Brand new Convection-Permitting simulations over South America: a look at the uncertainty sources at the sub-daily time scale

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The FPS-SESA ensemble

- The multi-model ensemble was developed as part of the CORDEX Flagship Pilot Study on Extreme Precipitation Events in Southeastern South America (FPS-SESA).
- This ensemble consists of four coordinated simulations produced by convection-permitting regional climate models (CPRCMs) at a 4 km resolution + one uncoordinated simulation covering the entire South American continent, by the NCAR South America Affinity Group, also at a 4 km resolution.
- Each simulation covers a three-year period (from June 2018 to June 2021.

Five-member ensemble that includes two distinct models with various configurations (two members using the WRF model and three members using the RegCM model)

The FPS-SESA ensemble

common_grid_CSAM-4i.txt

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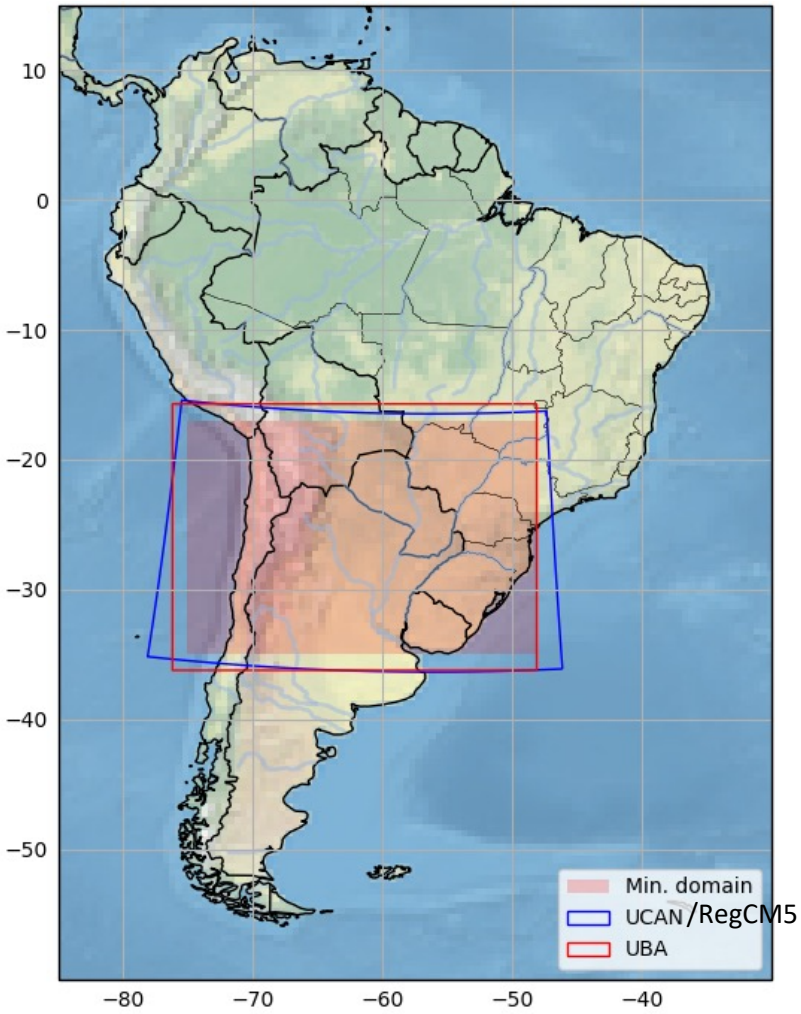
ysize = 451

xfirst = -75.0

xinc = 0.04

yfirst = -35.0

yinc = 0.04



Validation Data

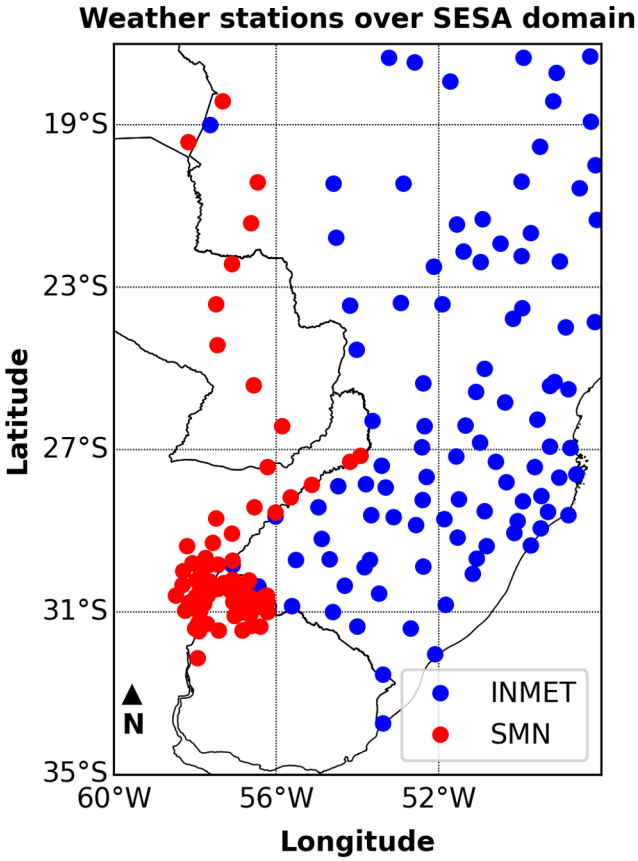
- Daily gridded datasets: MSWEP(0.1°), CMORPH (0.25°), CPC_Global (0.5°)
- Hourly Satellite Data (0.1°)
- Hourly stations

The uncertaincies grow when going at sub-daily timescales !!!

171 local stations:

- 100 from Brazil (INMet) and
  71 from Argentina, Uruguay and Paraguay (SMN - only rainfall)

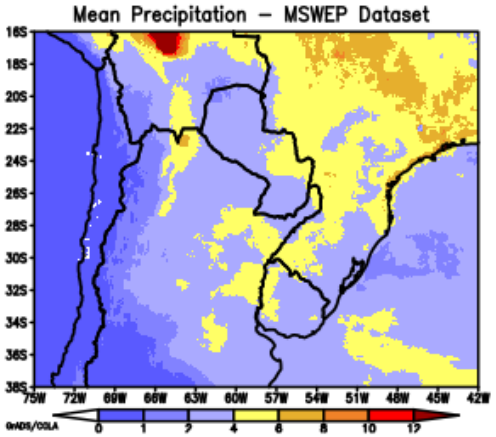
Period: June 2018 to December 2021

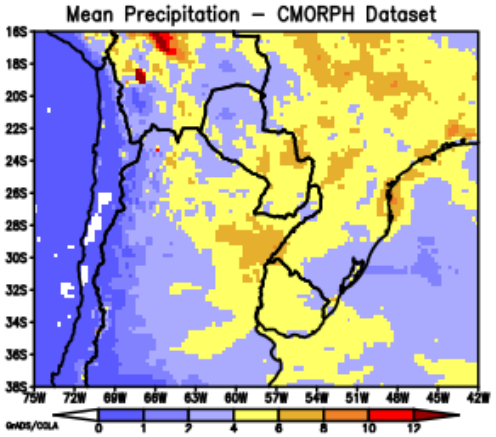


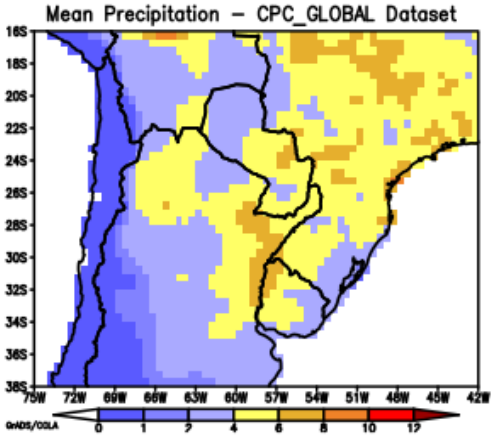
Thanks to: *Universidade de São Paulo, São Paulo, Brazil* and *University of Buenos Aires-CONICET, Buenos Aires, Argentina* for the data avaliability!!

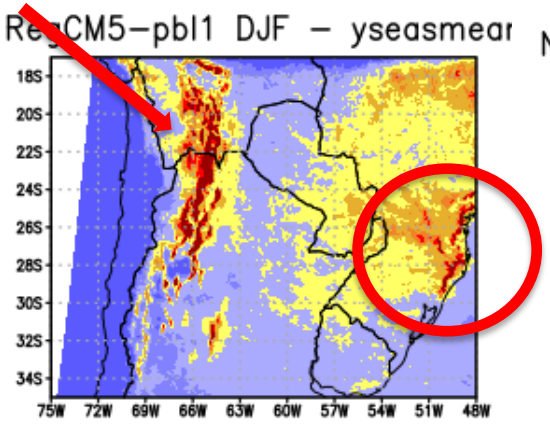
DAILY ANALYSIS

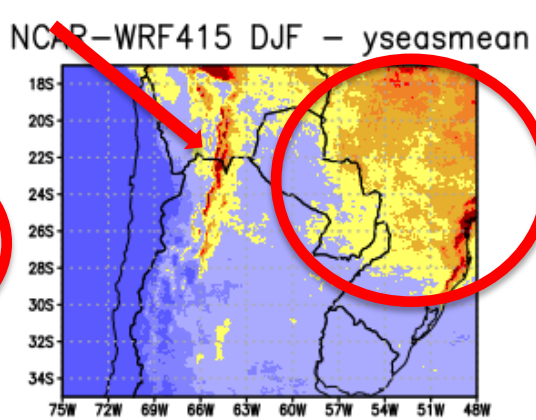
SPATIAL DISTRIBUTION OF DJF **DAILY MEAN** PRECIPITATION and comparison with 3 global datasets (mm/day)

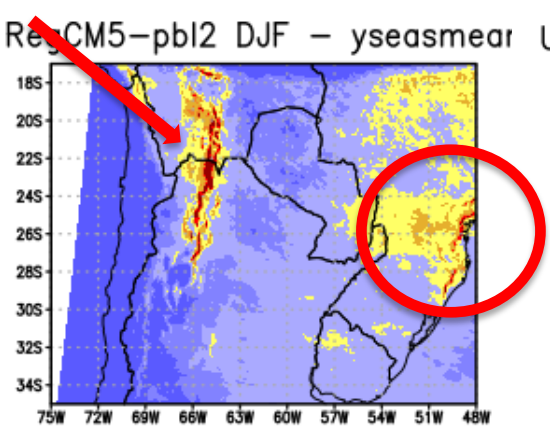


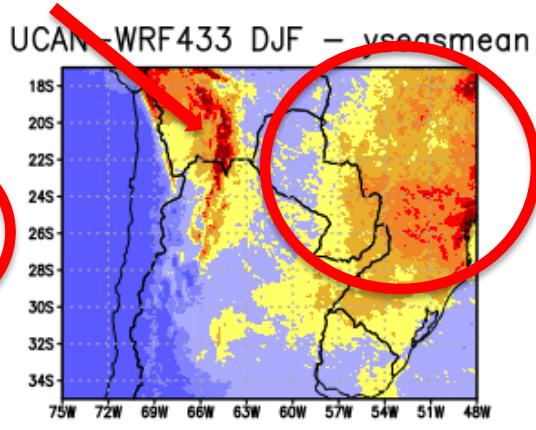


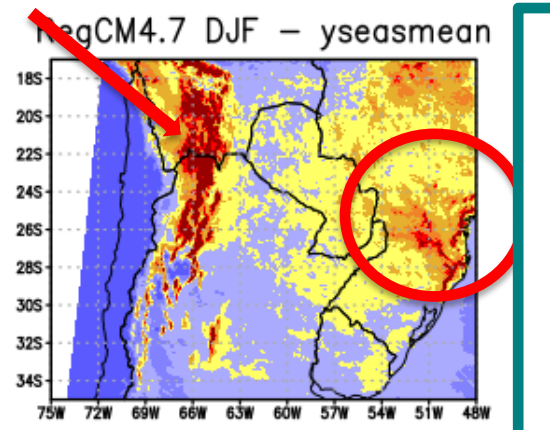


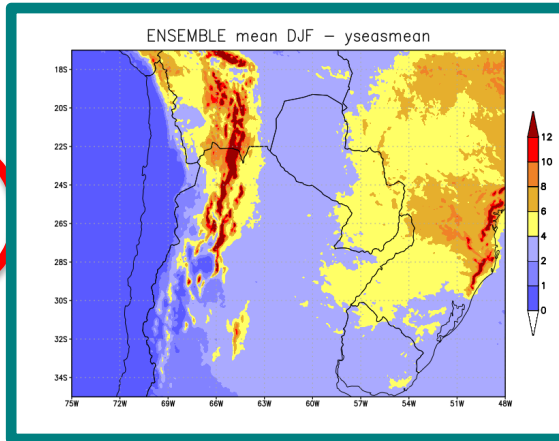






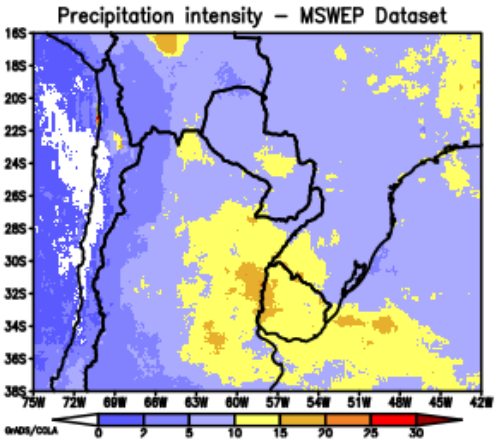


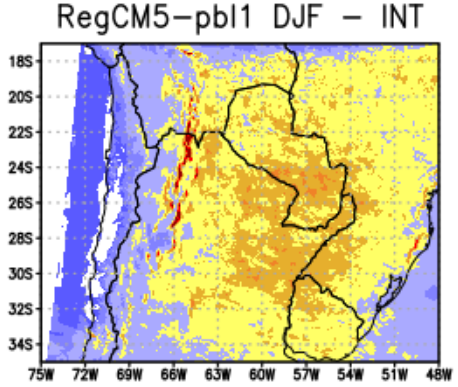


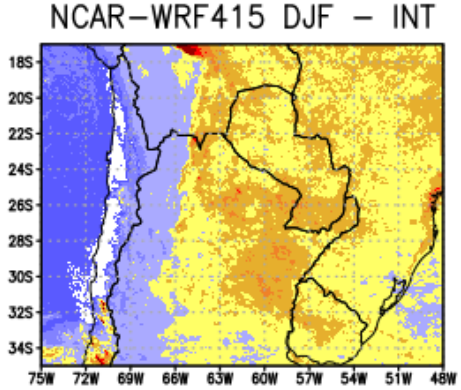


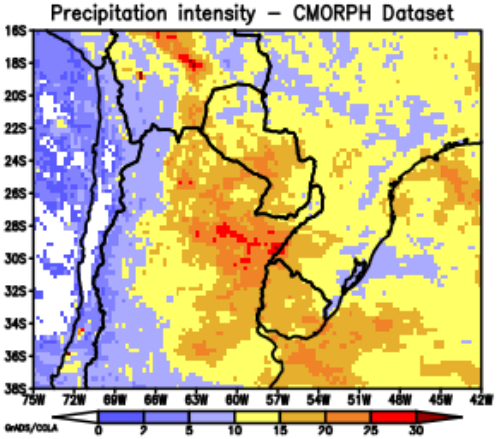
DAILY ANALYSIS

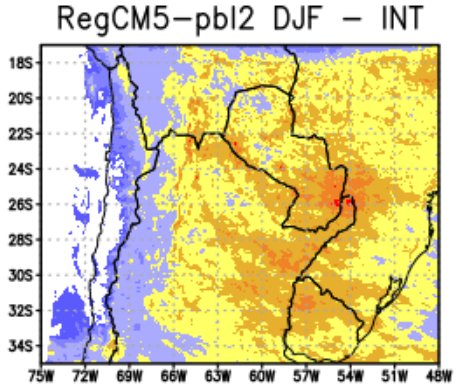
SPATIAL DISTRIBUTIO N OF DJF PRECIPITATI ON **INTENSITY** and comparison with 3 global datasets (mm/day)

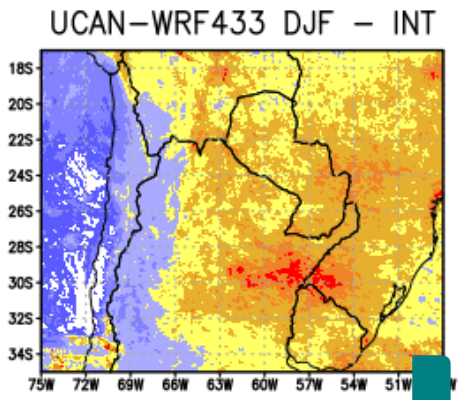


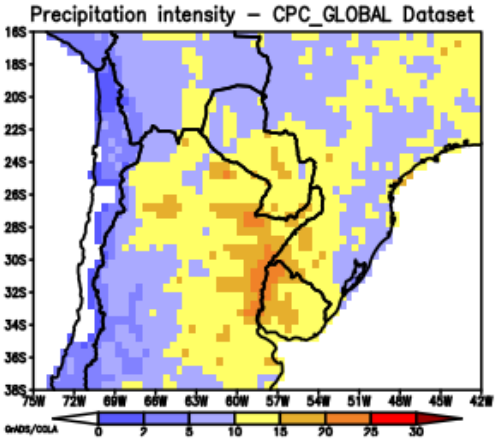


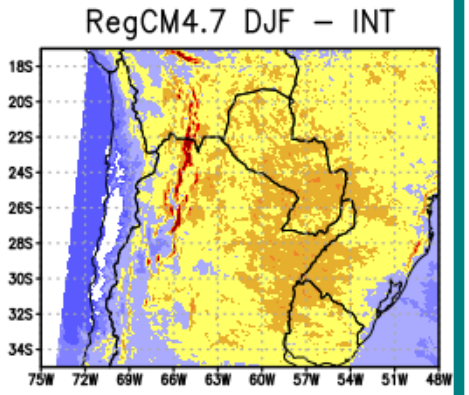


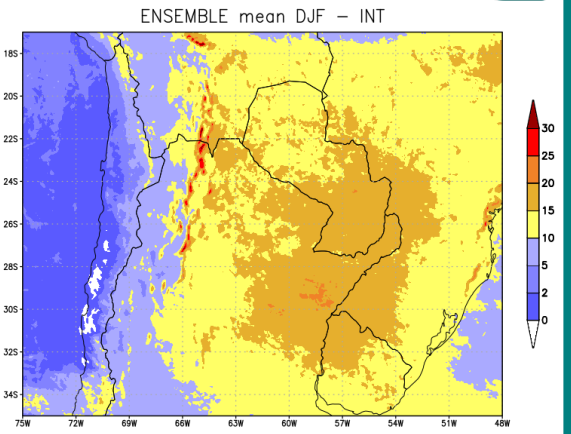






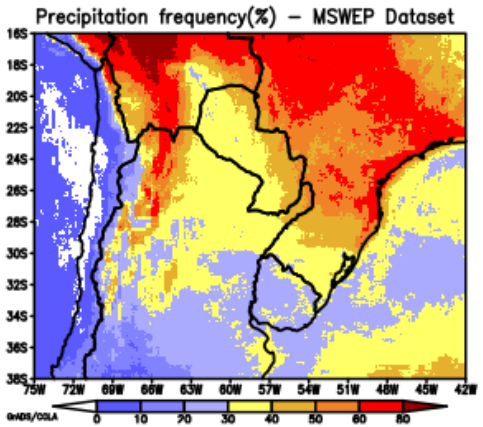


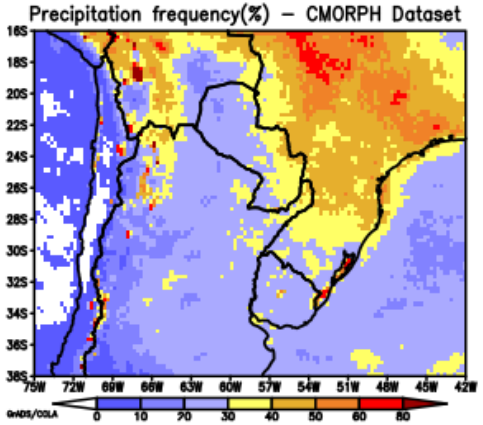


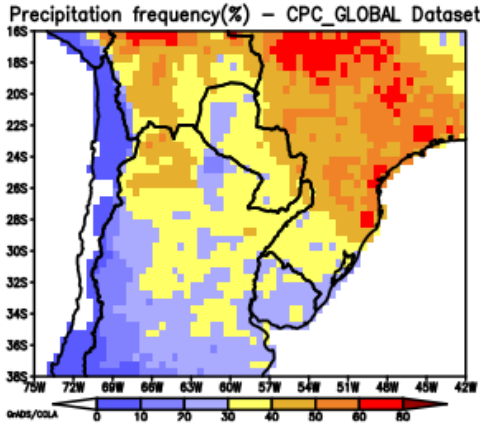


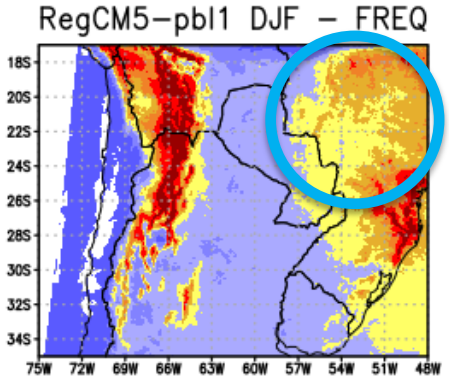
DAILY ANALYSIS

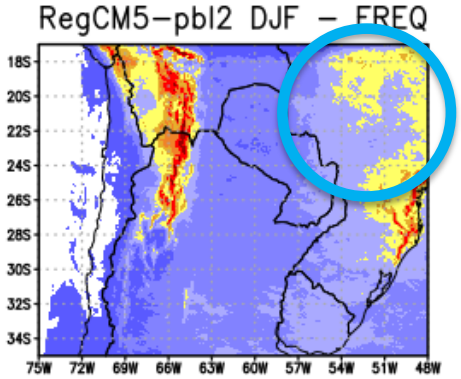
SPATIAL DISTRIBUTION OF DJF PRECIPITATION **FREQUENCY** and comparison with 3 global datasets

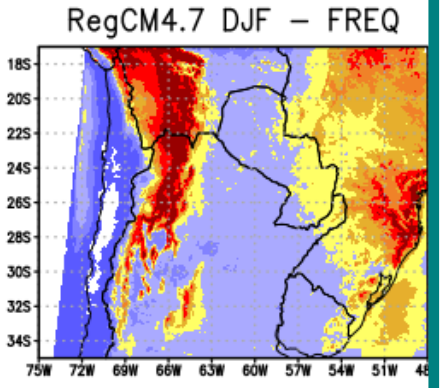


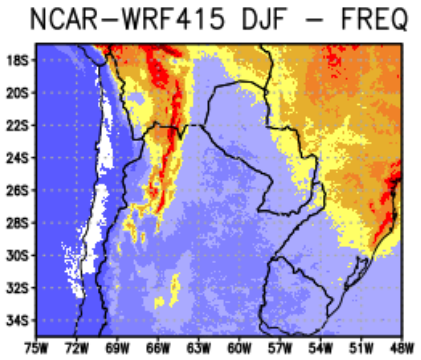


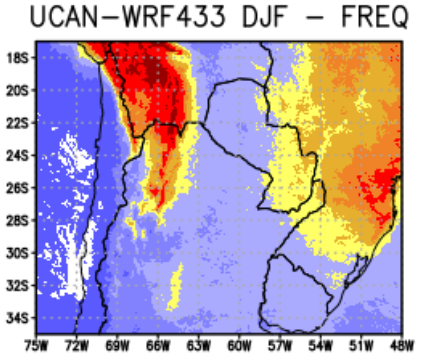


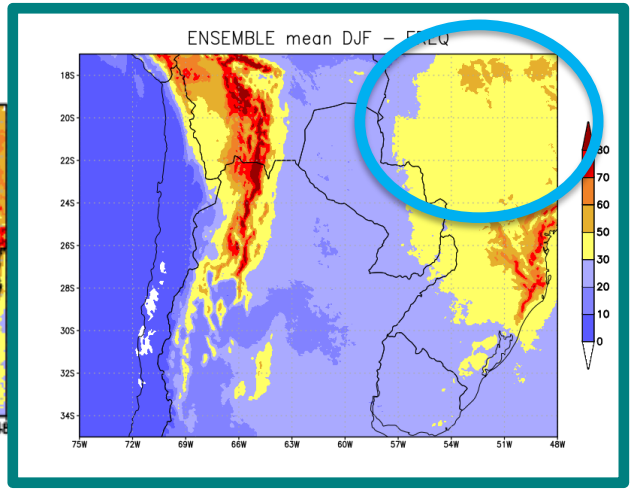




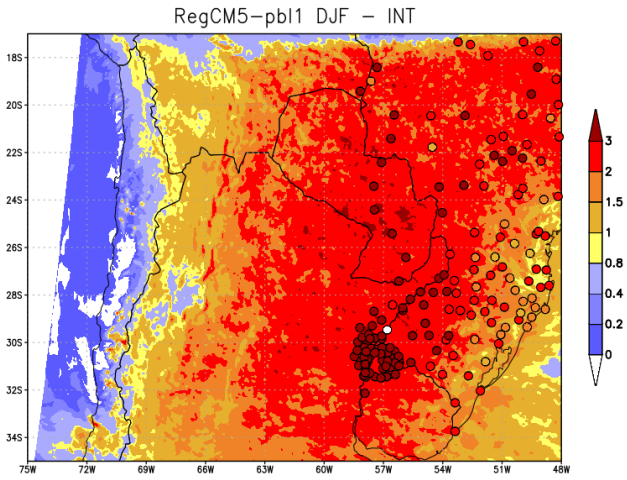


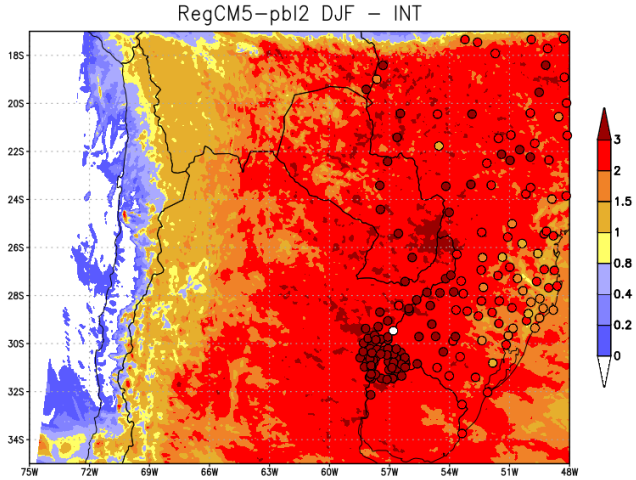


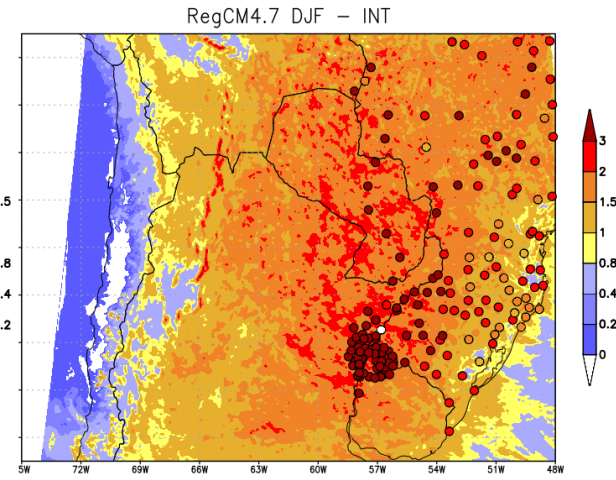


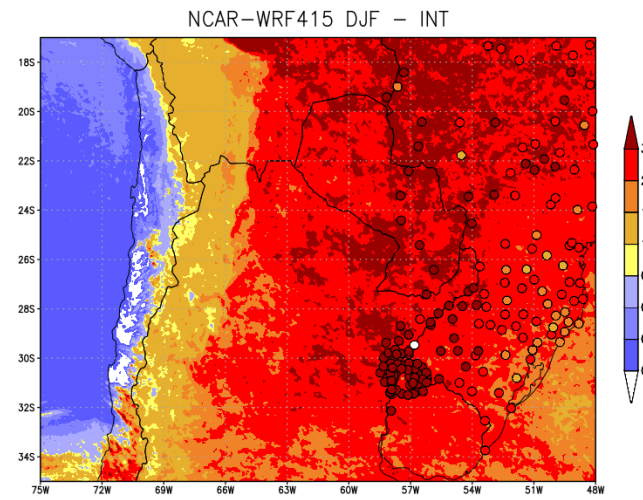


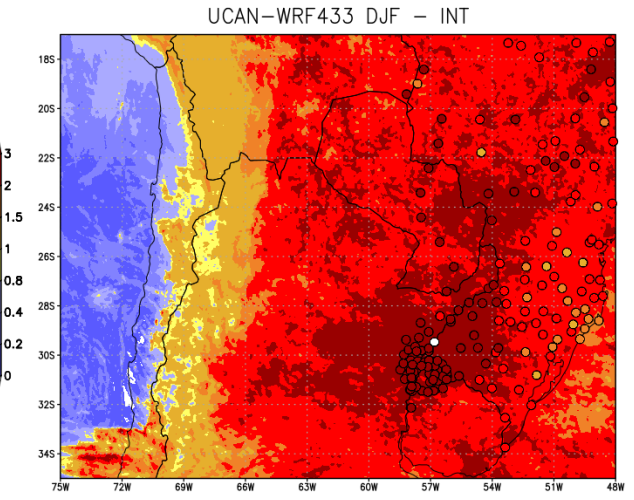
SPATIAL DISTRIBUTION OF DJF **HOURLY INTENSITY**: comparison with stations

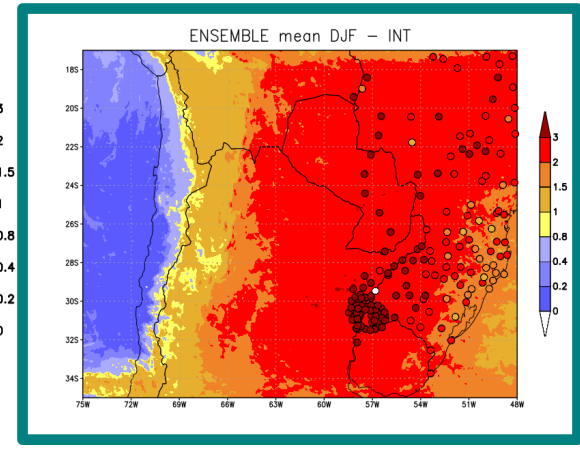




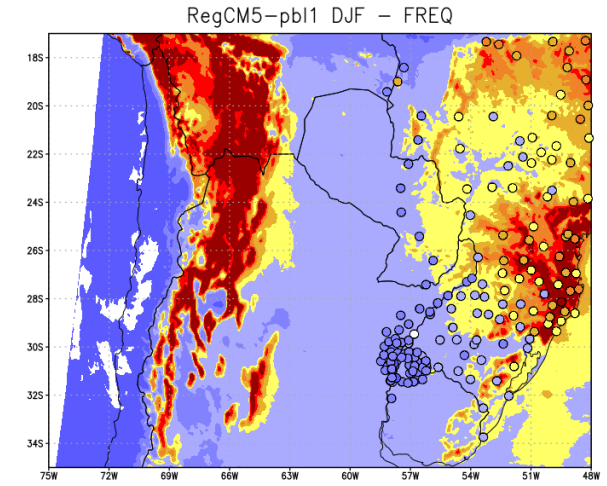


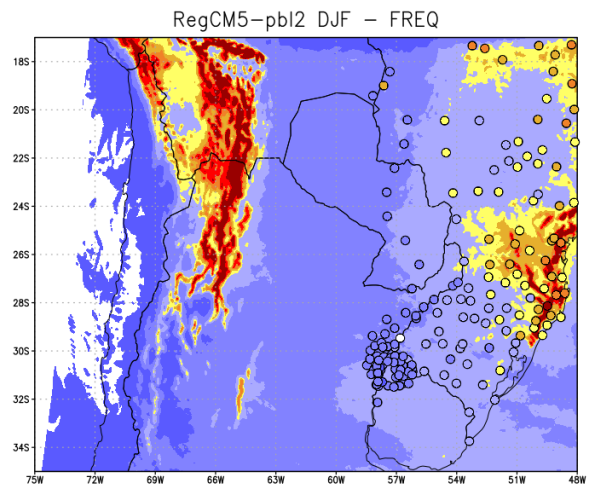


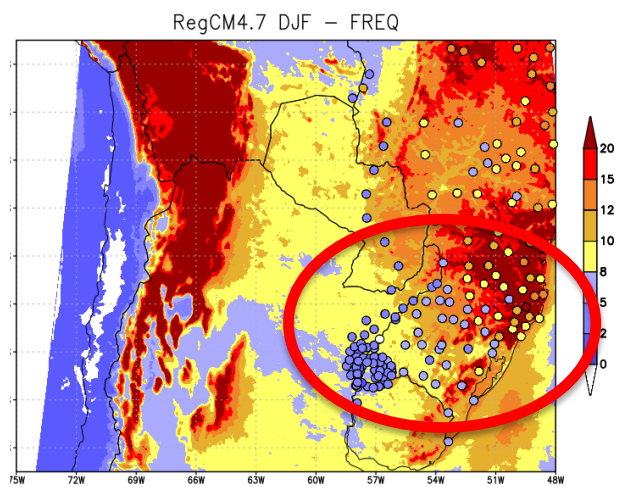


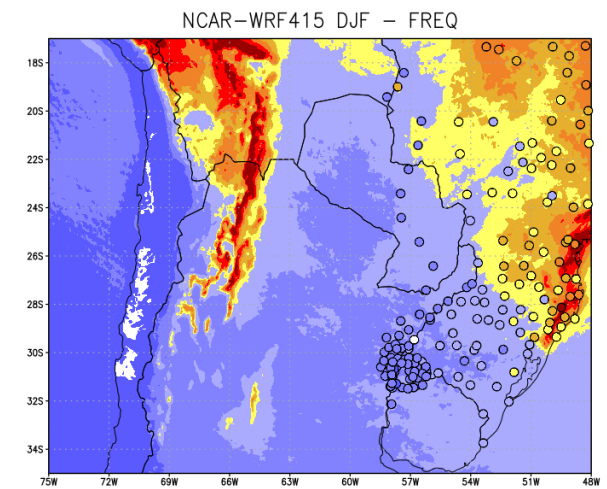


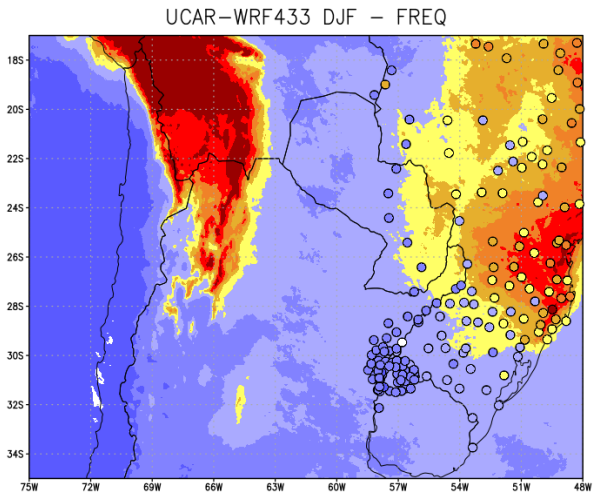
SPATIAL DISTRIBUTION OF DJF **HOURLY FREQUENCY**: comparison with stations

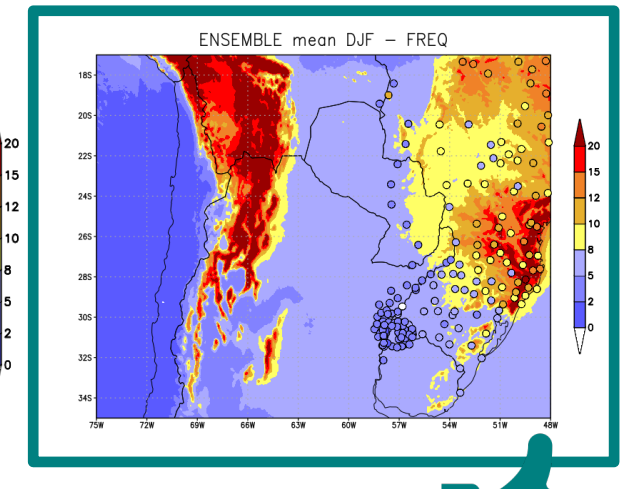




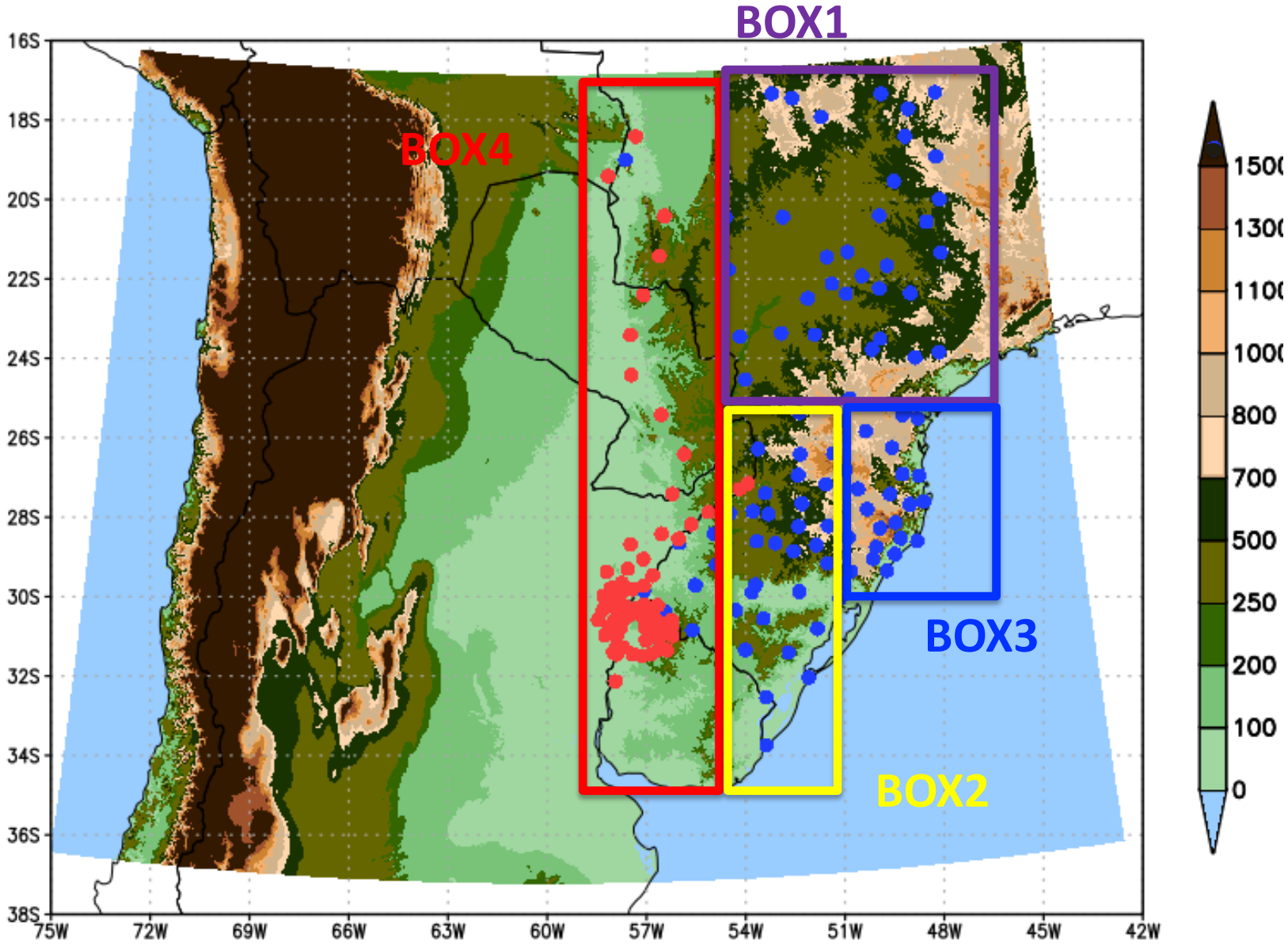






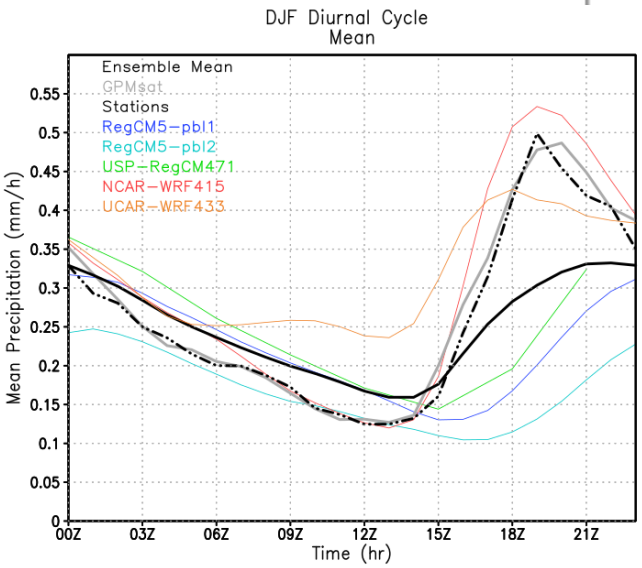


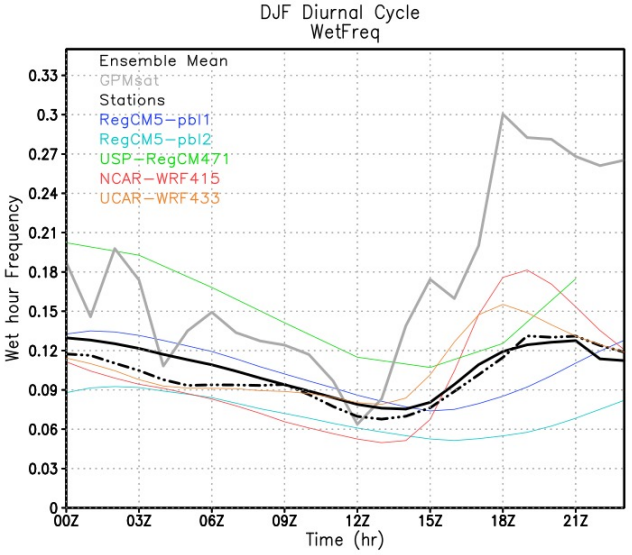
Stations location

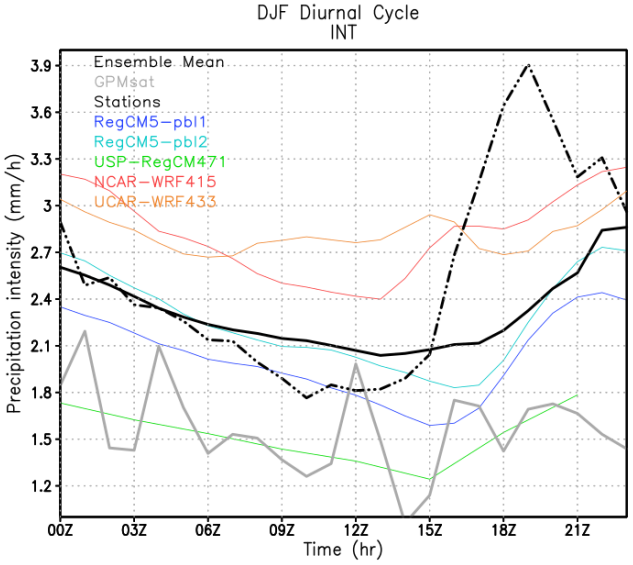


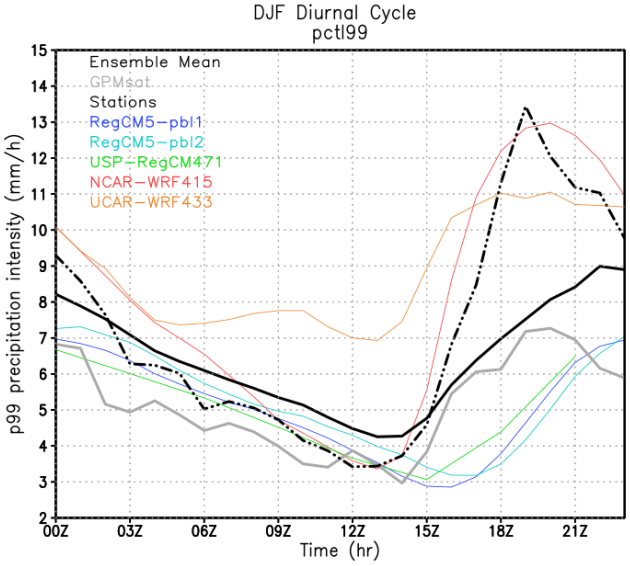
Diurnal cycles: BOX 1

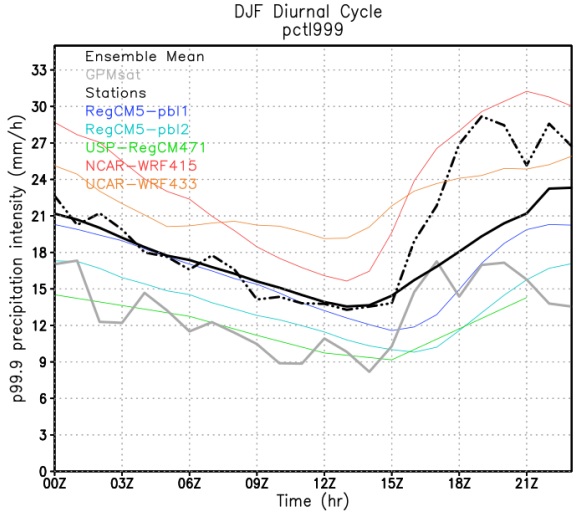
Stations _ .. _
Ensemble ——





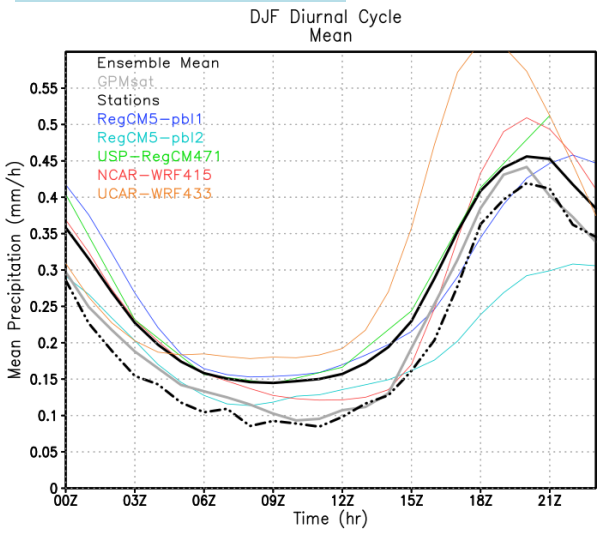


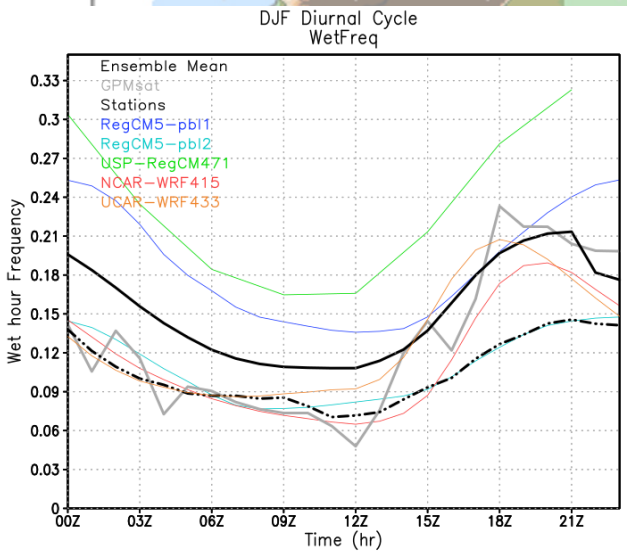


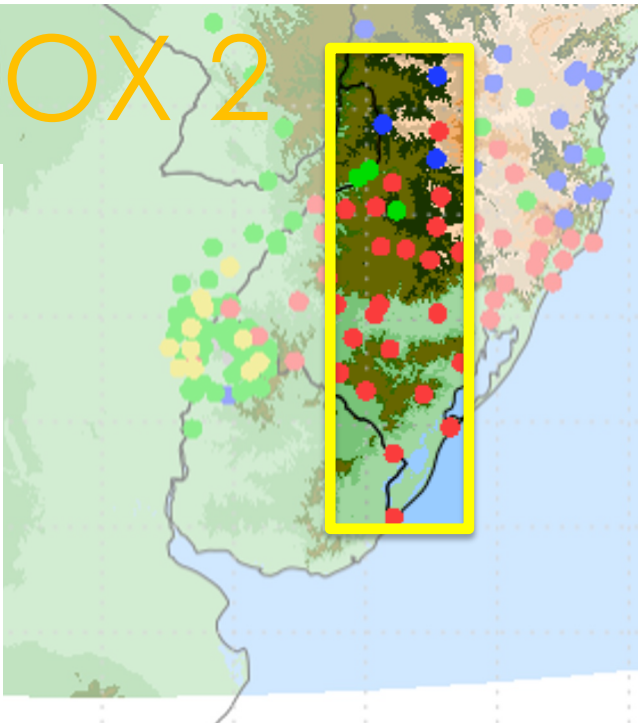


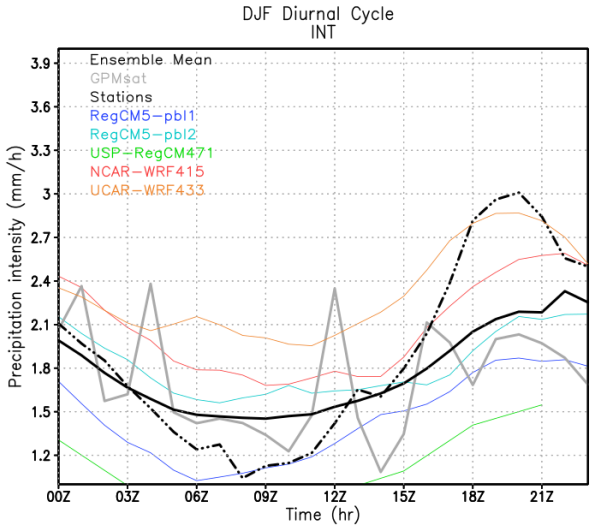
Stations – .. –
Ensemble ——

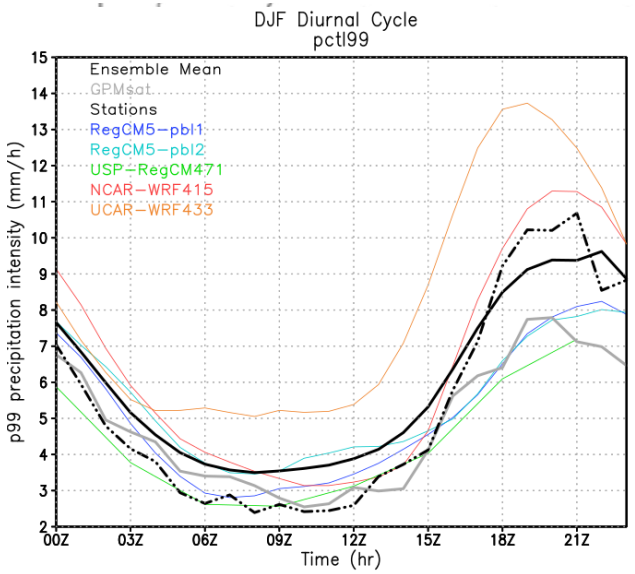
Diurnal cycles: BOX 2

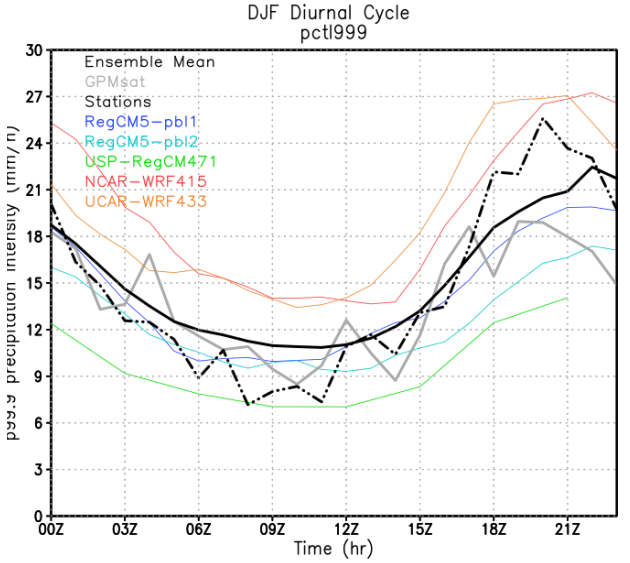






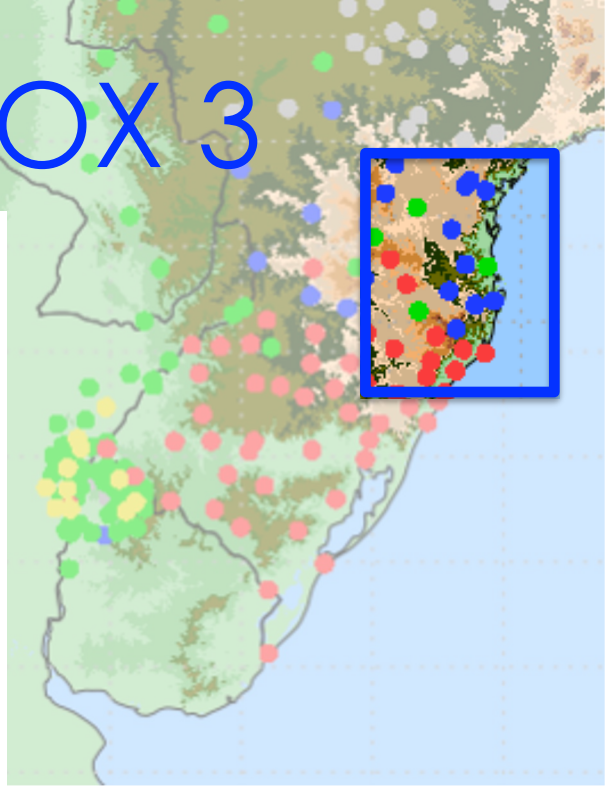


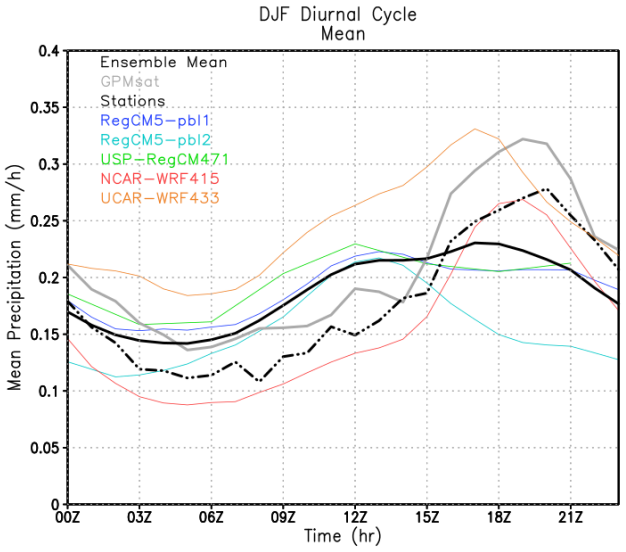


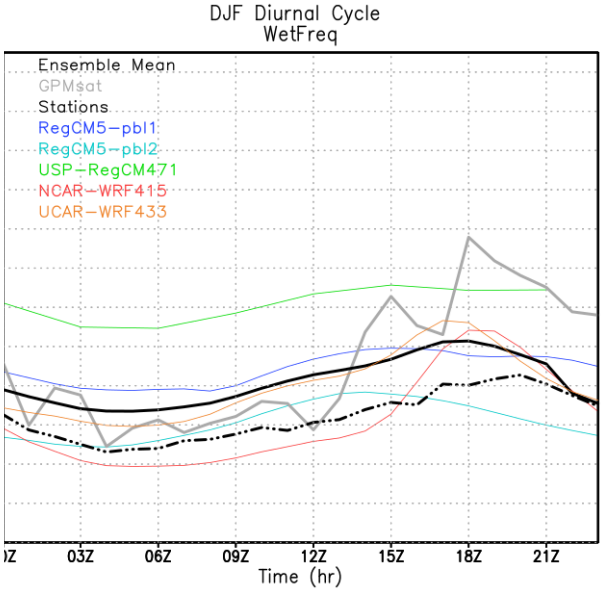


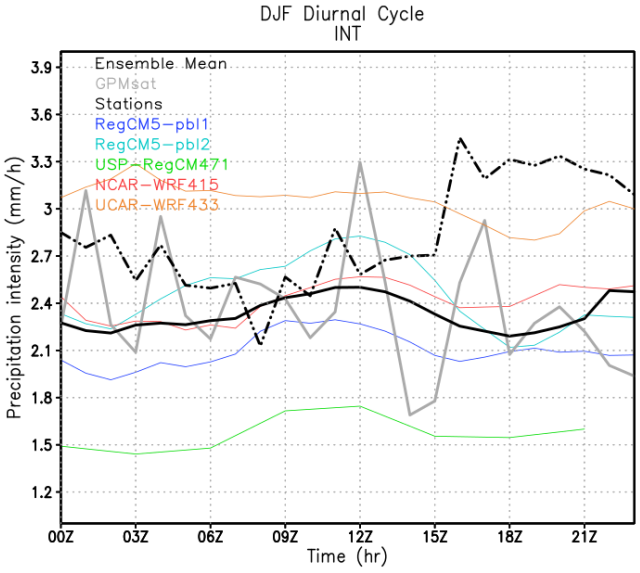
Stations – .. –
Ensemble ——

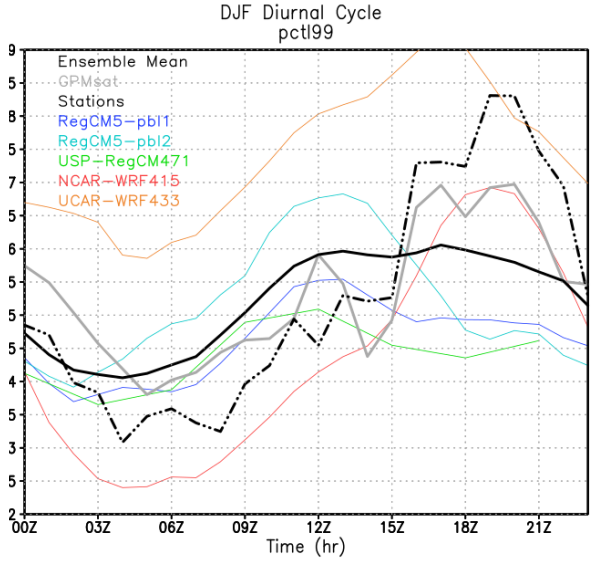
Diurnal cycles: BOX 3

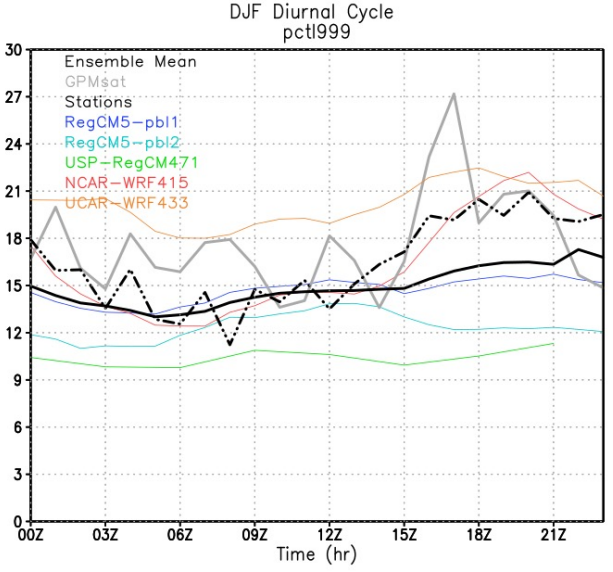






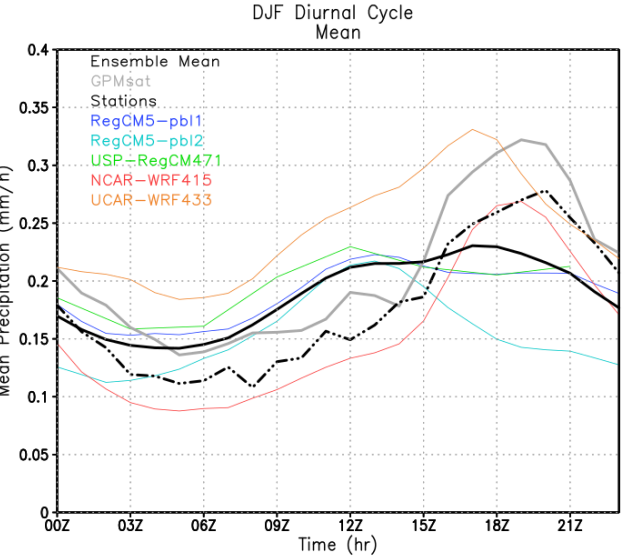


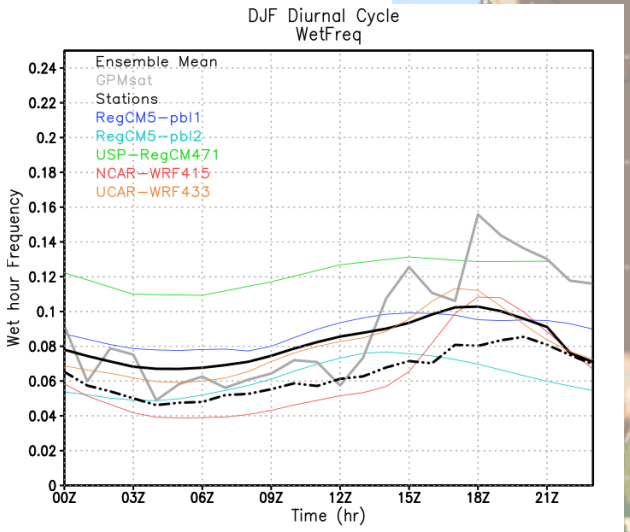


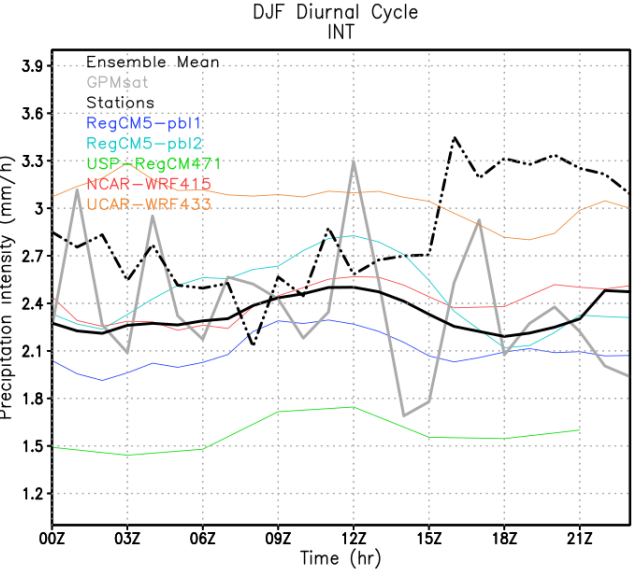


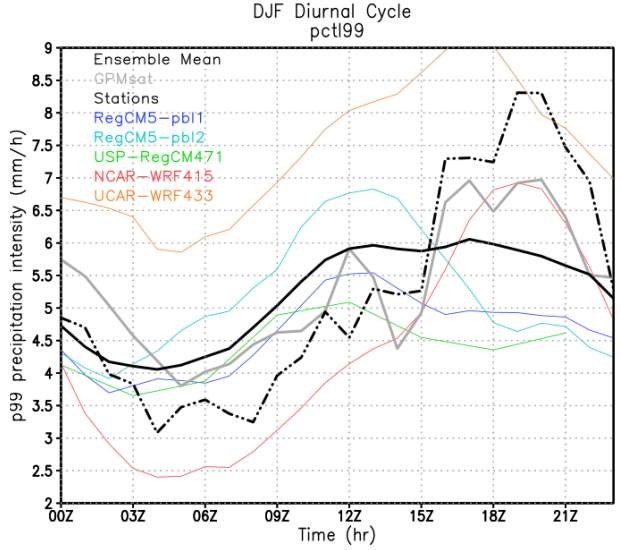
Stations – .. –
Ensemble ——

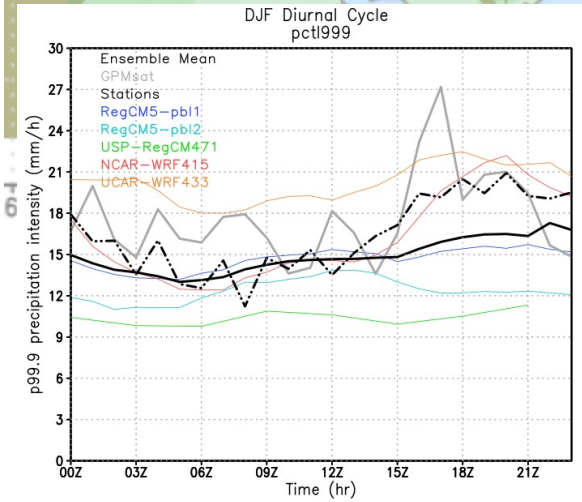
Diurnal cycles: BOX 4











Summary

- The available satellite and gridded observational datasets show a clear uncertainty: both at daily and hourly time scale;
- a station based observational dataset is needed, to assess the model uncertainty within the context of the observational uncertainty;
- an additional important source of uncertainty, linked with the representation of sub-grid scale, are the different configurations of the models of the ensemble: the parameterizations used to represent sub-grid scale processes (i.e. PBL schemes), can make a big difference when using the same model.
- A further analysis is needed to go through a deep understanding of local characteristics to investigate why models are behaving so different depending from the chosen regions.