Reproducing El Niño and La Niña events in La Plata Basin using CHyM model

4th Workshop on Water Resources in Developing Countries: Hydroclimate Modelling and Analysis Tools

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Objectives

- Compare two data sets
  - Persiann (Satellite data: Precipitation)
  - ERA-Interim (Reanalysis)

- La Plata Basin is affected by La Niña and El Niño events
  - La Niña: ↓ Precipitation, ↓ Temperature
  - El Niño: ↑ Precipitation, ↑ Temperature
  - Compare the patterns for La Niña (2007-2008) vs El Niño (2009-2010) for summer (DJF); **these were moderated events**
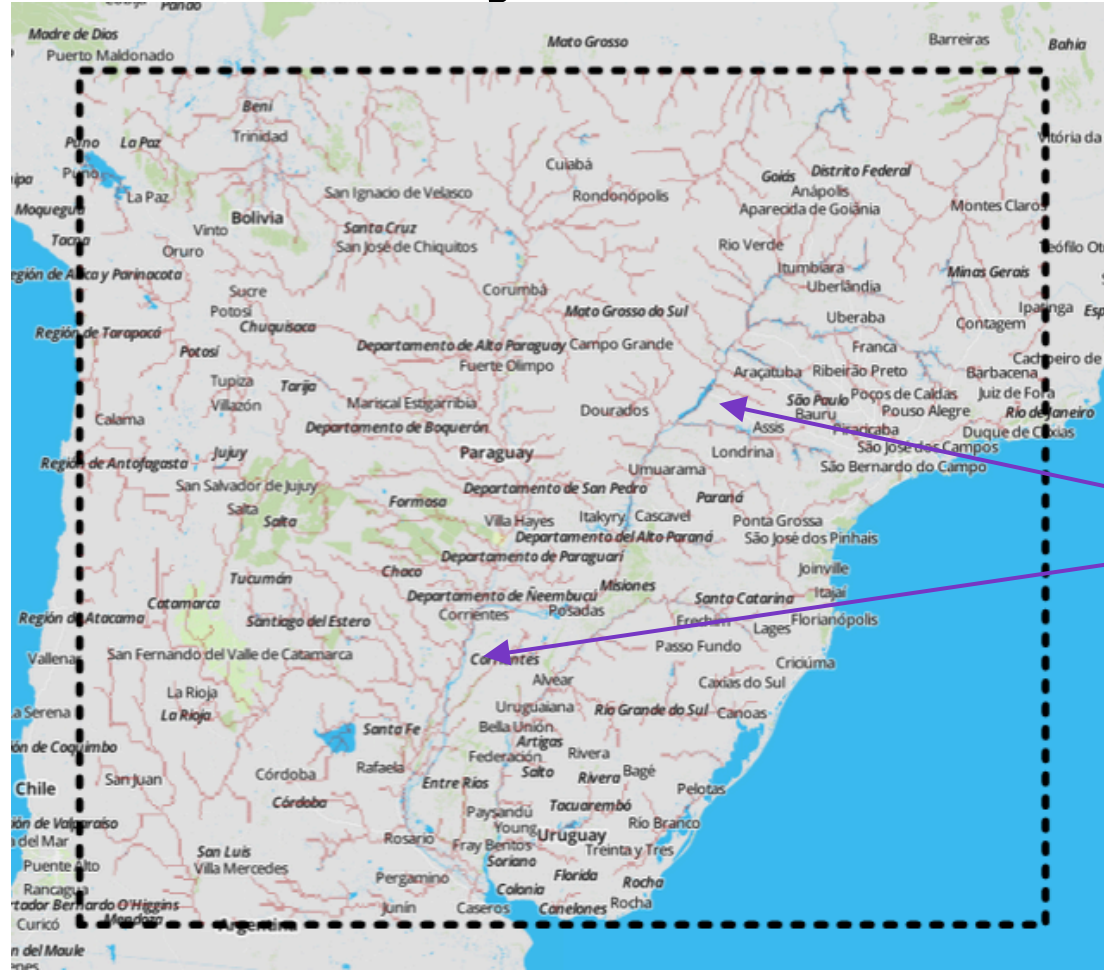
La Plata Basin
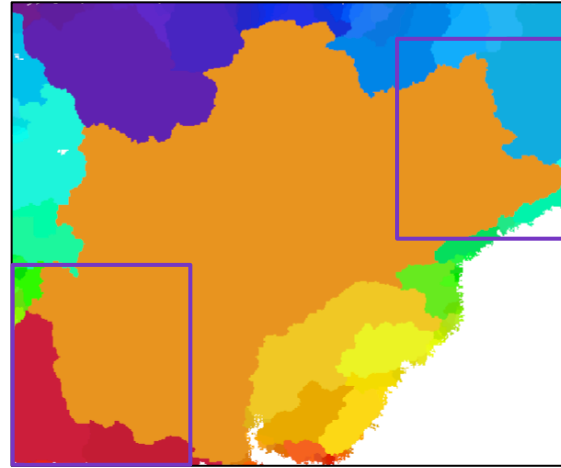
DEM: Italy + Global
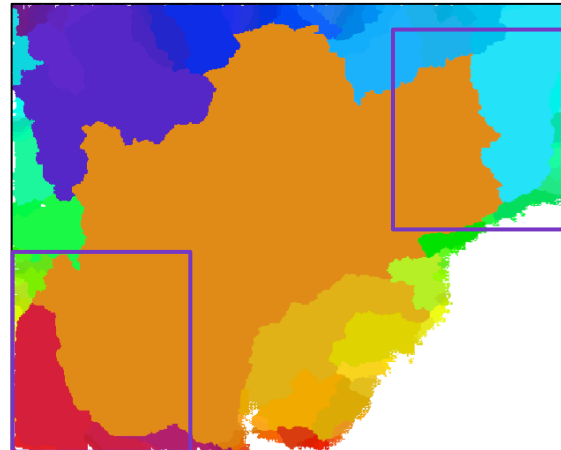
DEM: Hydrosheeds

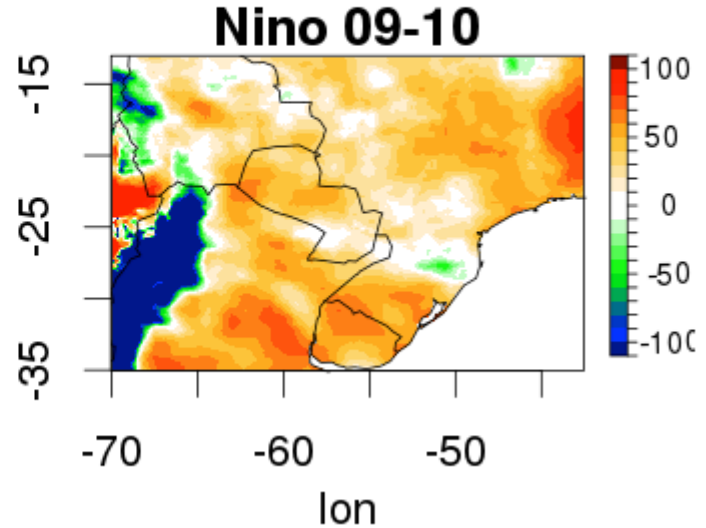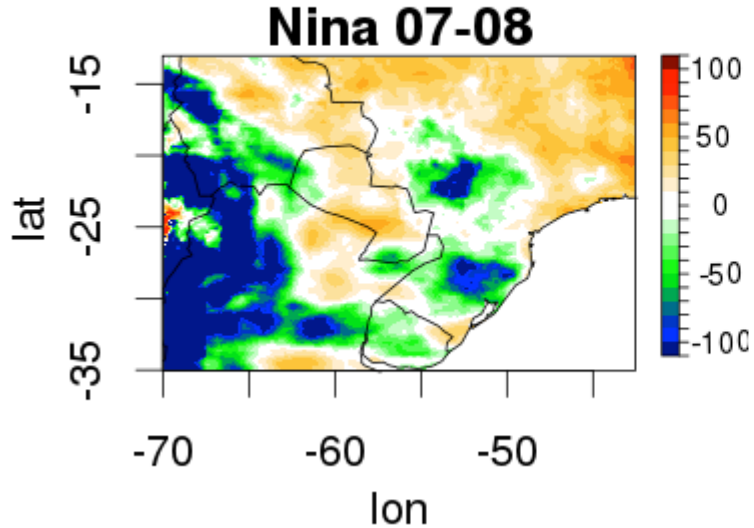No significant difference between DEM

CHyM model for La Plata Basin

The two main rivers (Parana and Uruguay) are satisfactory reproduced

Persiann vs ERA-Interim

PP percentage difference [mm/hr]

Nina 07-08

Nino 09-10

[(Persiann - ERA)/Persiann].100

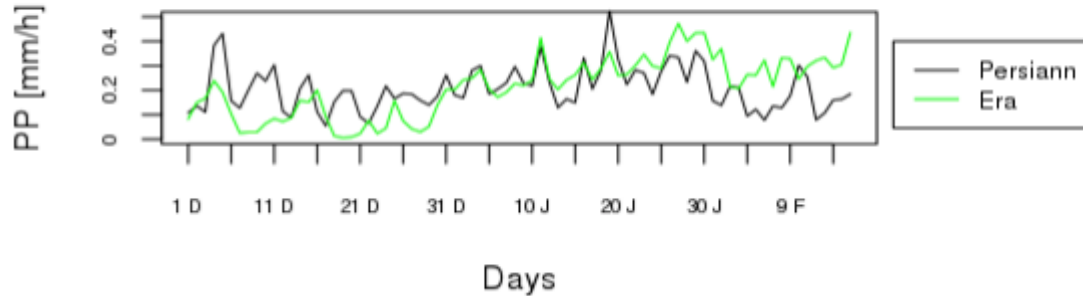Calculated for the mean fields (DJF)

La Niña & El Niño
- ERA overestimates precipitation in Los Andes
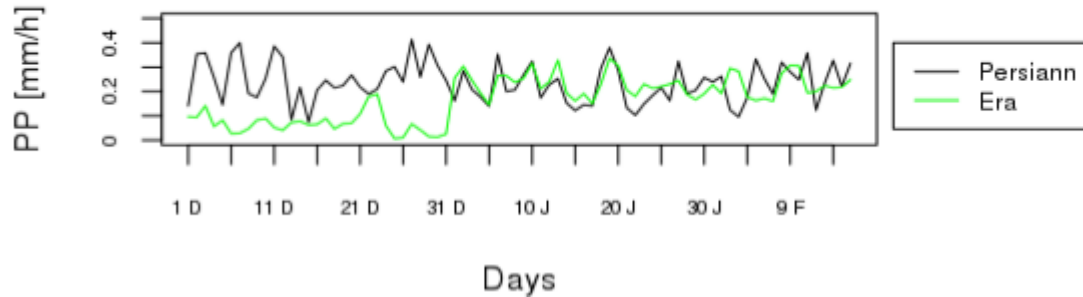- ERA does not reproduce properly the precipitation pattern

Persiann vs ERA-Interim

Field mean

Nina 2007-2008: Persiann vs Era

Nino 2009-2010: Persiann vs Era

Evolution of PP

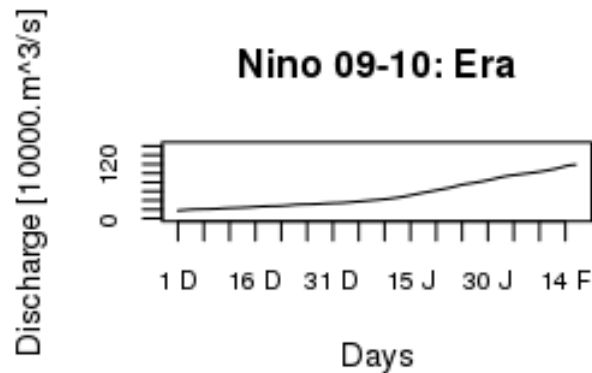ERA underestimates precipitation in December in both events
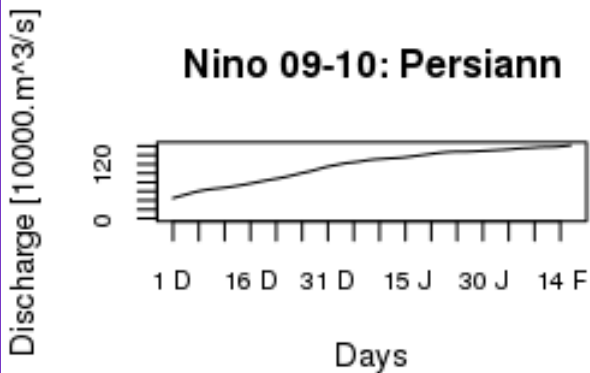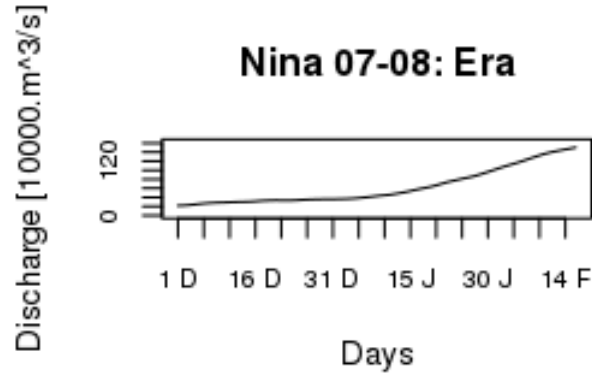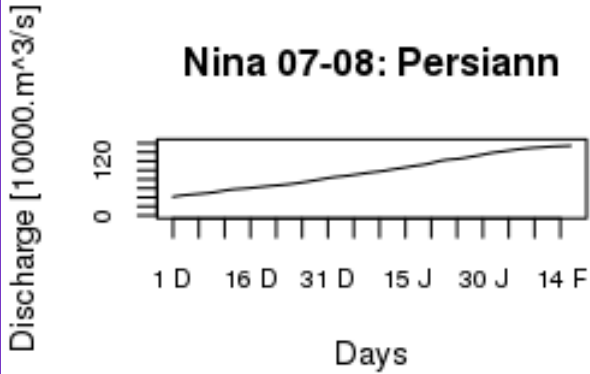
ERA overestimates precipitation from middle of January for La Niña

Persiann for estimating precipitation

Persiann vs ERA-Interim

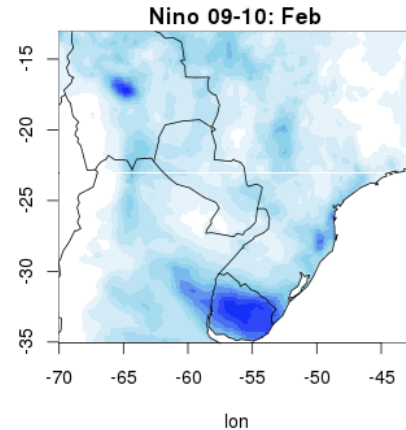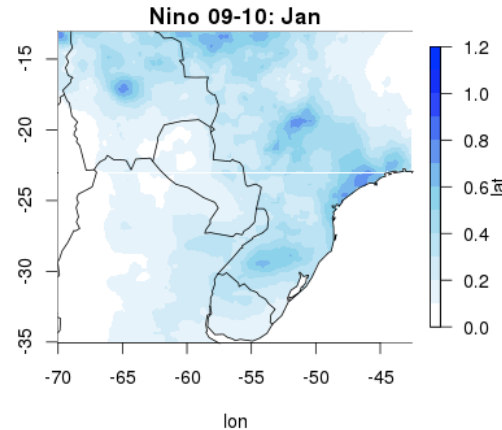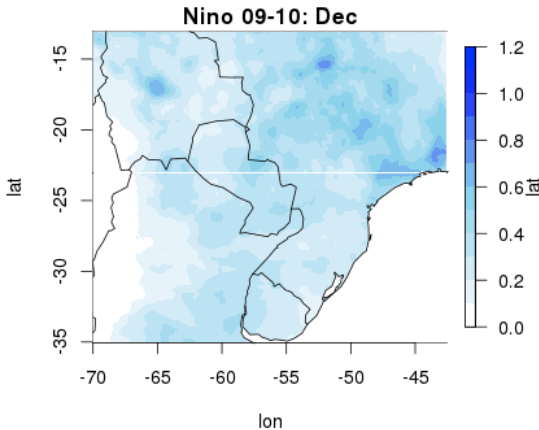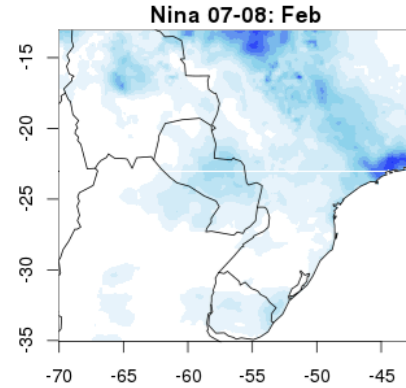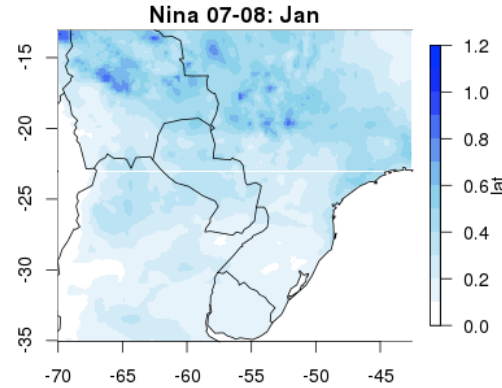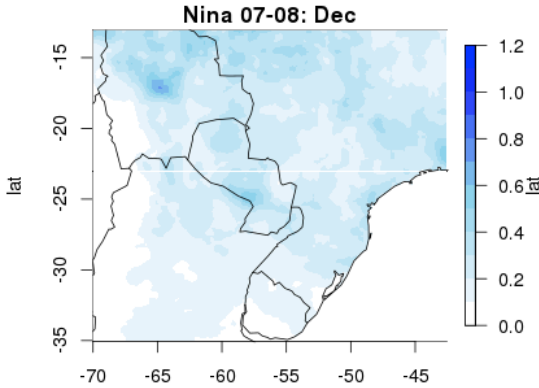**Discharge at the end of the basin**

ERA also underestimates the discharge at the end of the basin, particularly in January

La Niña vs El Niño

PP monthly mean [mm/hr]

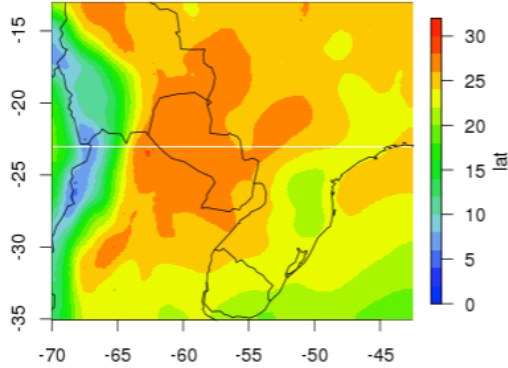More precipitation in Dec and Feb for El Niño

There is hotspot in Uruguay in Feb for El Niño

The events do not differ much one from each other, except for February
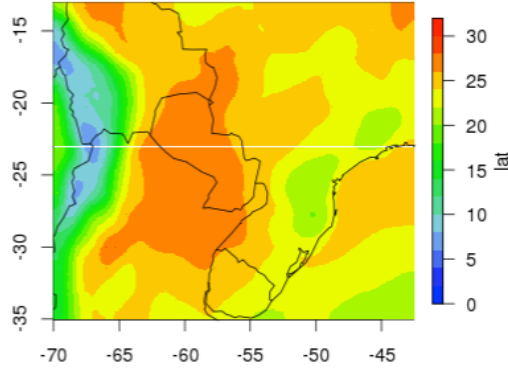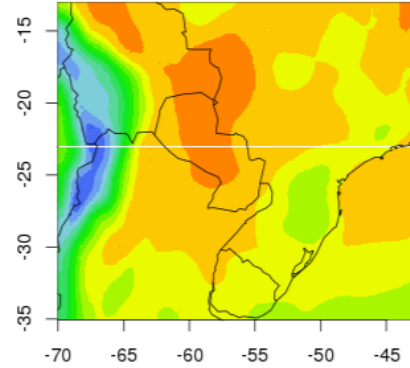
La Niña vs El Niño

T monthly mean [°C]

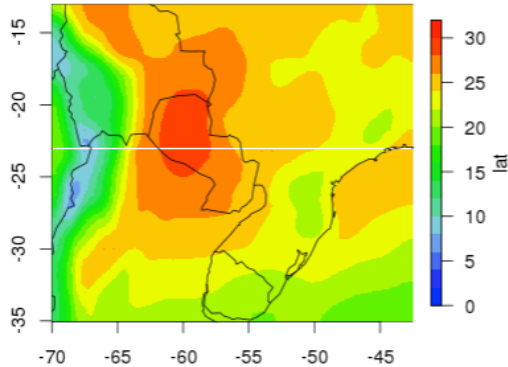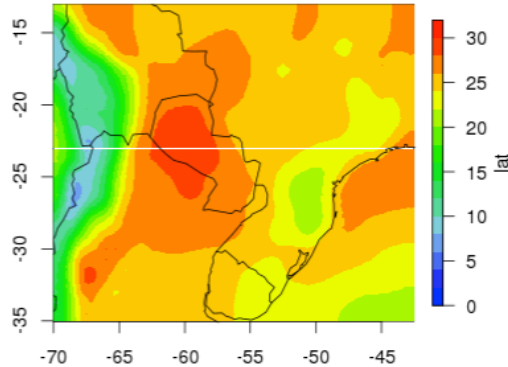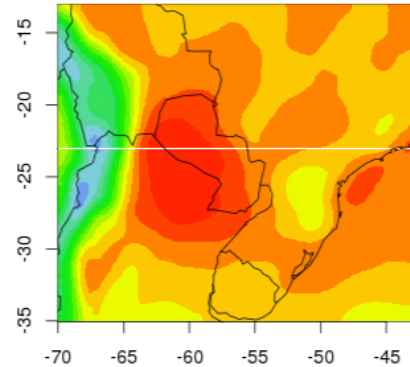In Dec, temperature is higher in Paraguay for El Niño

In general, temperature is higher in La Plata Basin during Jan and Feb for El Niño

La Niña vs El Niño

Discharge at the end of the basin

Nina 07-08: Persiann

Discharge [10000.m^3/s]

120

0

1 D   16 D   31 D   15 J   30 J   14 F

Days
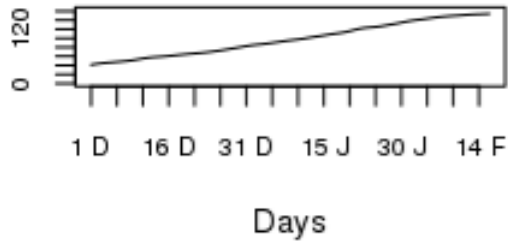
Nino 09-10: Persiann

Discharge [10000.m^3/s]

120

0

1 D   16 D   31 D   15 J   30 J   14 F

Days
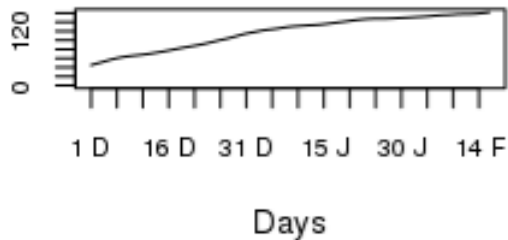
Discharge increases more rapidly during El Niño event

Discharge value of La Niña (16-Feb) = 1540429 m^3/s
Discharge value of El Niño (16-Feb) = 1617906 m^3/s
El Niño -> 5% larger

Conclusions

- CHyM model is able to reproduce La Plata Basin
- ERA-Interim mean precipitation differs from Persiann database and, therefore, discharge differs too

The analyzed events were moderated:

- *Precipitation patterns* for El Niño and La Niña do not show an important difference as expected; except for February
- *Temperature* is higher in La Plata Basin during summer for El Niño
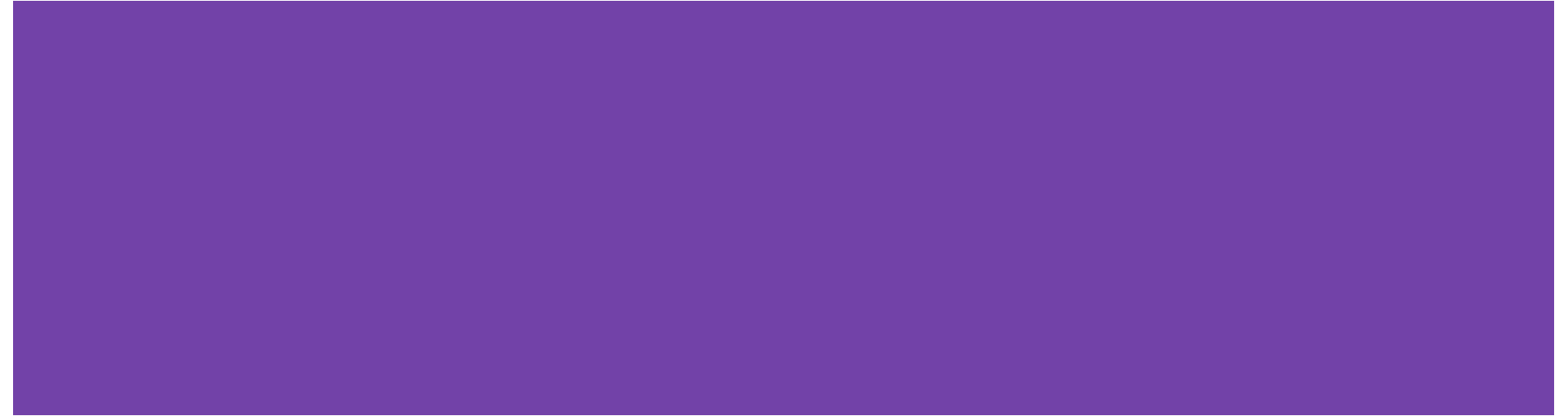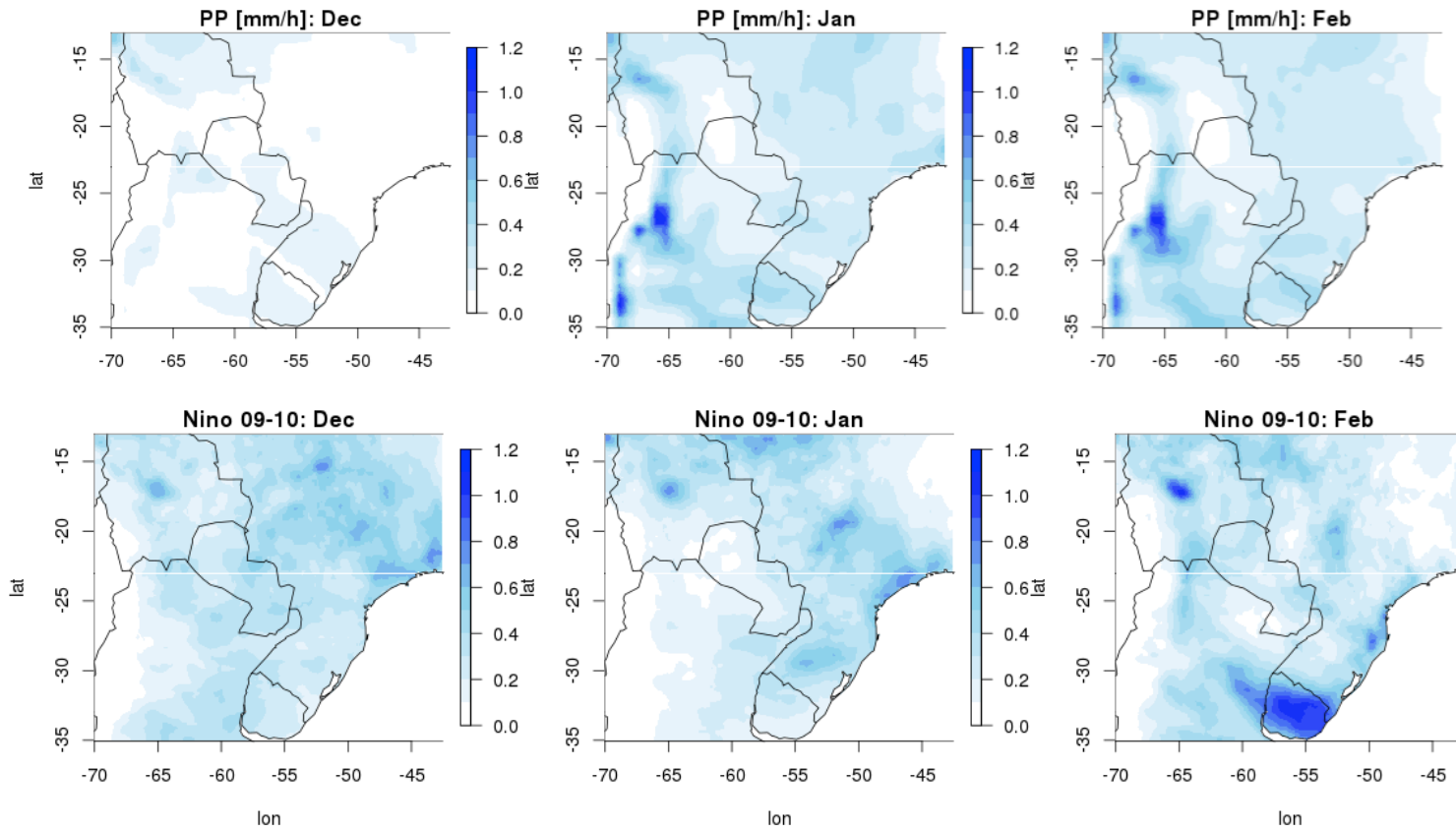- *Discharge at the end of the basin* increases more rapidly during El Niño event and is a 5% higher
- **The model shows differences between both events as expected but more events should be analyzed to asses if they are indeed properly reproduced**

Thank you!

El Niño 97-98 (strong event) vs El Niño 09-10

El Nino 1997-1998 monthly mean (Era-Interim)

El Niño 97-98 (strong event) vs El Niño 09-10

El Nino 1997-1998 monthly mean (Era-Interim)