Tracking the Movement of Water and Energy from the GEWEX Integrated Product

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Paula Brown

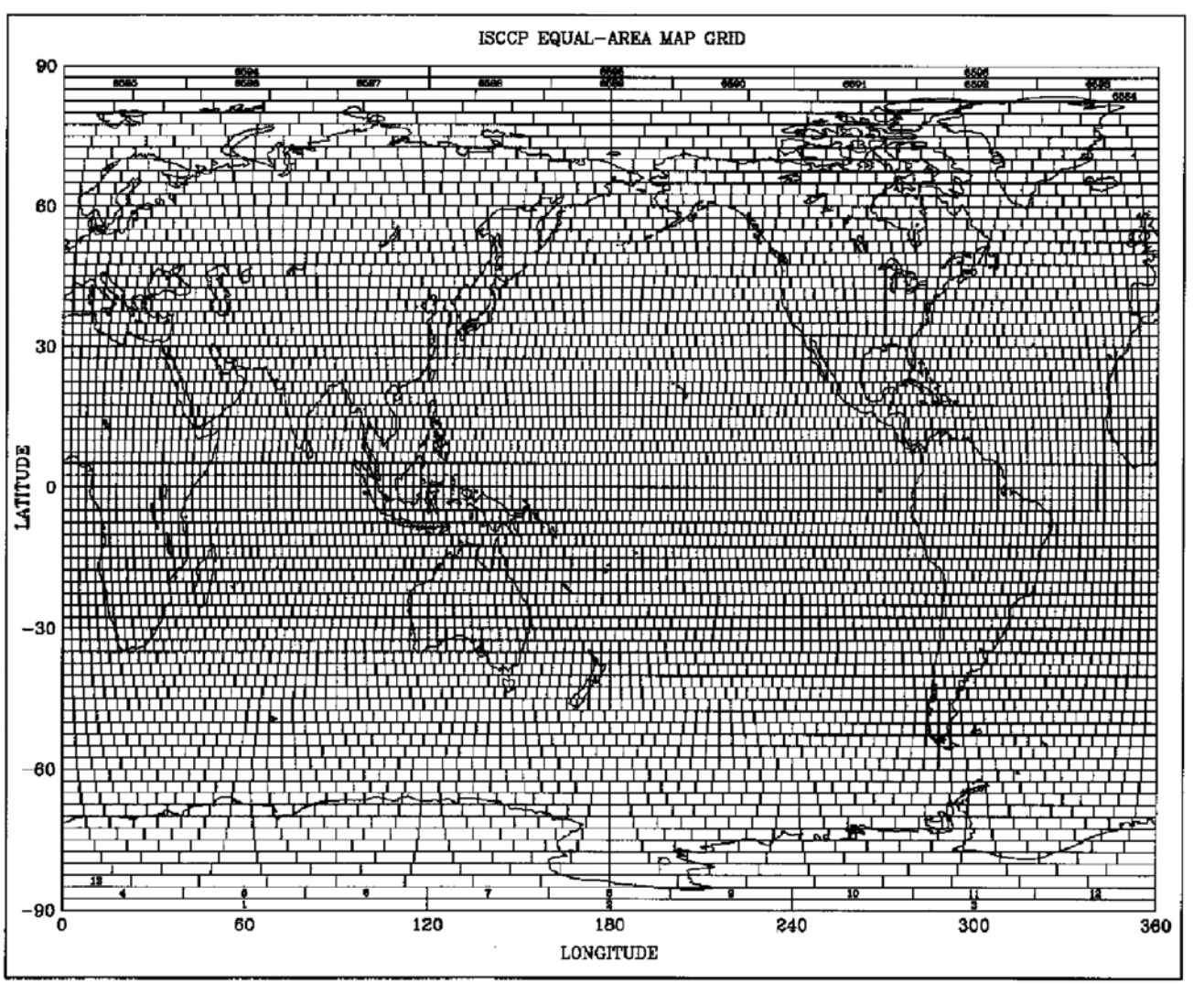
& Bill Rossow (for starting the Integrated Product in the previous century)

Clouds, their Properties, and their Climate Feedbacks: A symposium to celebrate William B. Rossow's science contributions and retirement
New York, June 6-8 2017

The “Integrated Product”

* Test period: 1 Jan 2007 – 31 Dec 2007
* 1°, 3-hourly equal-area grid
* ISCCP Clouds, MAC V2.0 Aerosols, SRB Radiation (TOA & Sfc)
* Land/SeaFlux for Sensible and Latent heat flux,
* GPCP Precipitation
* ERA-Interim for Water Vapor transport, CAPE, dynamical context

Equal-area grid



ISCCP variables

Surface and Atmosphere variables:

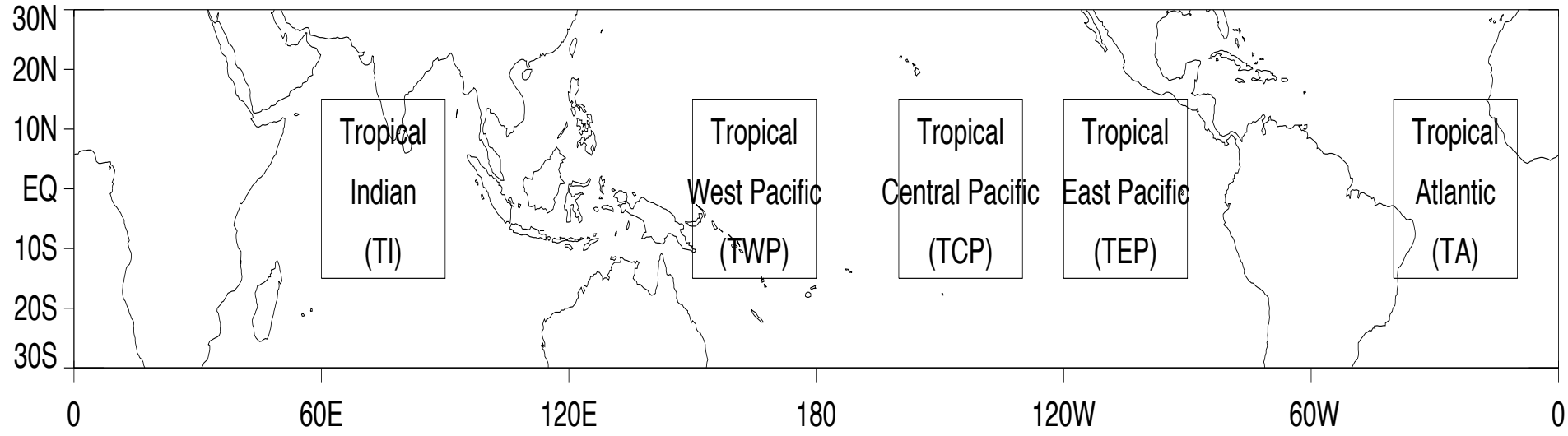
* "Snow/ice cover”
* "Mean TS from clear sky composite"
* "Mean RS from clear sky composite”
* "Pressure levels”
* "Near-surface air temperature (2 meters)"
* "Atmospheric temperature profile"
* "Maximum temperature"
* "Tropopause temperature”
* "Surface pressure"
* "Pressure at max temperature"
* "Pressure at tropopause”
* "Near-surface relative humidity"
* "Relative humidity profile"
* "Relative humidity at max temperature"
* "Relative humidity at tropopause”
* "Ozone abundance”

Cloud variables

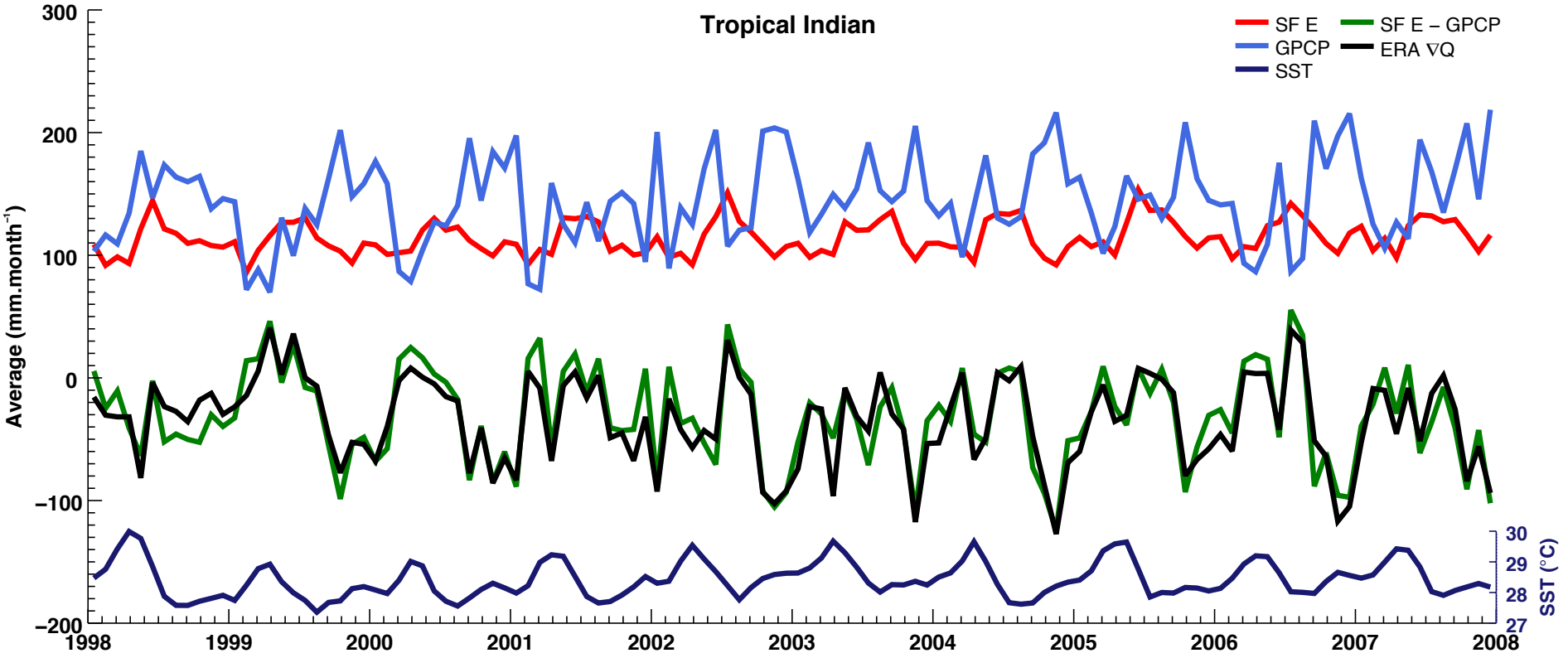
* ”Total number of pixels" (dividing other “number of pixels by this value gives cloud fractions)
* "Number of cloudy pixels"
* "Number of IR-marginally-cloudy pixels”
* "Number of IR cloudy pixels for IR cloud types" (low, middle, high)
* "Number of cloudy pixels for VIS/IR cloud types" (cumulus, etc)
* "Mean PC for cloudy pixels"
* "Mean TC for cloudy pixels"
* "Mean TAU for cloudy pixels"
* "Mean WP for cloudy pixels”
* "PC means for cloud types"
* "TC means for cloud types"
* "TAU means for cloud types"
* "WP means for cloud types”

A Water Budget Closure Test

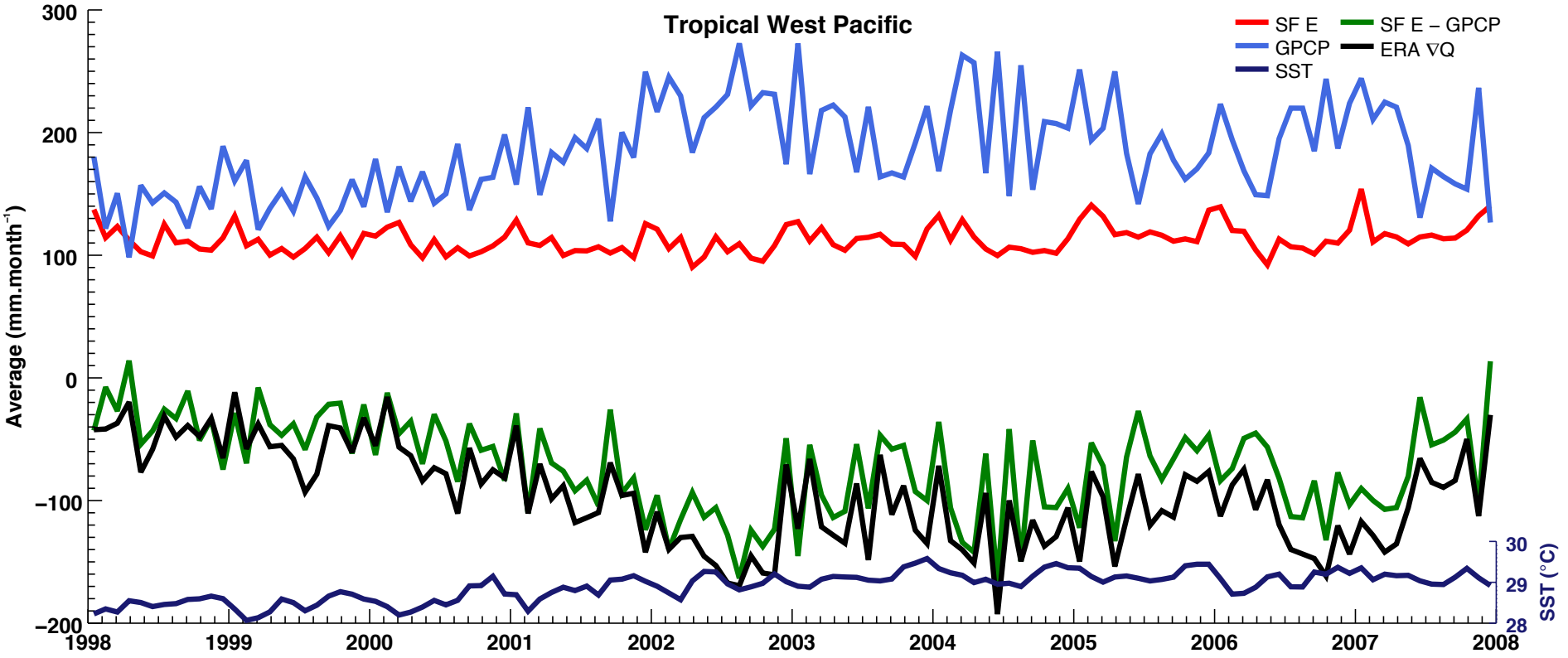
$$E - P = \nabla \cdot Q$$



E, P and Div(Q) for Tropical Indian Ocean

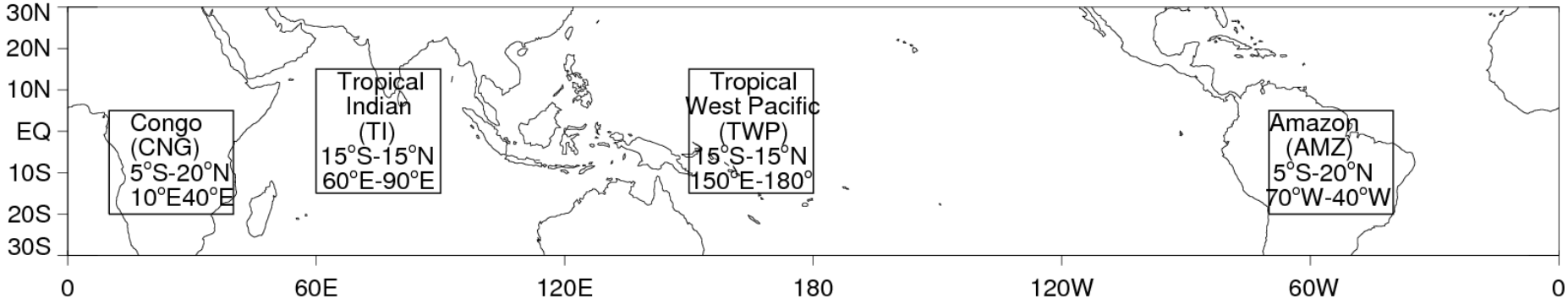


E, P and Div(Q) for Tropical West Pacific

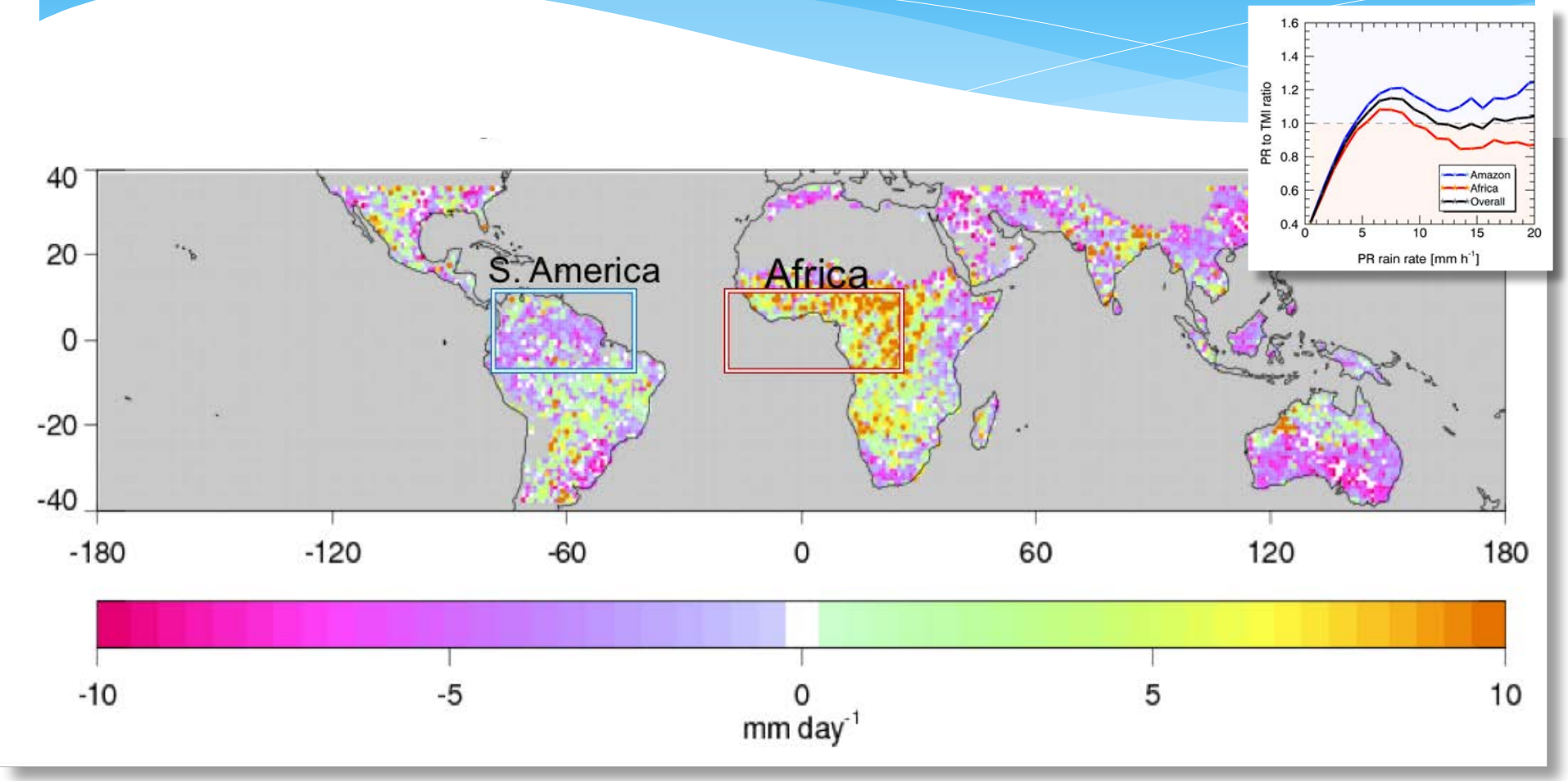


Integrated Product

* Data for 2007
* 4 tropical regions: 2 ocean and 2 land
* Moisture balance, Atmos. & Sfc. energy balance



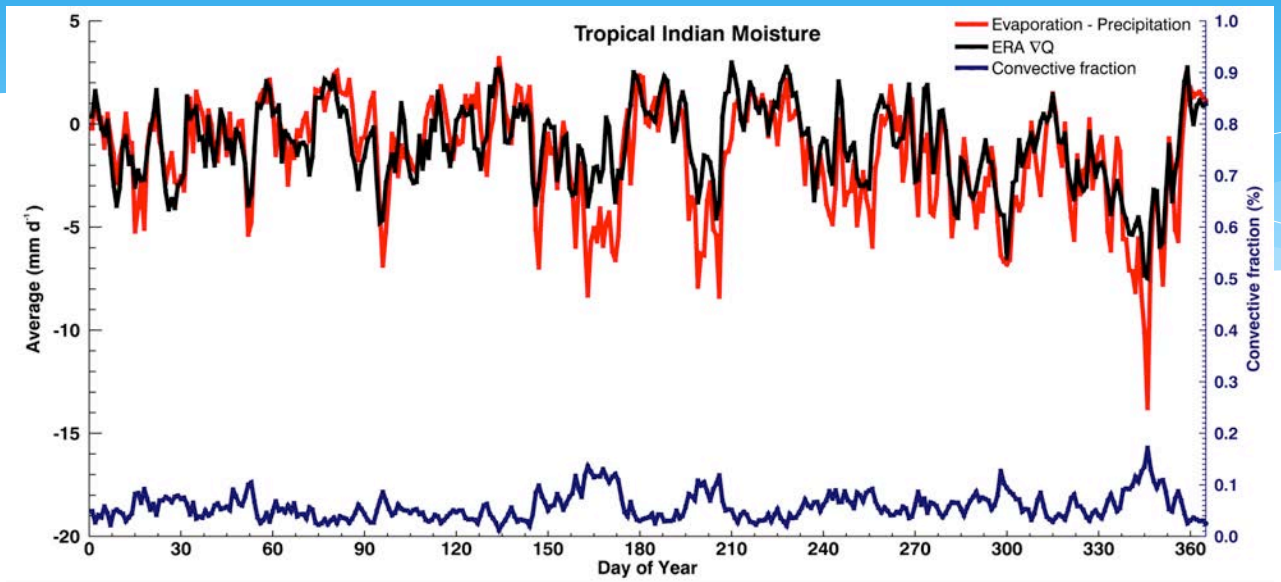
Congo vs Amazon biases



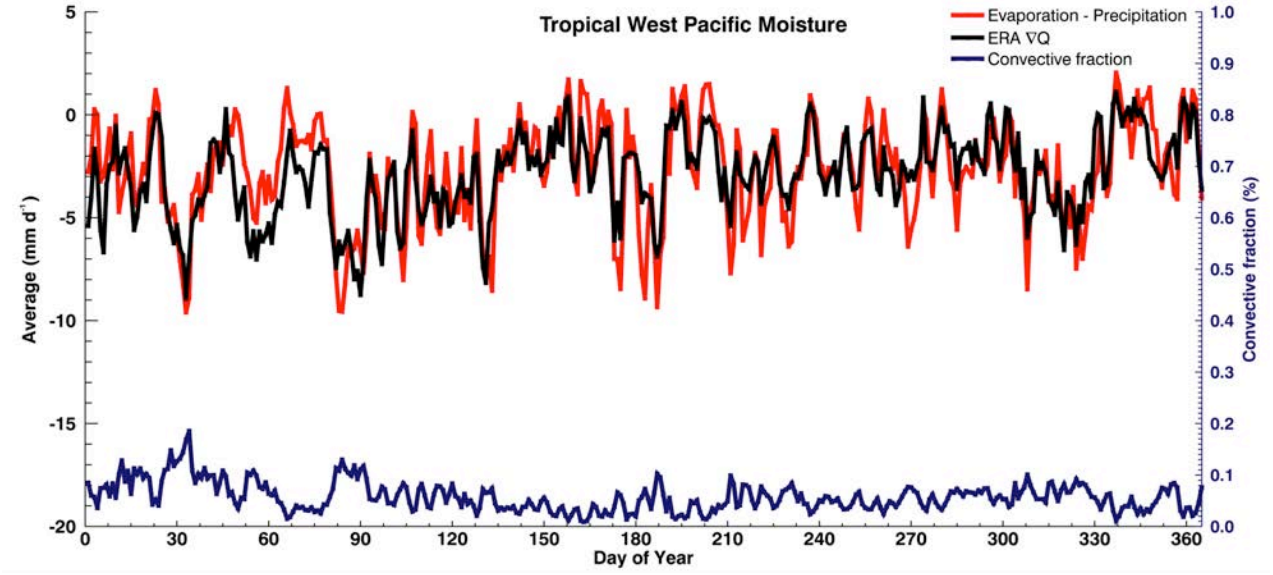
E, P and Div(Q)

Deep convective cloud fraction from ISCCP

Indian ocean



Pacific ocean



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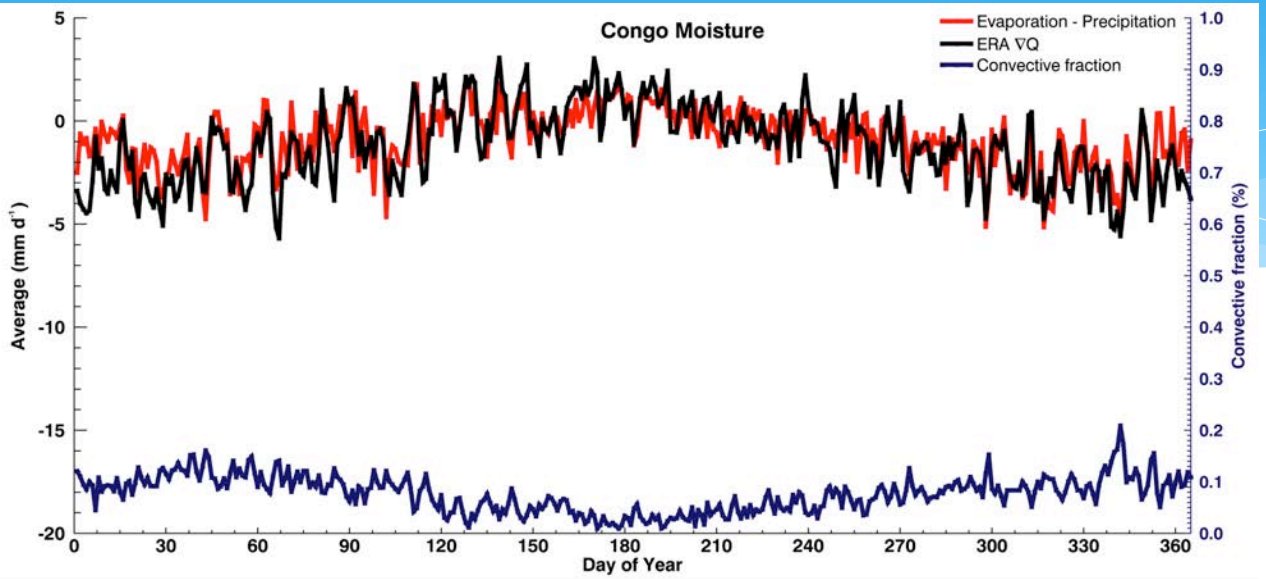
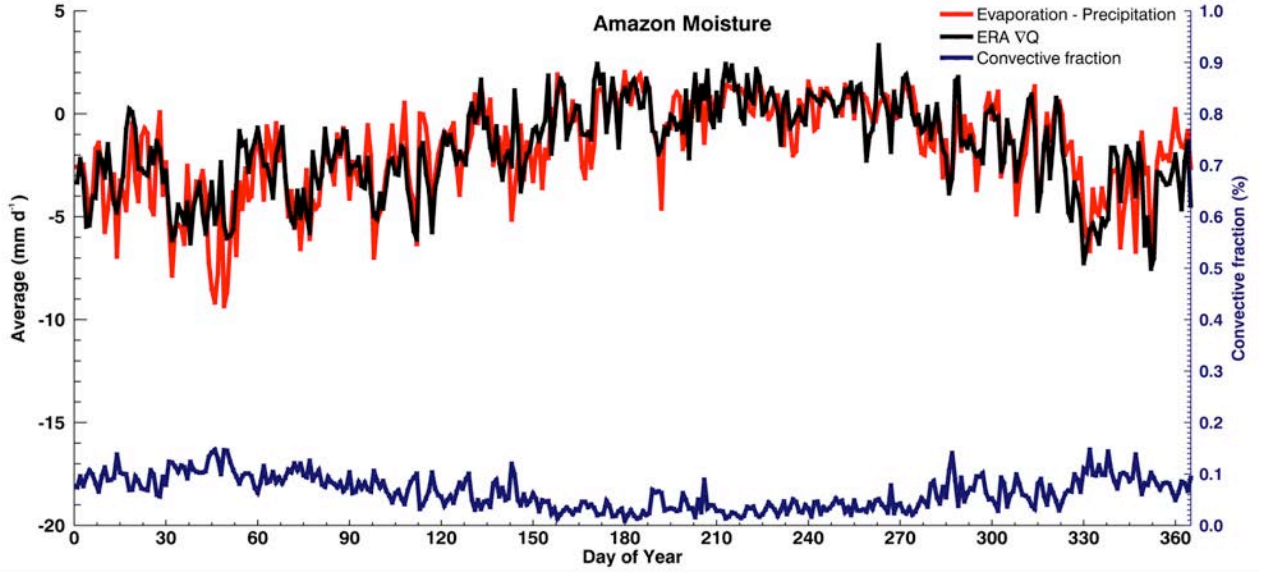
Congo basin



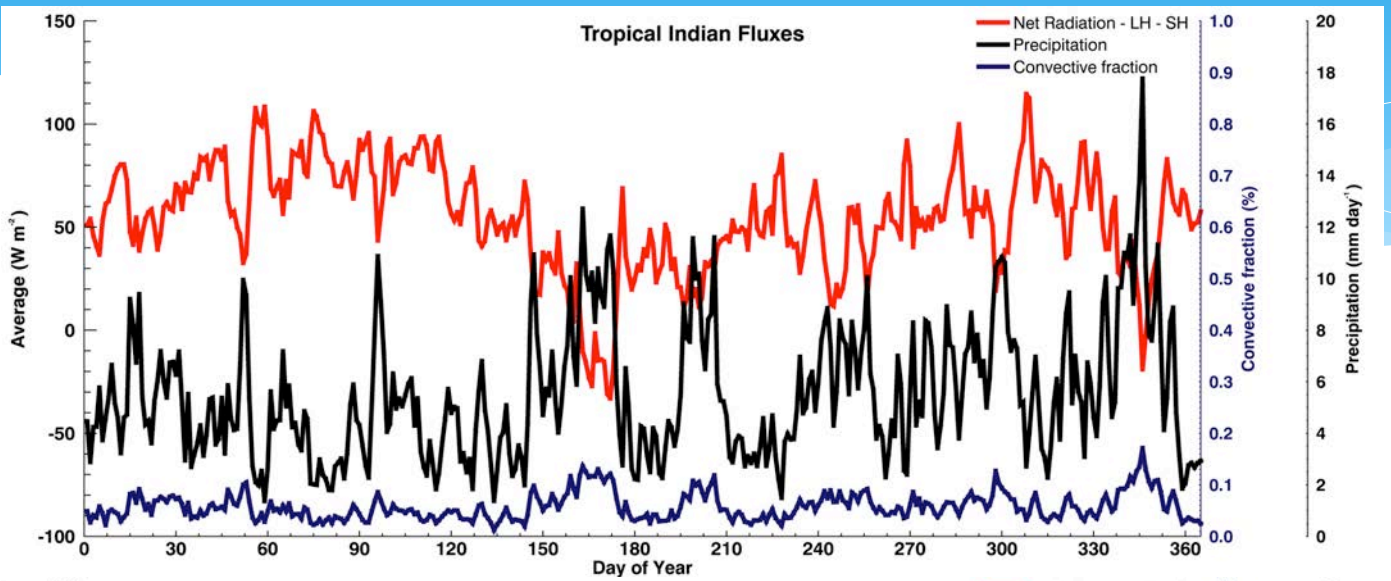
Amazon basin



Net surface heat flux

Precipitation & Deep convective cloud fraction from ISCCP

Indian ocean



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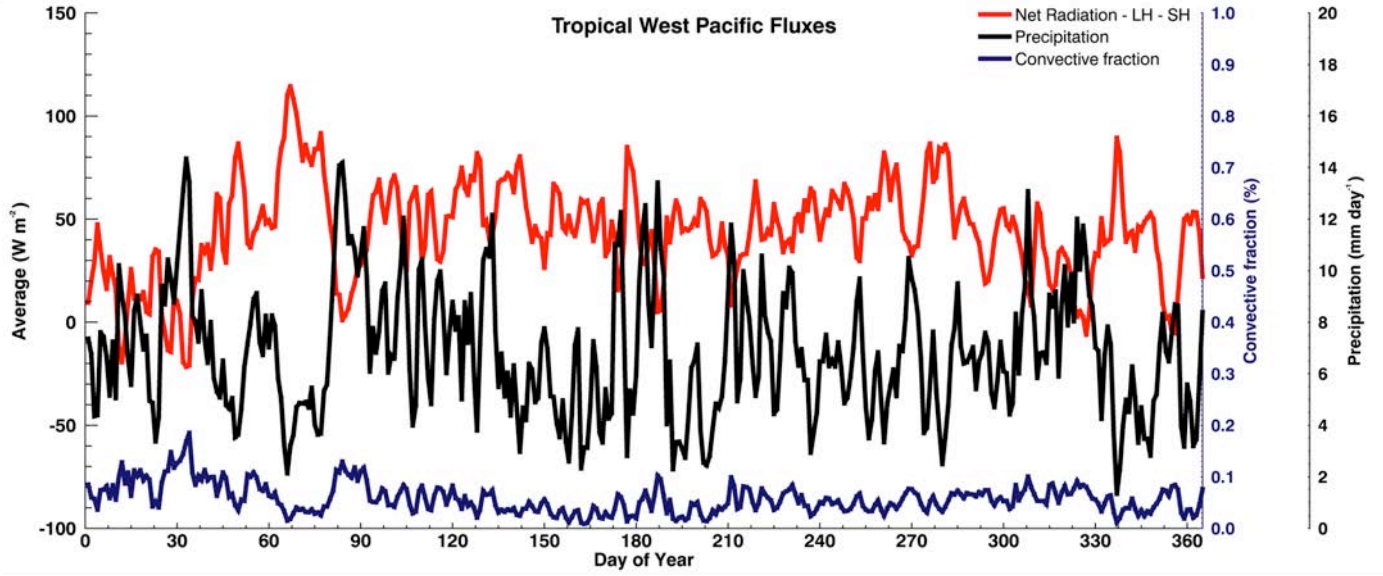

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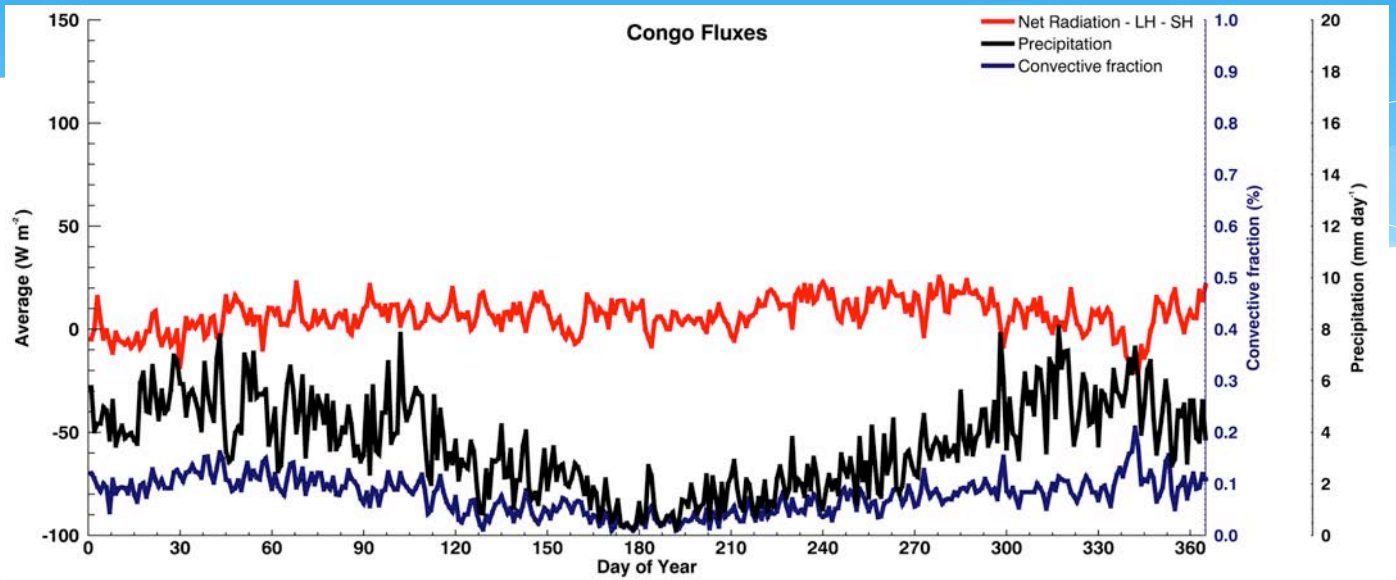
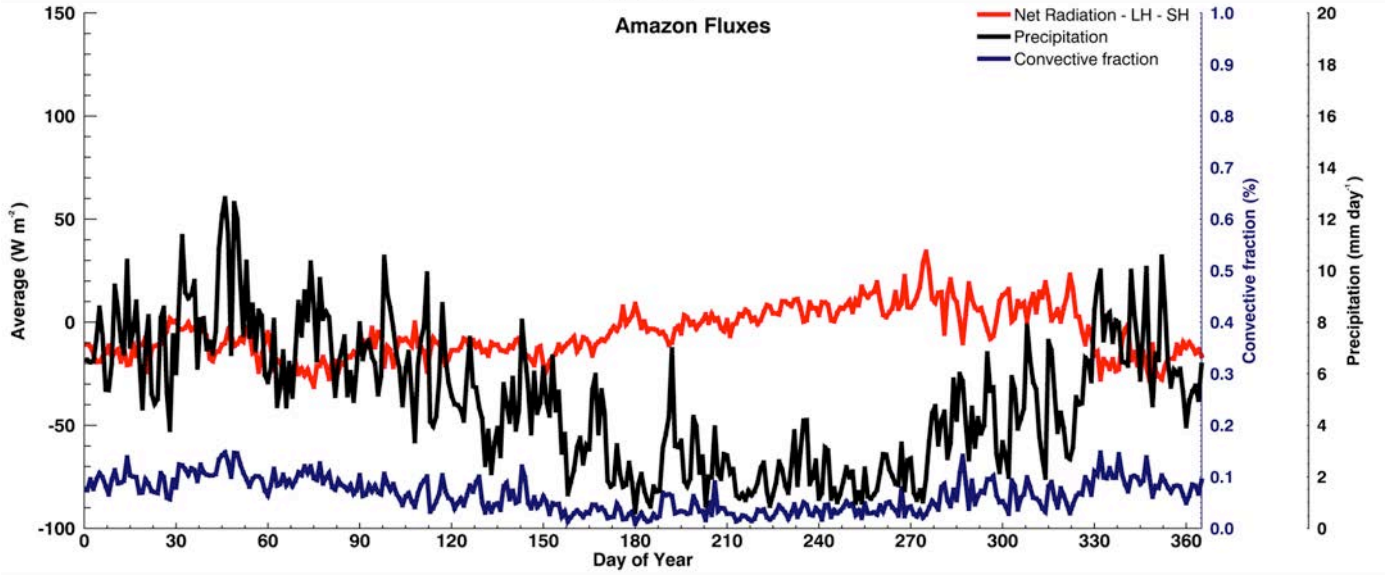


Amazon basin



Where to find the GEWEX Integrated Product

* ftp://rain.atmos.colostate.edu/ftp/pub/GEWEX_IP/pbrown/GEWEX_IP/2007/

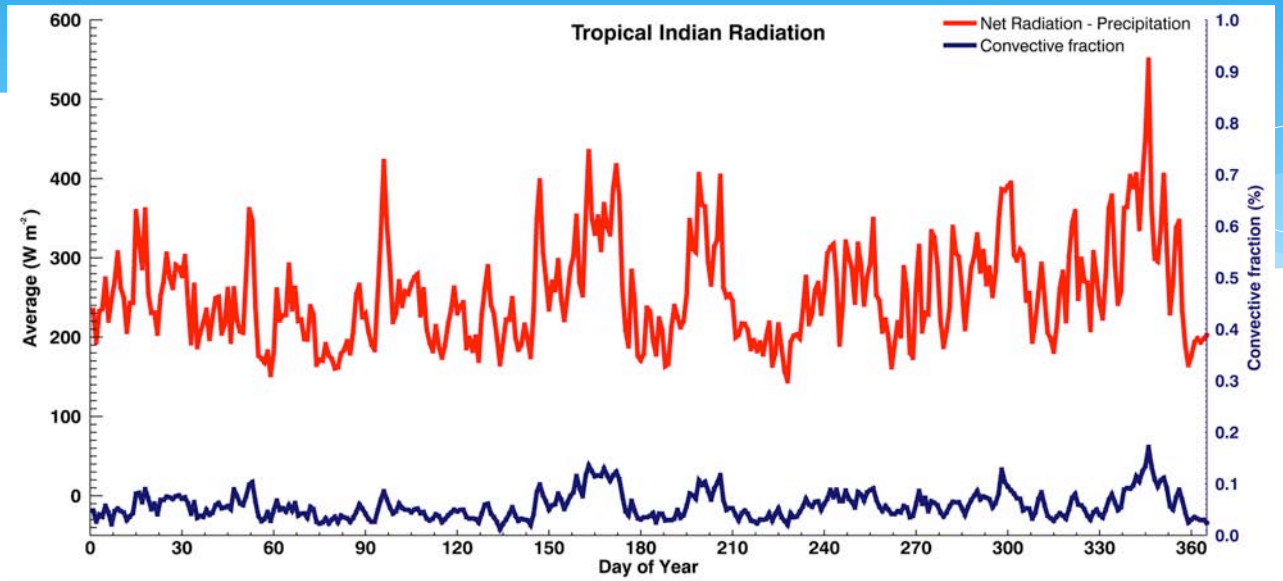
* NetCDF format
* 3-hourly data files

* Who to talk to: pbrown@atmos.colostate.edu

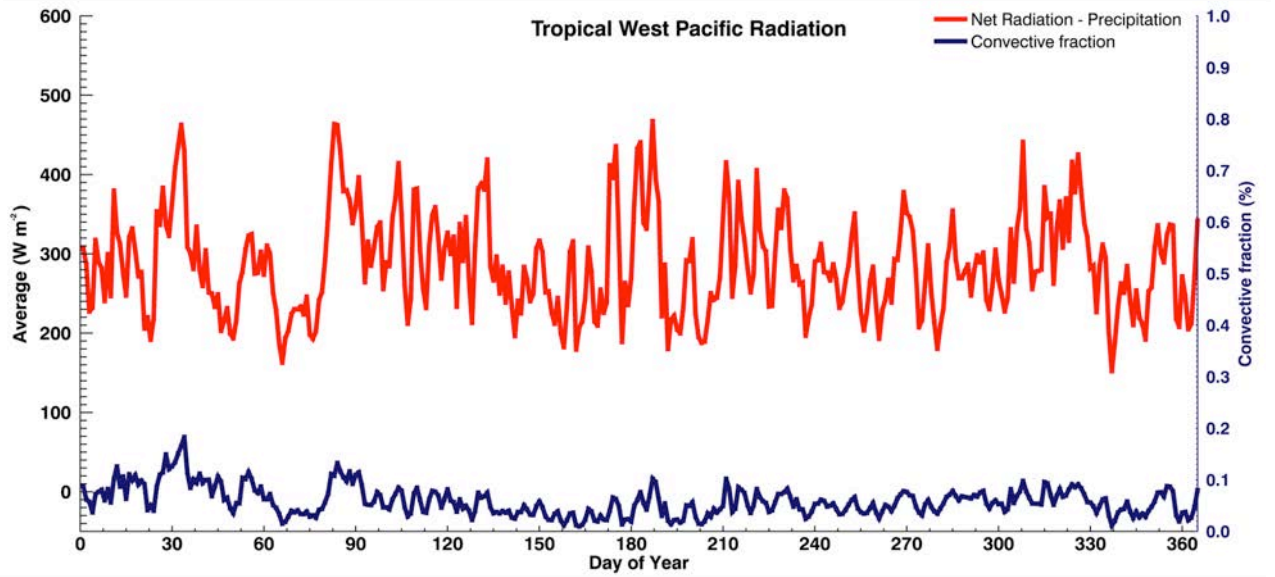
Net radiative cooling - Precipitation

Deep convective cloud fraction from ISCCP

Indian ocean



Pacific ocean



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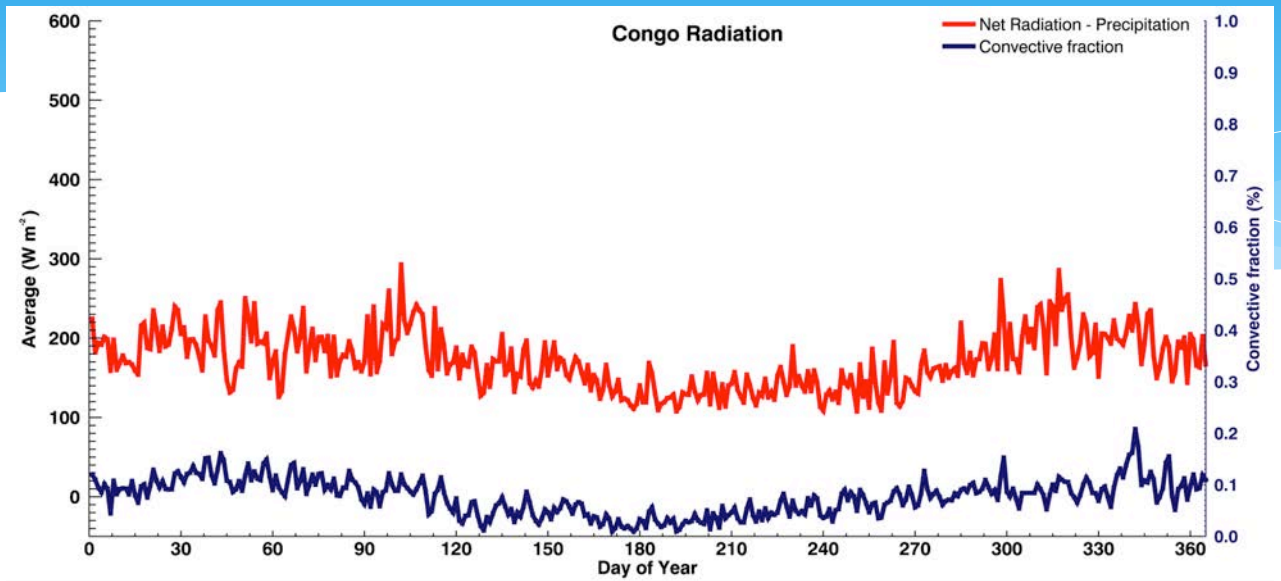

Amazon basin