Universidad Nacional Autónoma de México

INTEGRATED HYDROLOGICAL VALIDATION:

USE OF RADAR AND SATELLITE DATA IN HYDROLOGICAL MODEL

Baldemar Méndez A.

Fernado Glez. Villarreal

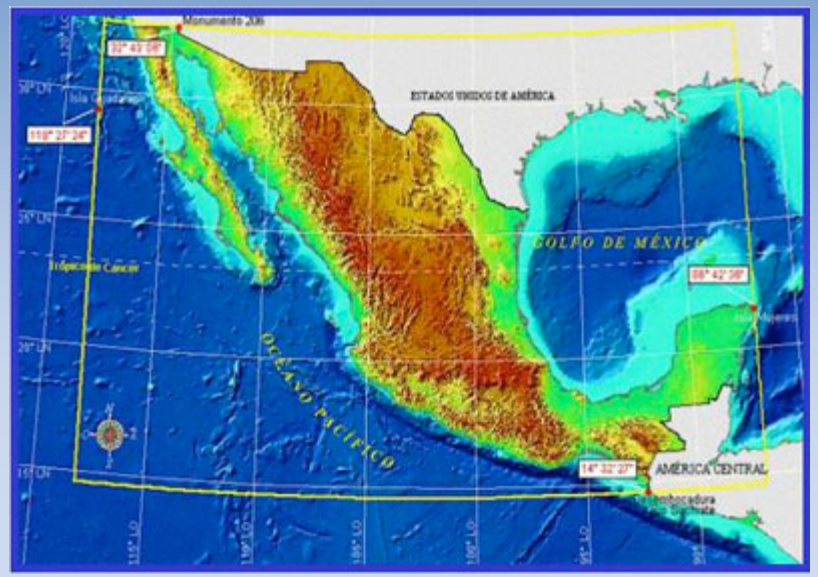
Víctor Magaña

Ernesto Caetano

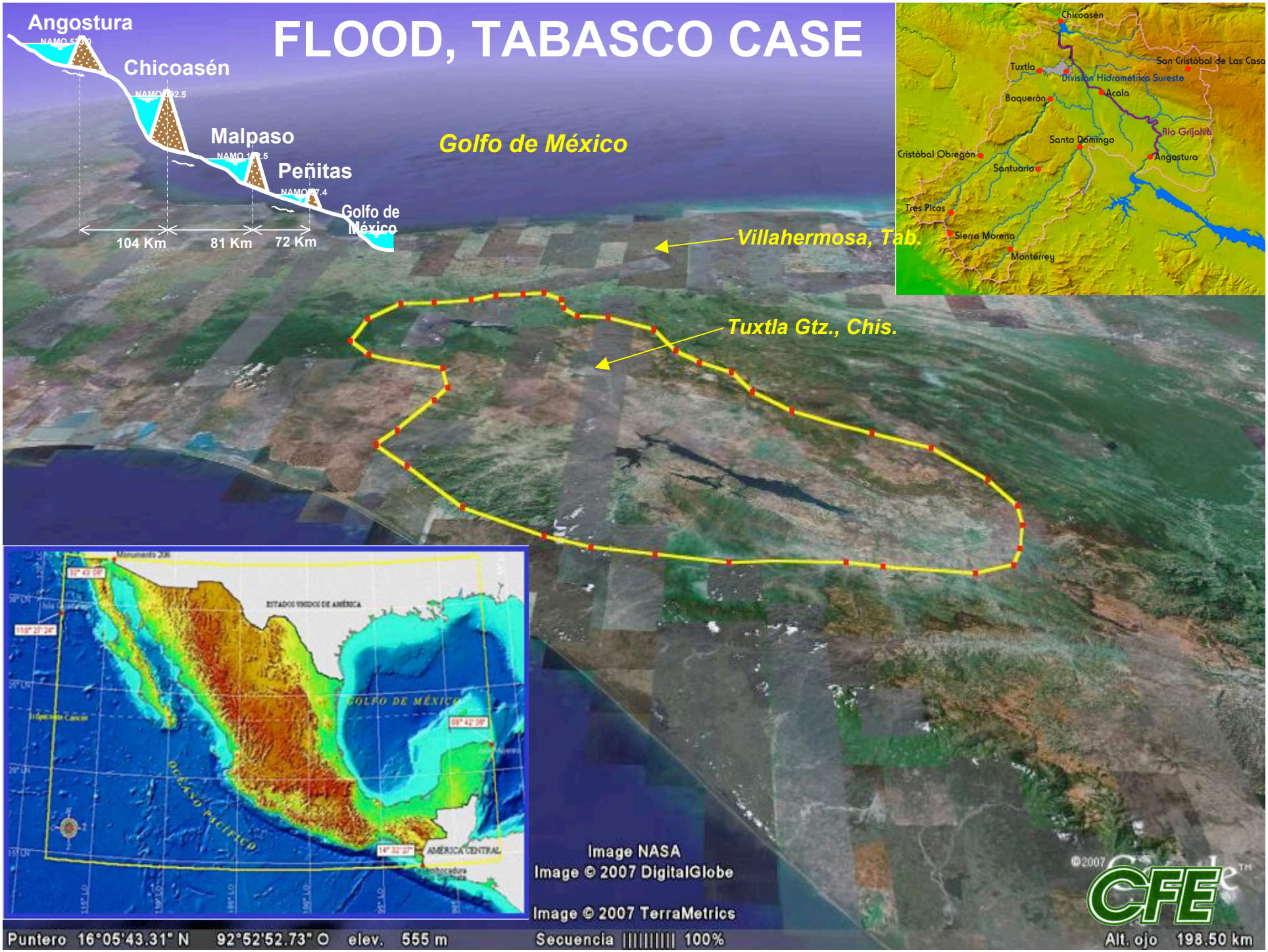
Luiz Augusto Toledo Machado

Carlos Frederico Angelis

HYDROMETEOROLOGICAL DISASTER



FLOOD, TABASCO CASE

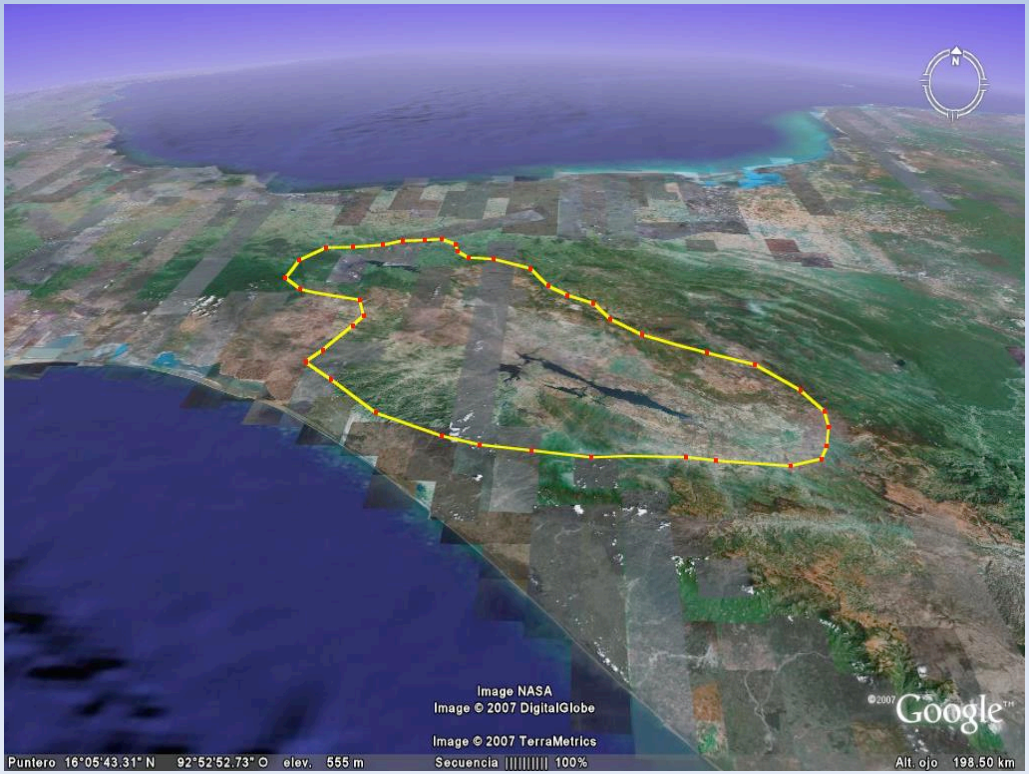


Developing countries experience major losses in relation to extreme hydrometeorological events:

- 95% of deaths related to "natural" disasters occur in the developing countries

The loss by disasters are 20 times greater in the developing countries

Fonte: www.worldbank.org/dmf



National radar networks

DATA BASE

http://irid.ldeo.columbia.edu/SOURCES/.UNAM/.gridded/.monthly/

dataset: UNAM gridded monthly - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://iridl.ldeo.columbia.edu/SOURCES/.UNAM/.gridded/.monthly/

Getting Started Latest Headlines

IRI Data Library

Finding Data Tutorial Questions & Answers

UNAM gridded monthly documentation

help@iri

UNAM gridded monthly options | Help | Expert Mode

Data Selection | Data Downloads & Files | Data Tables

served from IRI/LDEO Climate Data Library

SOURCES UNAM gridded monthly

UNAM gridded monthly

UNAM gridded monthly: Cressman analysis of monthly precipitation for Mexico and surroundings based upon CLICOM daily station data, GHCN Version 2 monthly station data, and GPCC monthly gridded data, from the Centro de Ciencias de la Atmósfera.

Documents

outline an outline showing all sub-datasets and variables contained in this dataset

Datasets and variables

Monthly Precipitation UNAM gridded monthly pcp[X Y | T]

Grids

Time grid: /T (months since 1960-01-01) ordered (Jan 1951) to (Dec 2000) by 1. N= 600 p

Longitude grid: /X (degree_east) periodic (140.75W) to (59.25W) by 0.5 N= 164 pts :grid

Latitude grid: /Y (degree_north) ordered (4.25N) to (40.75N) by 0.5 N= 74 pts :grid

Other Info

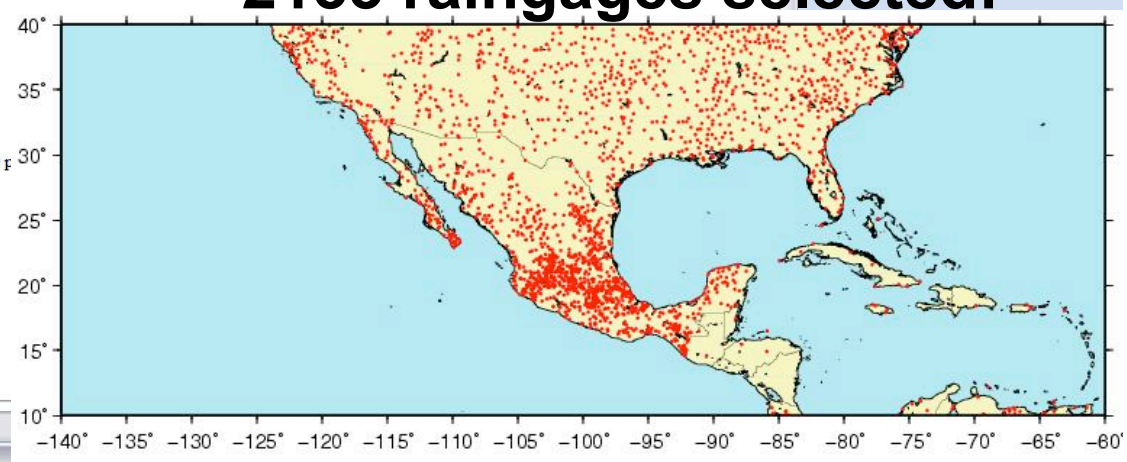
iridl:hasSemantics
iriref:Mendez_M

Last updated: *Tue, 17 Oct 2006 17:02:19 GMT*

Done

start | dataset: UNAM gridd... | examen_candidatura

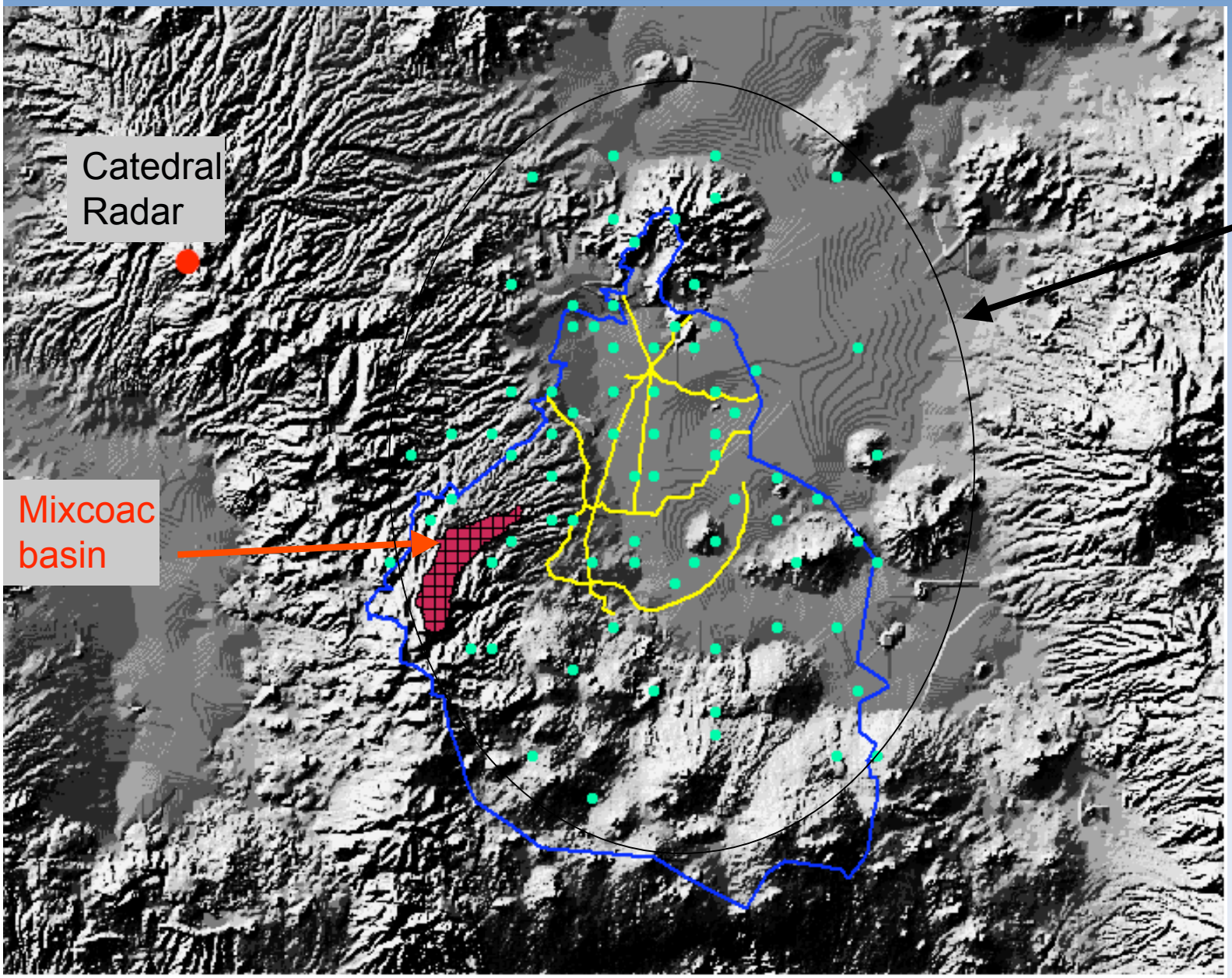
2133 raingages selected!



VALIDATION OF RADAR DATA

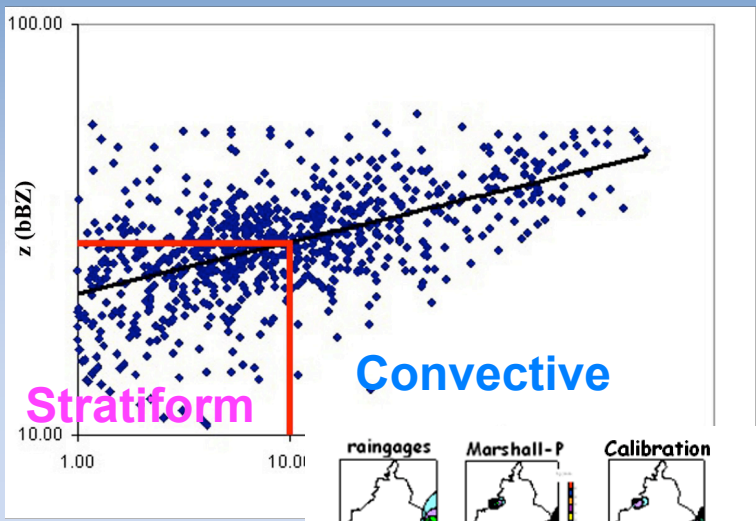
Mexican case

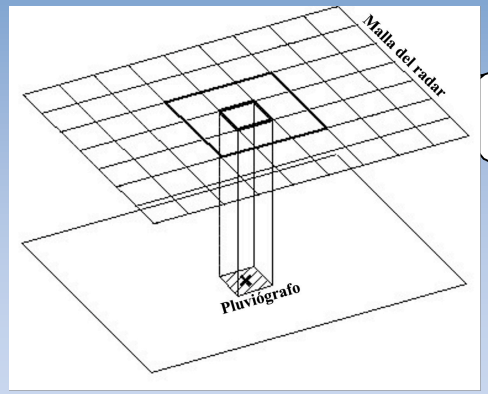
Mexico City

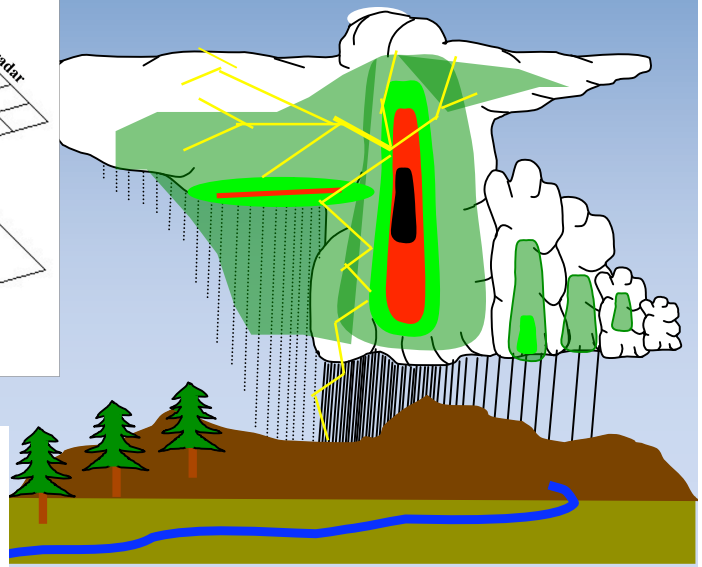

Raingages
Streets
Catedral Radar
Calibration area
Mixcoac basin

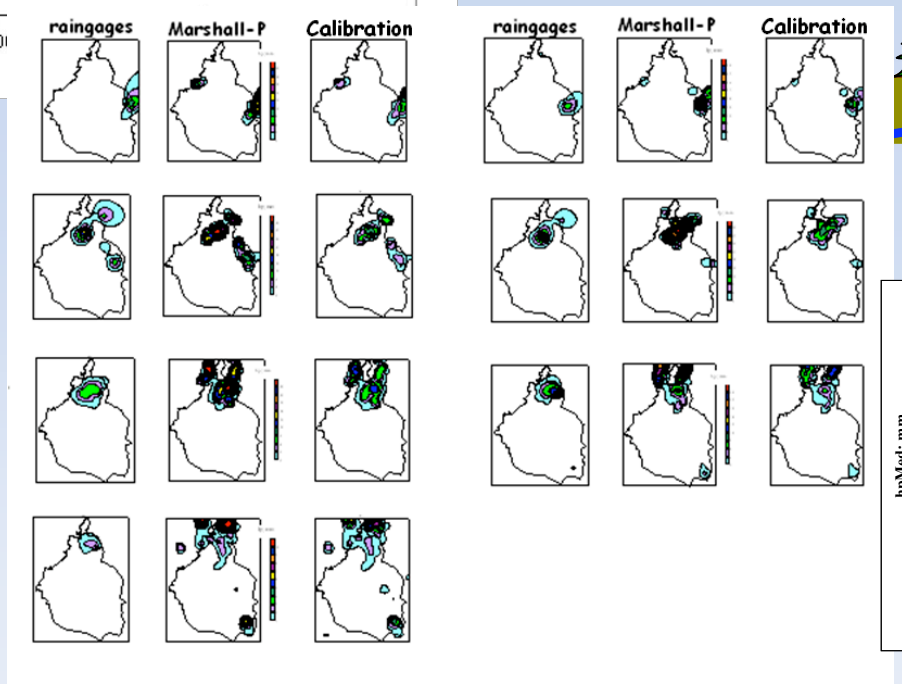
Validation of data

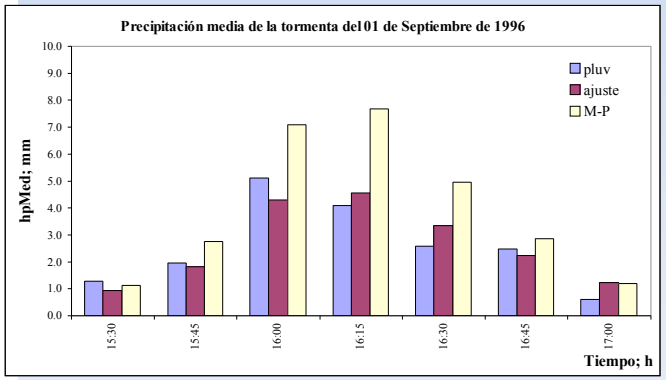
STRATIFORM < z = 31 DbZ > CONVECTIV

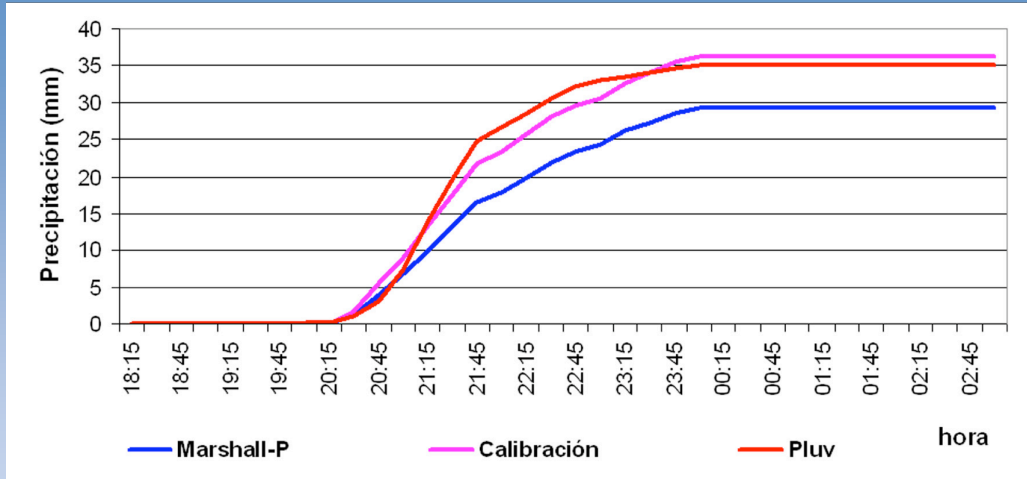








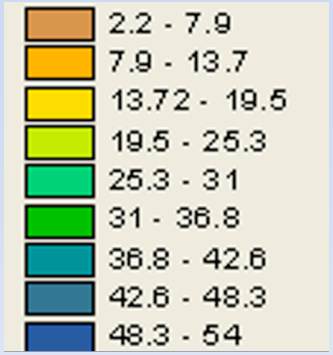




Raingauge

Calibration

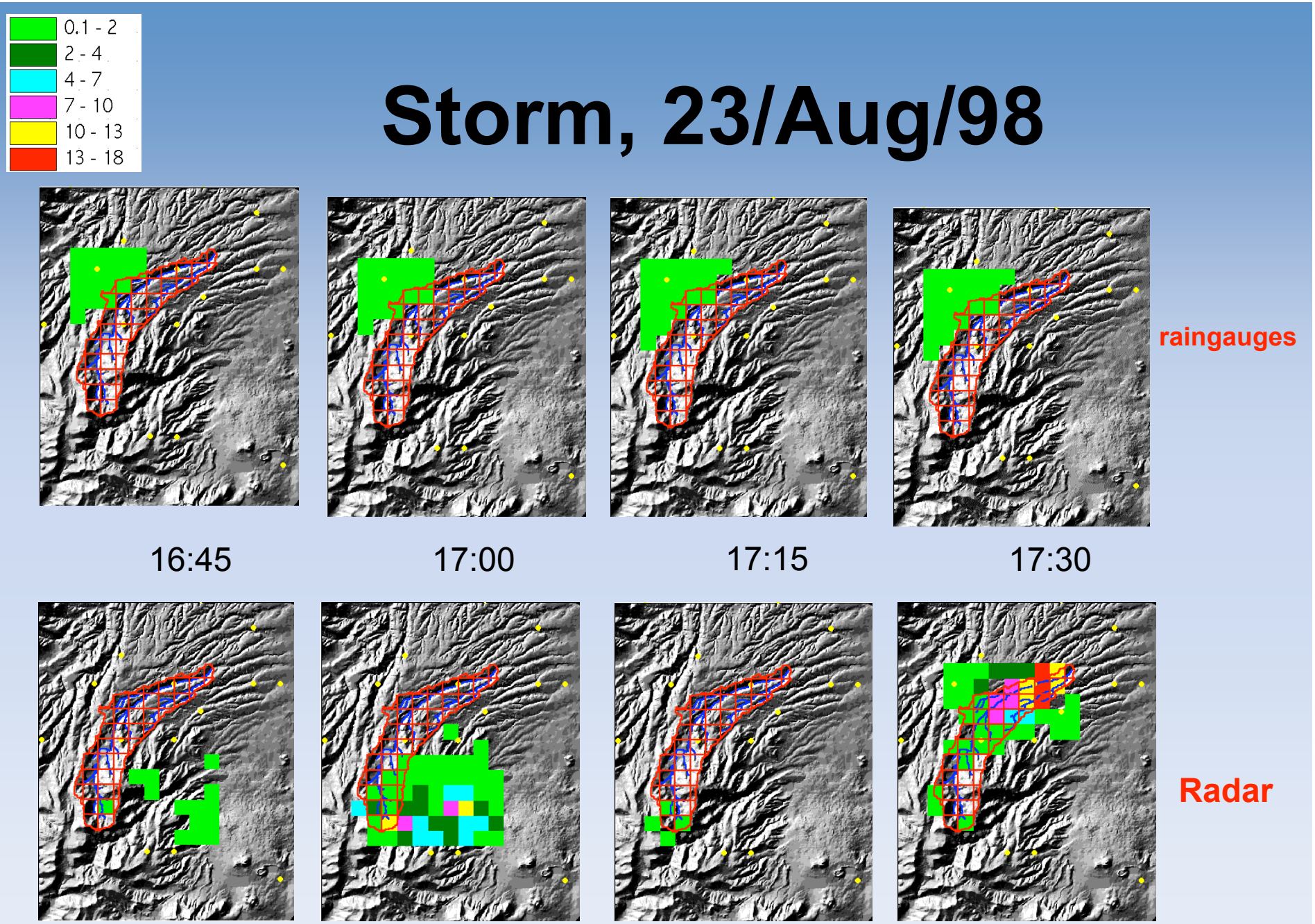
Fit



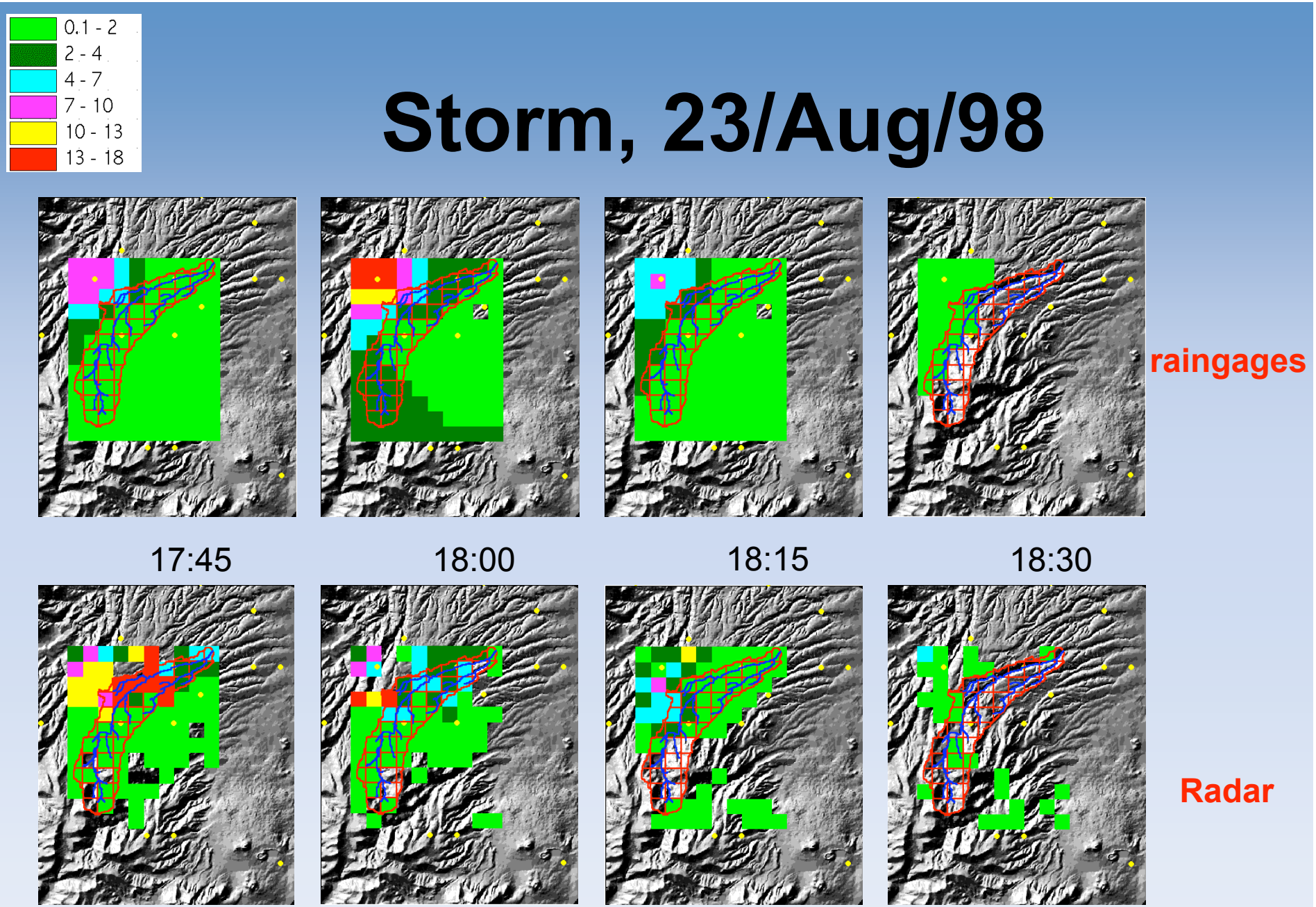
Desierto de los Leones

Storm 28 july 1998

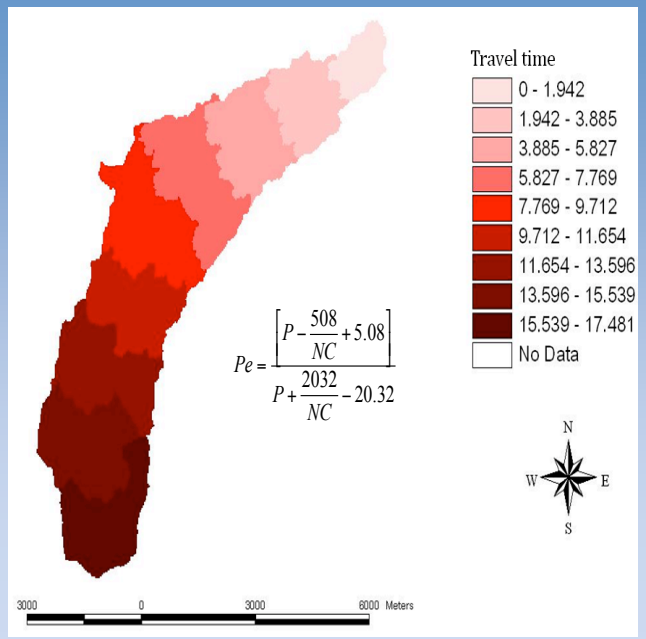
Storm, 23/Aug/98



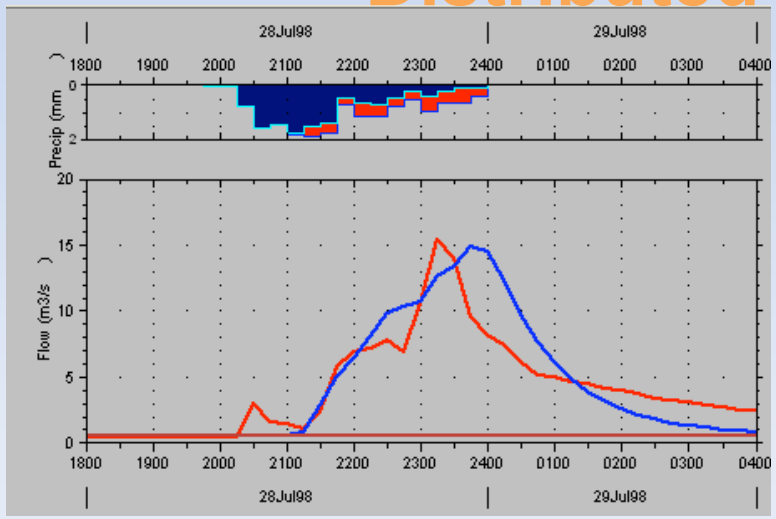
Storm, 23/Aug/98

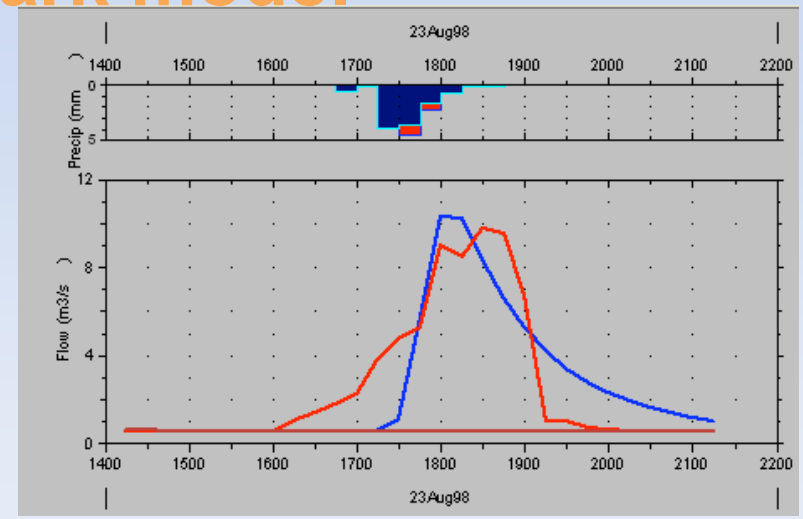


Hydrograph Unit



Distributed Clark model



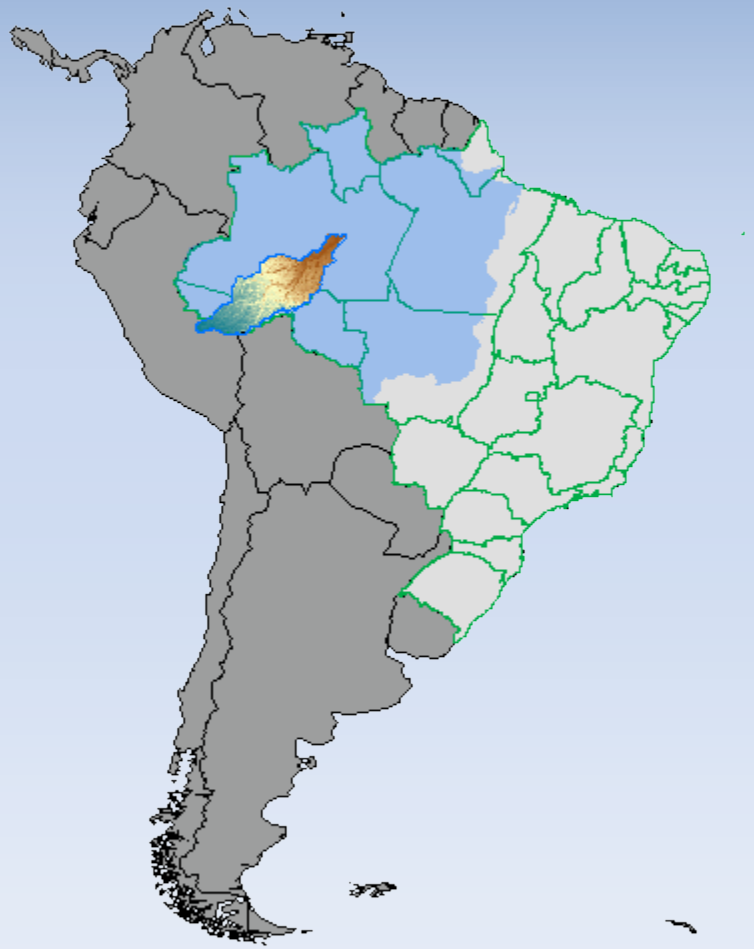


VALIDATION OF SATELLITE DATA

Brazilian case

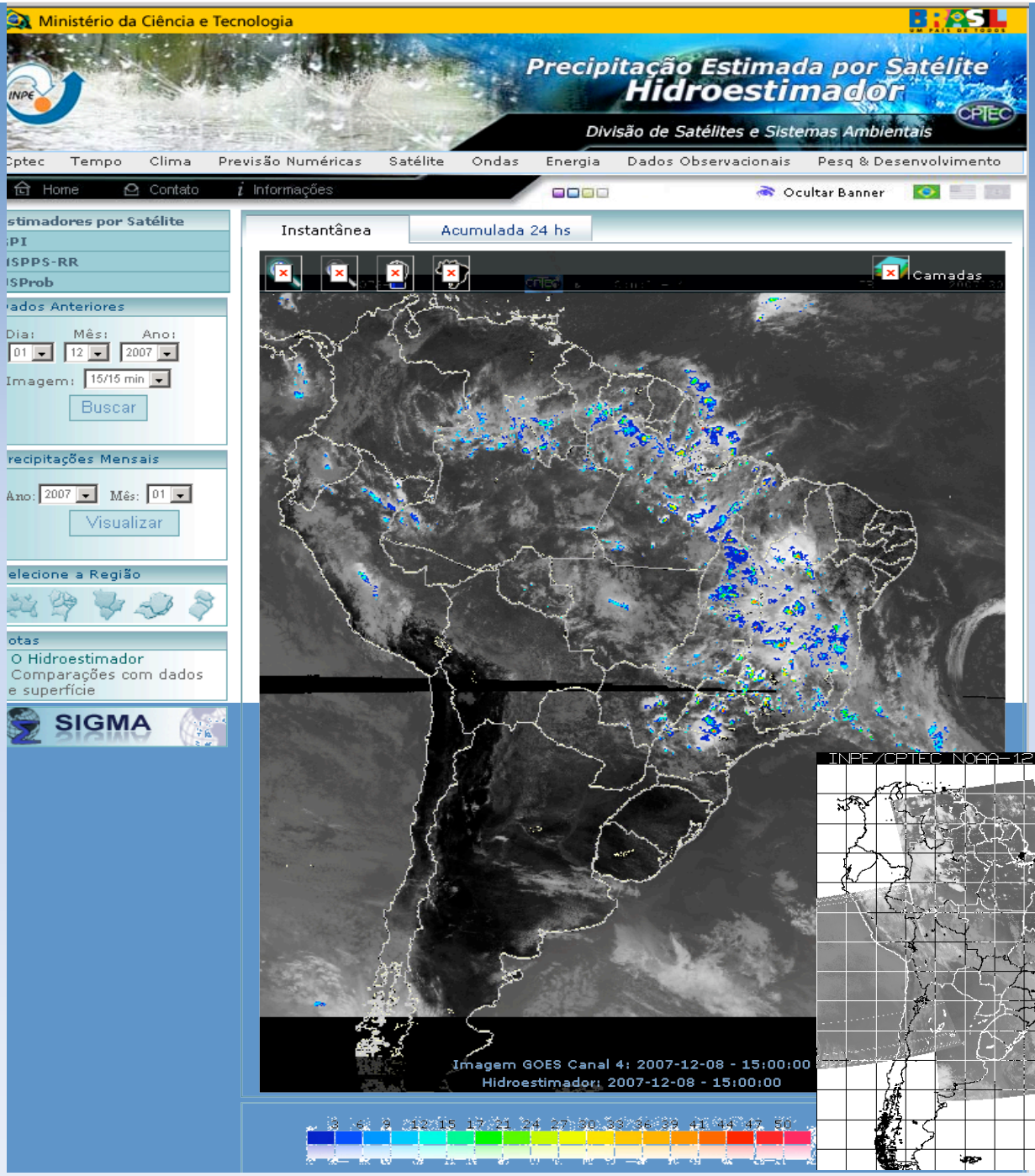
HIDROLOGICAL MODELATION OF PURUS RIVER

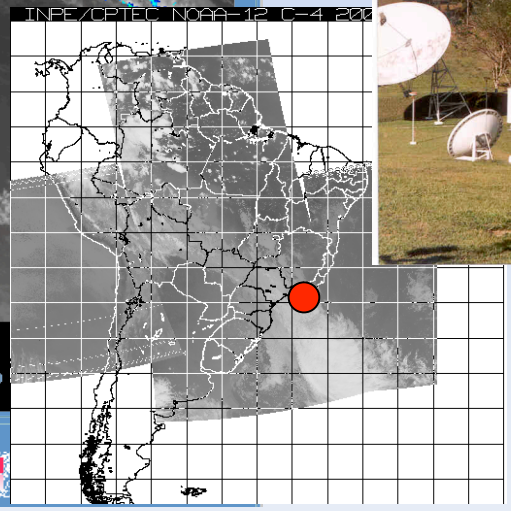
- **Hydrology of the basin**
- **Hydrological model**
- **Operational model**



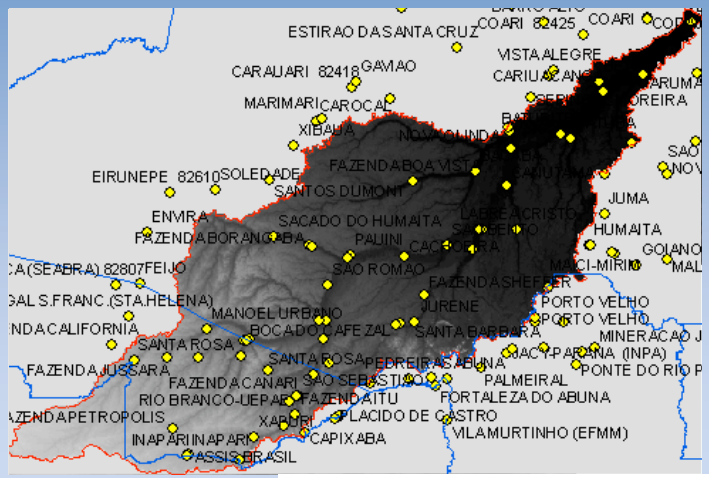
DSA/CPTEC/INPE

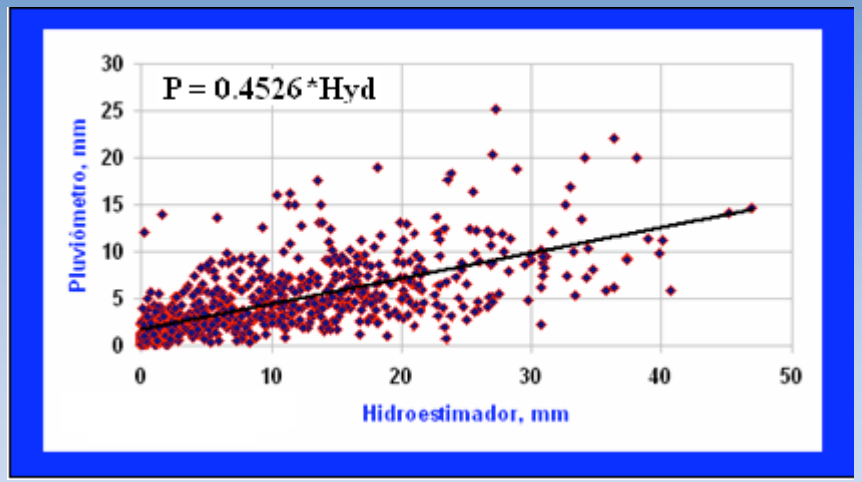
HYDROESTIMATOR

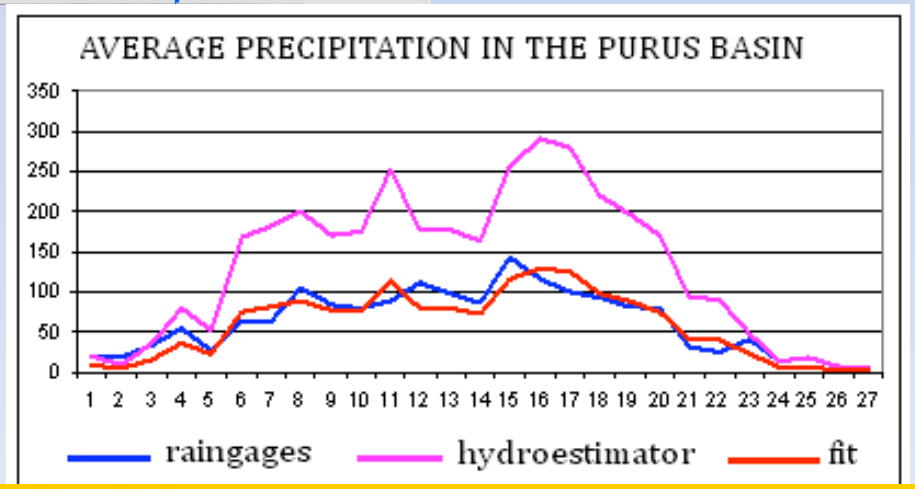




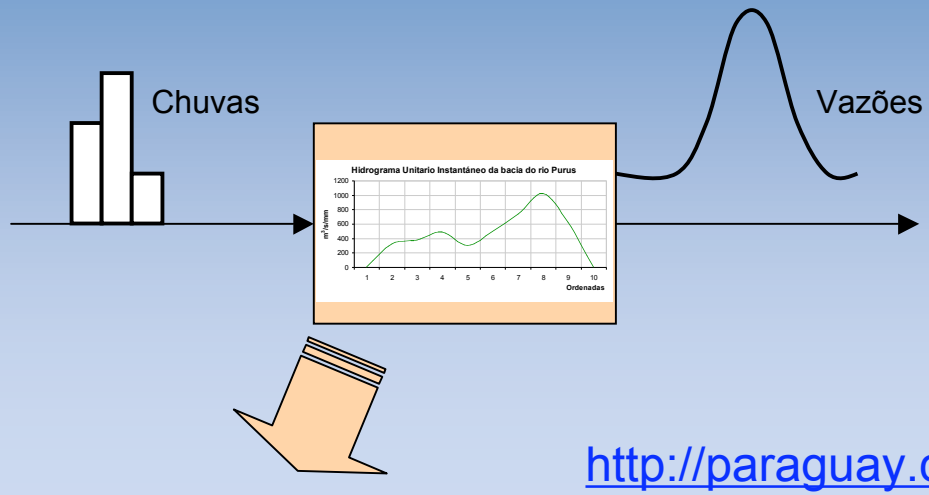
VALIDATION OF THE HYDROESTIMATOR DATA



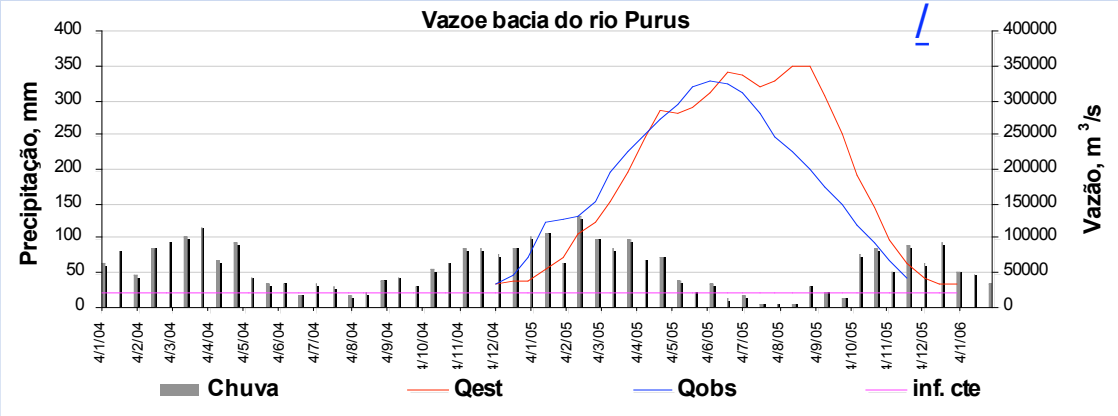




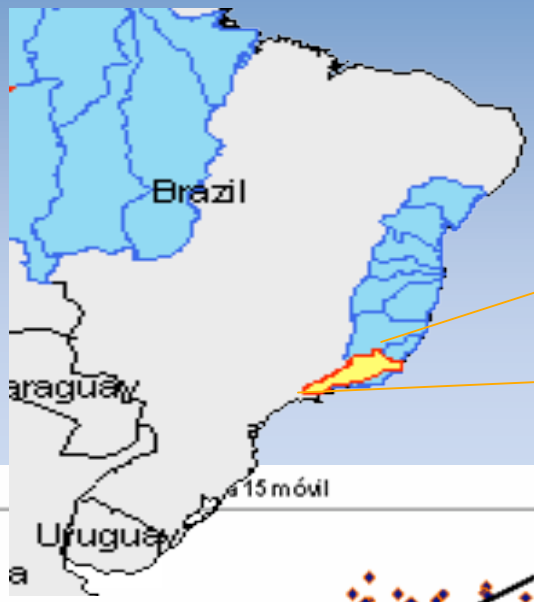
Transfer Function

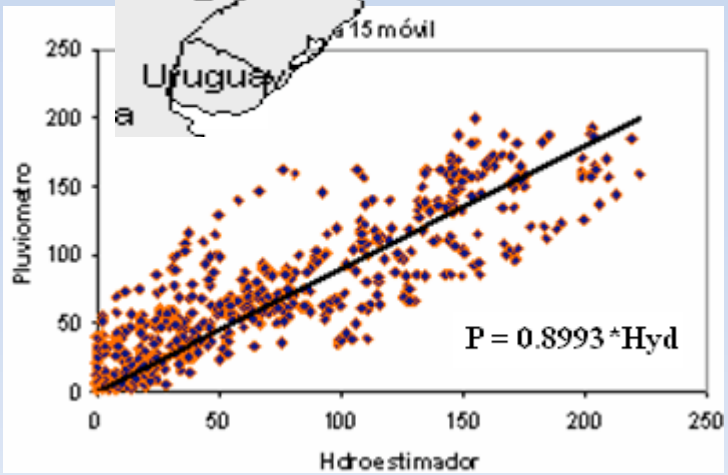


http://paraguay.cptec.inpe.br/produto/purus/

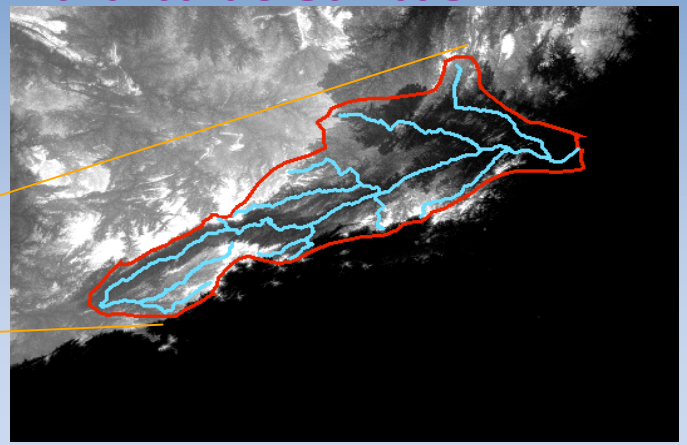


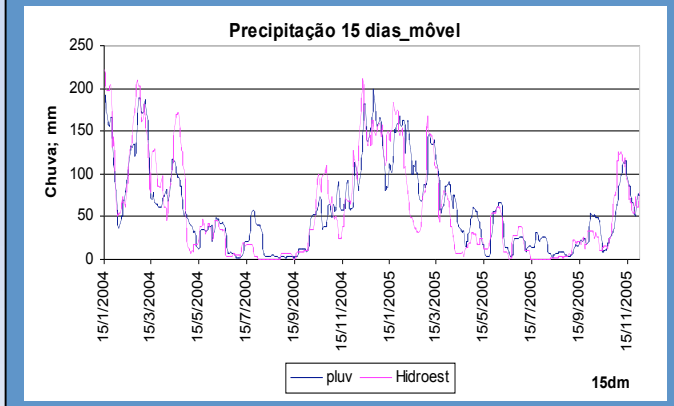
DISTRIBUTED MODEL, f(t,s)



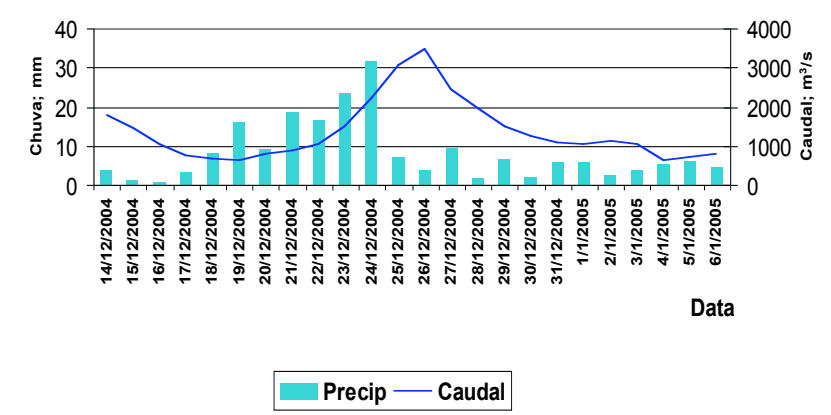


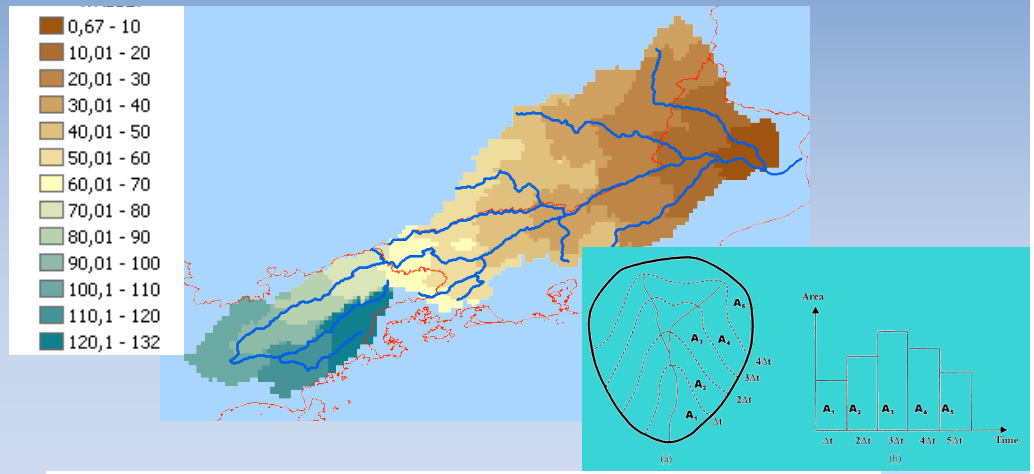
Paraíba do Sul basin

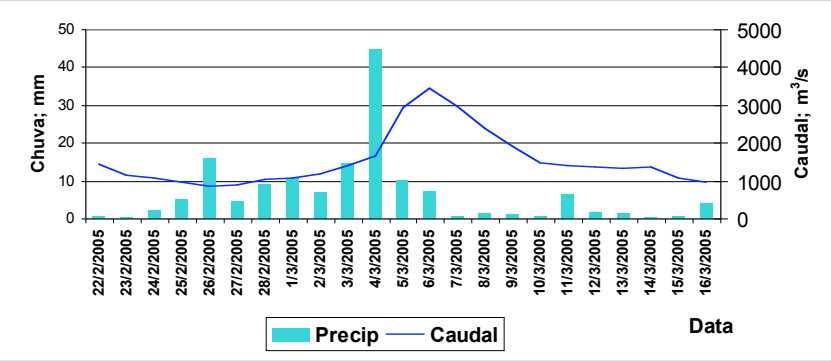


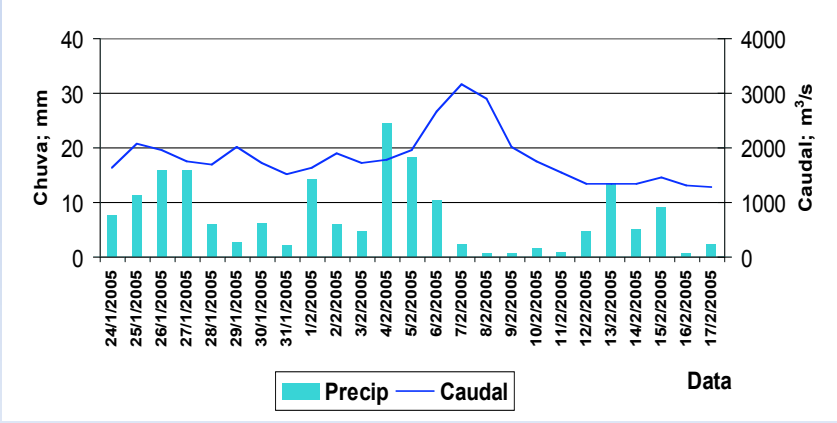


ISOCRON DISTRIBUTED MODEL

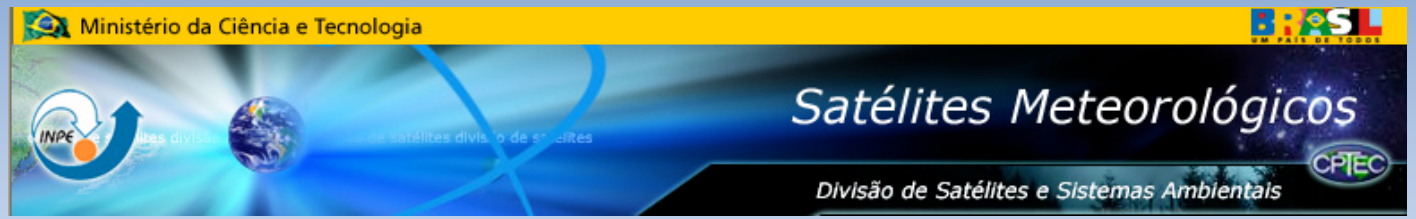








COLLABORATION



Uruguay and Colombia cases

Remote Sensing in Hydrology: GPM

Table 1. The three primary sensors used to estimate precipitation, their associated strengths and weaknesses, time and spatial scales of measurements, and current operational applications.

Sensor	Strengths	Weaknesses	Time–space scales	Operational applications
Weather radar	• High spatial and temporal resolution • Good areal coverage	• Range effects • Coverage in complex terrain • Z_e–R and Z_e–S uncertainties • Nonmeteorological target contamination	• 5–10 min • 1 km	• Precipitation nowcasting • Flash flood forecasting • River forecasting (after bias correction) • Land surface modeling (after bias correction)
Geostationary satellite	• Continuous spatial coverage	• Indirect measurements of precipitation • Difficulty with nonprecipitation clouds	• 15 min • 4 km	• Nowcasting • Flash flood forecasting • River forecasting (after bias correction) • Land surface modeling (after bias correction)
Polar-orbiting satellite (passive microwave)	• Continuous spatial coverage	• Poor spatial/temporal resolution • Indirect measurements of precipitation • Difficulty with non-ice-bearing clouds	• 3–6 h (6+ satellite constellation) • 15 km	• Tropical Rainfall Potential (TraP) • Adjustment of GOES precipitation estimates
Precipitation gauge	• Direct measurement of precipitation	• Nonuniform spatial distribution • Latency in real-time data transfer • Problems with quality of measurements • Frozen hydrometeors • Wind effects • Uncalibrated (tipping-bucket type in high rain rate)	• 10 min–1 day	• Flash flood forecasting • River forecasting • Land surface modeling • Water supply forecasting • Correction of radar and satellite QPE • Hydroclimatological studies • Verification

Remote Sensing

Weather Models

Data Assimilation,

Hydrological model:

Nowcasting

Log term: Water management

Hydrometeorological Products

Alert System

Risk Administration

*IMPROVING QPE AND VERY SHORT TERM QPF, STEVEN V. VASILOFF et al. AMERICAN METEOROLOGICAL SOCIETY; DECEMBER 2007 BAMS 1899

THANKS!

baldemar@cptec.inpe.br
baldemar.mendez@prohimet.org
BMendezA@iingen.unam.mx