# UMI3351 research in the context of CLIMAX Project

Carolina Vera on behalf of

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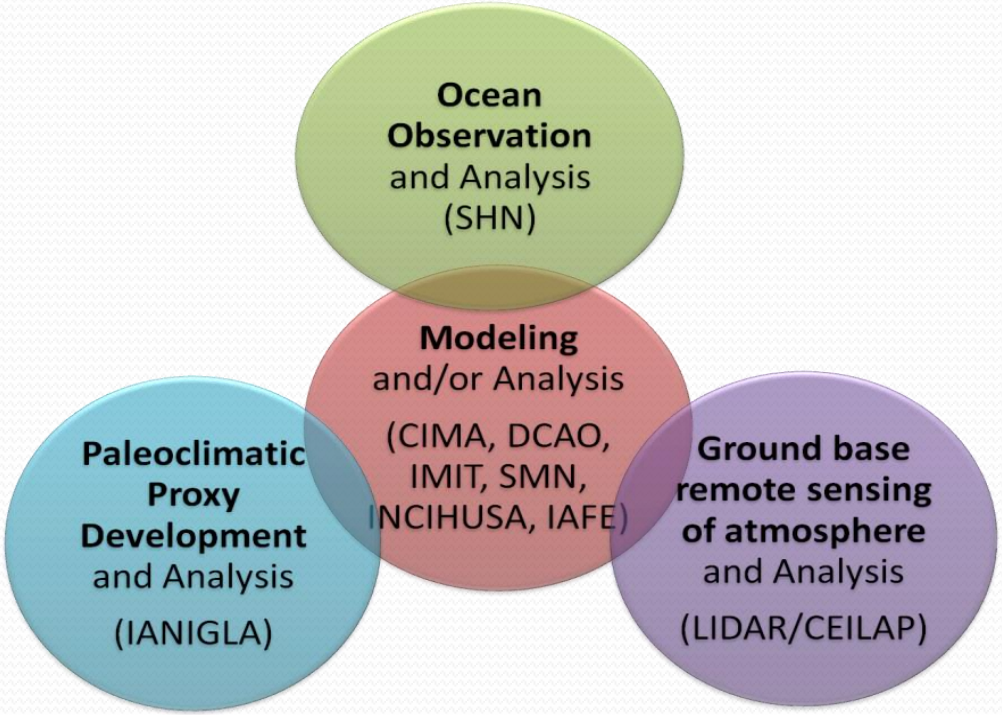
Buenos Aires, Argentina

UMI-IFAECI was established to strengthen France-Argentina scientific collaboration on a research agenda oriented to better understand, simulate and predict climate variability and change, as well as their impacts in southern South America and surrounding Oceans




**Main research focus at the different UMI-IFAECI facilities**

# Research Themes

| | | |
|---|---|---|
| *T1:Climate variability and change in southern South America* | *T2: Mathematical methods for studies of weather and Climate* | *T3: Weather and Climate Prediction* |
| *T4: Regional climate modeling and sensitivity studies* | *T5: Impact studies* | *T6: Ground-base remote sensing of the atmosphere and its applications* |
| *T7: South Atlantic Studies* | *T8: Physical atmospheric processes at meso and synoptic scales* | *T9: Physical processes in coastal areas and the Rio de la Plata Estuary* |

# DIVAR Research Group: Dinámica de la Variabilidad atmosférica sobre Sudamérica

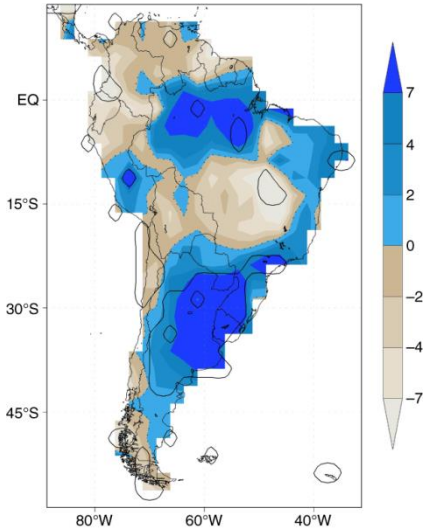
- DIVAR Goal: Increase knowledge on climate variability and change in South America to develop new tools to predict regional climate and its impacts, on weekly, monthly, annual and decadal scales

- Besides the DIVAR group, other researchers from UMI-IFAECI and the SMN participate in CLIMAX Project

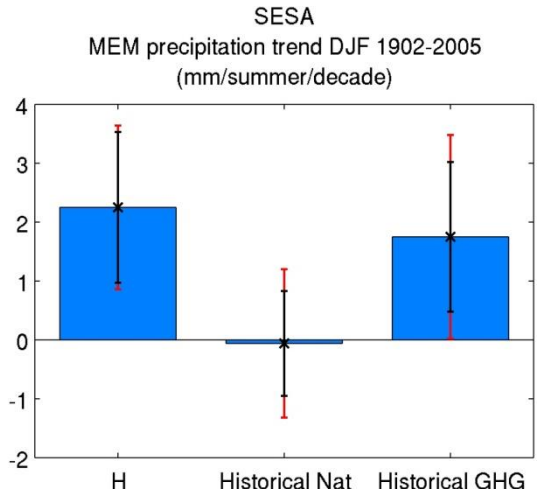
UMI-IFAECI (3351)

# Contributions to WP1

# Understanding drivers and mechanisms of observed large-scale variability and trends on interannual to decadal time scales (Leandro Díaz)



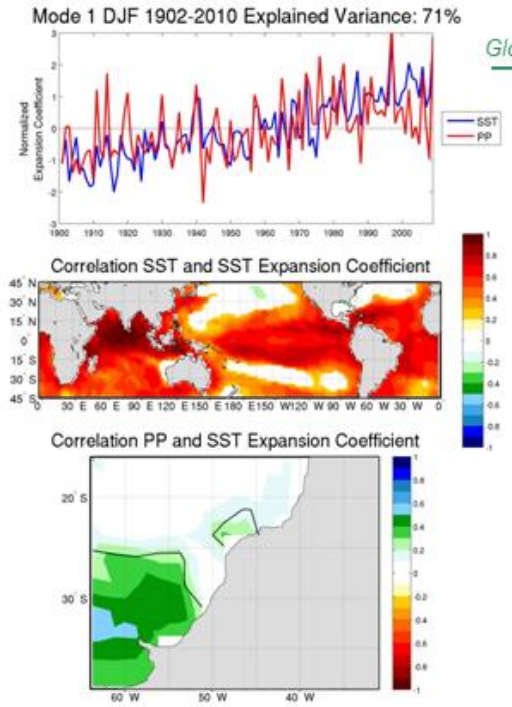

**Observed DJF Rainfall linear trends (1902-2005)**



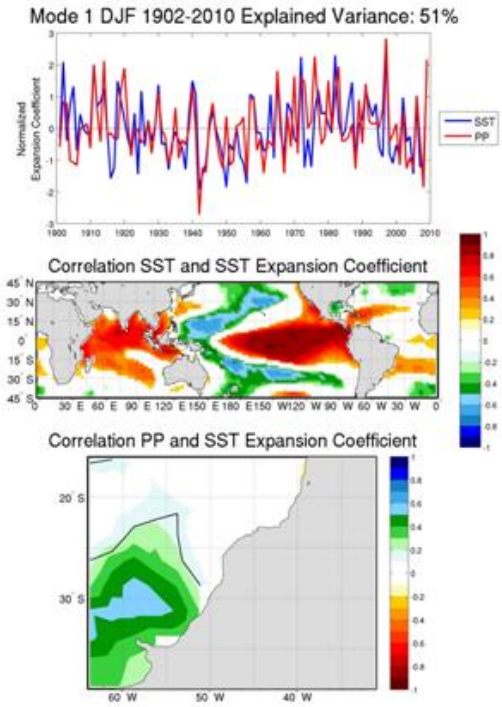

**How does the regional climate variability in South America will evolve in the next years-decades?**

- the internal natural variability mostly associated with the tropical ocean evolution

- The external climate forcing associated with both natural and anthropogenic sources

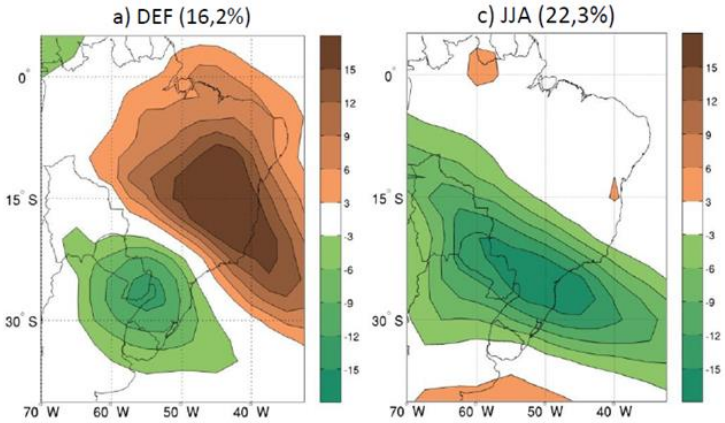



Global trend removed



# Understanding drivers and mechanisms of climate variability in SSA on subseasonal timescales (Mariano Alvarez)

***SIS pattern: EOF1 of IS-filtered OLR' (10-90 days)***

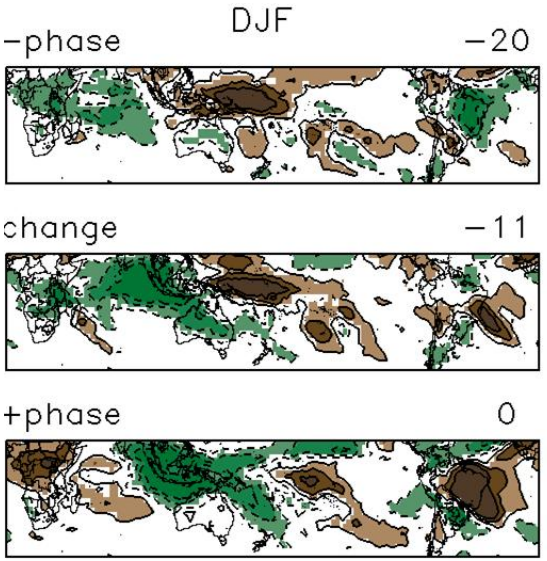


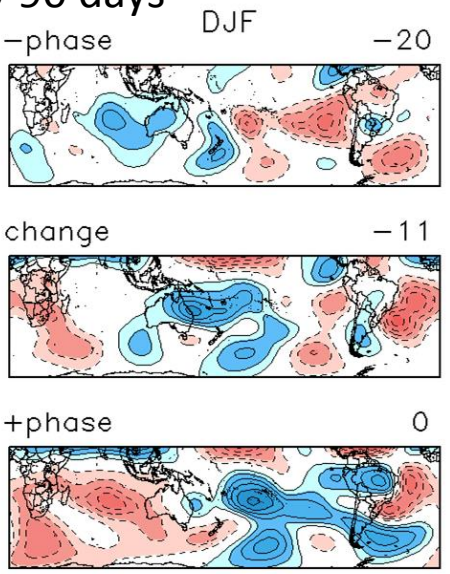

SIS index = PC1. Describes activity of SIS pattern

if positive, pp favored in **green** area

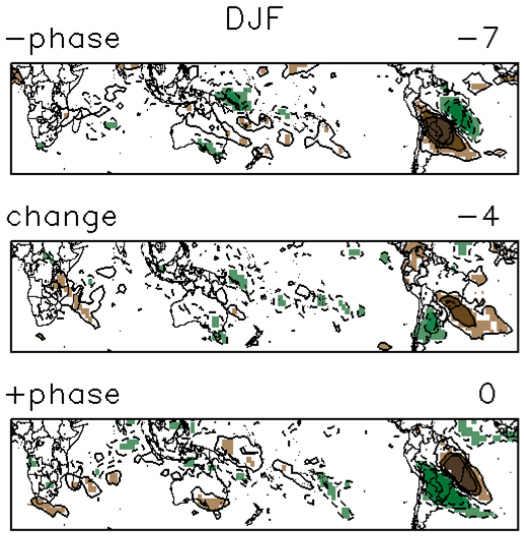
if negative, pp inhibited in **green** area

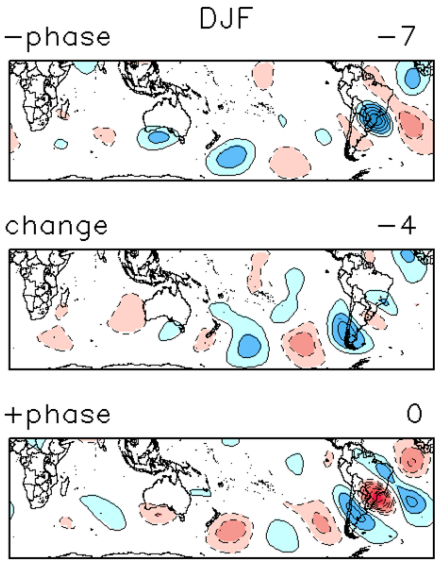
IS variability on 30-90 days



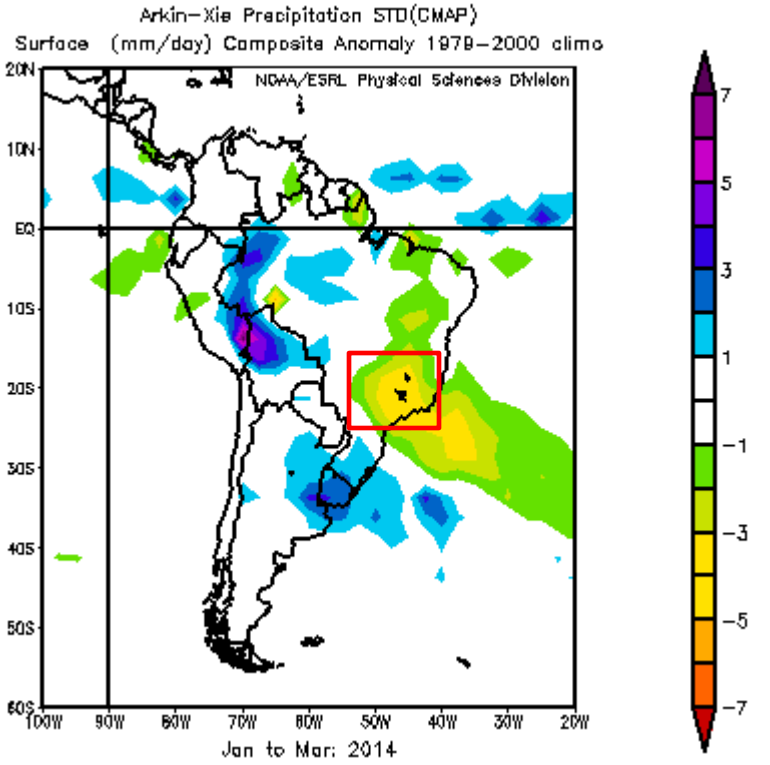

IS variability on 10-30 days



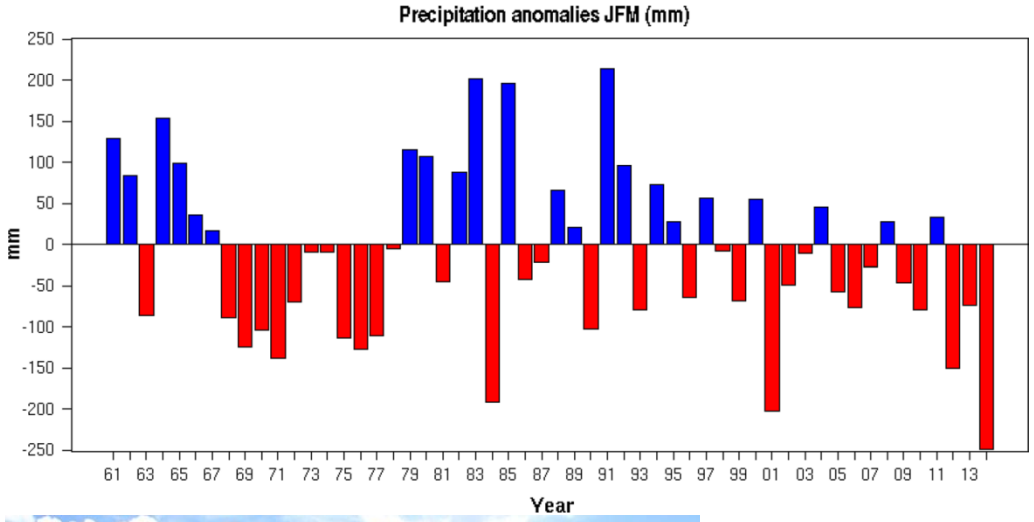



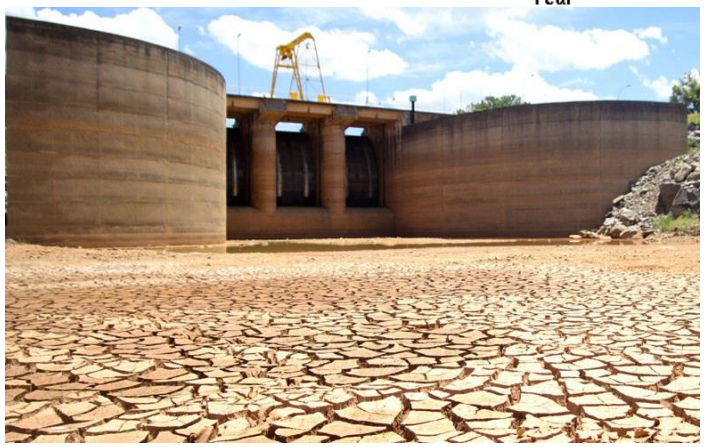
# The 2014 southeast Brazil summer drought: Extreme case of a positive EOF1 phase

JFM Precipitation anomaly in 2014




Observed JFM Precipitation anomalies averaged over southeast Brazil from 1961 to 2014

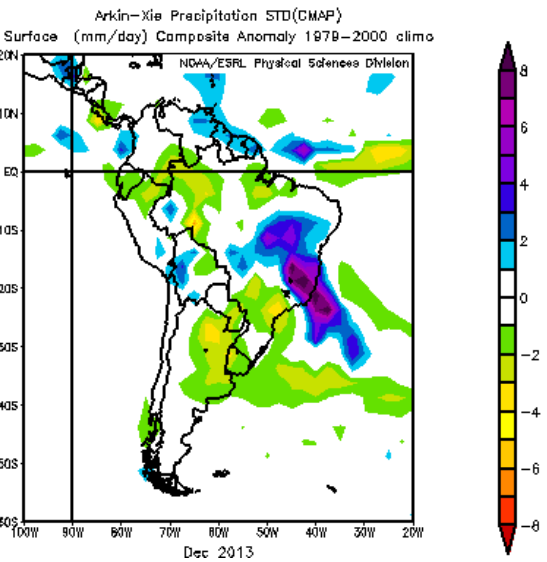


Coelho et al. (2015)

# 2013 December: Extreme case of a negative EOF1 phase

2013 December
Precipitation anomaly



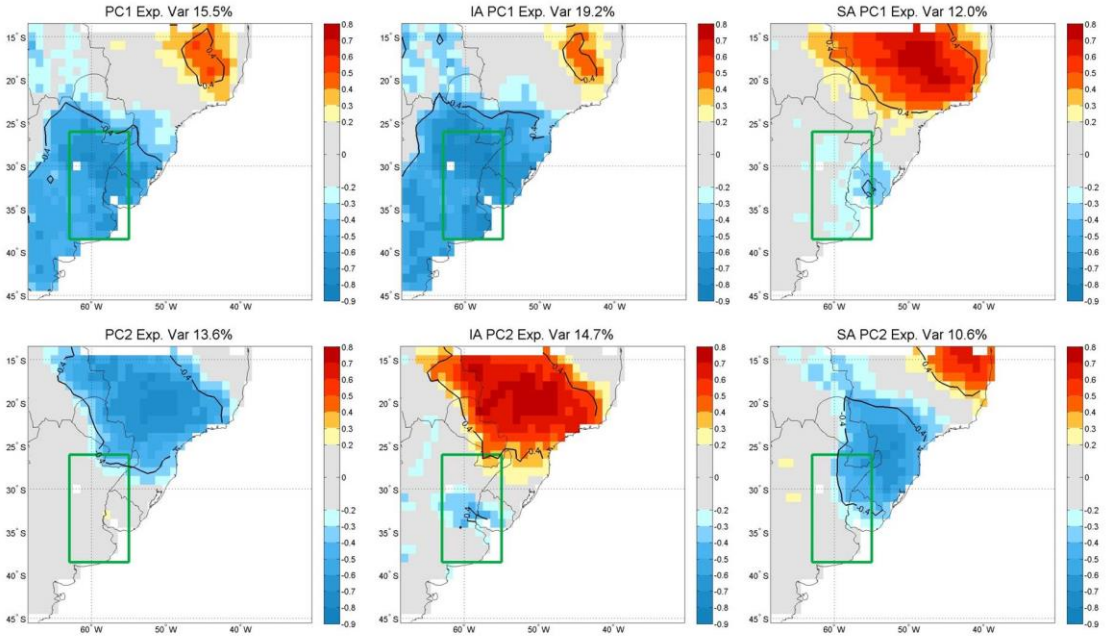

## Extreme heat wave in Argentina

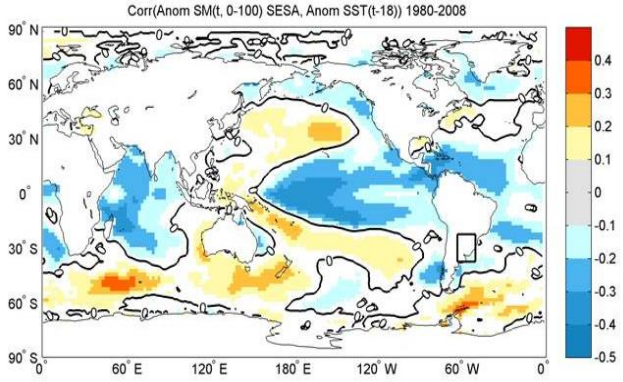
- More than 15 days with extreme hot conditions
- Collapse of the energy system of Buenos Aires

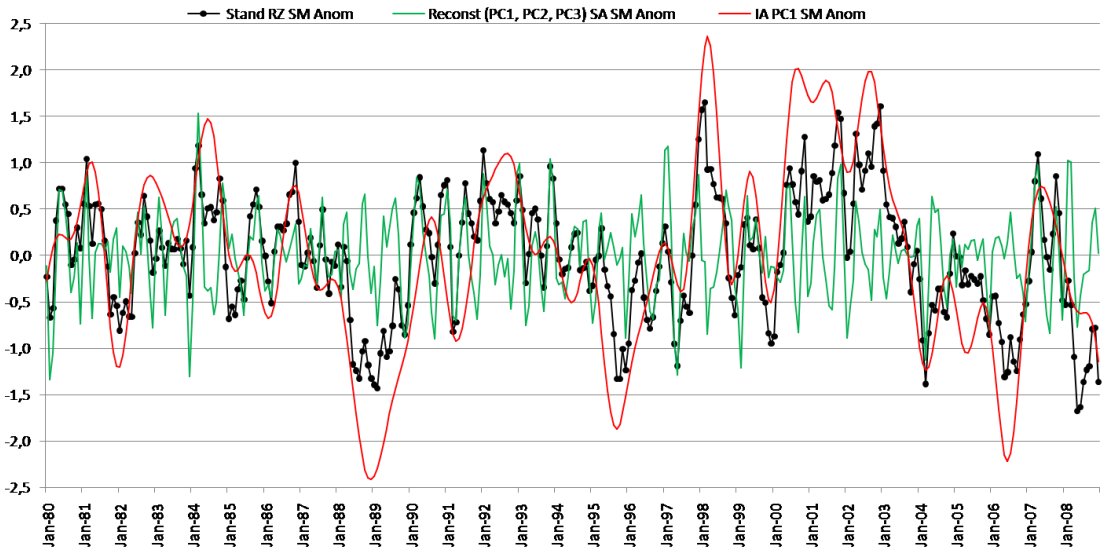

## Extreme precipitation and floods in Southeast Brazil

- More than 15 days with extreme rainfall conditions
- Emergency at many states, serious and large socio-economic impacts

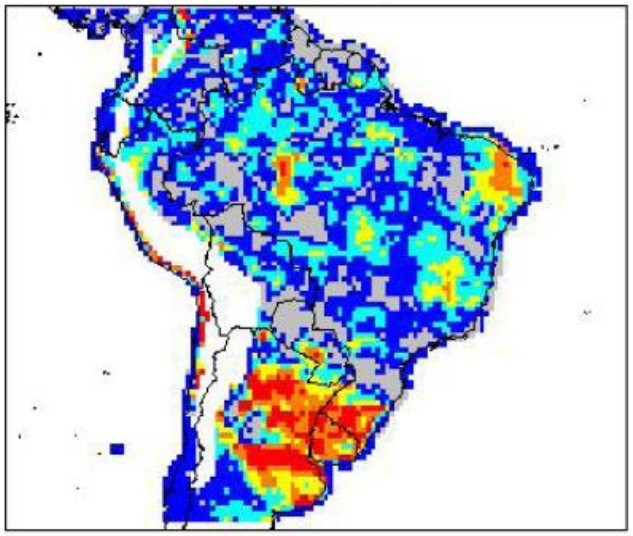
# Understanding drivers and mechanisms of soil moisture variability in SSA on subannual and internanual timescales (Pablo Spennemann)



# Understanding of the influence of land use change, floodplains and irrigation on hydrology in SSA (Anna Sörensson)



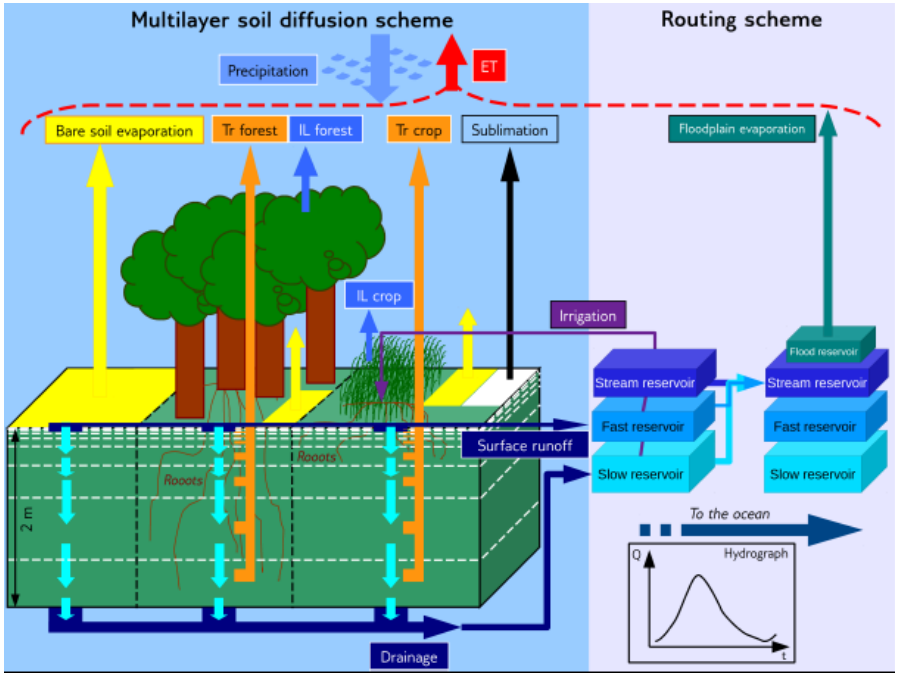

**Southeastern South America is a hot spot of land surface – atmosphere interaction both in present and future climate.**

(Sörensson and Menéndez 2011, Ruscica et. al 2016)

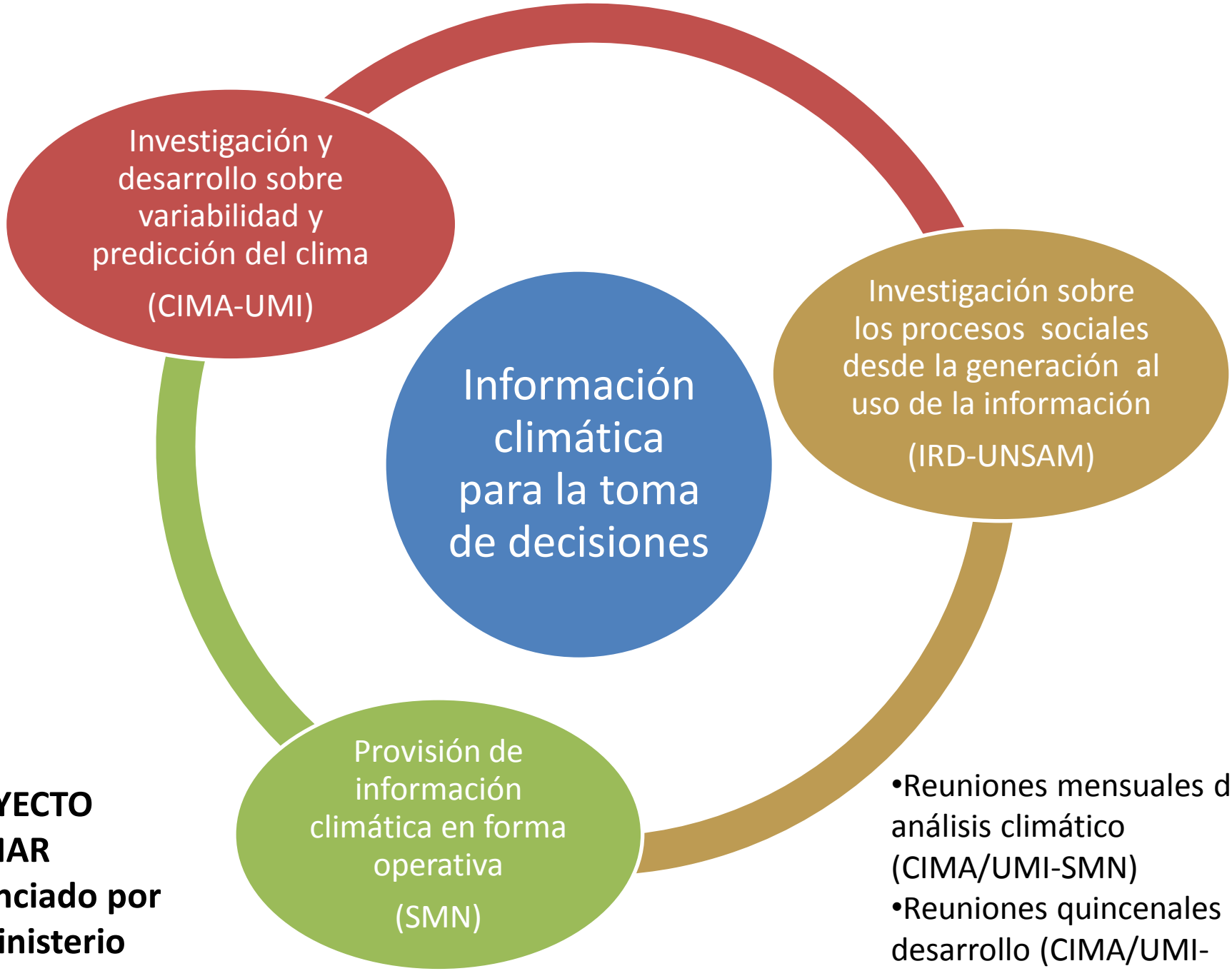
**How has historical land use change influenced on the hydrology of the rivers in the la Plata Basin?**

**How do horizontally propagating soil moisture anomalies (floodplains, irrigation) influence on hydrology, local surface climate and precipitation?**

**Tools: ORCHIDEE *(Organizing Carbon and Hydrology In Dynamic Ecosystems)* coupled to WRF**



# Contributions to WP2 and WP0

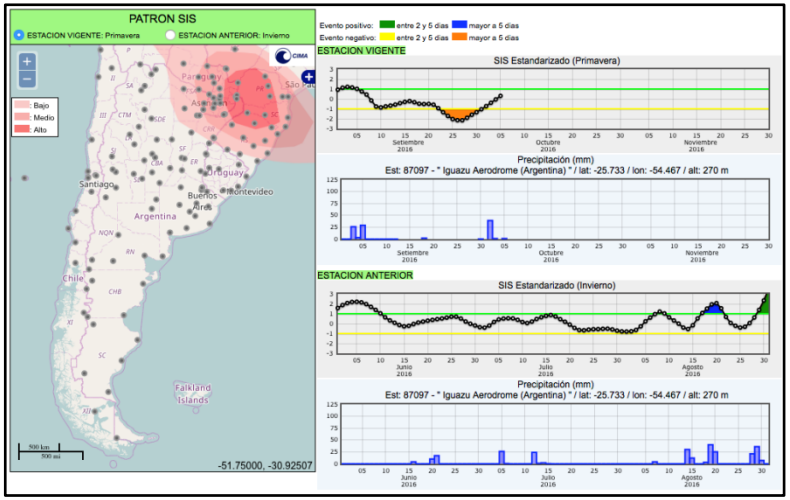



**PROYECTO CLIMAR**
**Financiado por el Ministerio de Defensa**

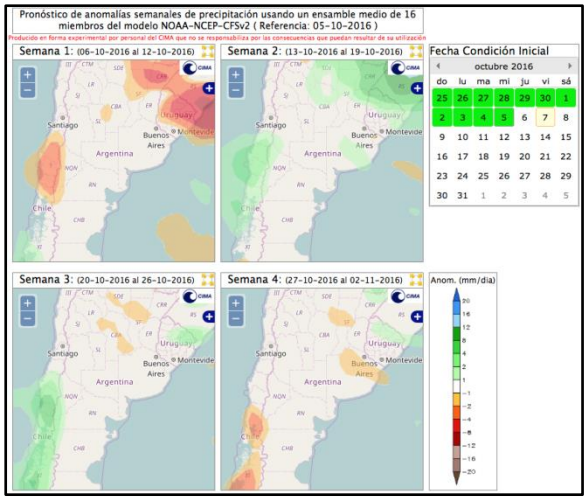
- Reuniones mensuales de análisis climático (CIMA/UMI-SMN)
- Reuniones quincenales de desarrollo (CIMA/UMI-SMN-UNSAM)

# Web-based tools of climate monitoring and prediction (Alfredo Rolla)

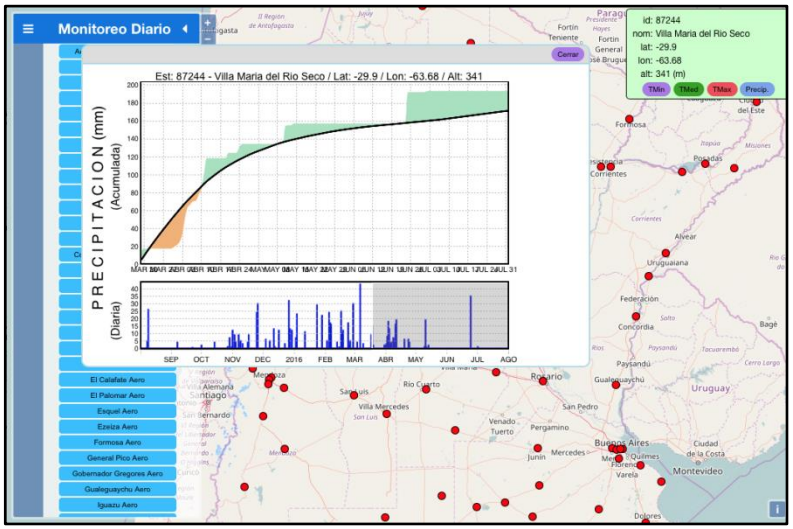
- SIS web implementation




- CFSv2 weekly forecast anomalies visualization (pre, t2m, z200,olr)




- Monitoring variables visualization ( tmax,tmin,tmed,pre )

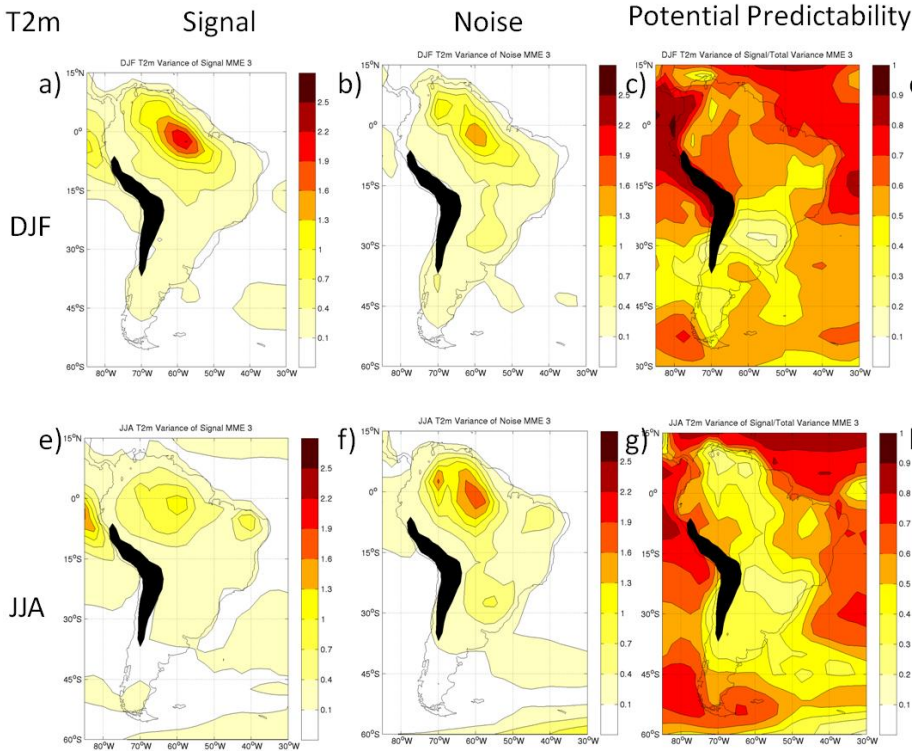


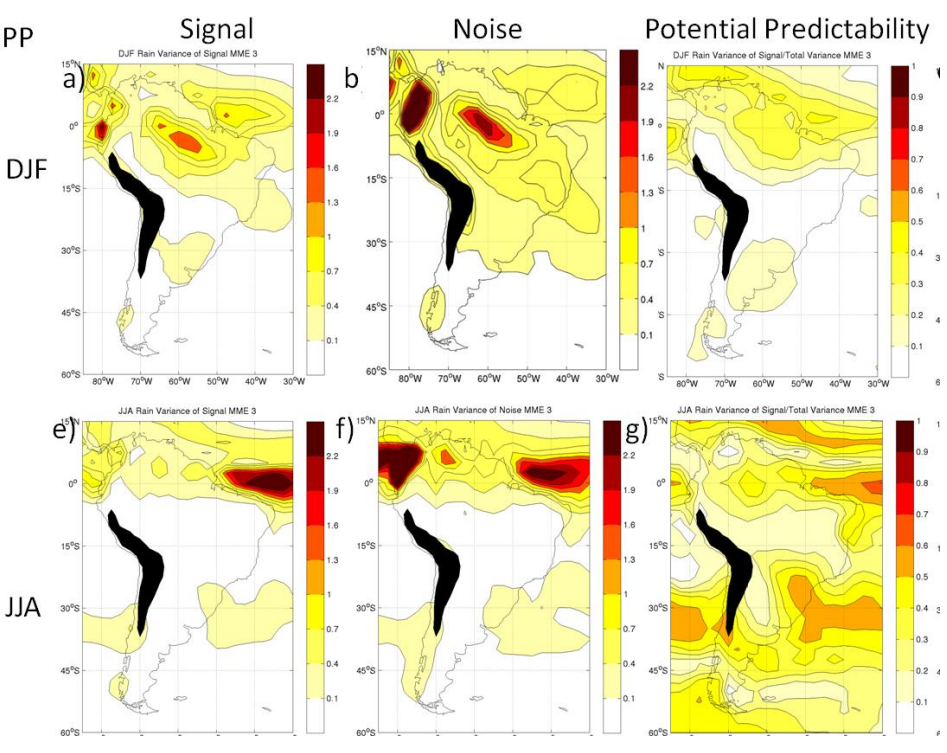

- Visualization Libraries (building block) :

  - ✓ Openlayers (mapping)
  - ✓ D3js (Data Driven Documents)
  - ✓ D3jsgeo (Geographic projections ext.)

# Regional predictability on seasonal timescales (Marisol Osman)

•Assessment of the predictability and skill of climate anomalies over South America considering a multi-model ensemble of 99 seasonal forecasts from 9 coupled global circulation models included in the Climate Historical Forecast Project (CHFP)/WCRP.



# Calibrated probabilistic climate predictions on subseasonal timescales (Alfredo Rolla)

Weekly Climate Forecasts

Member 1

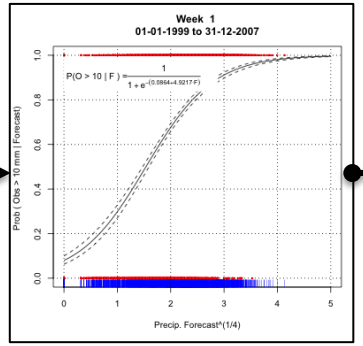
Member 2

Member 3

Member

$\sqrt[4]{F_{ens}}$

Calibrated regional statitical models of logistic regression




CFSv2
40 models / region
GEFV2
20 models / region

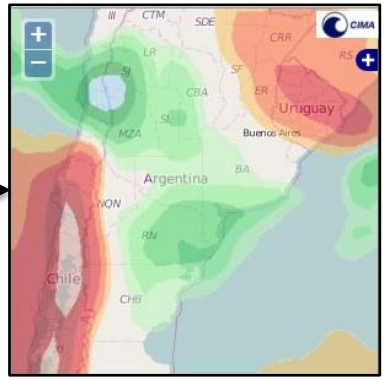
**P**[ O > Tr | F ]

Where:

O: Observations
Tr: Threshold
F: Forecast

**P**[ O > Tr | F ]:
Probability that observation in the region exceeds the threshold of 10 mm given the forecast

Expected result



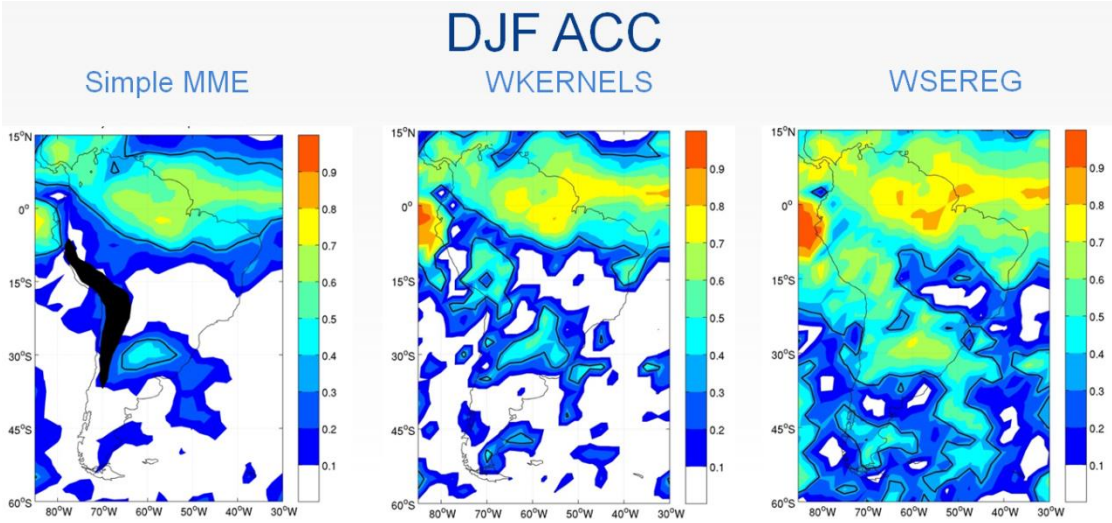

CFSV2 n:16 (4 weeks)
GEFSv2 n:11 (2 wekks)

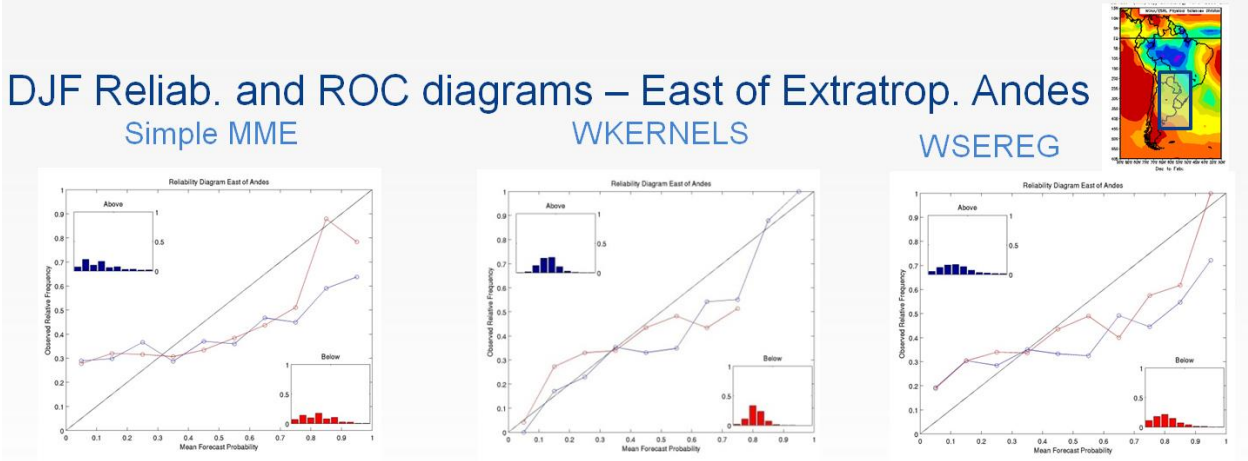
# Calibrated probabilistic climate predictions on seasonal timescales (Marisol Osman)

•11 models participating in the Climate Historical Forecast Project (CHFP). ~ 10 ensemble members each. Precipitation forecast valid at DJF and JJA for the 1982-2006 period, made with IC from Nov and May, respectively (Lead 1 month).

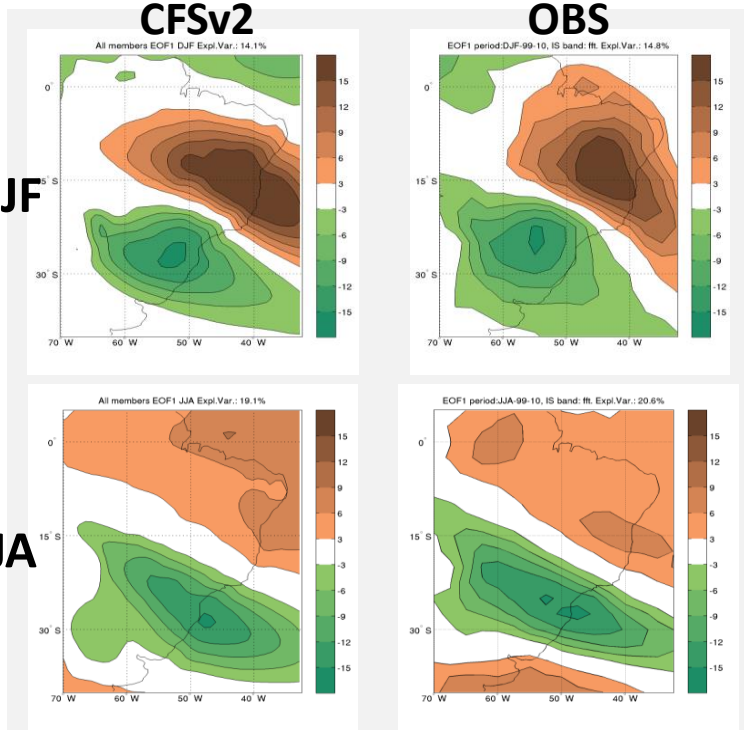
•For each model: Detrended and Standardized ensemble, we applied Ensemble Regression → PDF that represents each ensemble set, Determine the probability of each model of being the best → Model's Weight

•Model consolidation: WKERNELS: Sum Weighted PDF to get a consolidated PDF. WSEREG: Apply EREG to the Weighted Super-Ensemble.



# Climate information on subseasonal timescales: Monitoring and prediction (Mariano Alvarez)

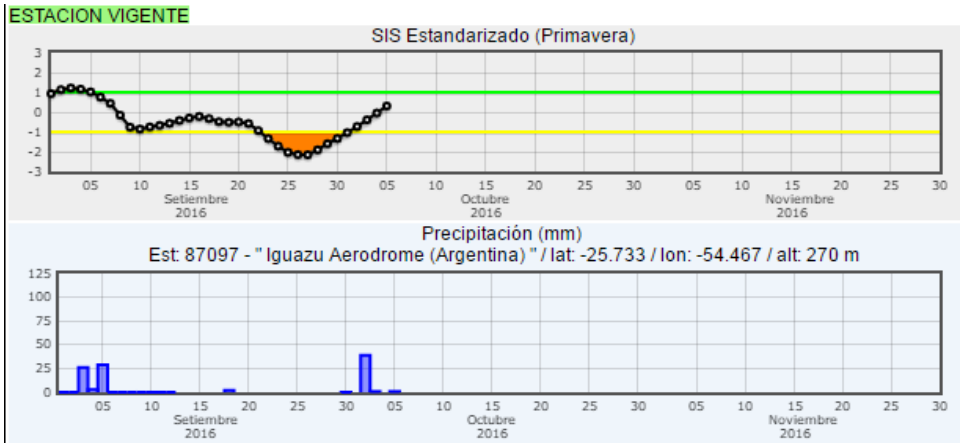



***SIS pattern: EOF1 of IS-filtered OLR' (10-90 days)***

Well represented by the CFSv2 model, which runs operationally

Current efforts in:
- Improving **RT** index performance
- Assessing predictability levels and prediction skill of SIS pattern

***SIS index monitoring*** → Uses quasi-RT OLR obtained from NOAA. With A. Rolla

# Participatory Research: “Anticipando la crecida” (Federico Robledo)

**Anticipando la crecida-Anticipating the flood**


**¿How do we anticipate the flood?**


- Coordinated by young people

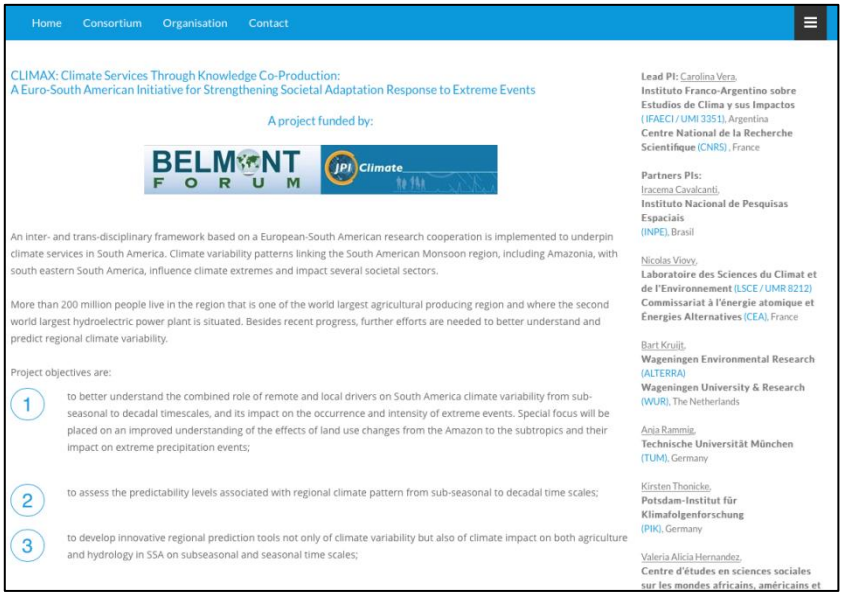
- Based on a co-design and co-production framework including actors from:
  - Different offices of the local government
  - Different civil society organizations
  - Academic-scientific institutions (social and natural sciences)
  - Operational agencies (National Weather Service, National Water Agency)

# Contributions to WP4

# Project Management and organization: Web-based tools (M.I. Ortiz de Zárate)

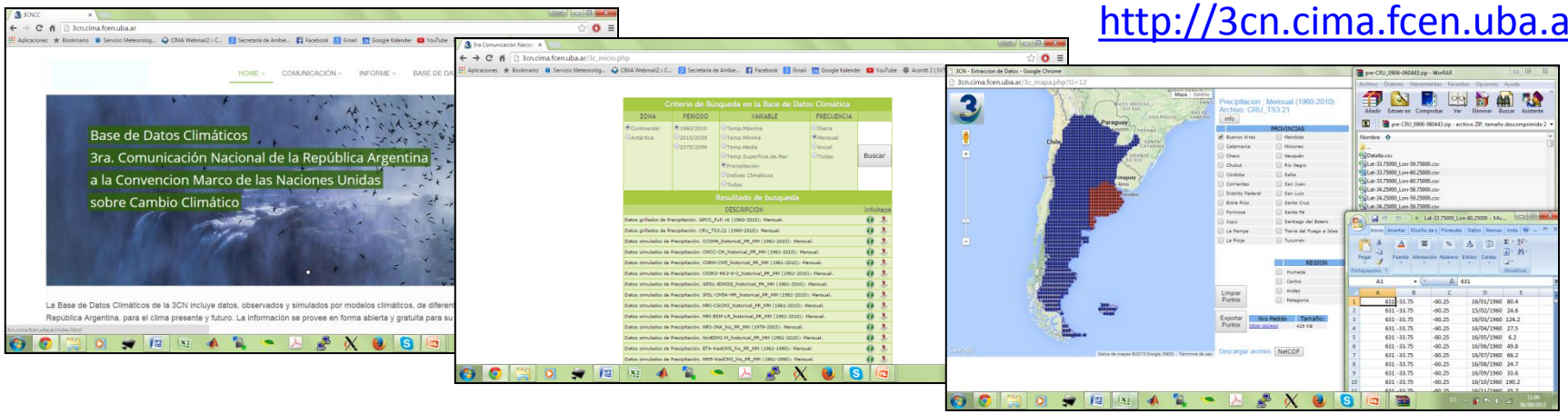
**Trello**: A cloud-based project management tool

A cloud-based team collaboration tool



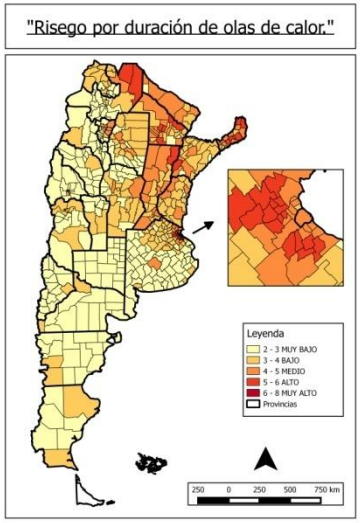

CLIMAX web-portal

# Impact studies of 3rd National Assessment of Argentina: Data Portal and key results

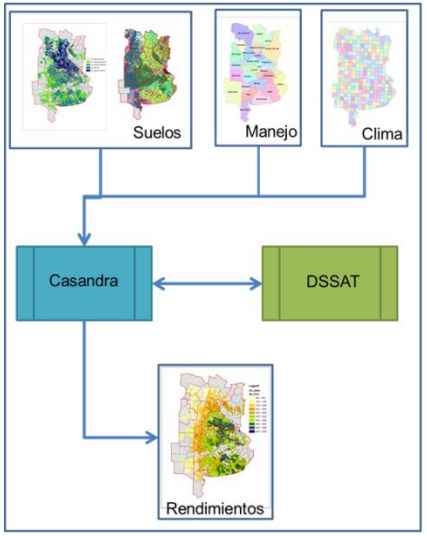



http://3cn.cima.fcen.uba.ar

## Social vulnerability




## Yield of principal crops




## Livestock production