

SEASONAL CLIMATE PREDICTION AND  
COMMUNICATION OVER  
SENEGAL USING A MULTI-MODEL SYSTEM  
ASHER SIEBERT, SYLWIA TRZASKA, ANDREW ROBERTSON

---

45<sup>TH</sup> CLIMATE DIAGNOSTICS AND PREDICTION WORKSHOP

OCTOBER 2020

# PYCPT AND NEXTGEN FORECASTING: APPLICATION TO SENEGAL

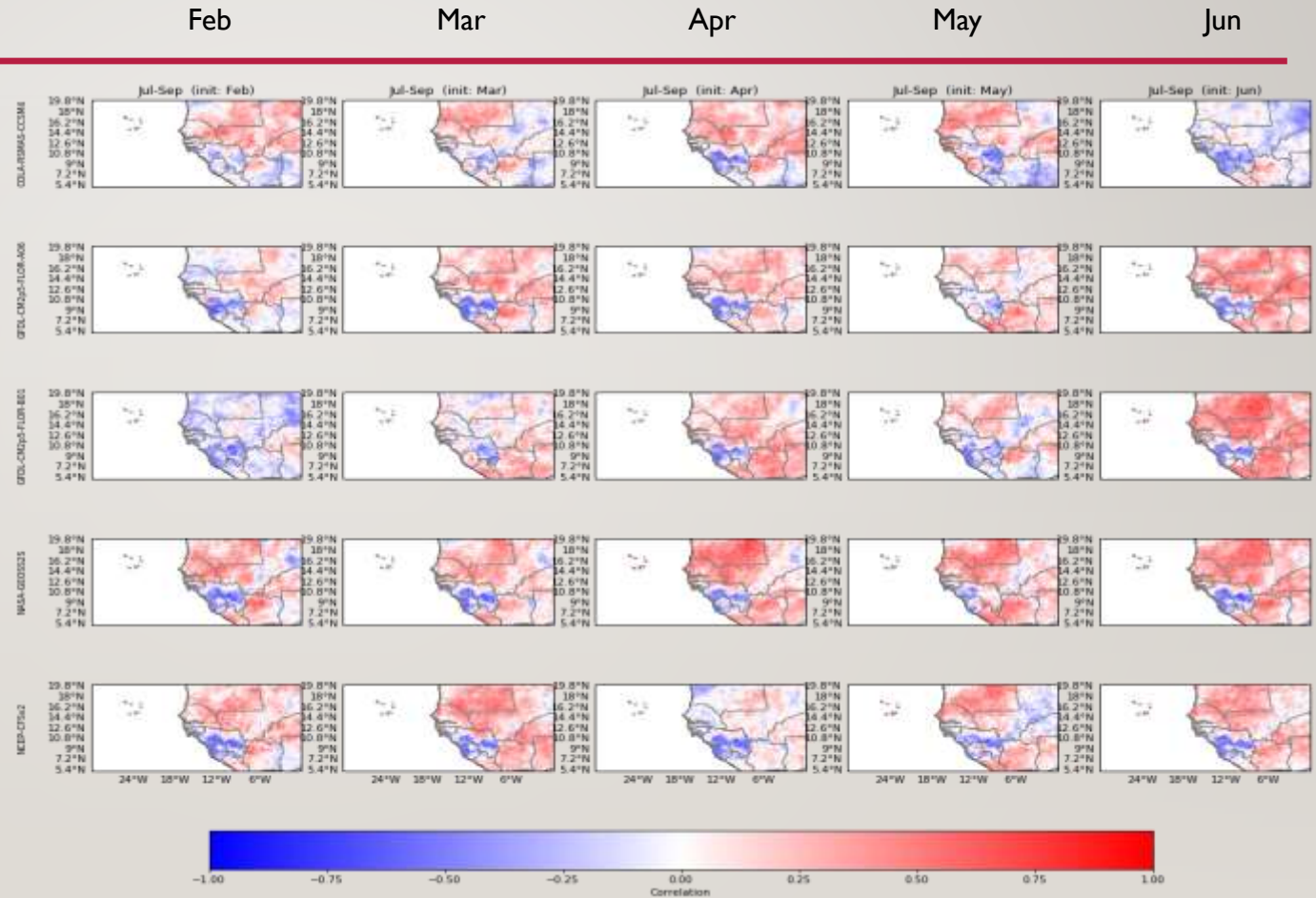
---

- NextGen forecasting efforts are underway at [IRI](#) to make systematic, calibrated, objective forecasts of rainfall and other critical variables at the national and regional level, primarily using publicly accessible GCM data as predictors.
- The goal is to implement WMO guidelines to encourage and enable NMHS to implement objective forecasts based on dynamical model output and user-tailored predictands
- NextGen efforts can also provide flexible forecasts in digital maproom format.
- PyCPT is the main tool in this effort and it is a set of Python function files and executables that can call the program Climate Predictability Tool (CPT) to conduct GCM validation, canonical correlation analysis (CCA), principal component regression (PCR) or extended logistic regression (ELR) with chosen pairings and specified domains of predictors and predictands.
- PYCPT can then also create a multi-model ensemble calibrated forecasts that provide skill improvements over using single models.
- Senegal is one of the countries in IRI's [ACToday](#) project and faces several agroclimatic challenges; a semi-arid climate with a single rainy season, strong multi-decadal variability punctuated by both droughts and floods and a tendency for early rainfall to sometimes be followed by damaging dry spells



# SKILL OF NMME MODELS WITH EARLY LEAD FORECASTS

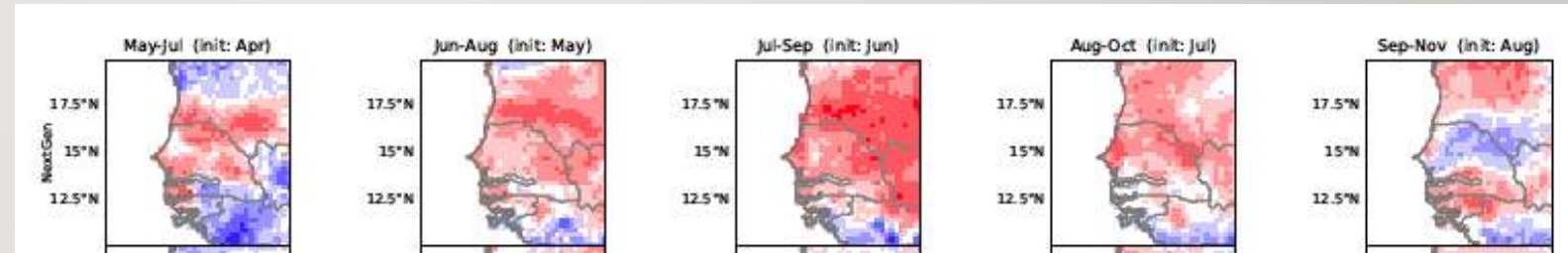
- Canonical Correlation Analysis
- CHIRPS 0.25 JAS rainfall (predictand)
- NMME models COLA-RSMAS-CCSM4, GFDL-FLOR-A06, GFDL-FLOR-B01, NASA-GEOSS2S, NCEP-CFSv2 rainfall (predictor)
- 20-10W, 10-20N domain for both predictor and predictand
- Pearson correlation shown, Spearman, 2AFC, RPSS and GROC also calculated
- Good early lead skill particularly with NASA model



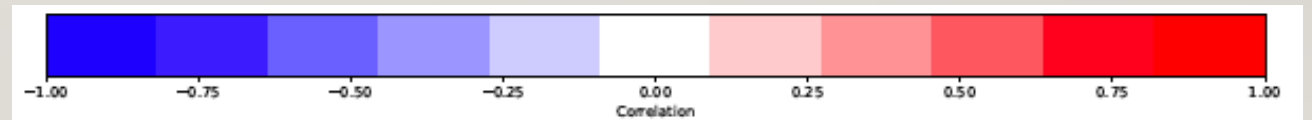
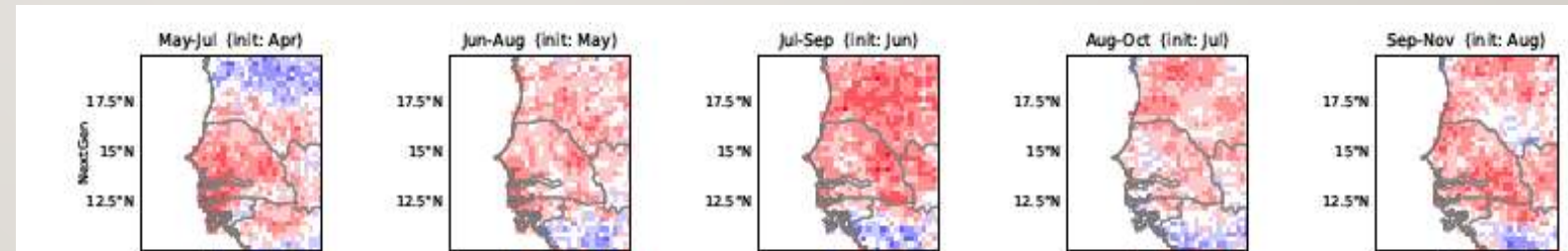
# FORECAST SKILL (OPERATIONAL)

- Calibrated MME CCA forecast shown as NextGen
- Same models and predictand
- 20-0W, 5-20N domain for predictor, 20-10W, 10-20N domain for predictand
- Pearson correlation shown, Spearman, 2AFC, RPSS and GROC also calculated
- Initializations one month before first target month
- Good skill particularly for core of rainy season (JAS) with more limited skill in early and late season

## Seasonal Rainfall



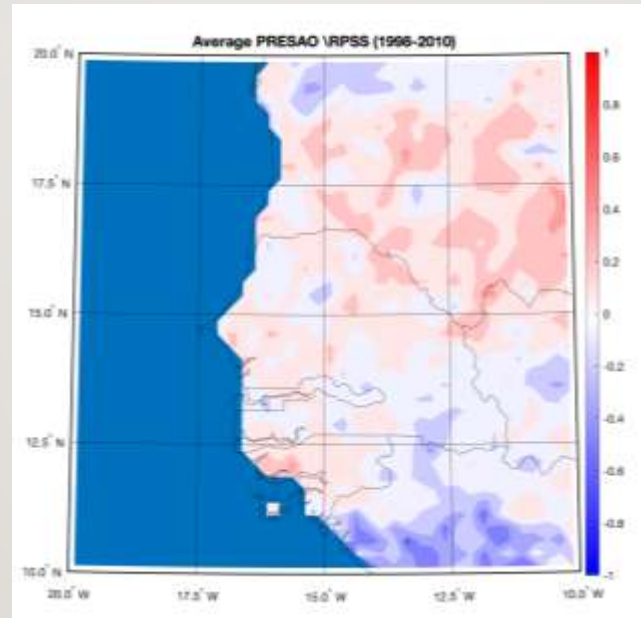
## Rainy Day Frequency (1mm+)



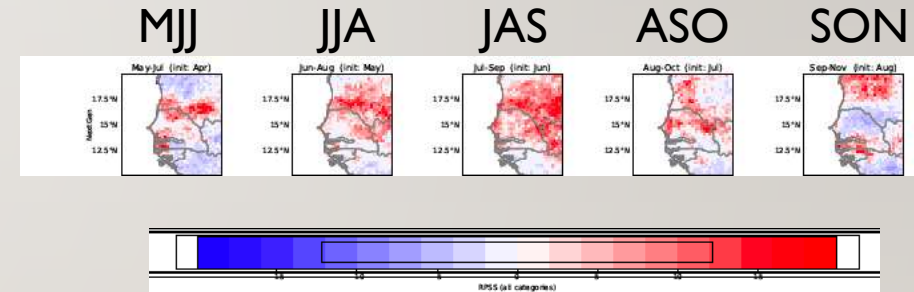
# COMPARISON WITH PRESAO/PRESASS FORECASTS

- Can only do RPSS or some other categorical skill assessment because of tercile format of the PRESAO-PRESASS
- PRESAO-PRESASS tercile forecasts retrieved and digitized from Pirret et al. 2020 paper
- CHIRPS data converted to percentiles
- RPSS for PRESAO-PRESASS for 1998-2010
- RPSS from NextGen also shown (but based on 1982-2010 training window  
\*should be redone in retroactive mode for 1998-2010 period)

PRESAO/PRESASS RPSS for JAS rainfall



NextGen RPSS



# ADVANTAGES OF FLEXIBLE FORMAT WITH USER SPECIFIED THRESHOLDS

- User specified thresholds
- Format contains information on both the forecast mean and variance and is compared to climatology
- May be more salient than tercile forecasts
- May be less inclined to hedge on the near-normal category (issue found in review of RCOFS: Mason and Chidzambwa and Pirret et al. 2020)

