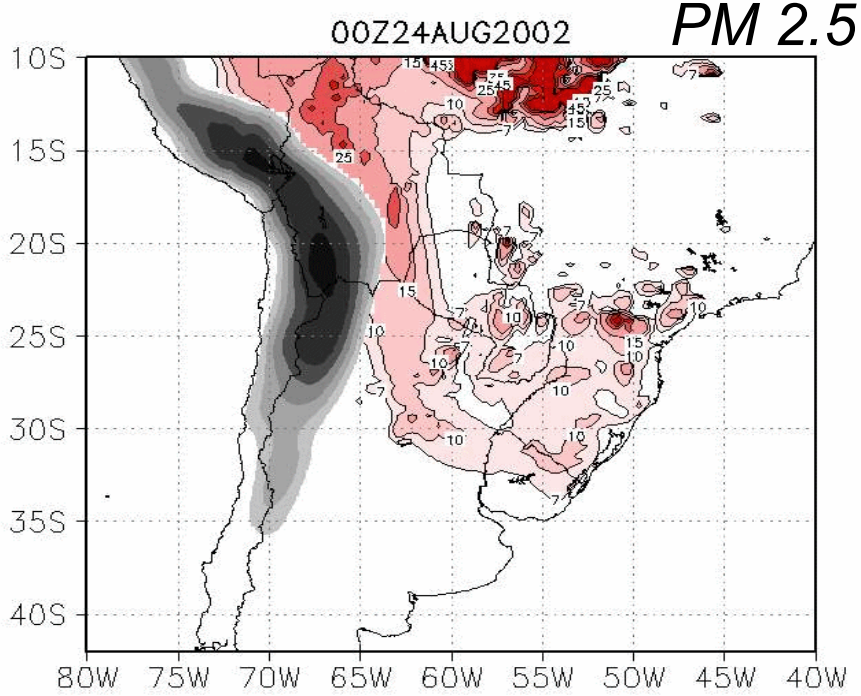
http://aeronet.gsfc.nasa.gov

24 - 28 August 2002

Wind (ms^{-1}) and Bonner criteria

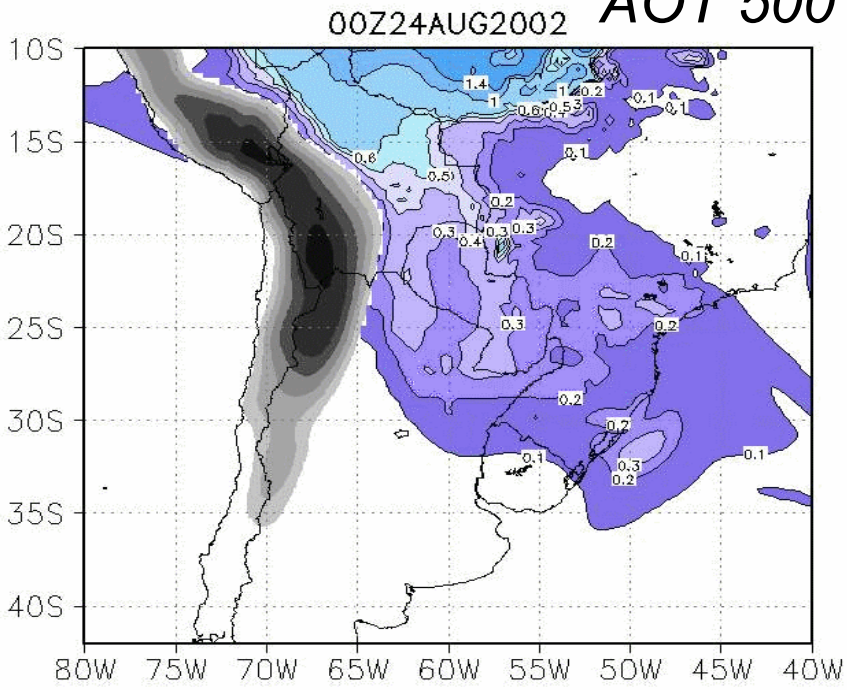


CJ 1



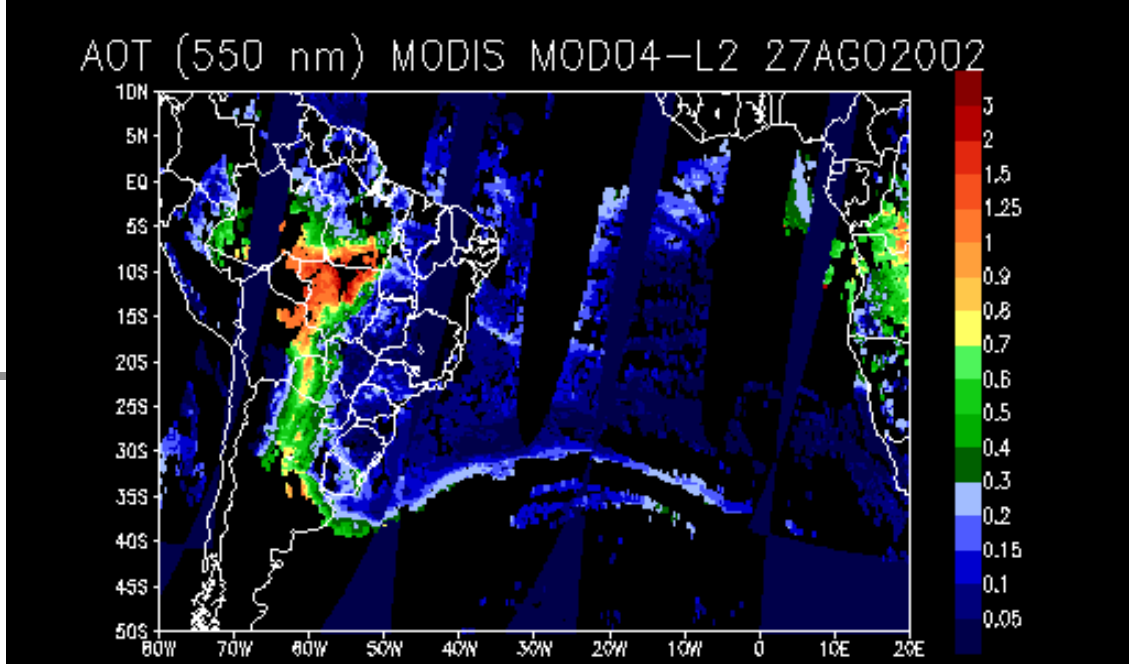
PM 2.5 (μgm^{-3})

CATT-BRAMS

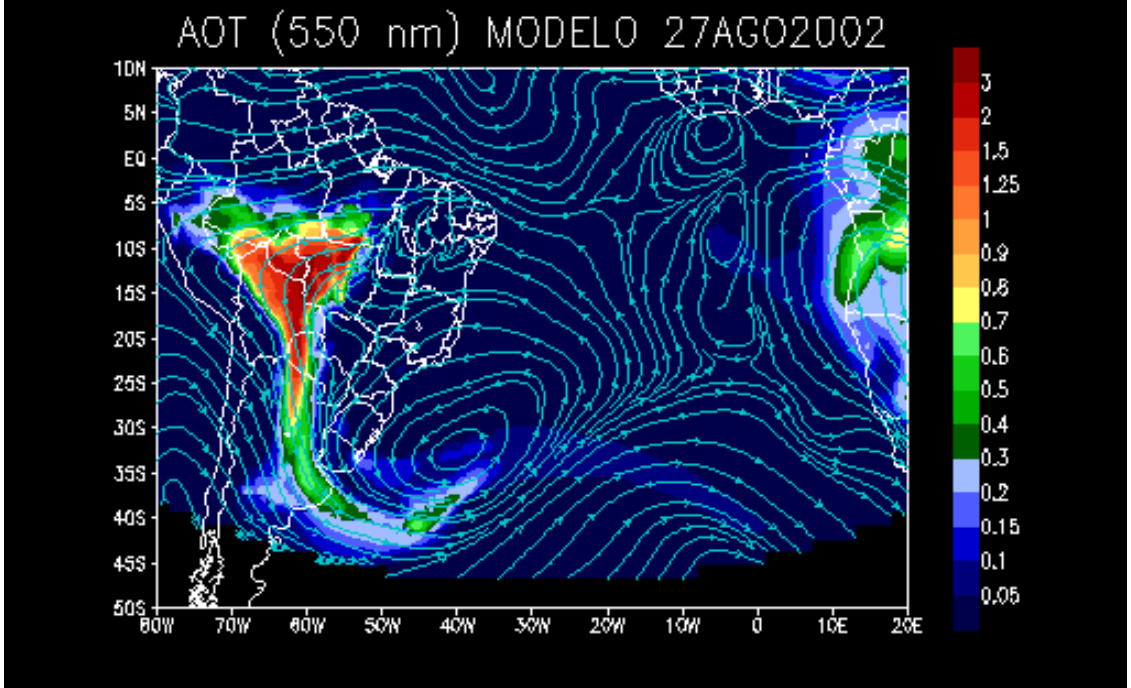


AOT 500 nm

AOT (MODIS)

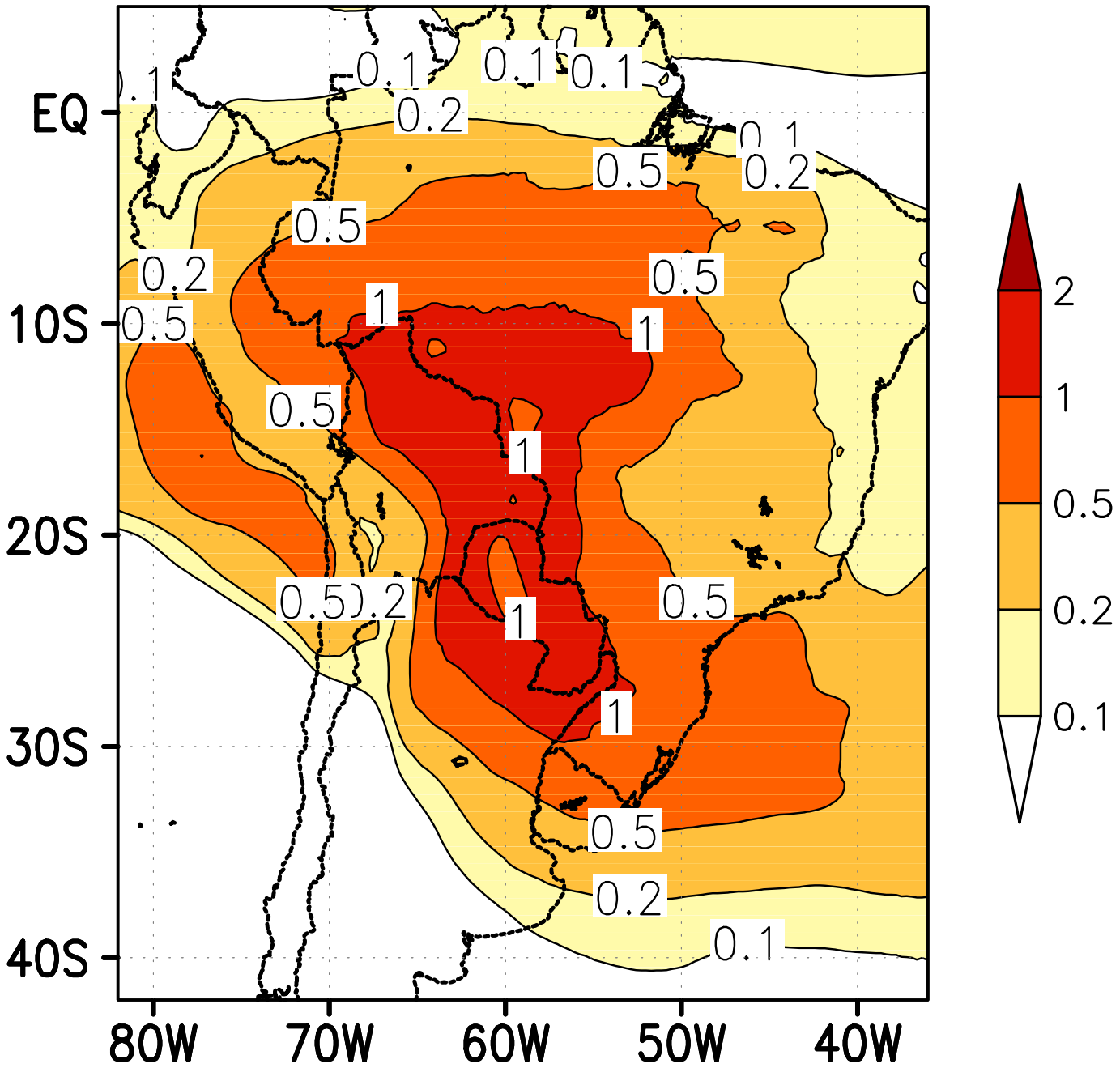


AOT (CATT-BRAMS)



CATT-BRAMS
AOT500nm

Composite for
2002 CJ1_BB



Summary

- The CJ is the main regional transport mechanism of biomass burning products in SESA,
- It was found:
  - an increase in the aerosol load in the atmospheric column in BA,
  - a significant difference between the mean AOT for the sub samples CJ1 and no_CJ1 and CJ1_BB and CJ1_NBB (2001-2005).

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