Towards Improved Assessment of Radiation Budgets in Support of LBA Hydrological Modeling

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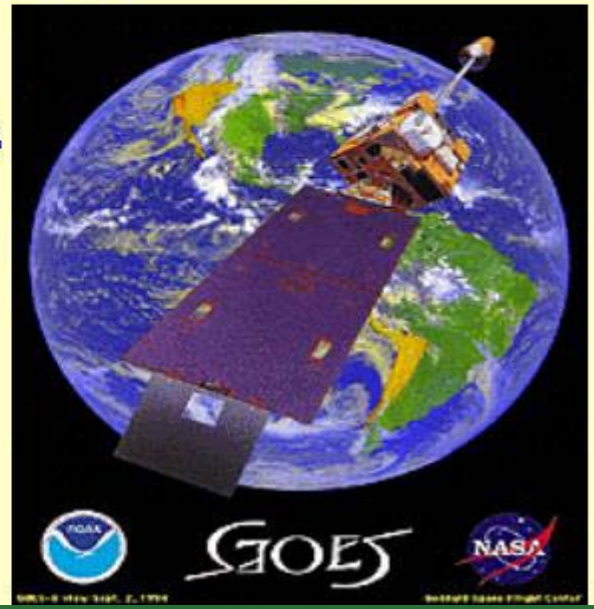
Objectives:

- Provide information on radiative fluxes to advance understanding of role of water in land-atmosphere Interactions

- Improve satellite techniques by accounting for deforestation and biomass burning in the Amazon Basin



In response produced:

- About twenty years of radiative fluxes at 2.5-degree from satellite PATHFINDER observations at global scale.
- About ten years at 0.5 degree for North and South America from GOES and METEOSAT using optimal interpolation techniques for merging
- Three years at 1/8 deg for the Amazon Basin from pixel level GOES data during the LBA project

Time scales range from hourly to monthly.

Parameters provided at the surface and Top of the Atmosphere

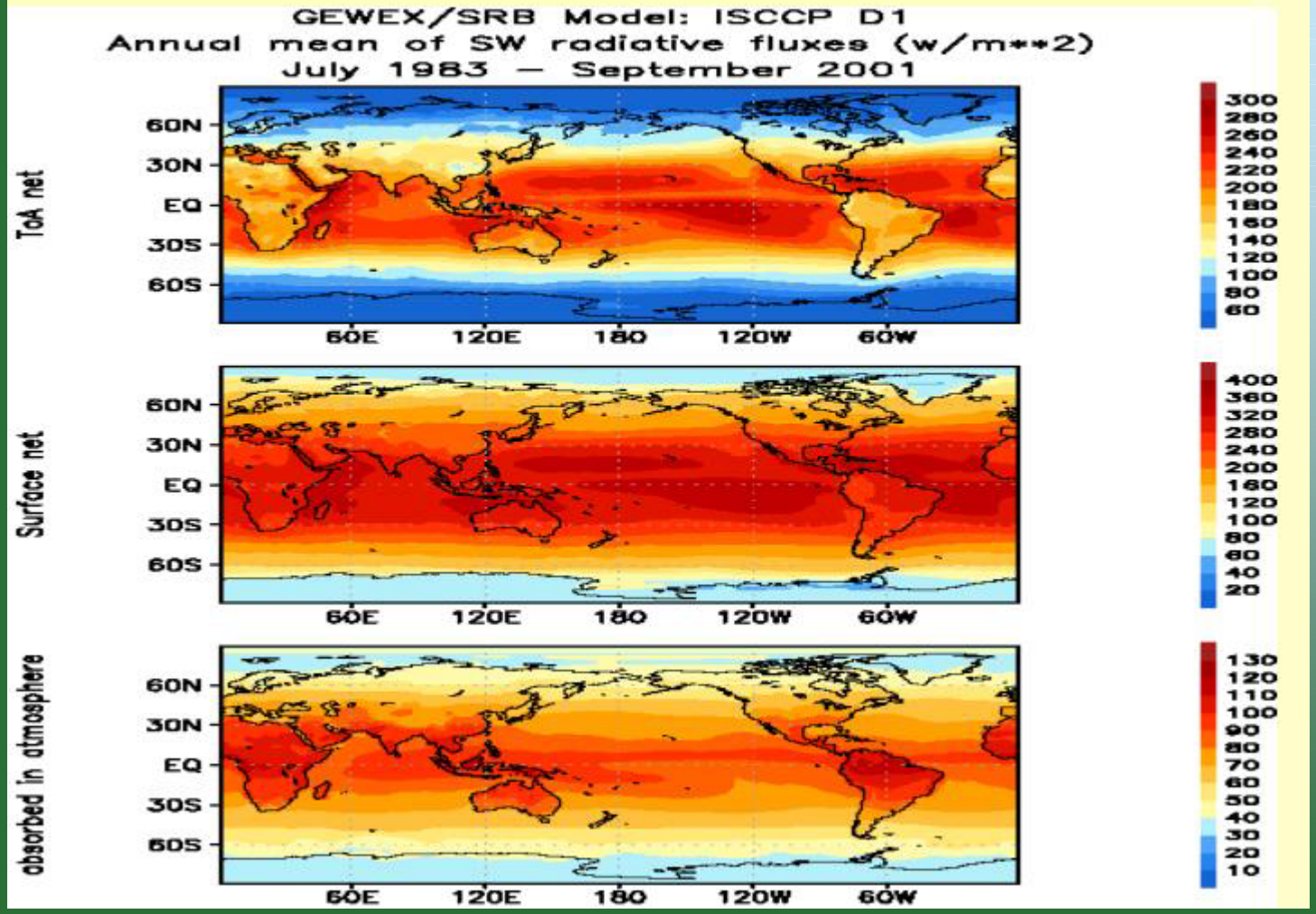
- Total and diffuse short-wave fluxes
- Photosynthetically Active Radiation (PAR)
- Near-Infra-Red (NIR) radiation

Data available from:

http://www.atmos.umd.edu/~srb/lba/weblba.htm

http://glcf.umiacs.umd.edu/data/serf/

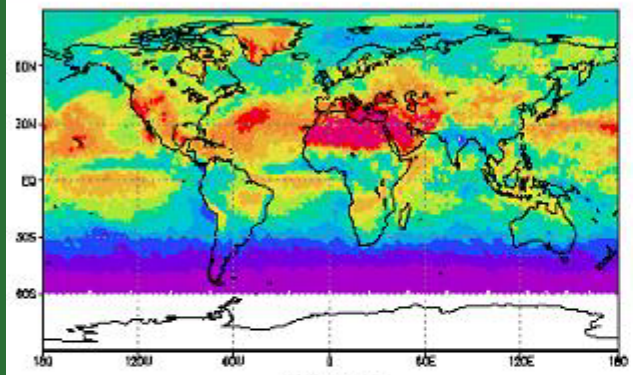
Example of global scale long-term products



Comparison with independent satellite data

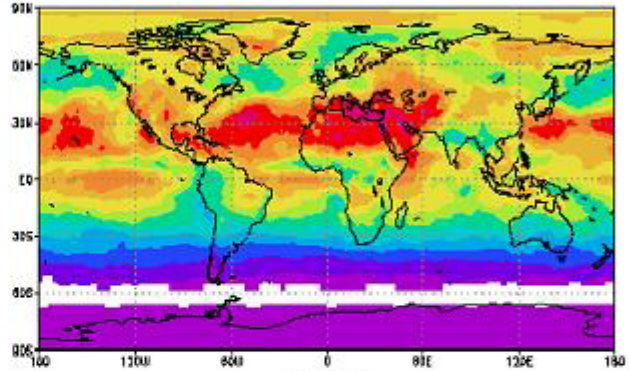
Monthly mean SW surface down flux (W/m**2), 2001

MODIS V004: Modified SRB

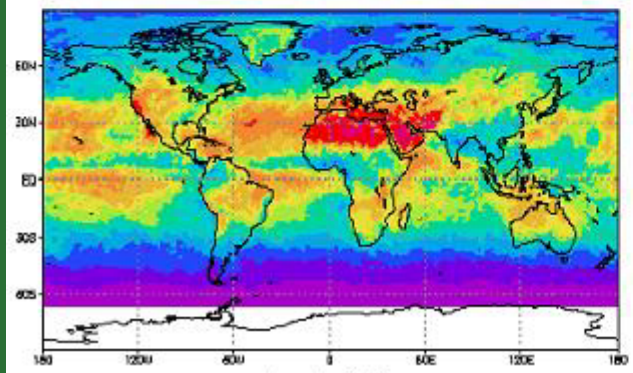


July, 2001

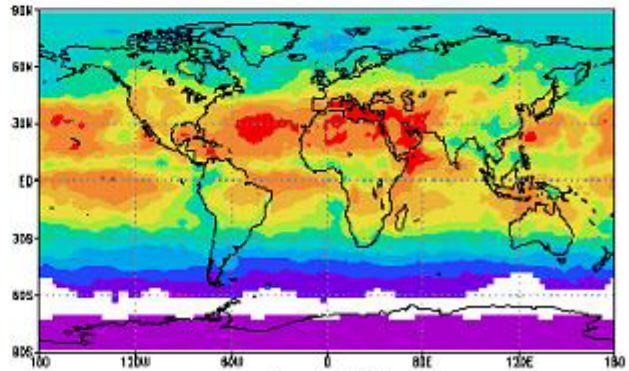
ISCCP D1: GEWEX/SRB



July, 2001

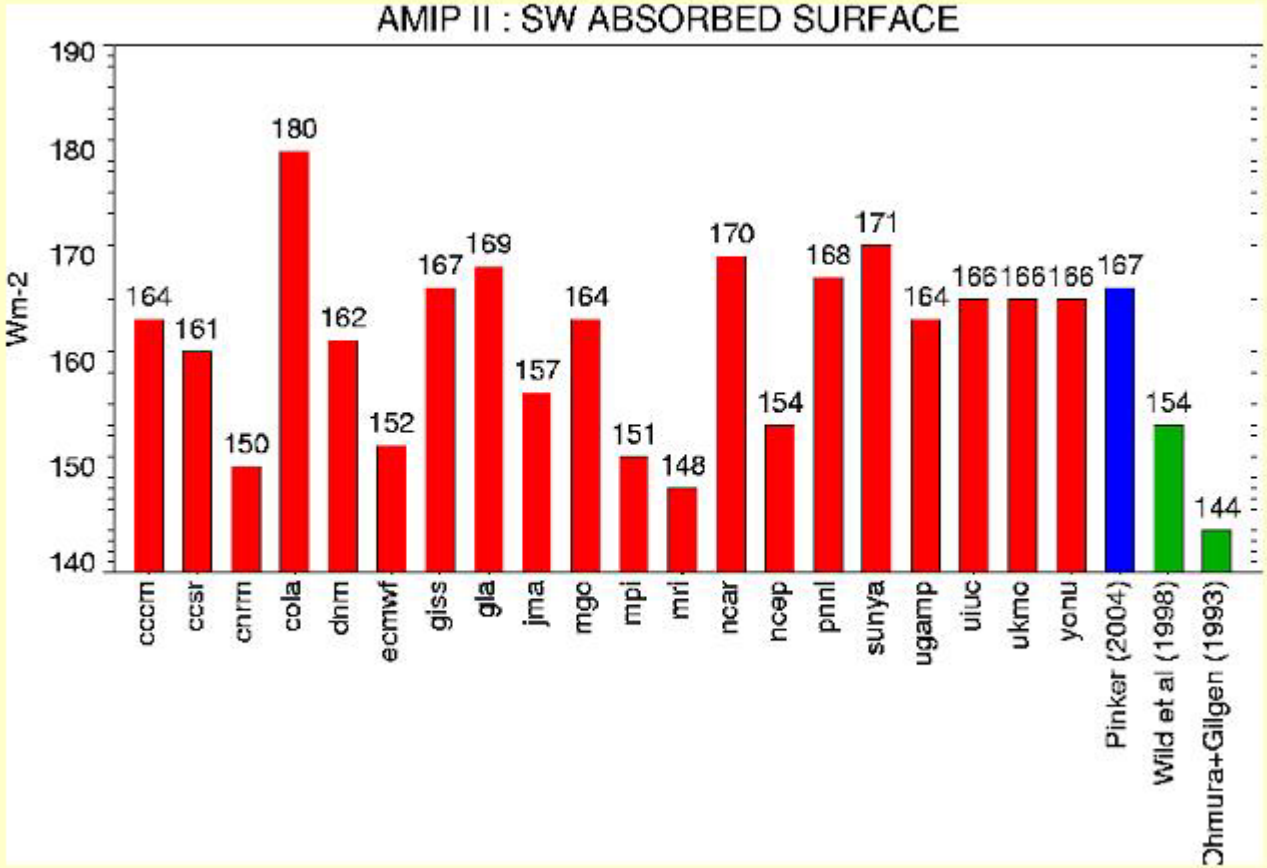


August, 2001



August, 2001

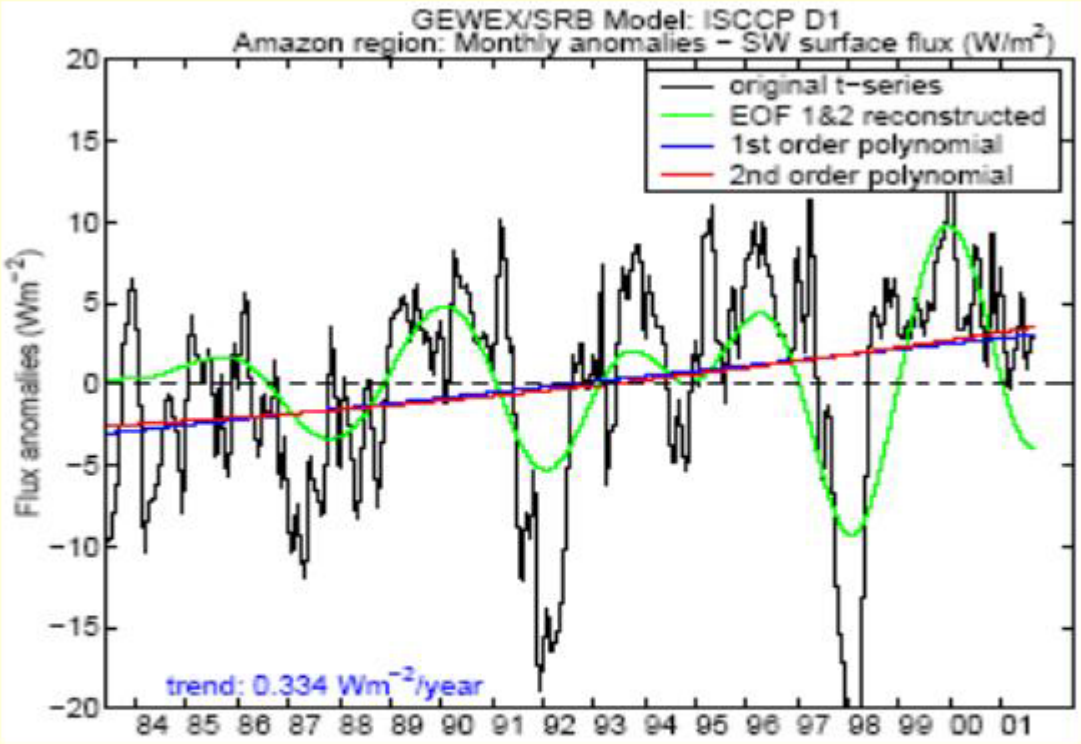
Comparison with GCM's



AMIP II Average: 163 Wm-2

GEWEX/SRB ISCCP D1: 167.3 Wm-2

Is there "Global Dimmimg" over the Amazon?

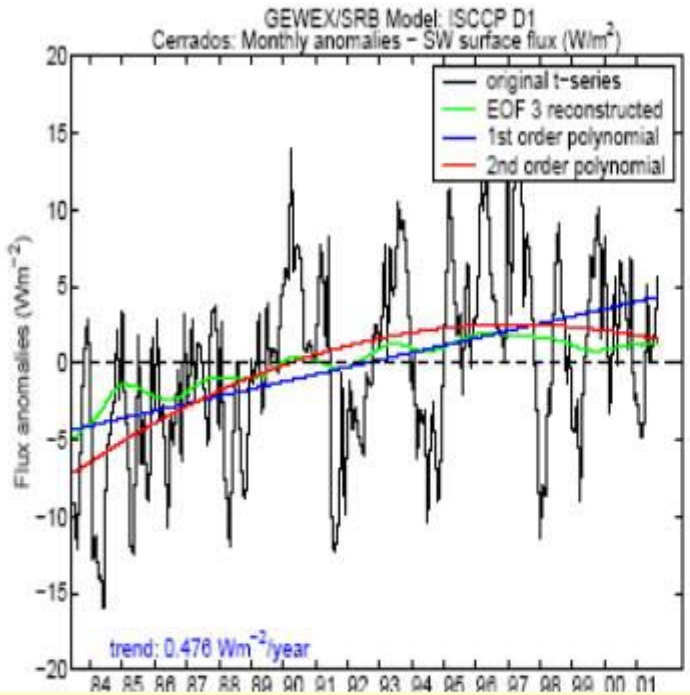


Linear trend significant at 99% level of confidence

Red Line 2nd order polynomial

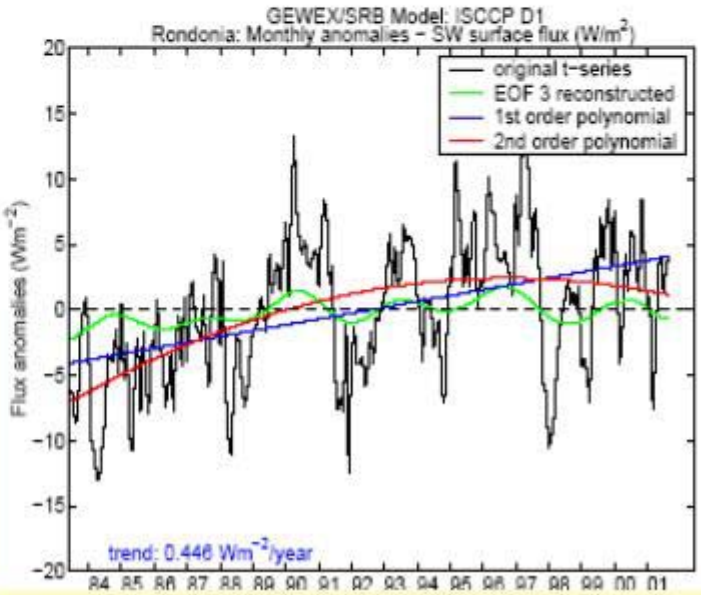
Green Line: Singular Spectrum Analysis (after Moron, Vautard, and Ghil, 1998)

Averaged over 5° N and 75° W to 16.5° S and 38° W domain.



Focus on Rondonia and the Cerrado

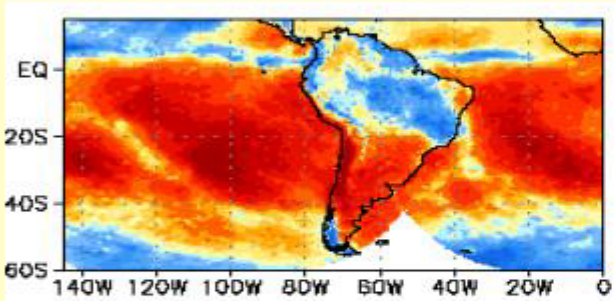
Trends in the 20-year time series of satellie estimates of surface radiative fluxes were investigated



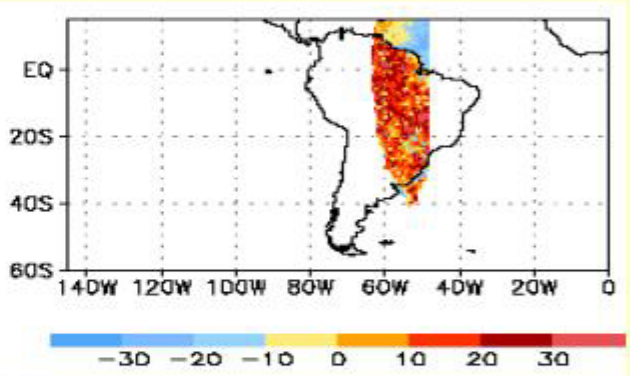
Significant positive trends found at both locations

Regional scale products from ISCCP DX METEOSAT/GOES/AVHRR at 0.5^0

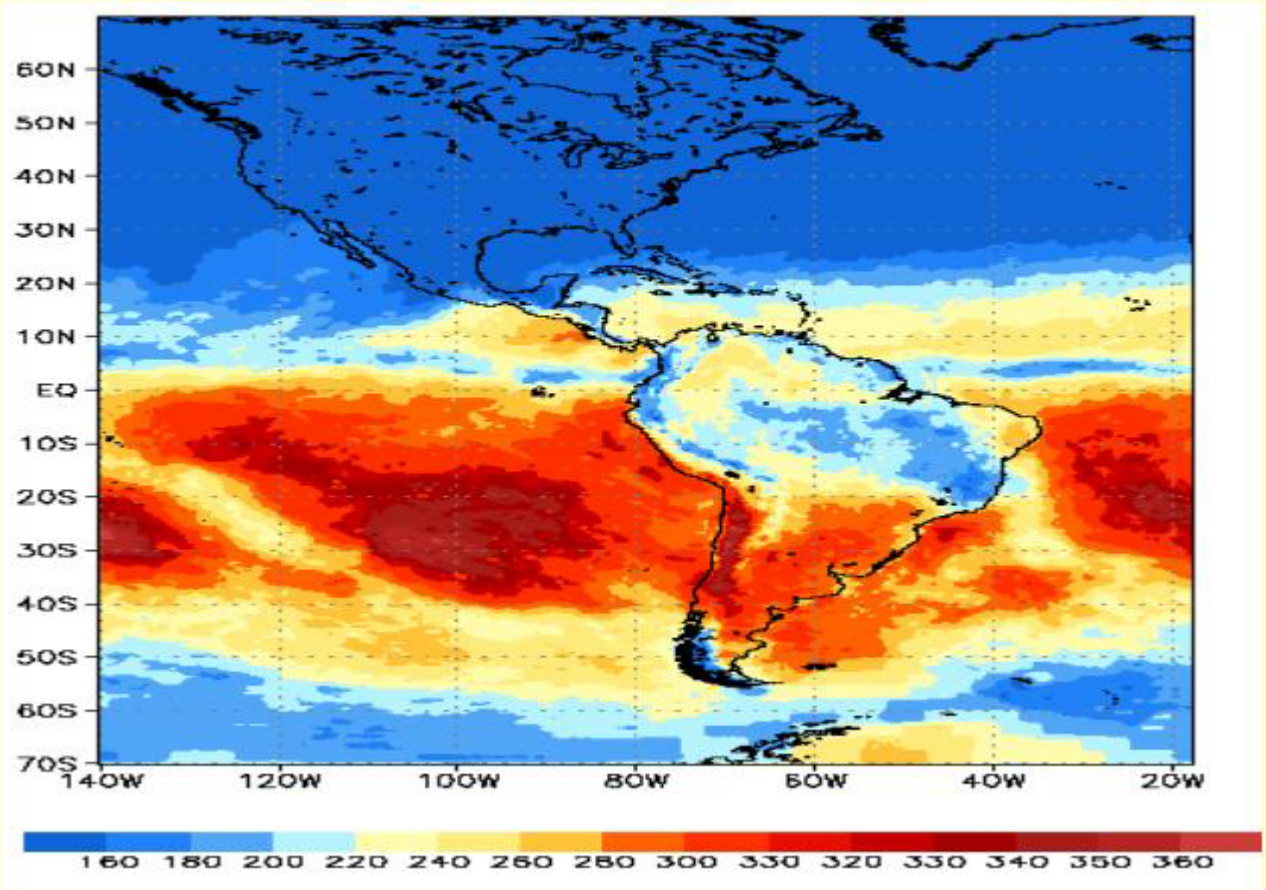
At Issue: Area of overlap between METEOSAT and GOES
EOF Analysis used for optimal merging



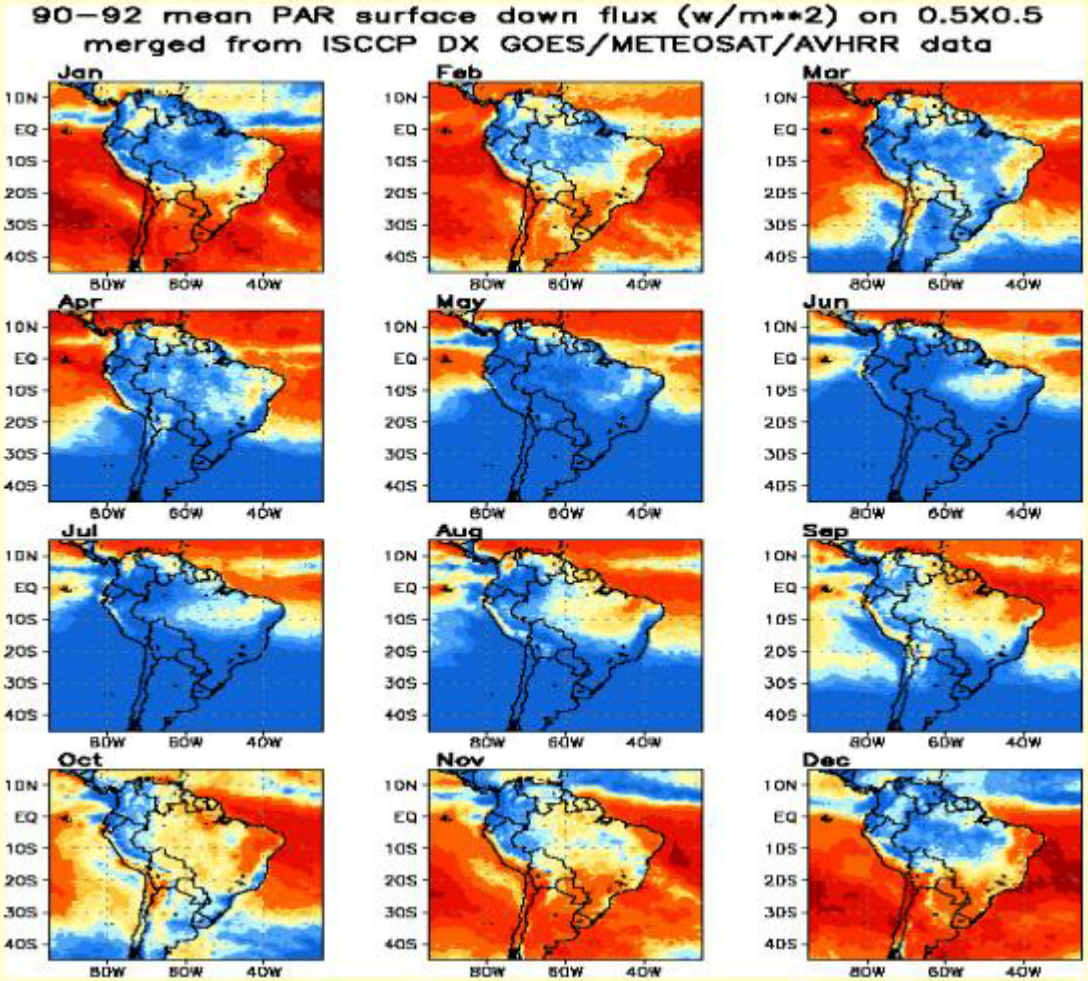
Clouds over Brasilia



Example of 0.5^0 product
Monthly mean surface shortwave SW flux (W/m^{-2}), using ISCCP DX from METEOSAT/GOES/AVHRR for Jan 92

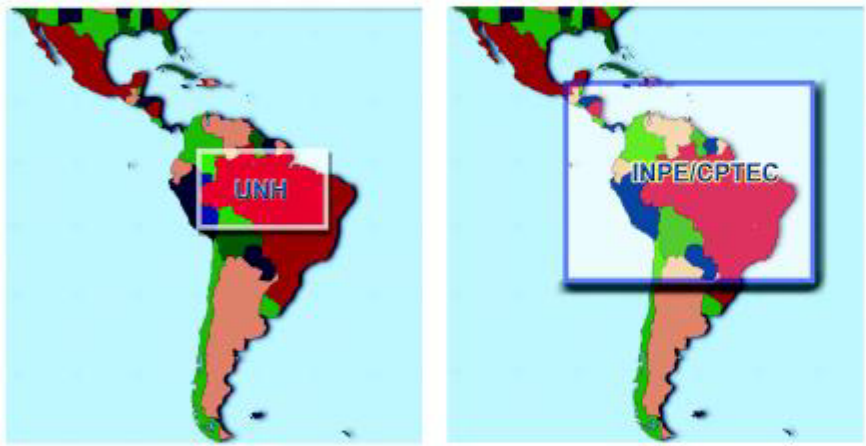


Another Example of 0.5^0 product for PAR (shown only for S. America)



For radiative flux estimates at $1/8^0$ at 1-3 hourly time scale for the LBA period 1998-2000, experiments were conducted with both UNH and INPE/CPTEC data

LBA GOES 8 SATELLITE DATA



The entire 3 years were processed with the UNH data

Input to the GEWEX/SRB pixel level model version during 1998-2000

GOES-8 Satellite Observation

WEB based System for Terrestrial Ecosystem Research (EOS-WEBSTER), University of New Hampshire; 5° N and 75° W to 16.5° S and 38° W; half-hourly, hourly, or 3-hourly from March 1998 thru February 2001

Aerosol Optical Depth Climatology

AERONET/GOCART/MODIS merged (Liu, Pinker, Holben, 2004)*; monthly mean

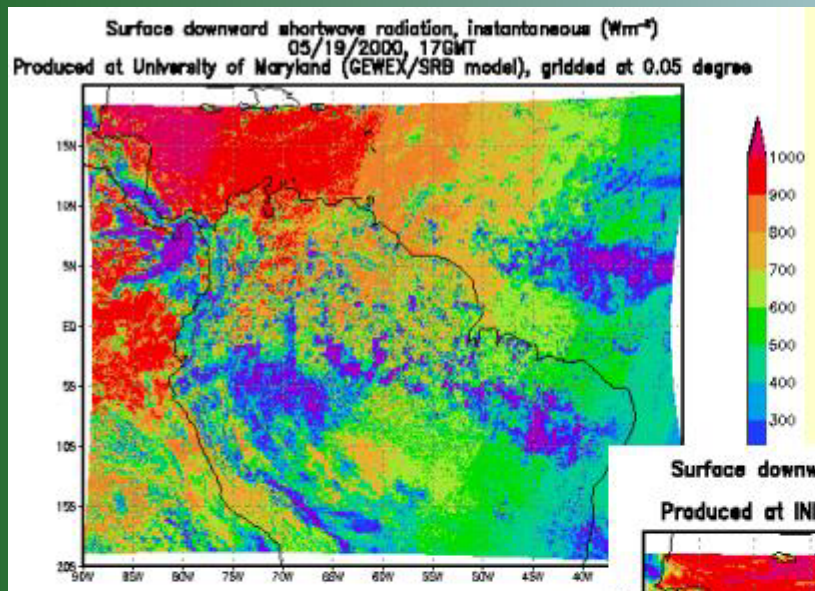
Total Column Ozone

Solar Backscatter Ultraviolet Radiometer/Version 2, NOAA/NESDIS/OSDPD; monthly mean

Precipitable Water

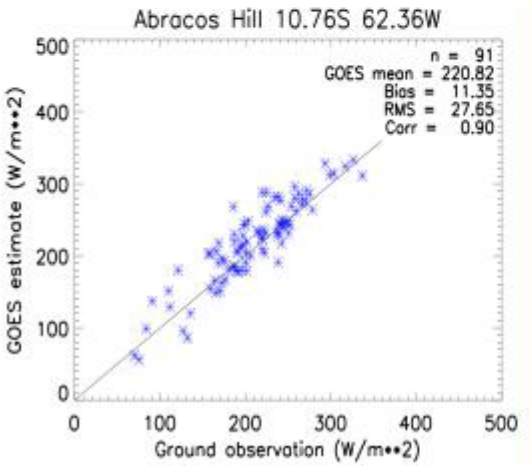
CDAS-NCEP/NCAR Reanalysis; 6-hourly

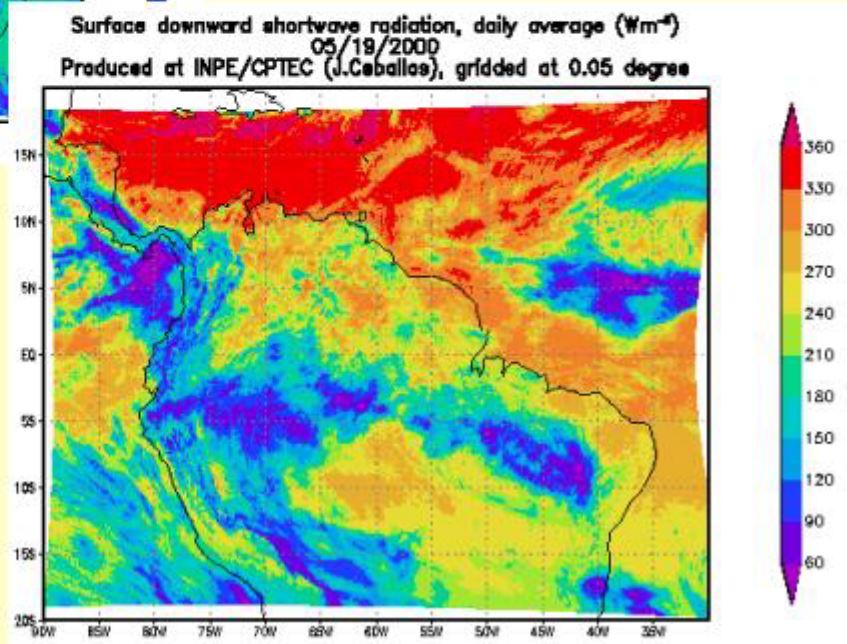
* Liu, H., R. T. Pinker and B. N. Holben, 2004. A global view of aerosols from merged transport models, satellite and ground observations. JGR-Atmos., in revision



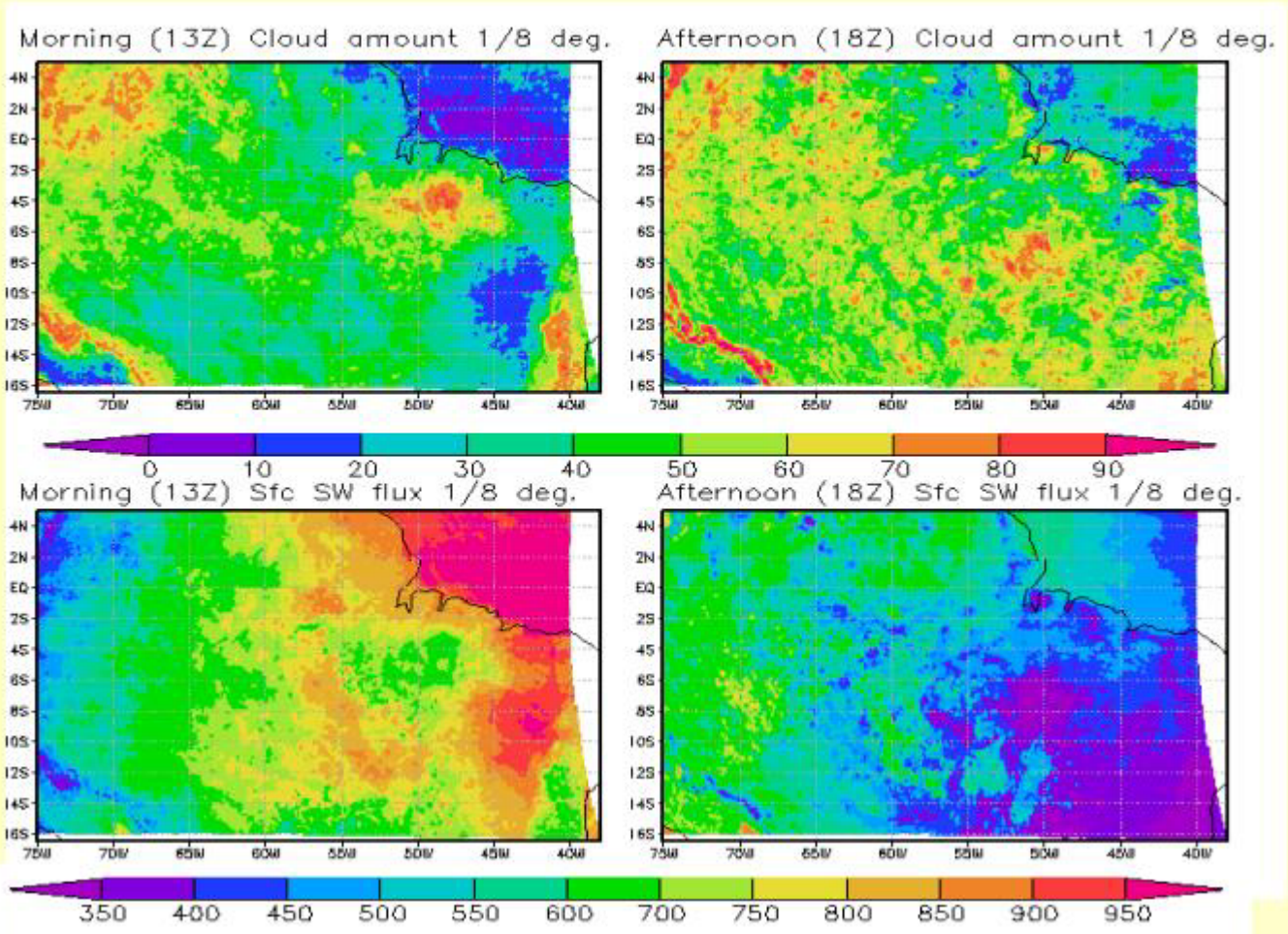
Experiments at high spatial and temporal resolutions

Collaborative Effort between INPE/CPTEC and U of MD

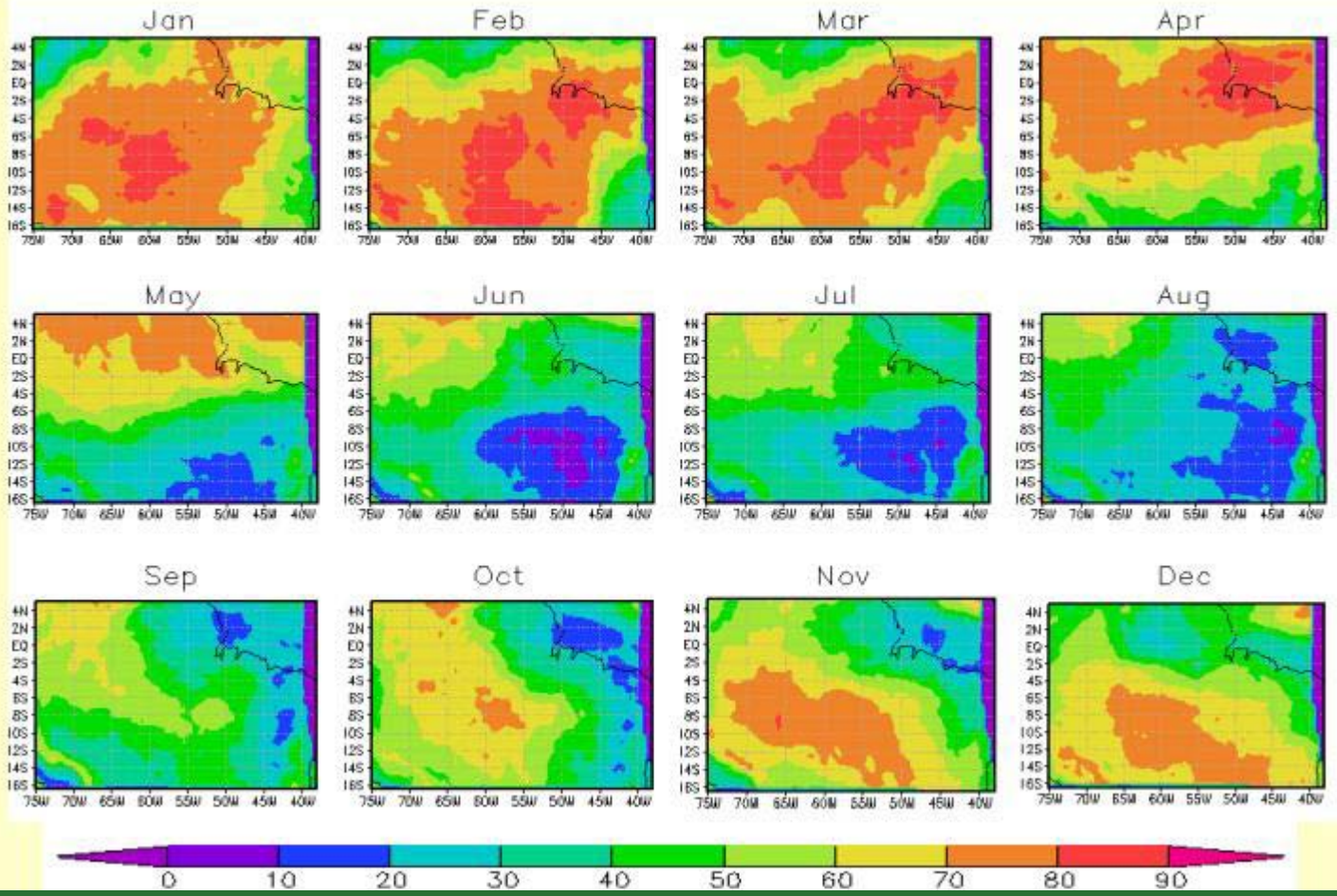




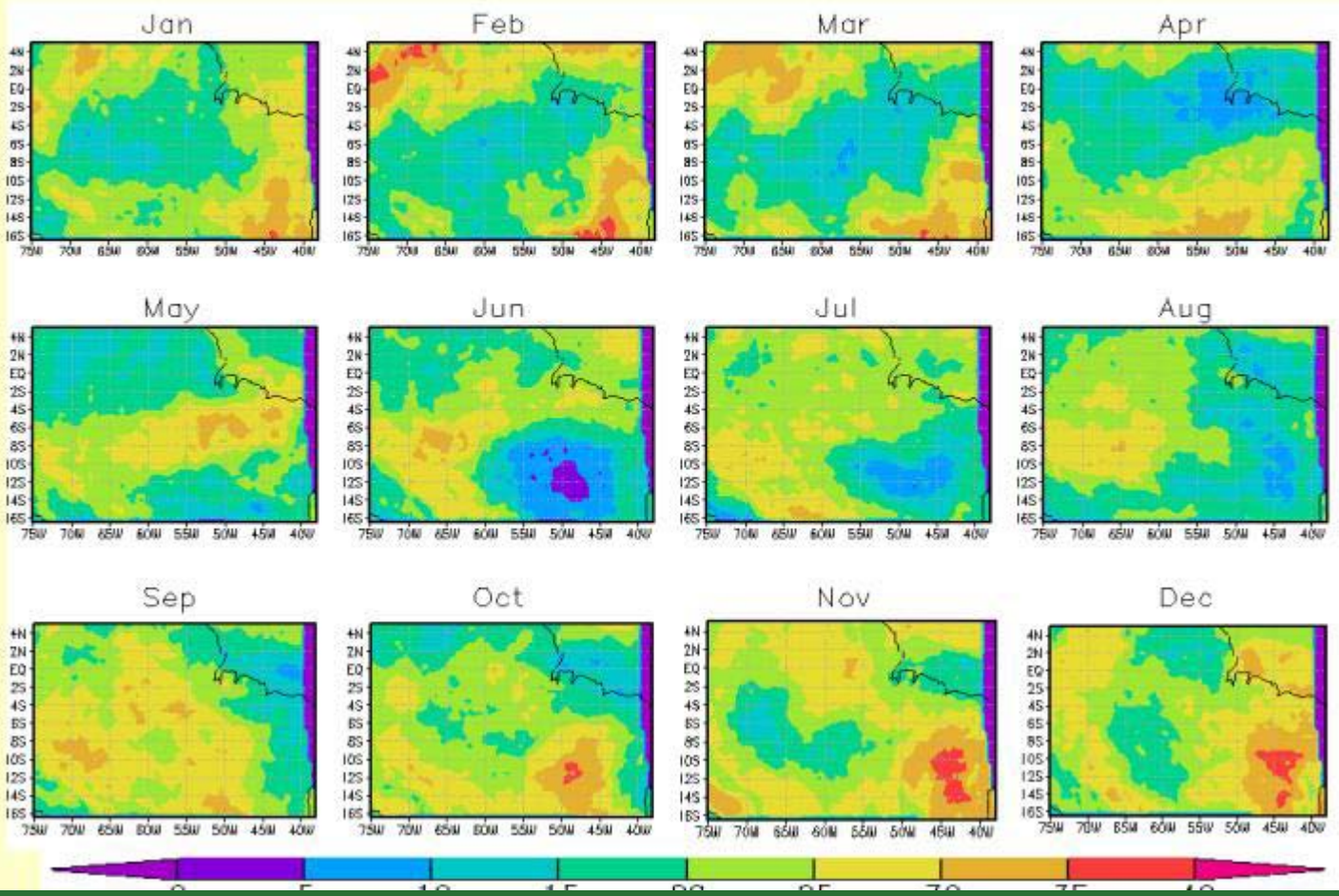
Morning and afternoon cloud amount and surface radiative fluxes, Sept. 2000



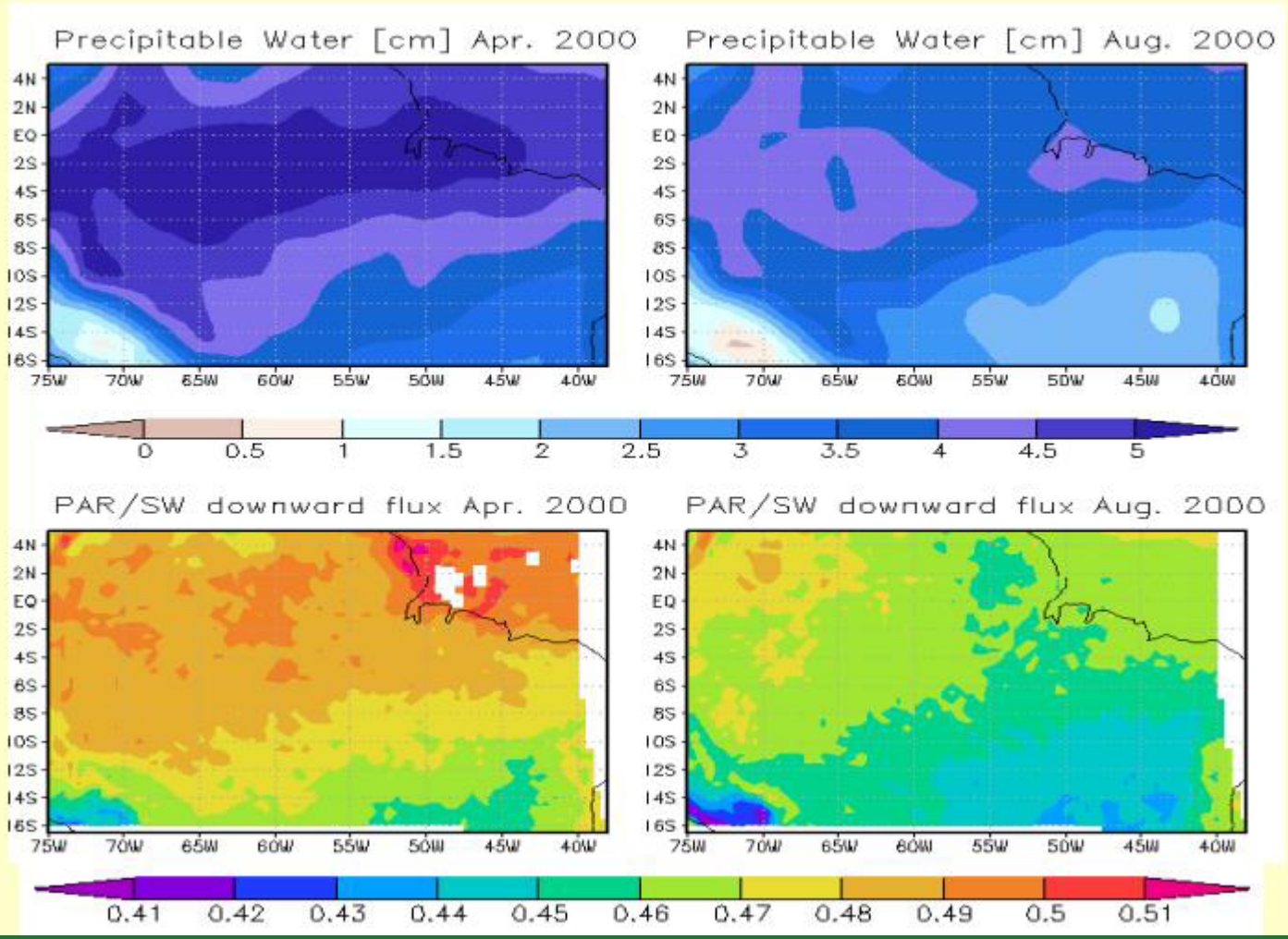
Monthly mean cloud amount at 0.5˚ for 2000



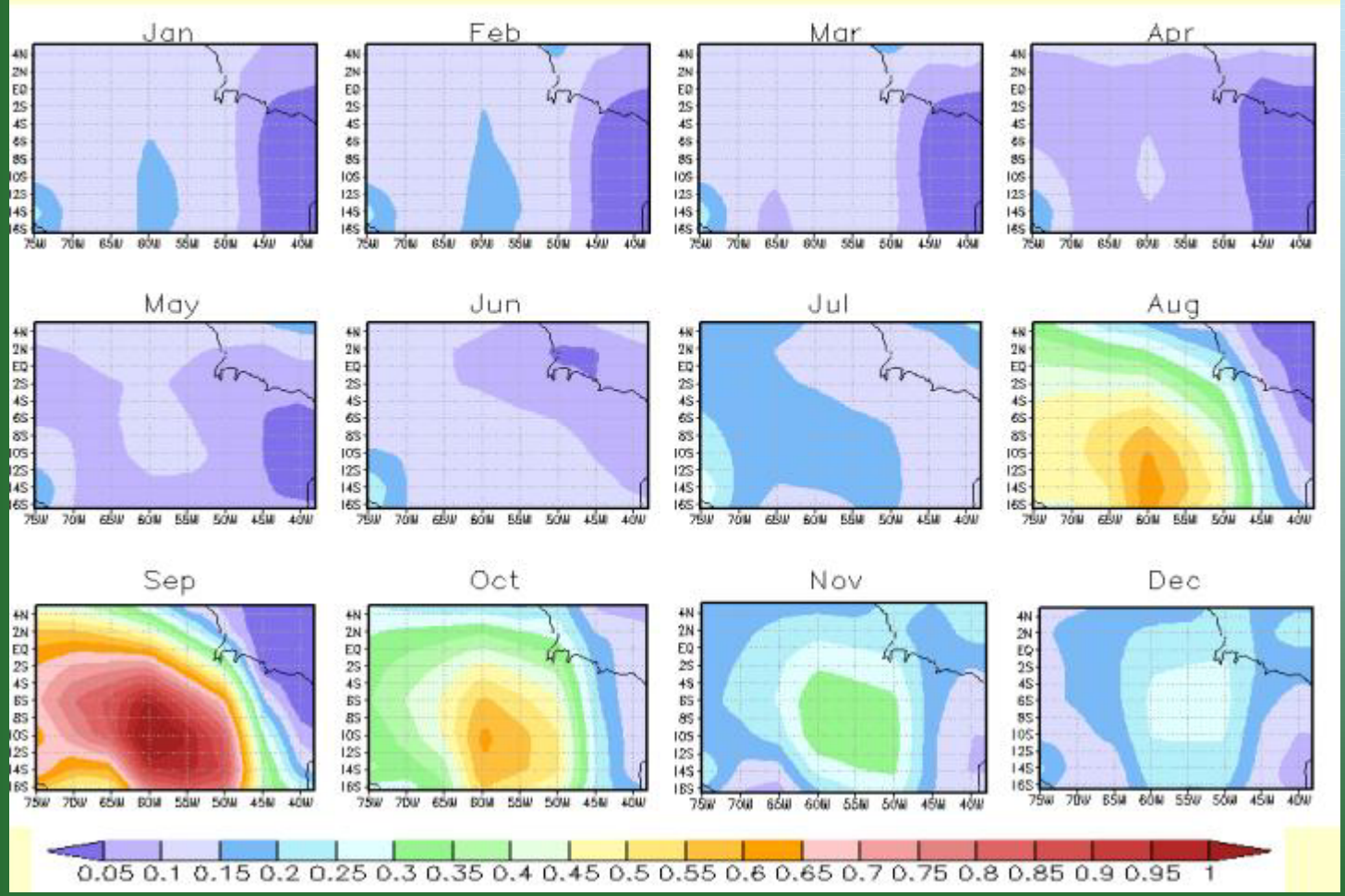
Cloud amount standard deviation at 0.5° resolution for 2000



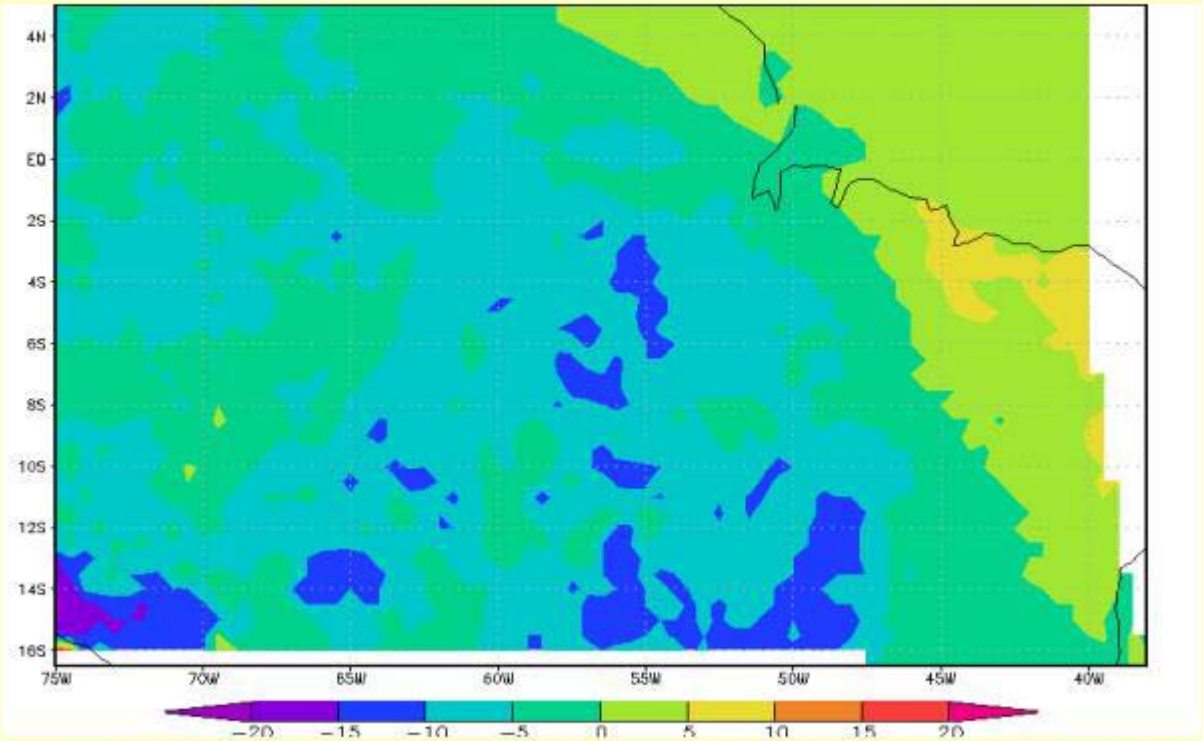
Dependence of PAR/SW ratio on precipitable water



Aerosol optical depth for 2000 merged from AERONET, GOCART and MODIS



Surface SW downward flux change, September 2000



Flux with merged AOD – Flux with default value of AOD

Summary

Methodologies were developed to infer surface SW radiative fluxes to meet the hydrological and ecological modeling needs over the Amazon Basin

Methodologies were applied at various spatial and temporal scales to address a wide range of issues related to the Amazon

Special attention was given to biomass burning and new aerosol Information was prepared to serve as input to the inference schemes

Evaluation against ground observations is in progress

Evaluation against independent satellite observations (e.g., MODIS) is desirable

Most of the results are available at several web sites

Updates on data access at: http://www.atmos.umd.edu/~srb/lba/weblba.htm

Daily data access also at www.satelite.cptec.inpe.br

Brasilia on the way to Belem

Thank you and sorry I could not be here