



Water information needs and National Data Sources and Services in Costa Rica

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Surface and subsurface data

- There is a relatively dense historical meteorological dataset by the Meteorological Institute of Costa Rica
- Hydrologic data is limited to streamflow (no soil moisture data) and in some cases affected by dams. Large number of ungaged basins (modeling is needed)
- We need more hydromet surface real-time data, which is very limited

Surface and subsurface data

Latitud: 09° 56'
Longitud: 84° 05'
Elevación: 1172 msnm

Instituto Meteorológico Nacional
Barrio Aranjuez, San José , Costa Rica

Los datos observados se actualizaron por ultima vez a las 09:12 AM del dia 02/12 /2009

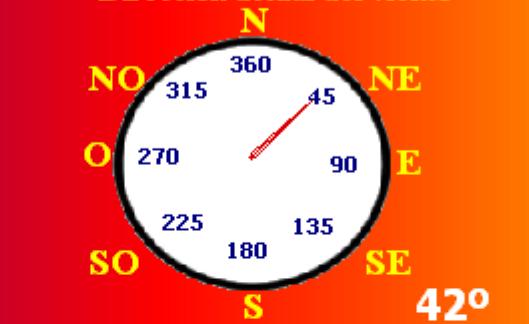
Velocidad actual del viento:

8.5 Km/h

Velocidad máxima del viento
(Desde las 12am de hoy)

16.3 Km/h

Dirección actual del viento



Temperatura actual

23.7 °C

Temperaturas extremas
(Desde 12am de hoy)

Máxima: **24.7 °C**

Mínima: **17.1 °C**



Lluvia acumulada
Desde 7am de hoy

0.0 mm

De 7am de ayer
a 7am de hoy:

0.0 mm

Humedad relativa actual

60 %

Presión

881.4 hPa

661.0 mm Hg

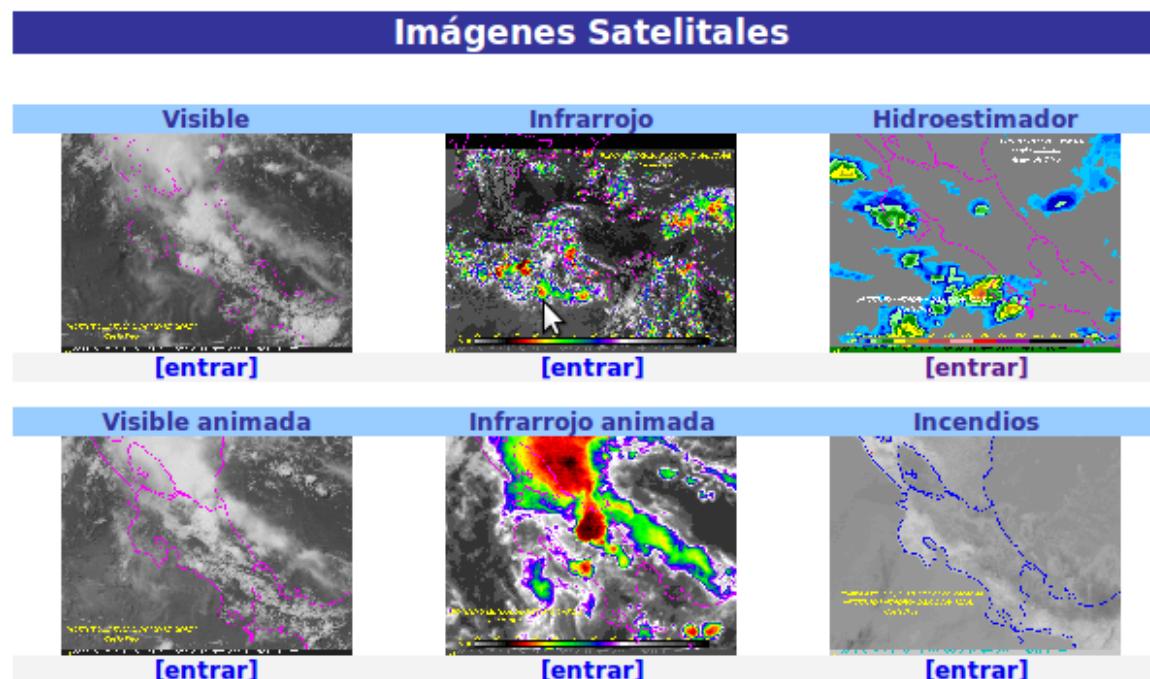
26.0 in Hg

Surface and subsurface data

- Better (higher res) soil and vegetation data is needed for hydro models
- Groundwater data is extremely limited and unreliable
- Radiosonde data from 1970s to the present is available daily at one site in Costa Rica
- Water-quality data not generally available

Remote-sensed data

- Access to satellite images is available at the Met Institute and at the University of Costa Rica (historical images generally not being archived)



Remote-sensed data

Carta Mission (2003,
2005)

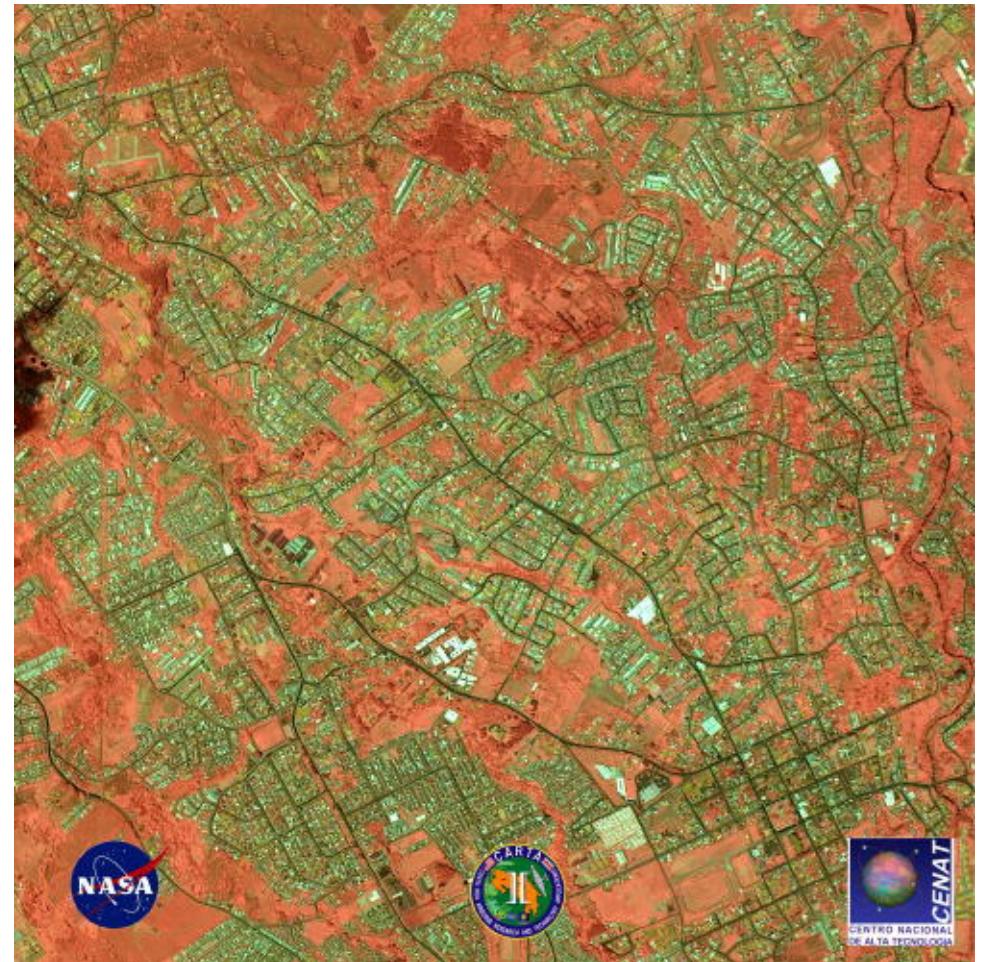
NASA – Costa Rica

High -res images 8000m
flights

Multispectral MASTER
sensor 50 bands visible-
to-infrared

Hymap sensor 128
bands

2004 Radar images



Remote-sensed data

- Met Radar not available (but Costa Rica Electricity Company is thinking of acquiring one relatively soon)

Modeling

- MM5 and WRF efforts at the Universidad de Costa Rica (UCR), Centro de Investigaciones Geofisicas at UCR and Instituto Meteorologico Nacional (IMN)
- PRECIS modeling for downscaling of GCM output for II Comunicacion Nacional de Cambio Climatico (IMN)
- Central American Flash Flood Guidance System (HRC/IMN)

Modeling and Infrastructure Needs

- Larger computational resources (computer clusters) for short-term forecast using numerical regional models and climate change impacts studies
- Retrospective climate variability studies are needed to support seasonal hydrological forecasts (ENSO and Tropical Storms impact greatly climate in CR)
- Impacts (dynamical/statistical) models are unavailable

Educational

- UCR/School of Physics is a regional center for WMO education and training
- We have a MSc program in Atmospheric Sciences and another in Hydrology
- UCR/CIGEFI program to fund labs and sending Central America Ph.D. Students to Sweden funded by Swedish International Development Agency

From science (technical info) to policy

- Systems/people that interpret (hydro) climatic information to decision-makers and planners are needed (impacts in agriculture, economy, hydro power generation, public health, insurance premiums, environmental and ecological)
- Integrated Geo-referenced databases are needed
- Adaptive management support systems are needed

Floods and droughts, two costly nature-induced disasters in terms of economic and human losses



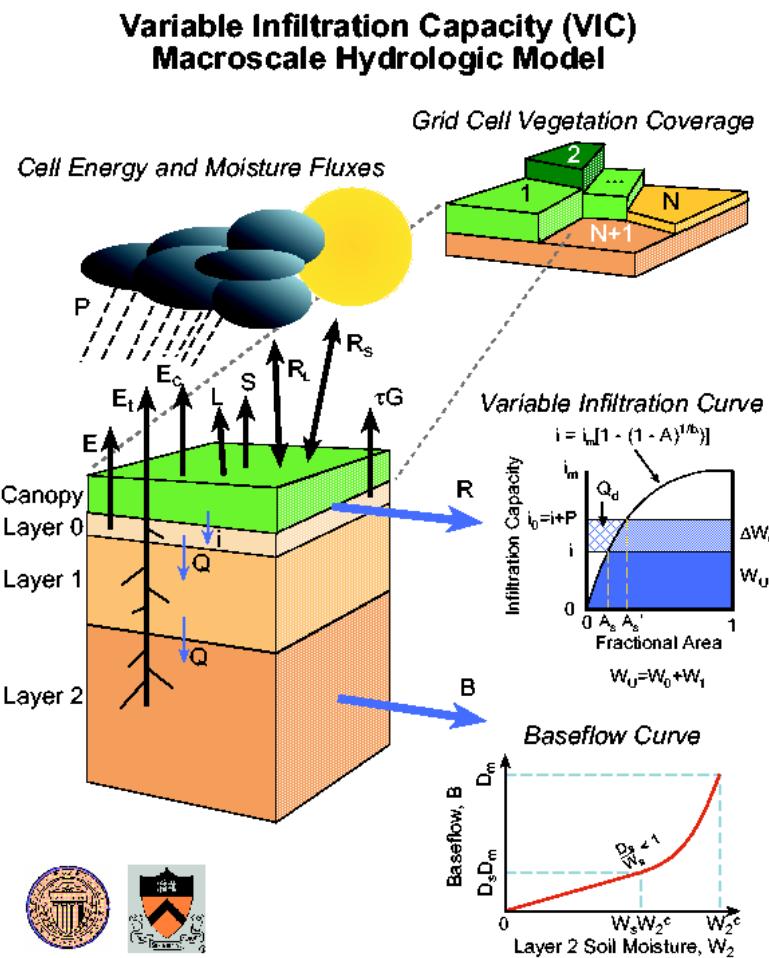
REUTERS/Daniel LeClair
Drought-induced famine in Central America
A lot of children have been hospitalized due to malnutrition and around 500 people have died this year in Guatemala

<http://www.lne.es/opinion/2009/10/09/hambre-guatemala/818840.html>



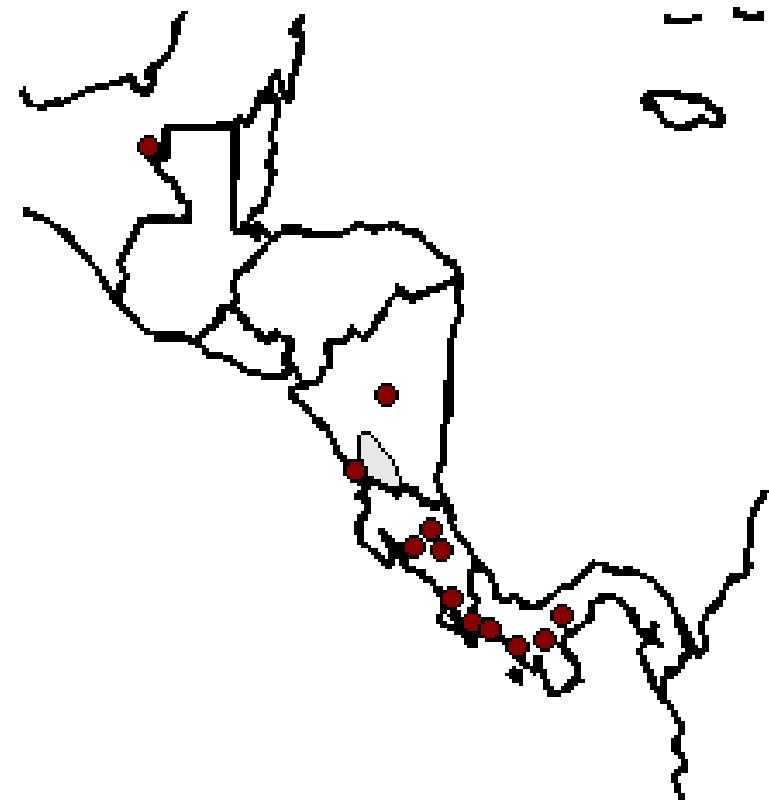
Retrospective study on hydrologic variability

The Variable Infiltration Capacity Model (Liang et al. 1994) developed at Princeton and the University of Washington



Hydro modeling

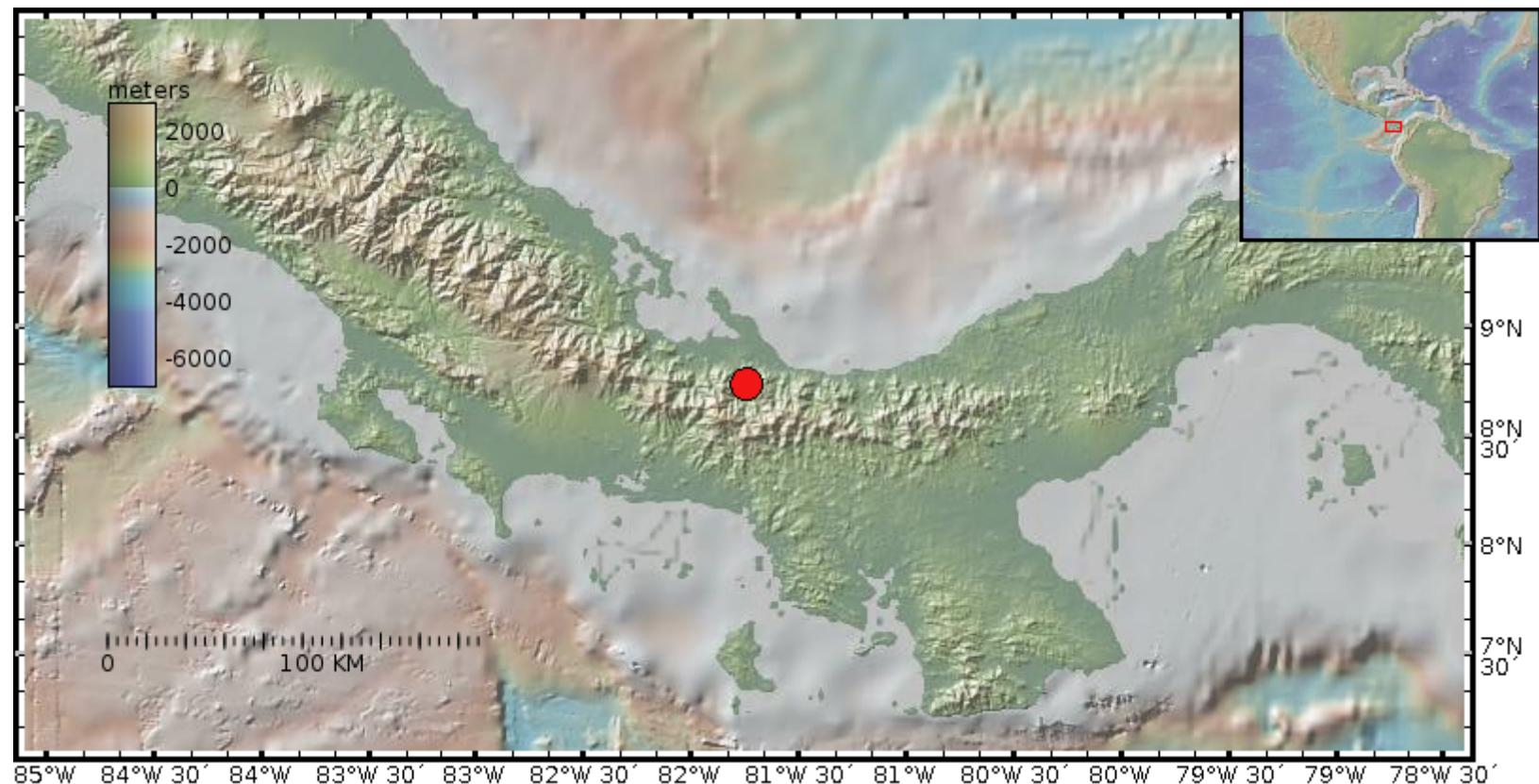
Streamflow stations



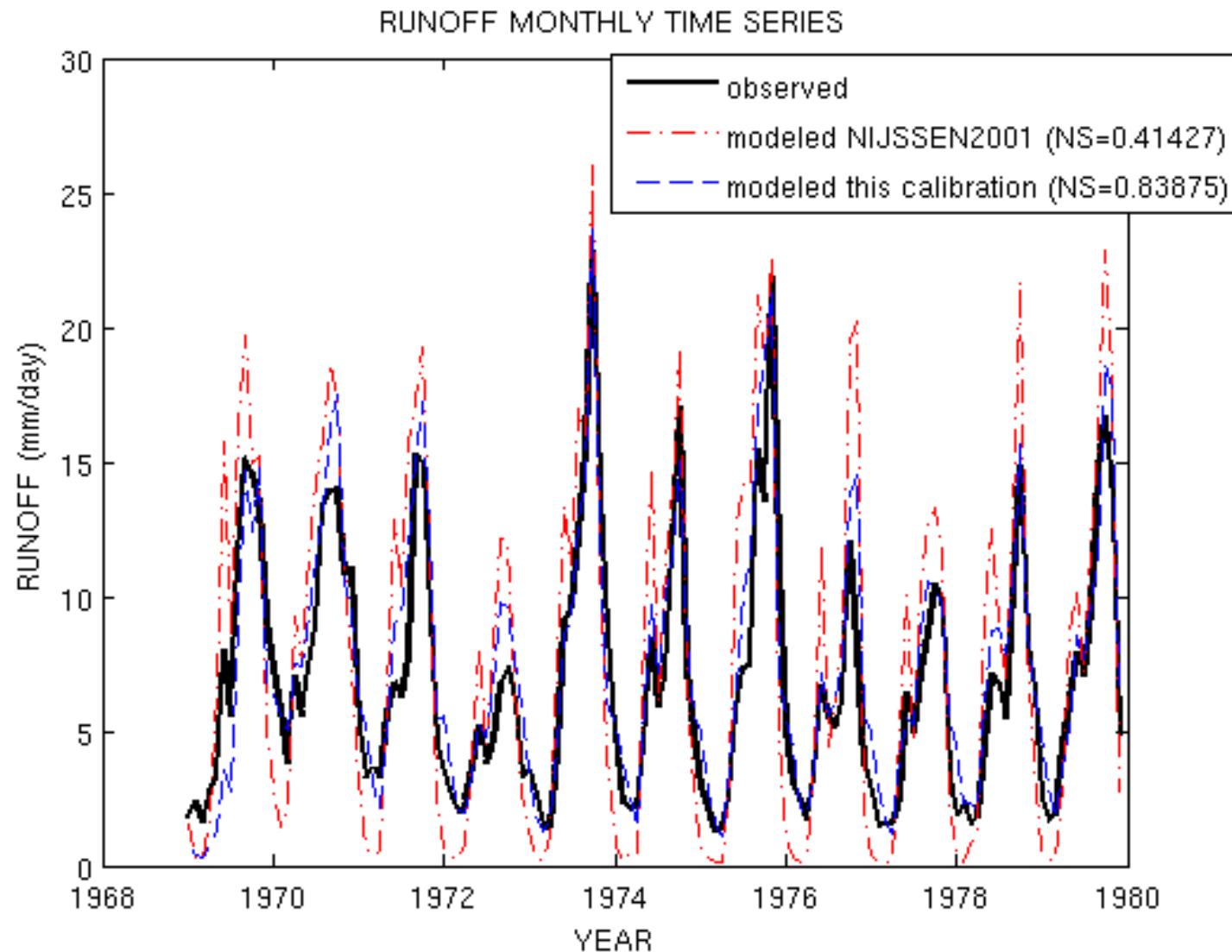
Model Grid (0.5x0.5)



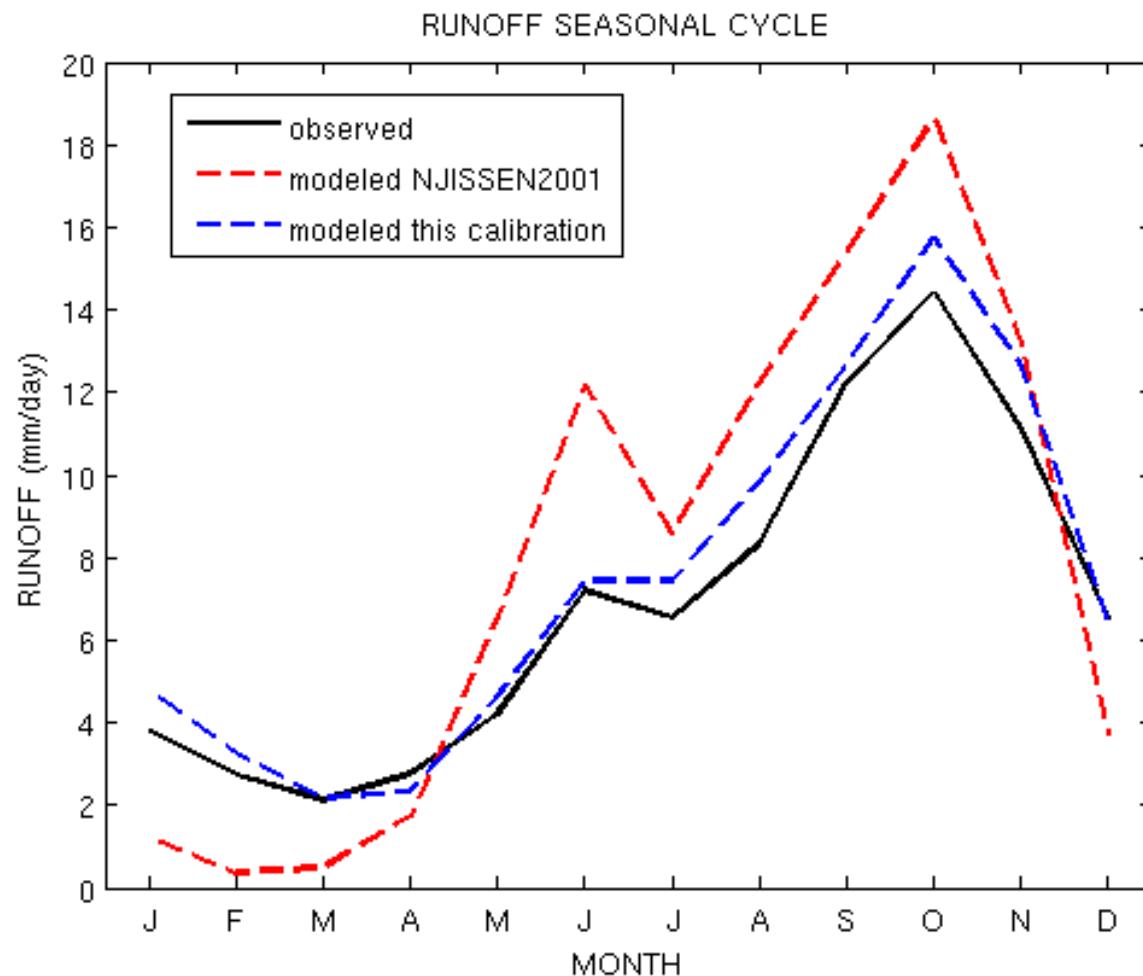
Best results gridpoint



Automatic calibration: Runoff monthly time-series 1969-1979

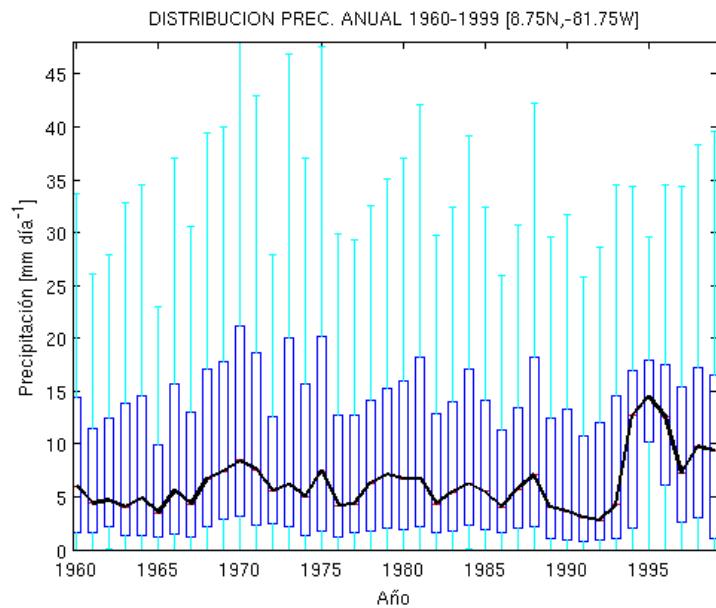


Automatic calibration: Seasonal Cycle of Runoff (1969-1979)

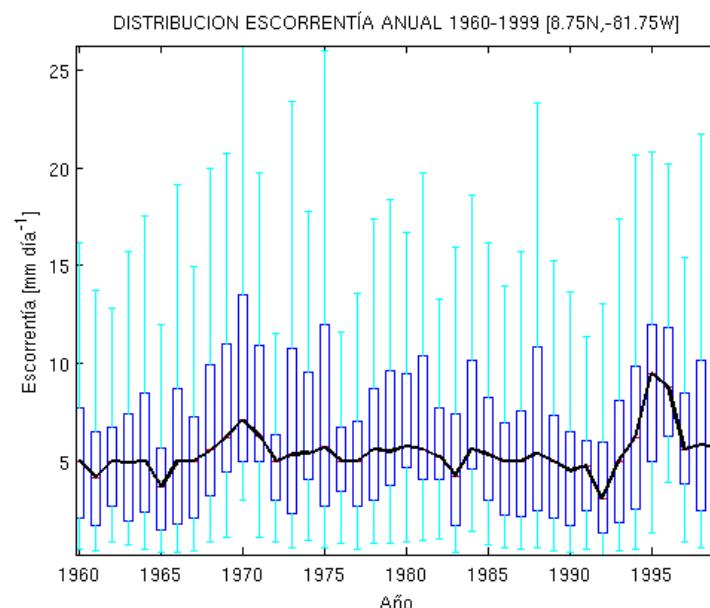


Annual distributions of daily data (1960-1999)

Precipitation

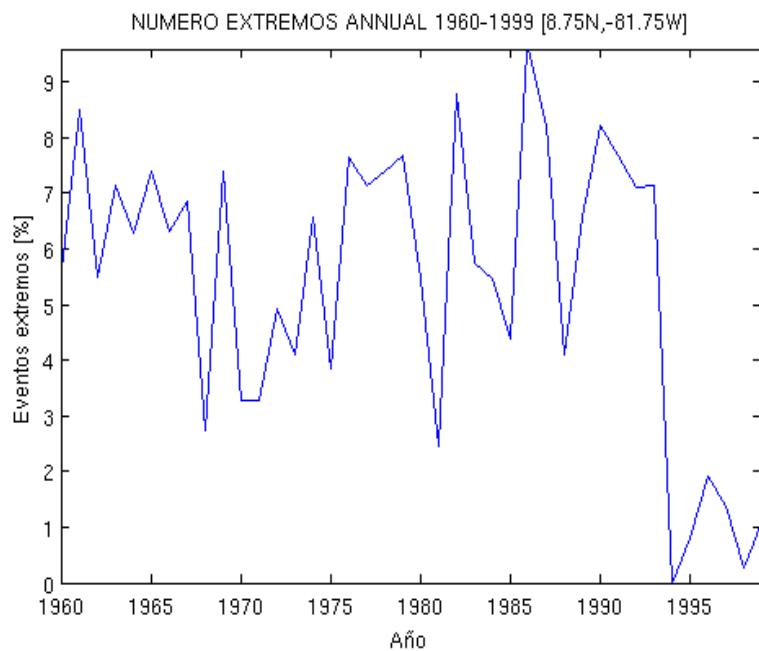


Runoff

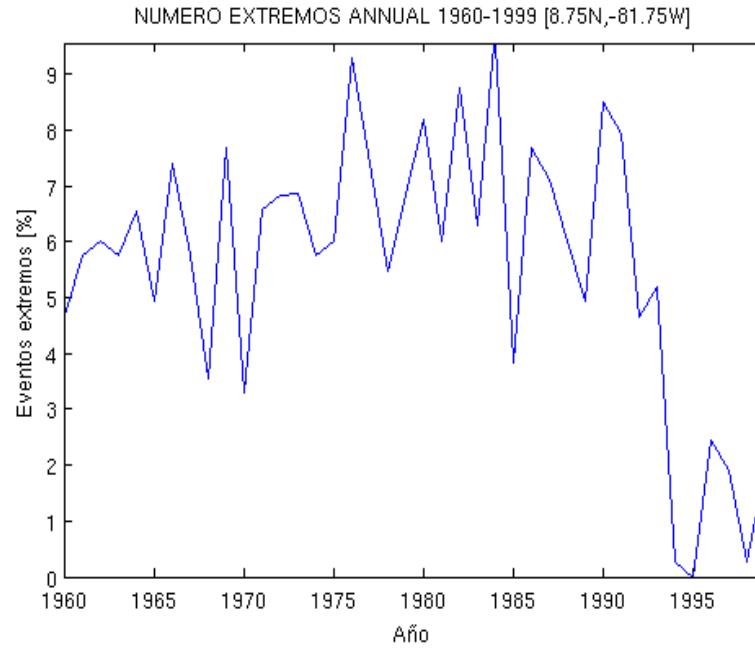


Number of extreme events (1960-1999)

Precipitation



Runoff



ENSO influence (1960-1999)

CORRELATIONS SOI vs. RAINY SEASON PRECIPITATION TOTALS

INDICE DE OSCILACION DEL SUR CORRELACIONADO CON PRECIPITACION EPOCA LLUVIOSA, 1960-1999

	LAG	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
	MESES	J	A	S	O	N	D	E	F	M	A	M	J	J	A	S	O	N		
meses promediados	3 meses														0,35	0,48	0,56	0,58	0,55	0,60
indicador ENOS	4 meses	-0,35													0,35	0,43	0,52	0,58	0,57	0,59
	5 meses		-0,35												0,43	0,48	0,55	0,57	0,60	
	6 meses			-0,32											0,35	0,47	0,51	0,55	0,60	
	7 meses														0,41	0,51	0,52	0,58		

CORRELATIONS SOI vs. RAINY SEASON RUNOFF TOTALS

INDICE DE OSCILACION DEL SUR CORRELACIONADO CON ESCORRENTIA EPOCA LLUVIOSA, 1960-1999

	LAG	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
	MESES	J	A	S	O	N	D	E	F	M	A	M	J	J	A	S	O	N		
meses promediados	3 meses														0,35	0,46	0,54	0,55	0,53	0,56
indicador ENOS	4 meses	-0,32													0,38	0,42	0,50	0,56	0,54	0,56
	5 meses														0,44	0,46	0,52	0,55	0,57	
	6 meses														0,37	0,48	0,49	0,52	0,58	
	7 meses														0,42	0,51	0,50	0,55		