Precipitation variability on the Mamoré Basin

Luis A. Blacutt B. PhD

Laboratorio de Física de la Atmósfera – IIF – UMSA

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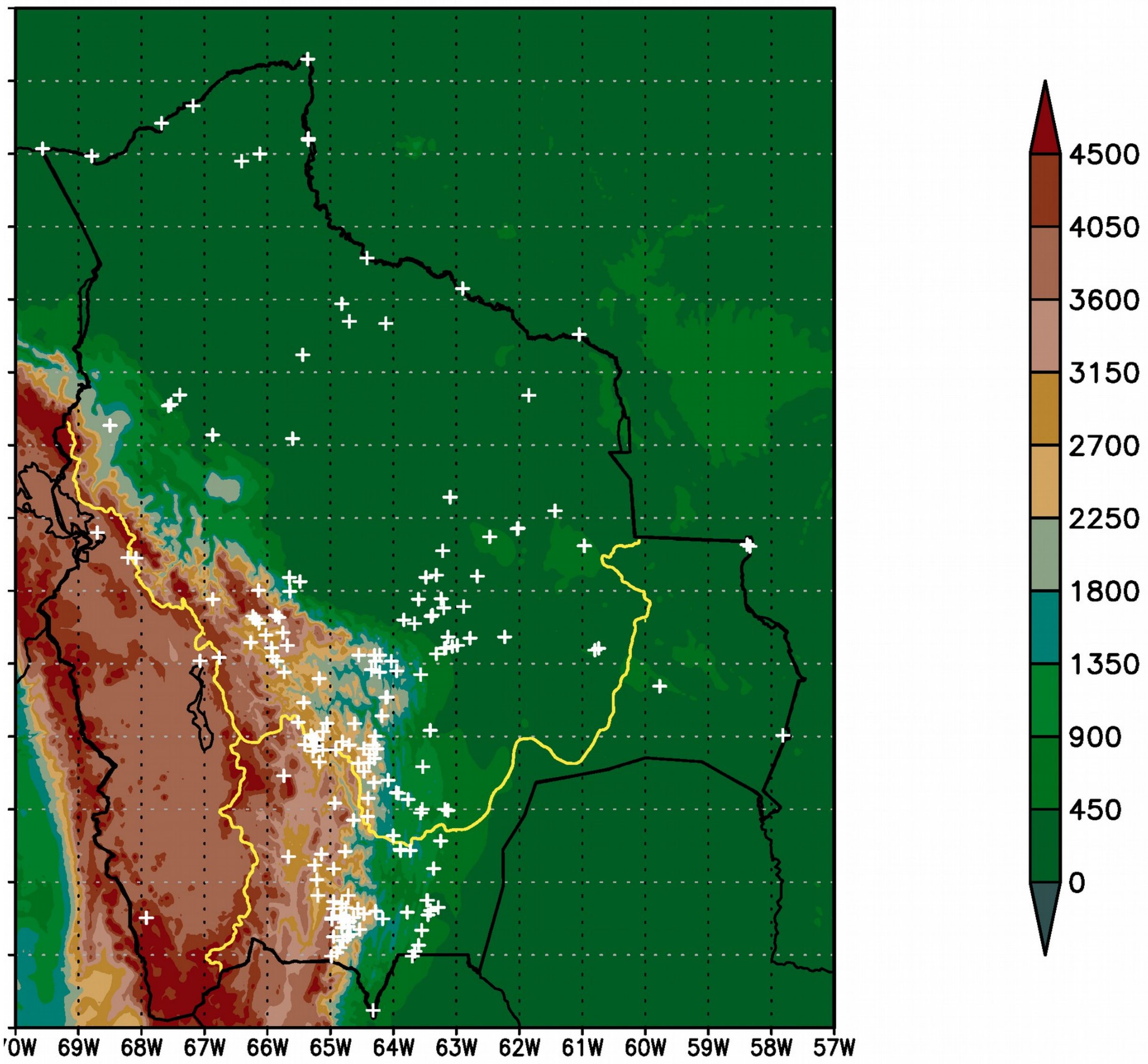
Motivation

- The study of precipitation and river discharge has an impact on various areas:
  - Water availability, power generation, agriculture, understanding of hydrological balance and prevention of droughts and floods.
  - Recently the Amazon basin suffered droughts (2005 and 2010) and floods (2008, 2009 and 2014).

Data and methodology

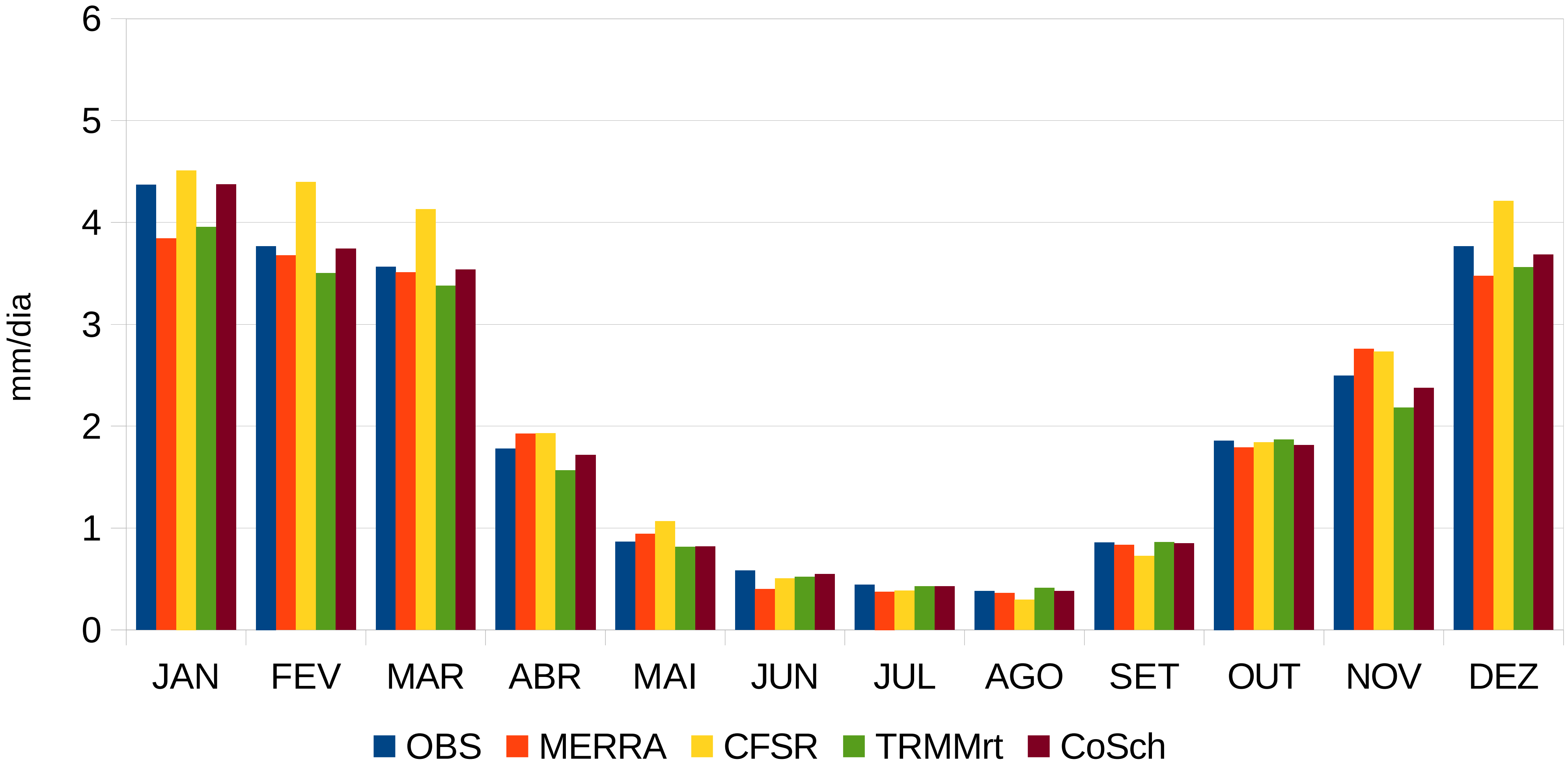


Data and methodology

- **Surface observations** 93 stations for the period 1999-2009
- **Reanalysis**
  - **MERRA** Horizontal resolution 1/2º × 2/3º
  - **CFSR** Horizontal resolution 38 km × 38 km
- **TRMM3B42RT** Available data every 3-hours, horizontal resolution 0.25° since 1998
- **CoSch-Bol** Combination between satellite and surface observation biases Blacutt et al. (2015).

Precipitation comparison
Results

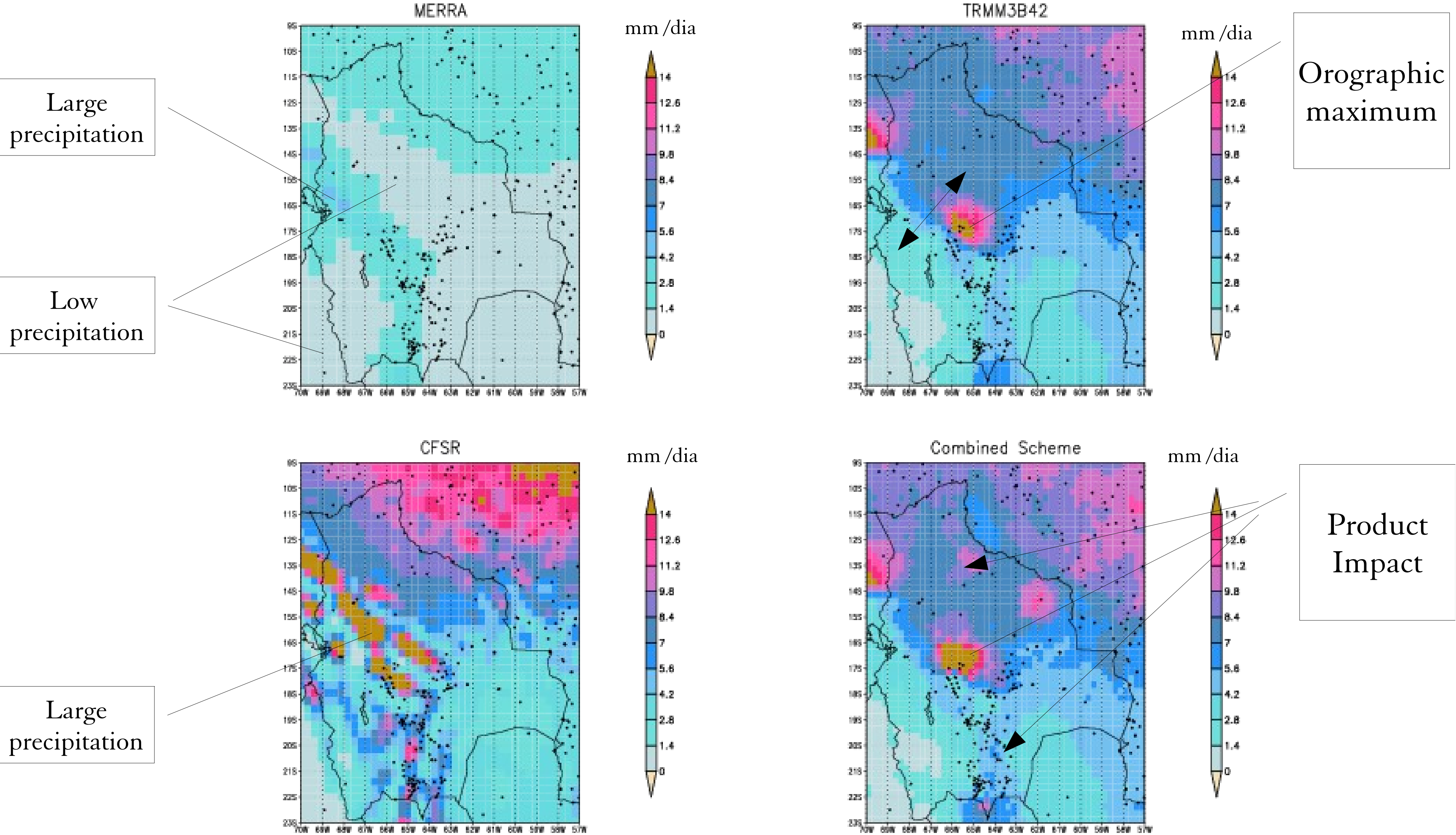
Average precipitation annual cicle Amazon



Fonte: Adaptado de Blacutt et al. (2015)

Precipitation comparison

Results – spatial distribution DJF



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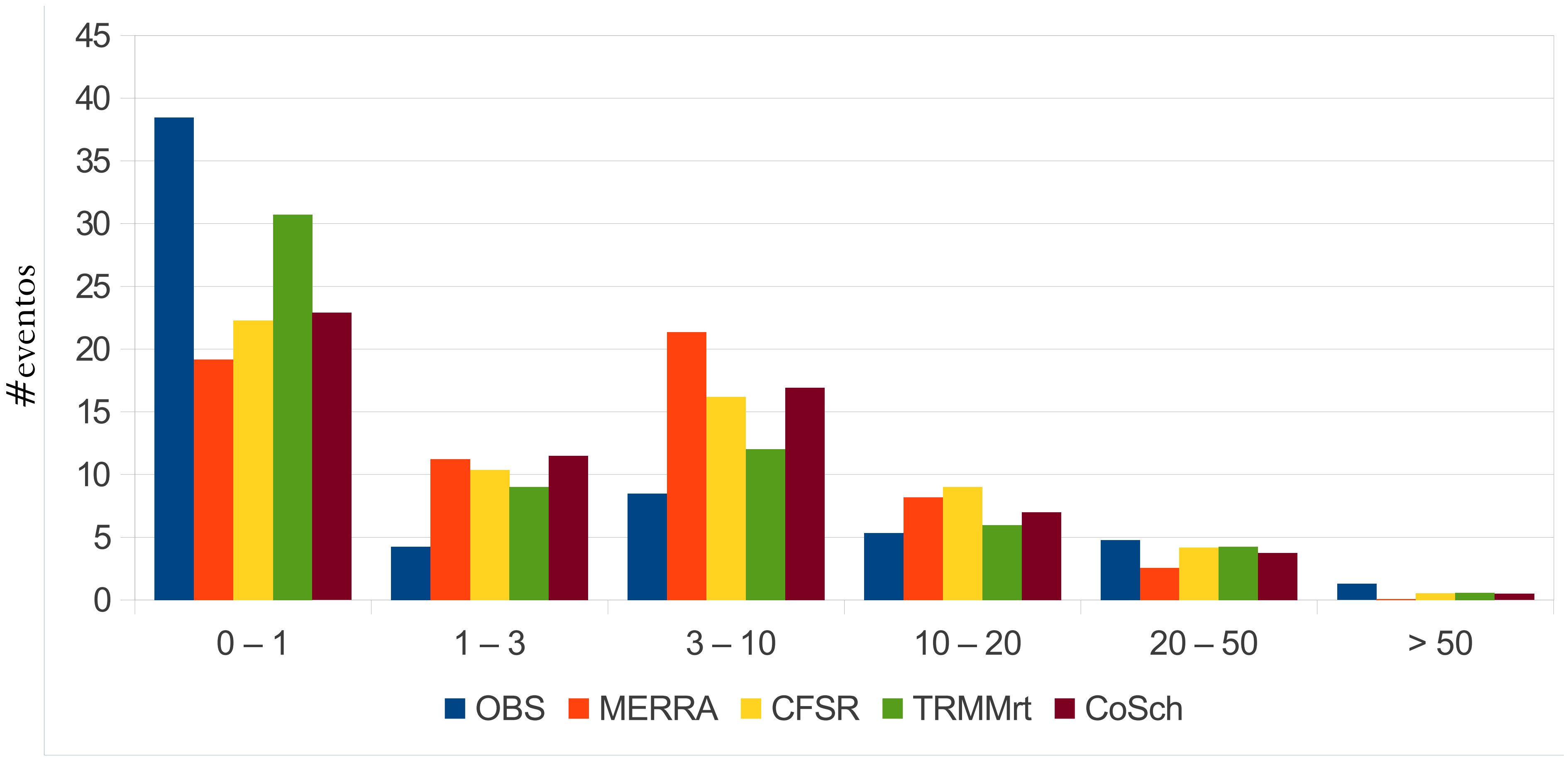
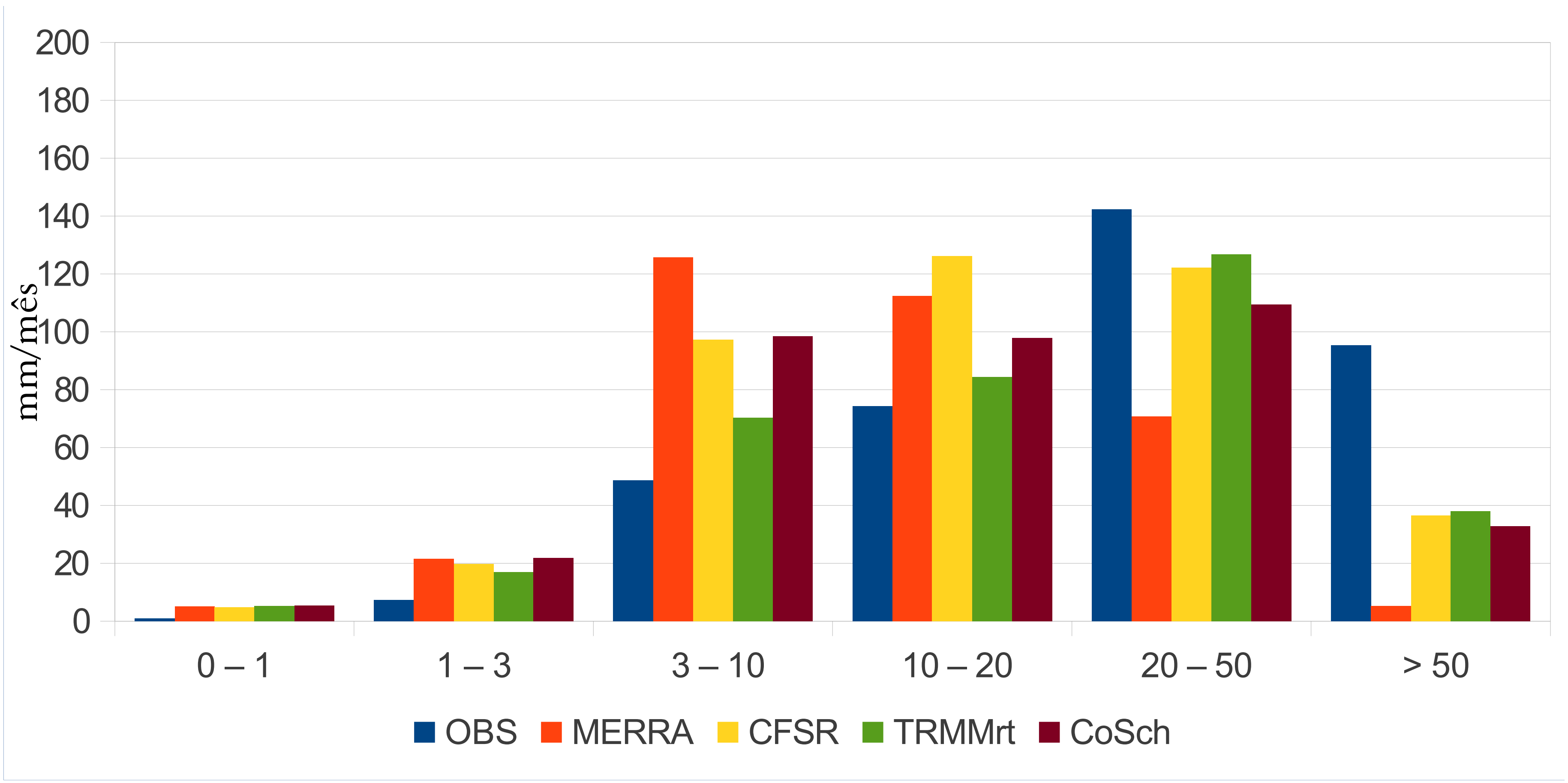
Precipitation comparison
Events DJF Amazon



Precipitation comparison

Precipitation accumulation DJF ~ Amazon

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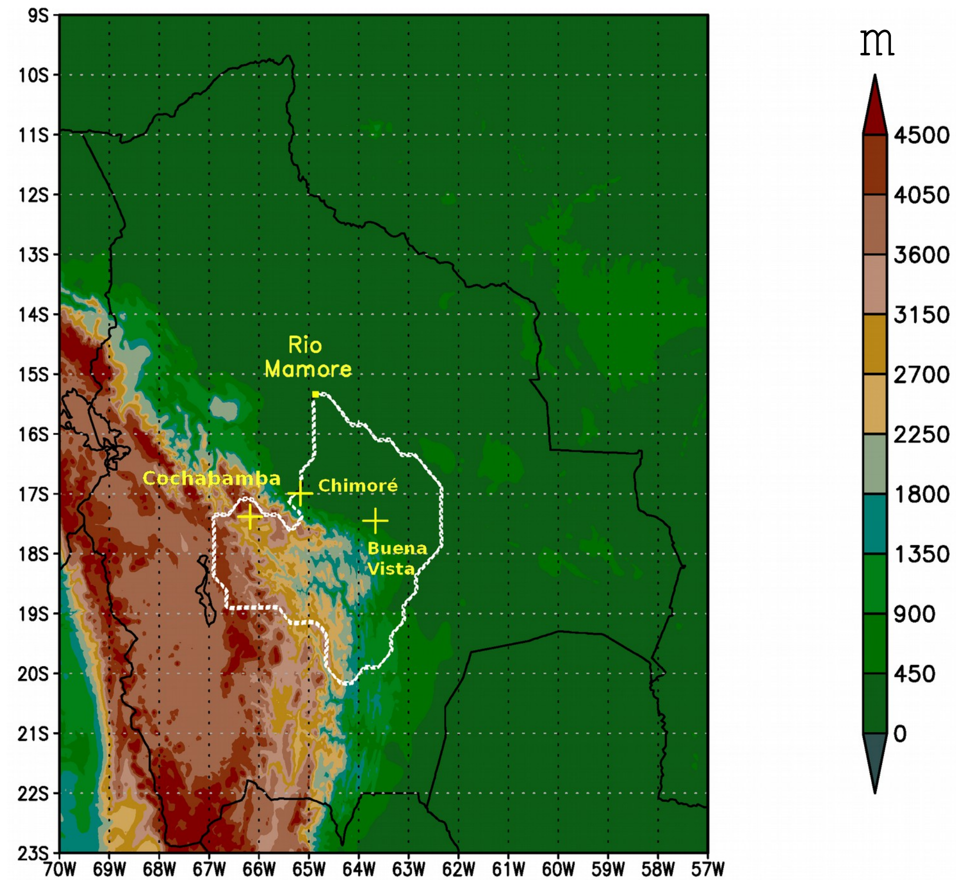
Hydrometeorological analysis

- The southwest region of the Amazon basin includes the Andes, the inter-Andean valleys and a plain known as “Llanos de Mojos”
- The Llanos de Mojos region is very susceptible to floods that can cover areas of up to 100 000 km^2.
- The cause of the floods can occur as a result of higher-than-normal rainfall and also because of processes in the Andes.



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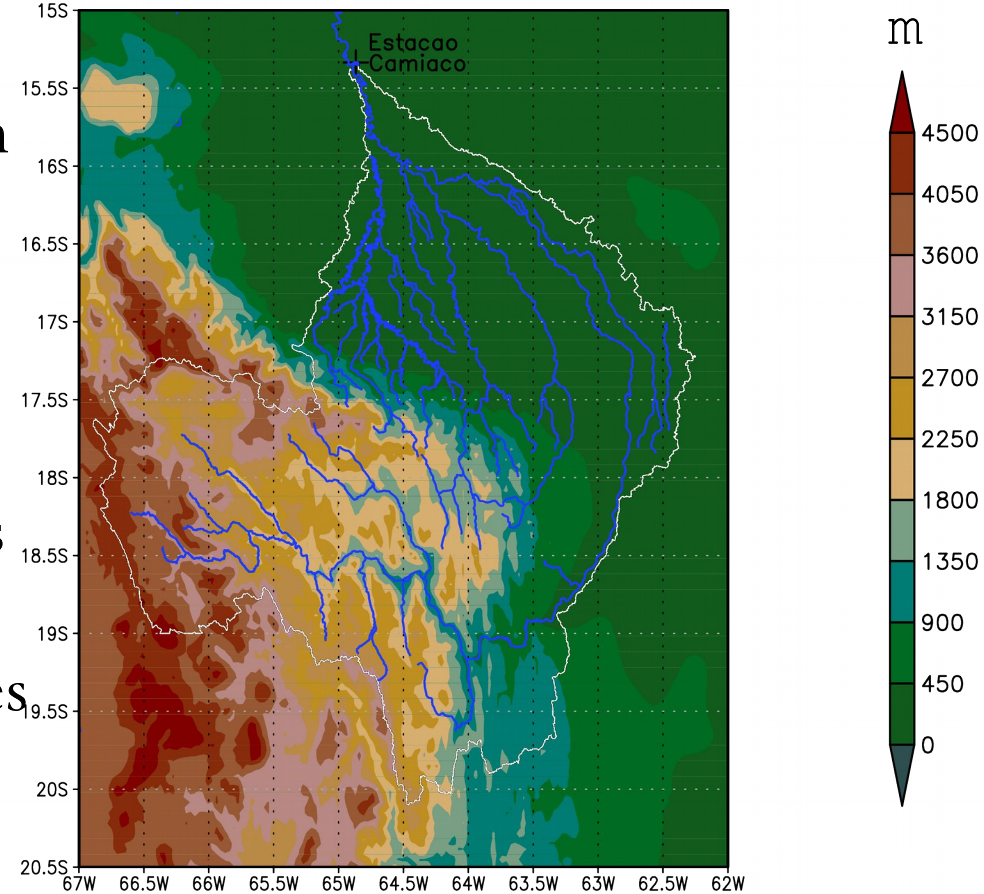
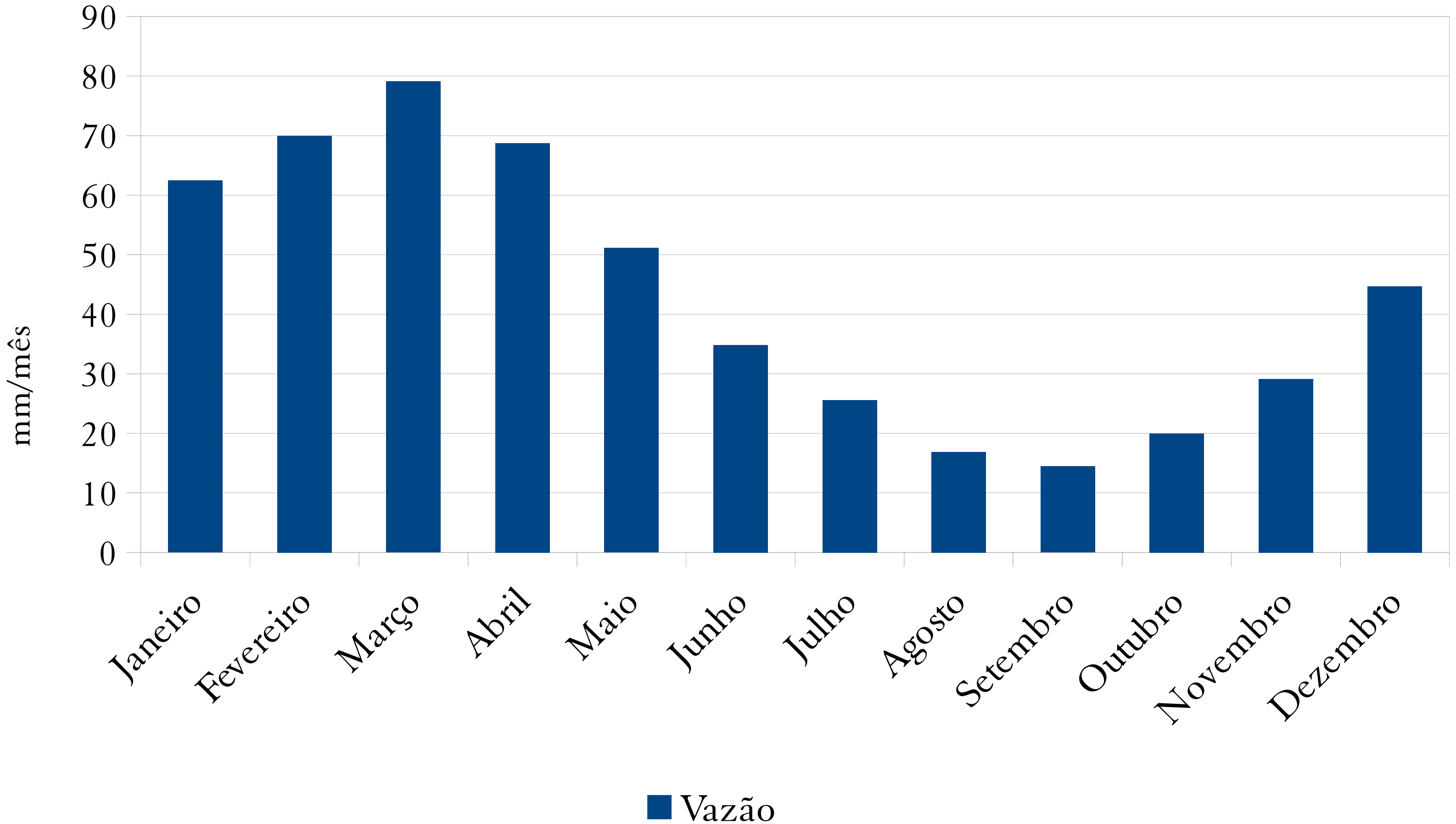


Hydrometeorological analysis

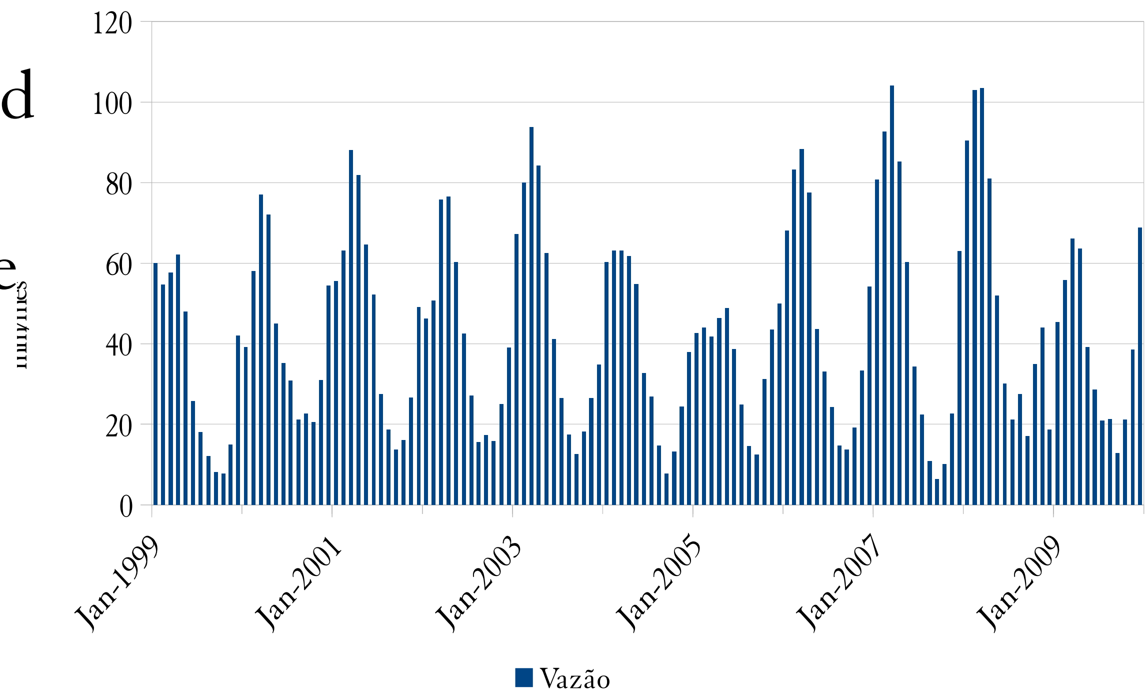
Mamoré river basin climatology

It presents monomodal behavior, the maximum corresponds to the months of February to April and the dry season from August to October.



Hydrometeorological analysis

- Time series The annual cycle: maximum in the rainy season and minimum in the dry season.
  - 2004 and 2005 correspond to the lowest flows.
  - The minimum values are related to the drought of the year 2005.
  - The years 2007 and 2008 correspond to the higher flows.



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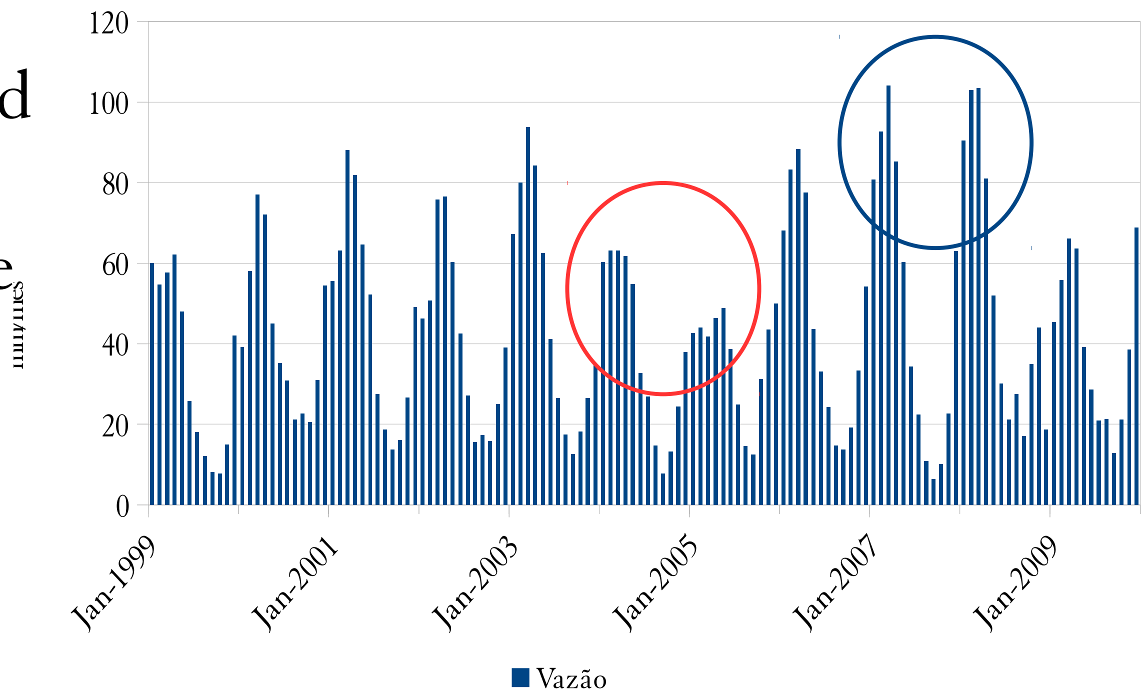
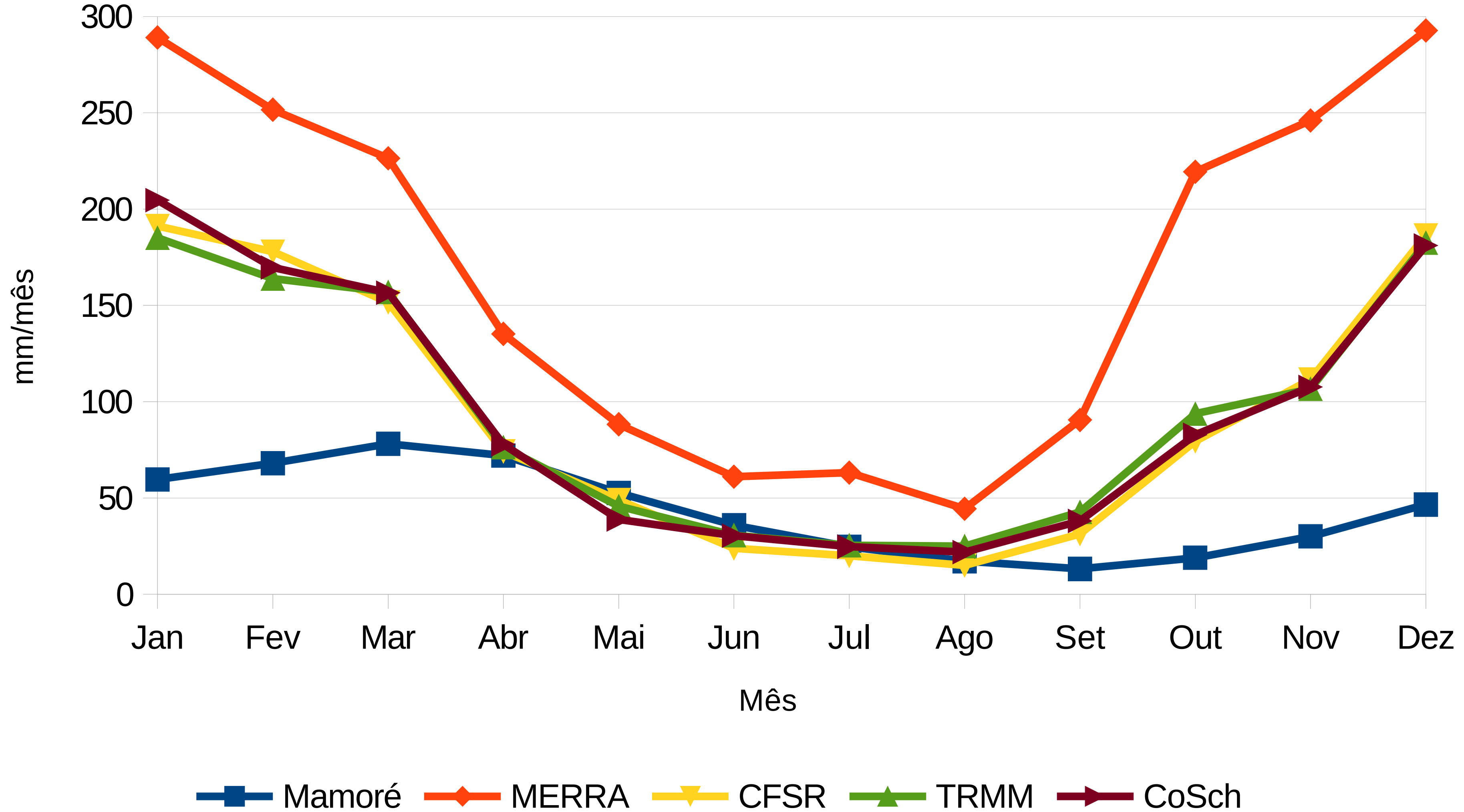


Hydrometeorological analysis



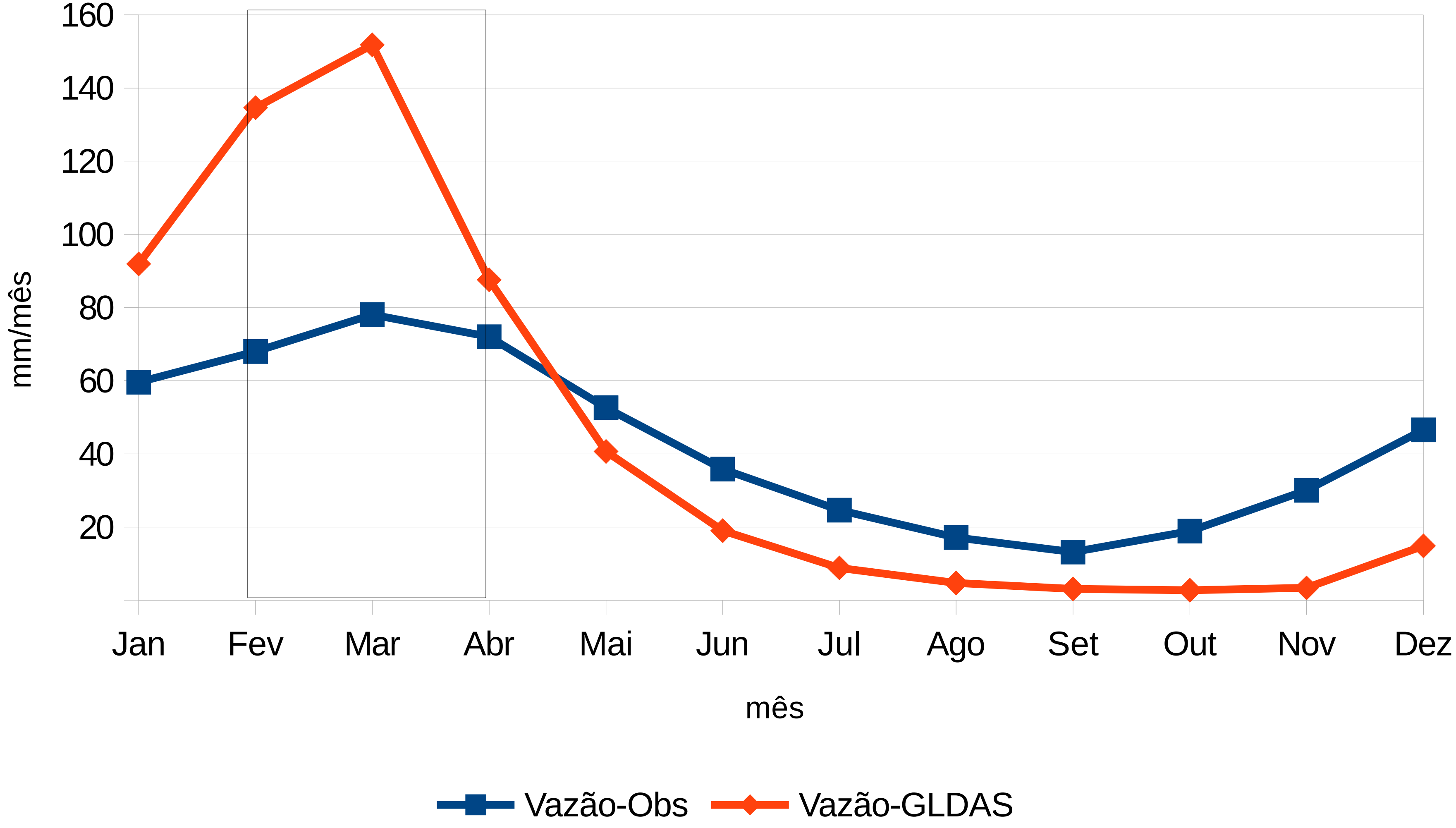
Hydrometeorological analysis

Correlation: precipitation – runoff

	Mamoré	MERRA	CFSR	TRMM	CoSch	WRF-30 km	WRF-10 km	WRF-3km
Jan	59.6	289.1	191.1	185.1	204.6	175.2	138.9	119.0
Fev	68.0	251.6	177.9	163.9	169.7	145.7	133.6	119.7
Mar	78.1	226.3	151.7	156.9	156.6	106.7	100.5	93.7
Abr	72.0	135.2	74.2	76.3	77.8	44.3	40.0	42.0
Mai	52.6	88.2	48.9	45.7	38.8	16.7	11.1	10.4
Jun	35.8	61.0	23.8	30.7	30.5	6.3	5.9	4.1
Jul	24.6	63.1	20.0	25.4	24.7	5.9	5.2	4.0
Ago	17.2	44.4	15.0	25.0	21.9	7.3	5.6	4.6
Set	13.1	90.5	31.3	42.7	38.0	18.4	18.7	13.7
Out	18.9	219.4	79.5	93.7	82.8	56.0	58.4	41.0
Nov	30.1	246.0	111.5	106.7	107.6	111.9	86.2	61.6
Dez	46.5	292.7	186.4	182.6	181.1	180.4	133.0	91.1
Correlação		0.40	0.57	0.56	0.58	0.47	0.50	0.54
Correlação 1-mês		0.73	0.84	0.84	0.85	0.78	0.80	0.80
Correlação 2-mês		0.80	0.82	0.85	0.86	0.85	0.85	0.80

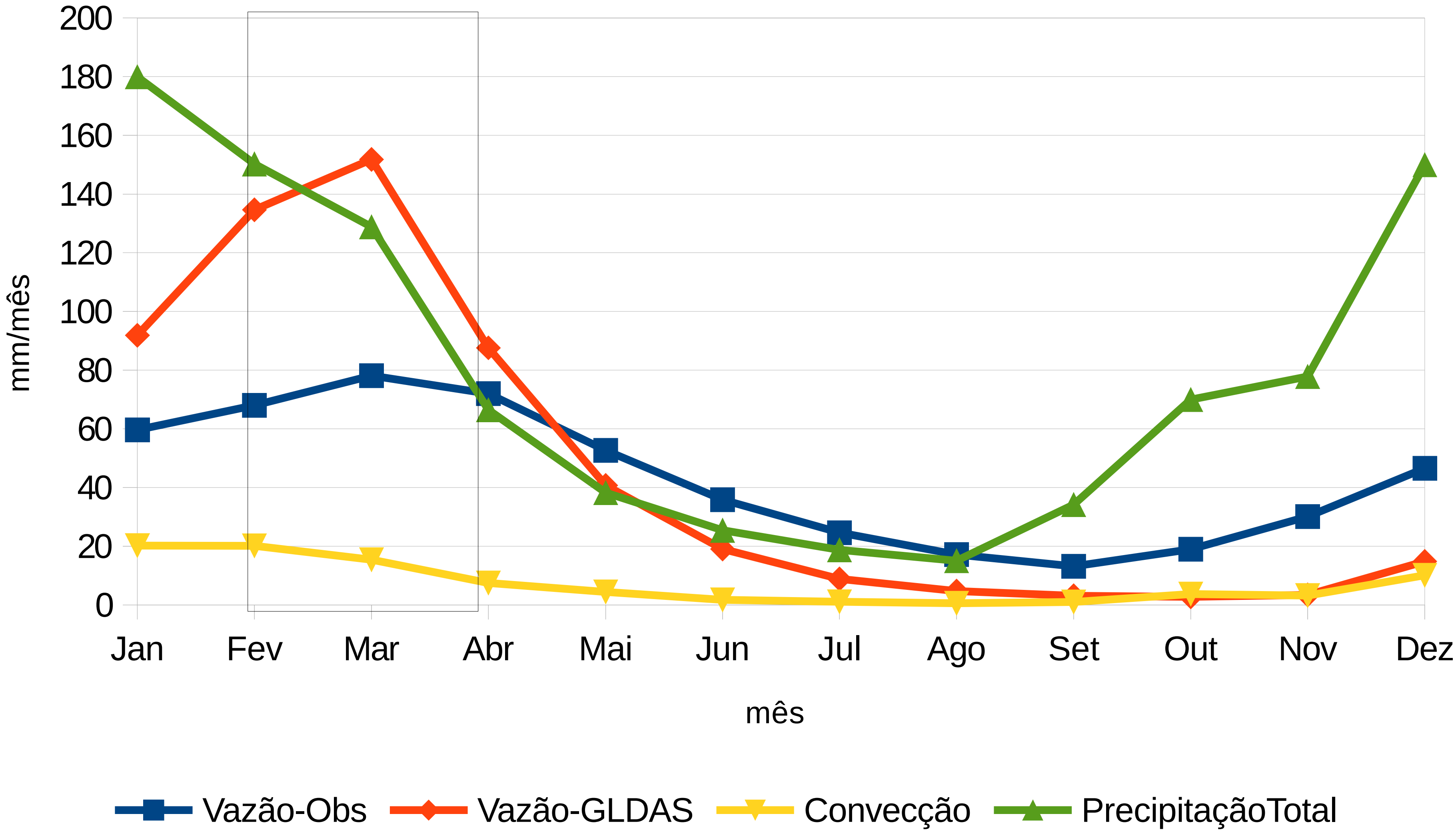
Hydrometeorological analysis

Comparison: Observed vs GLDAS runoff



Hydrometeorological analysis

GLDAS runoff components



Conclusions

- The maximum rainfall according to the data sets (February) does not correspond to the maximum flow rate, although the size of the basin is relatively small.
- The correlation is higher between precipitation and the flow shows two months of delay.
- The GLDAS data set was used to analyze the dynamics of the basin.

Conclusions

- The four products are able to show the annual cycle and spatial distribution of precipitation
- The categories that provide the greatest contribution to precipitation are key to understanding the over / under estimate of each product
- The average annual flow cycle shows that the maximum occurs in March and the minimum in September

Future work

- Expand the study to other databases
  - IMERG
  - CHIRPS
- Expand the study to other basins
  - Altiplano basin
  - La Plata basin

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Acknowledgments


THANK YOU
OBRIGADO