



Evaluating uncertainties in the PRECIS regional climate simulations over the Caribbean and Central America.

A First Look

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CONTENT

- Background

- Aims

- Methodology
 - Model Description

- Results
 - Temperature & Precipitation

- Summary of Results





BACKGROUND

- Climate change information using PRECIS exists
 - Karmalkar et al 2013; Karmalkar et al 2010
 - Campbell et al 2011
 - Centella et al 2008

- All used a single driving GCM
 - Useful for gleaning magnitude and type of change under given scenario
 - This however does not provide information about model confidence.

- 3 main ways to quantify uncertainty
 - Multi-Model Ensemble (MME)
 - Initial Conditions Ensemble (ICE)
 - Perturbed Physics Ensemble (PPE)





BACKGROUND

○ PPE

- Definition

- An ensemble of model runs from different model variants generated by varying the values of model parameters.

- Strengths

- Can control experimental design – Systematic sampling of modelling uncertainties
- Wider range of physical plausible outcomes
- As ensemble can be designed so its results can probabilistically interpreted, 1000's of ensemble members can be included

- Weaknesses

- Not possible to evaluate or sample structural uncertainty between models from different GCMs or modelling centres





AIMS

- For select variables, attempt to:
 - Examine the impact of parameter uncertainty in climate projections for the Caribbean and Central America using PRECIS
 - Quantify the effects of internal climate variability that are likely to significantly influence the performance of the PRECIS Regional Climate Model





METHODOLOGY

○ PRECIS

- Providing REgional Climates for Impacts Studies
 - Dynamical Downscaling Model – RCM
 - Maximum possible resolution of 25 km
 - Natural Variability and the variability in future emissions are accounted for
- Driven by the Quantifying Uncertainty in Model Projections
 - 17 member ensemble based on the HADCM3 Model
 - HADCM3Q0-16
- Limitation on resources & computational power resulted in only a small subset of experiments being conducted





METHODOLOGY

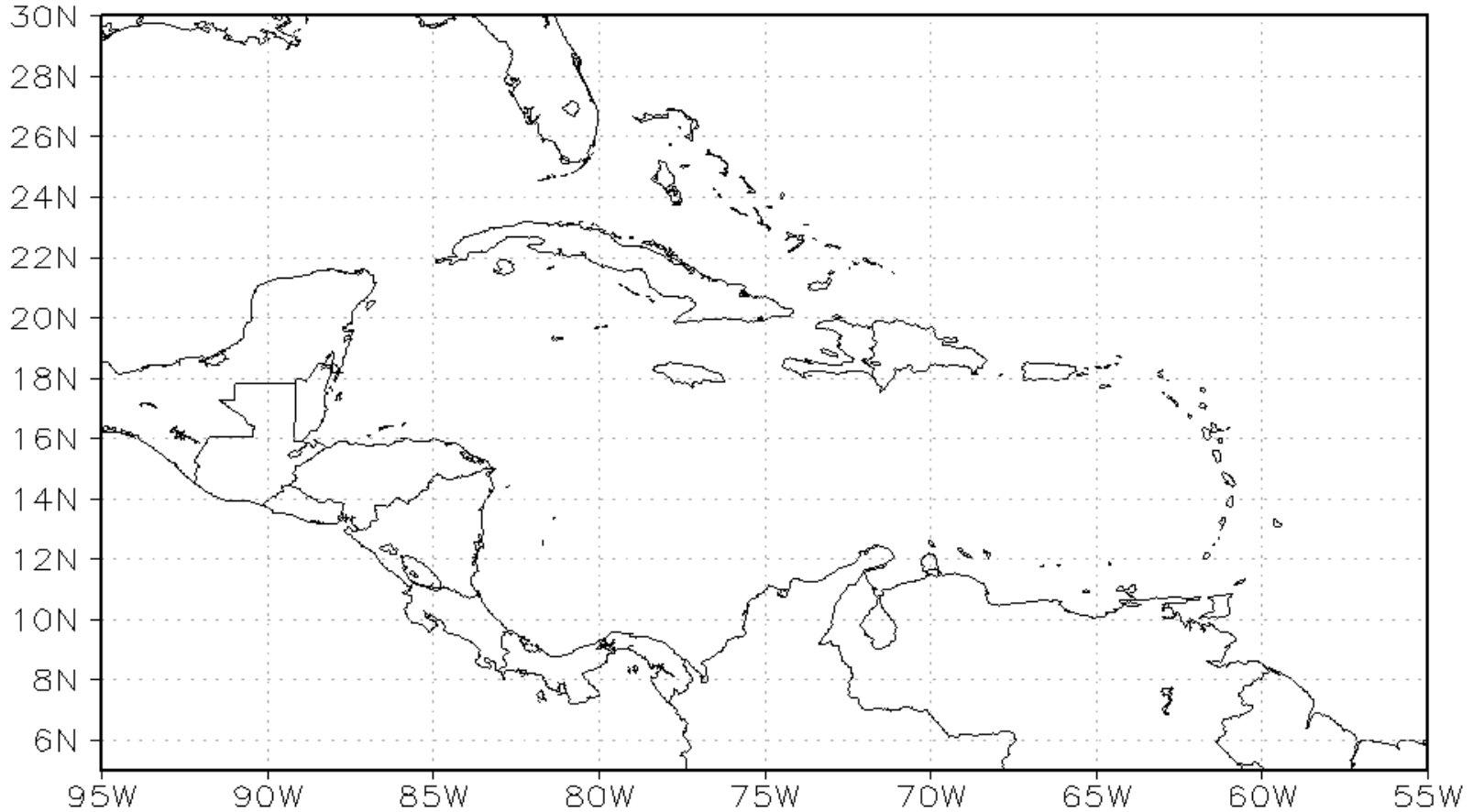
- Experiments conducted
 - HADCM3Q0 – AENWH (unperturbed or standard model)
 - HADCM3Q3 - AEXSA
 - HADCM3Q4 - AEXSC
 - HADCM3Q10 - AEXSK
 - HADCM3Q11 – AEXSL
 - HADCM3Q14 - AEXSM

- Period of interest is 1960 – 1990 and 2010 – 2040.
- Atmospheric variables of interest are
 - Precipitation
 - 2m Temperature



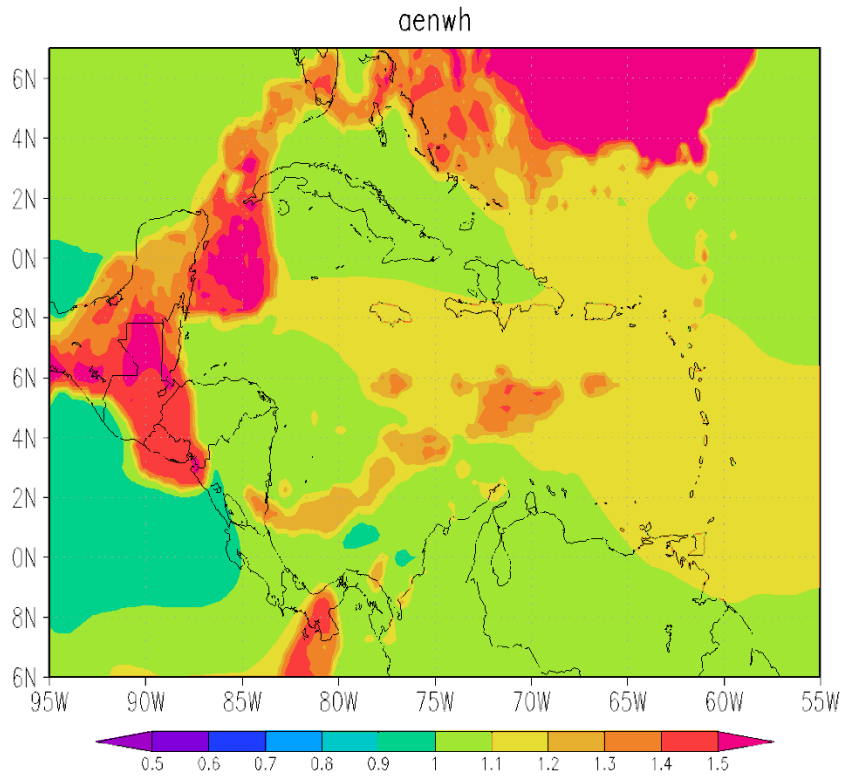


AREA OF STUDY



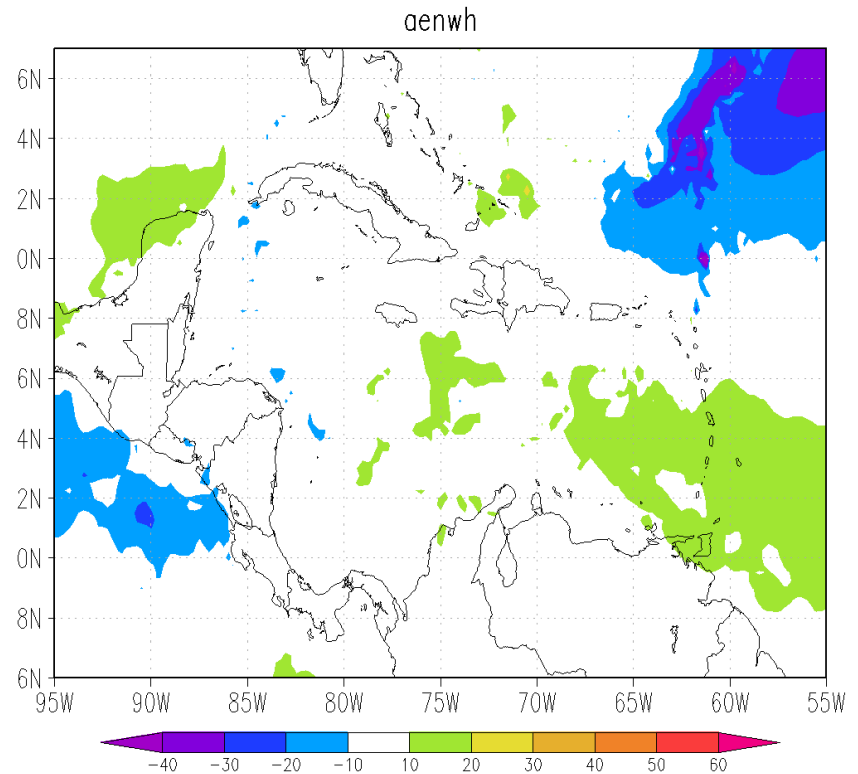


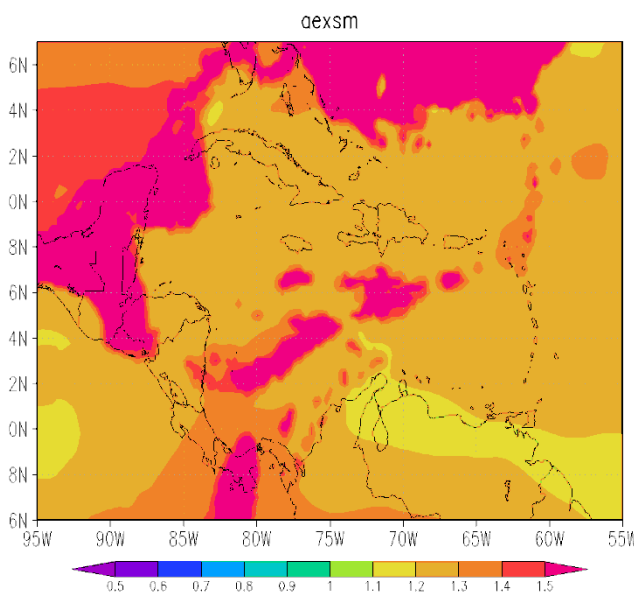
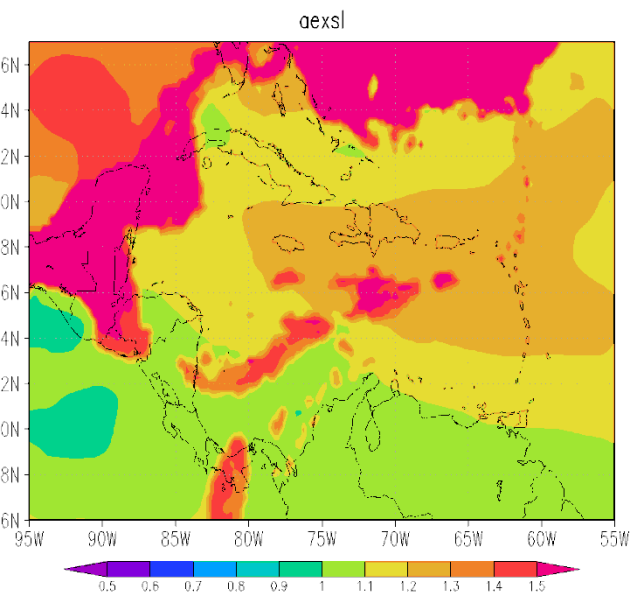
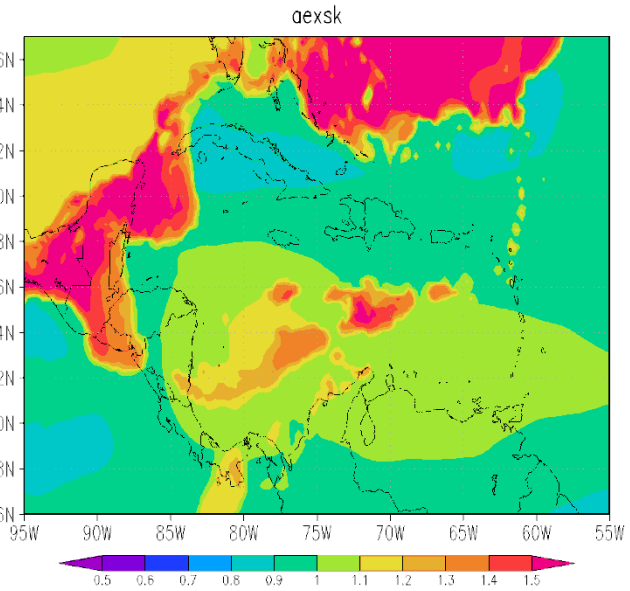
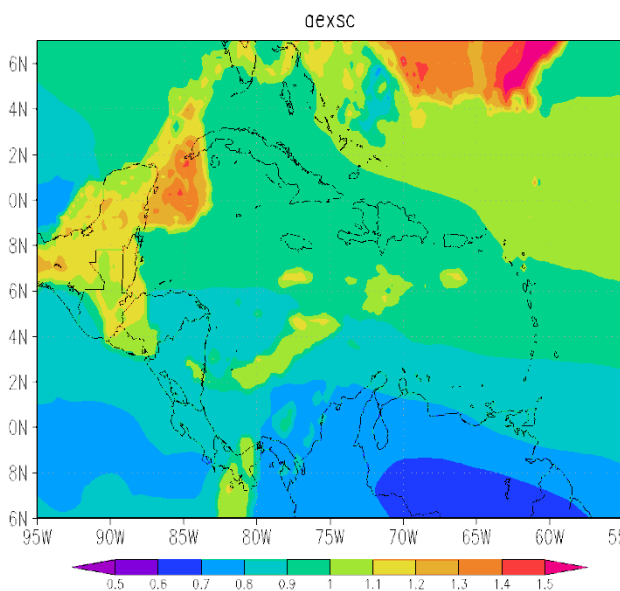
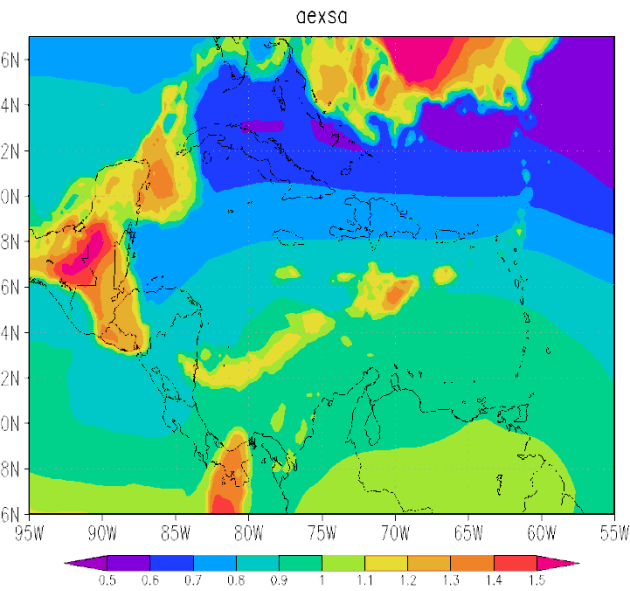
RESULTS



Temperature

% Change in Precipitation

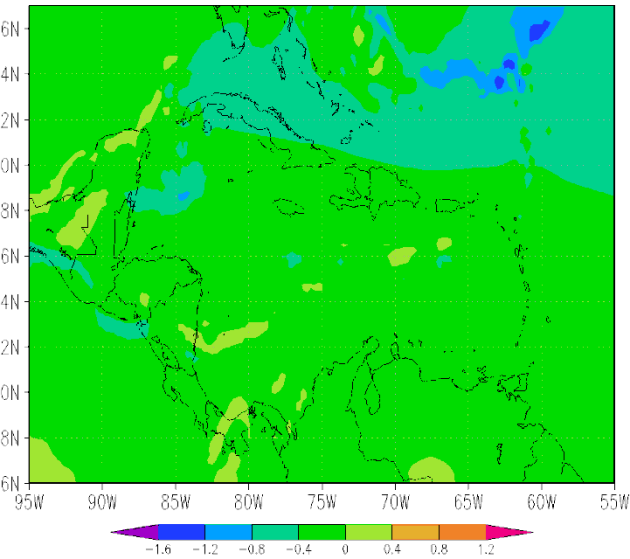




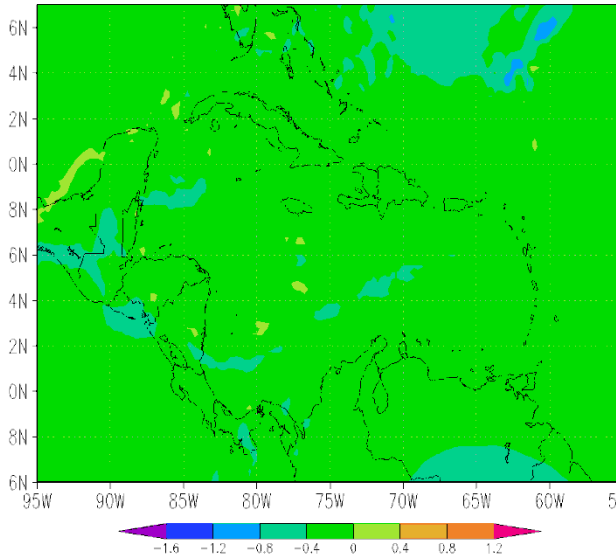
Temperature
Future – Base



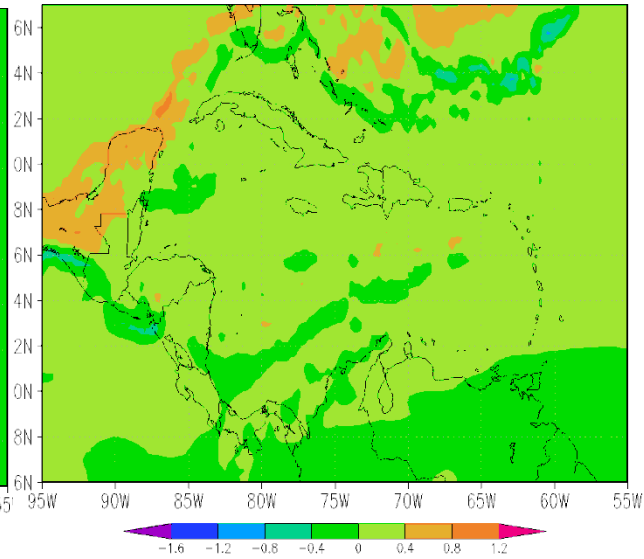
aexsa - aenwh



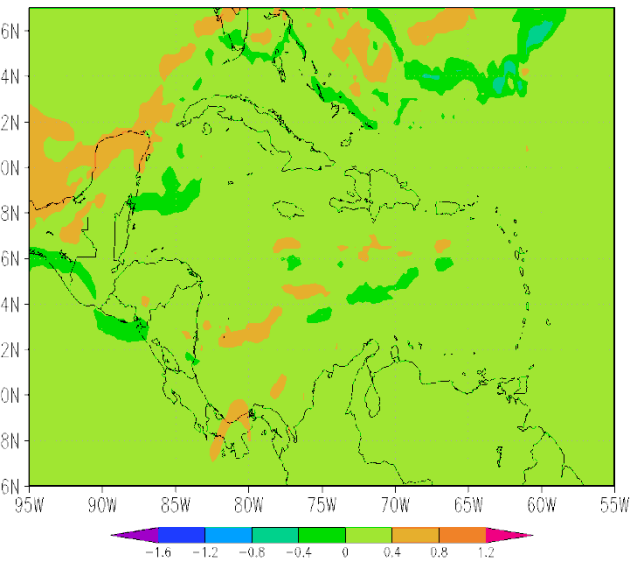
aexsc - aenwh



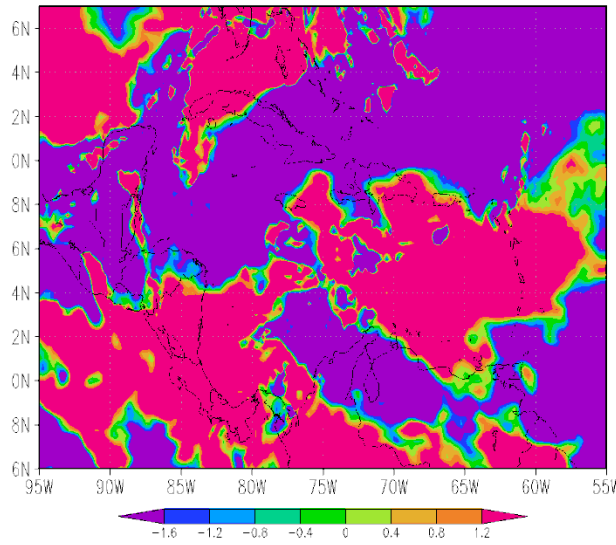
aexsl - aenwh



aexsm - aenwh

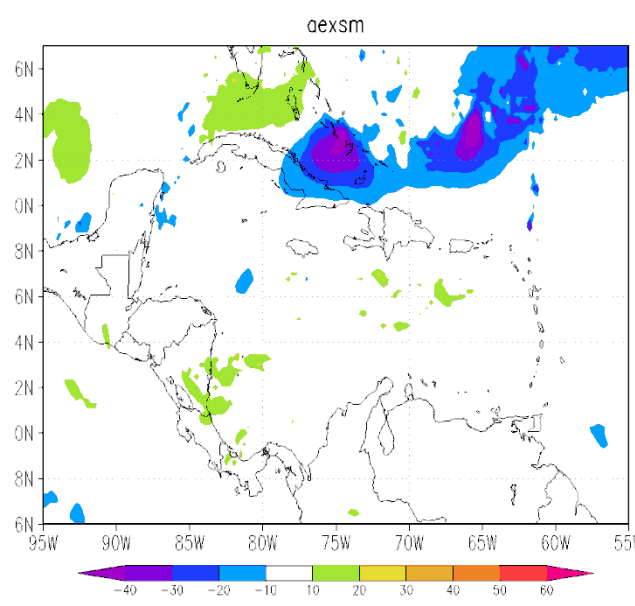
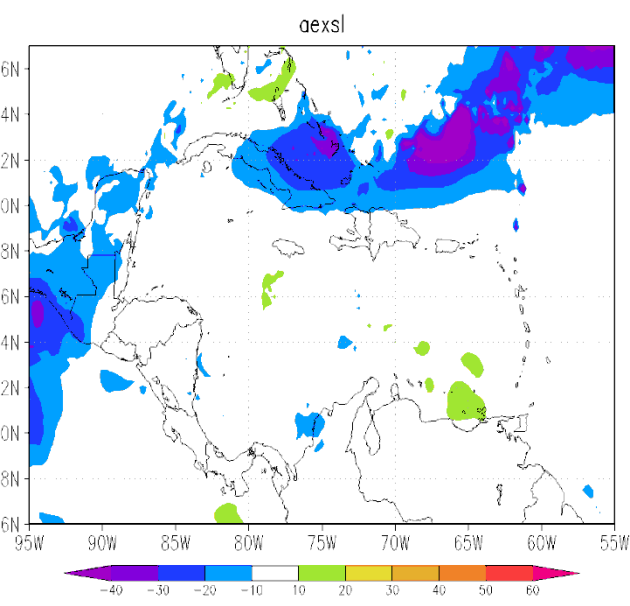
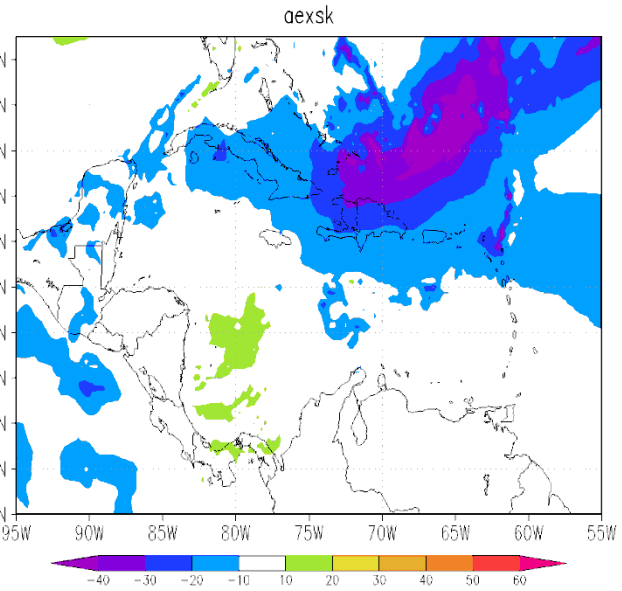
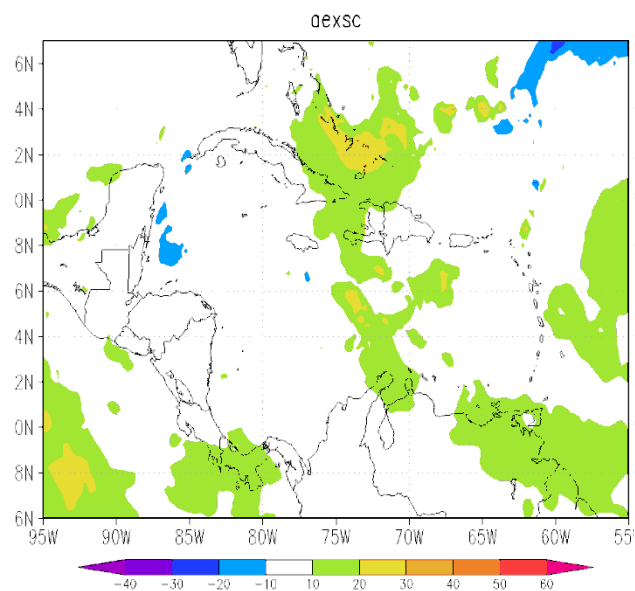
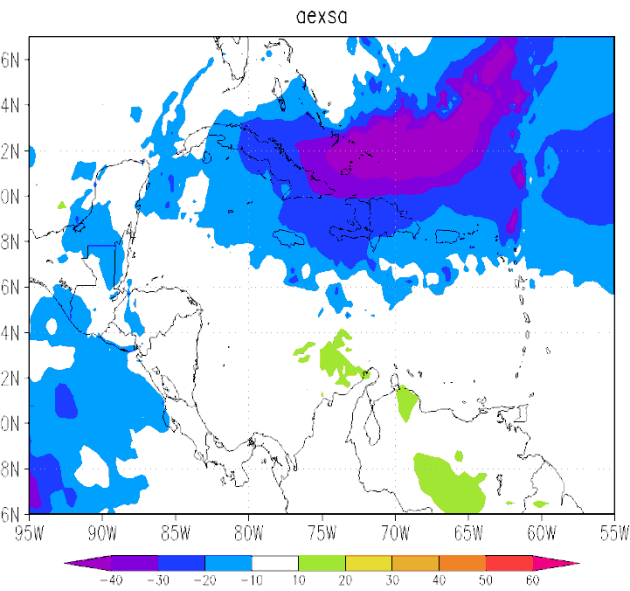


aexsm - aenwh



Temperature
Change PPE – Unperturbed





Precipitation (PPE)

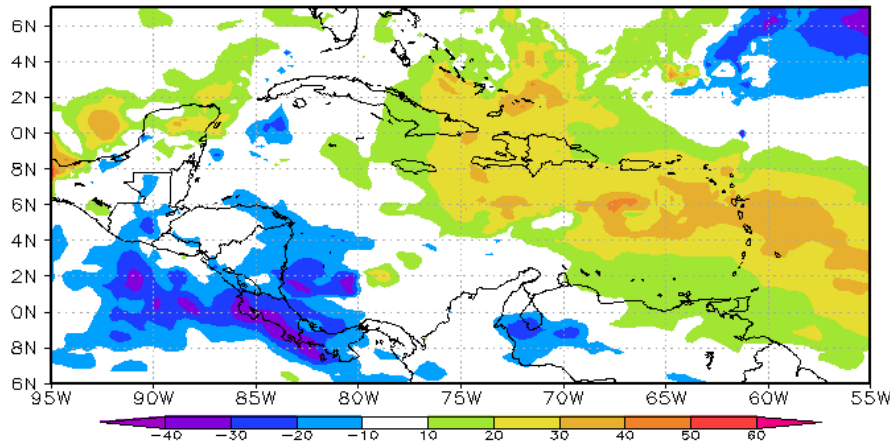
Future – Base



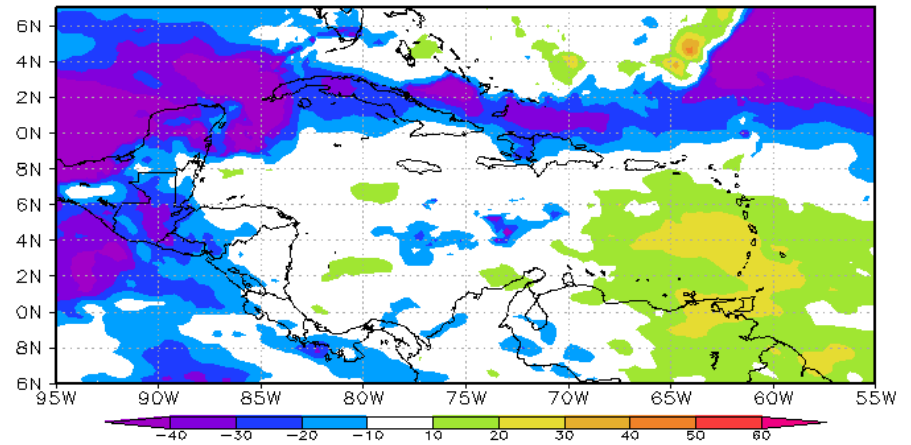


Precipitation : Future – Base (AENWH)

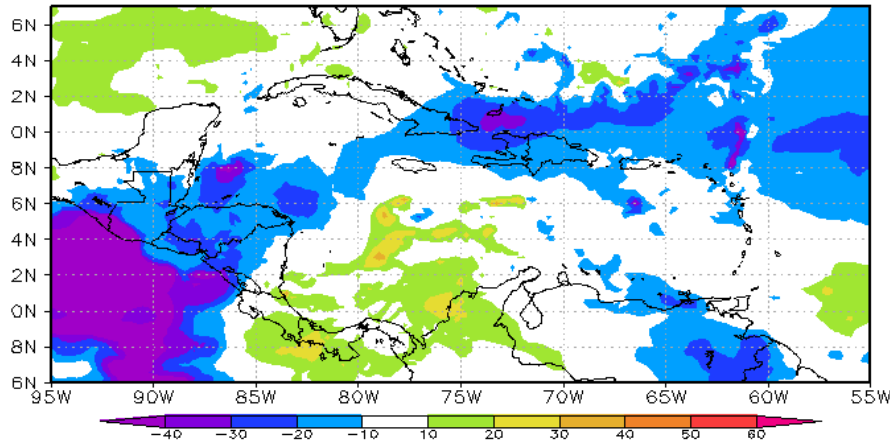
NDJ



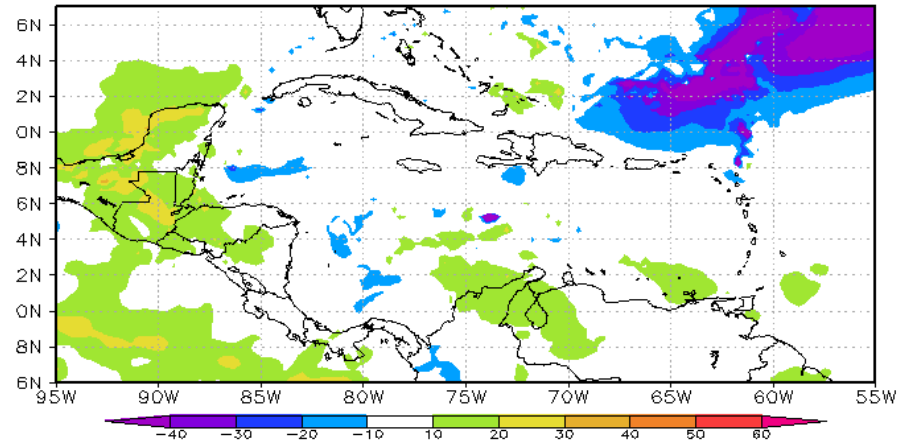
FMA



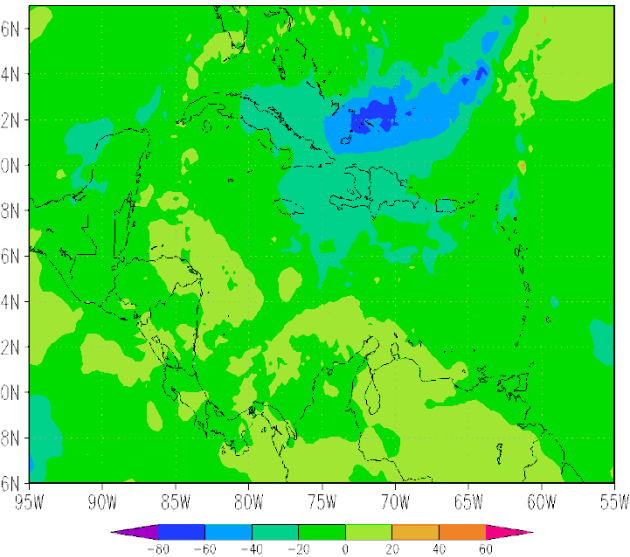
MJJ



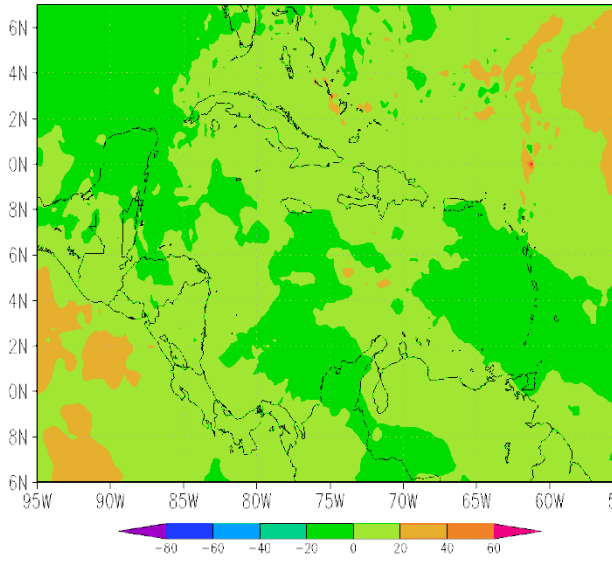
ASO



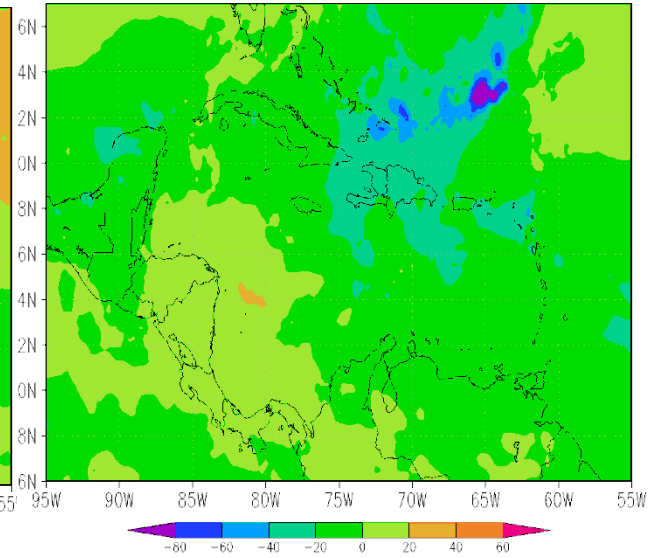
aexsa - aenwh



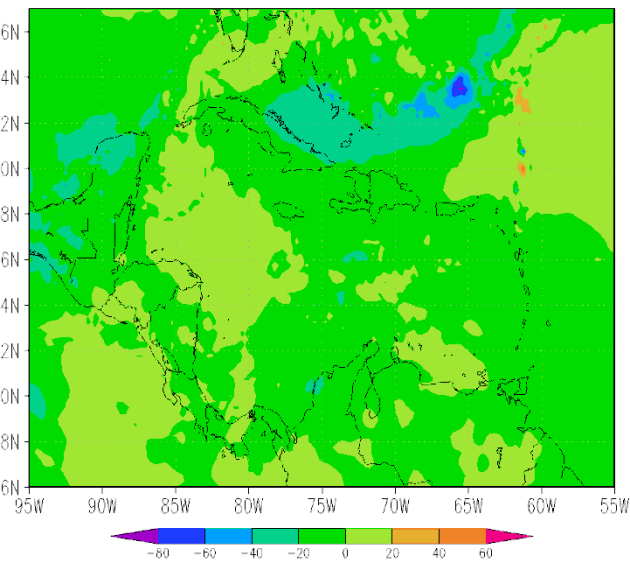
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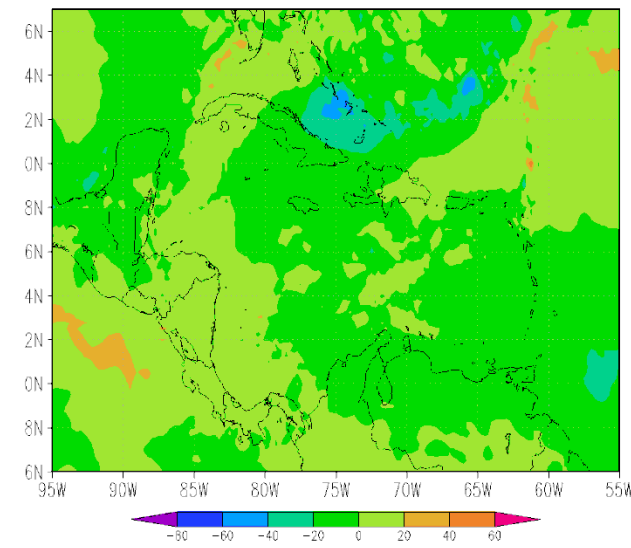
aexsk - aenwh



aexsk - aenwh



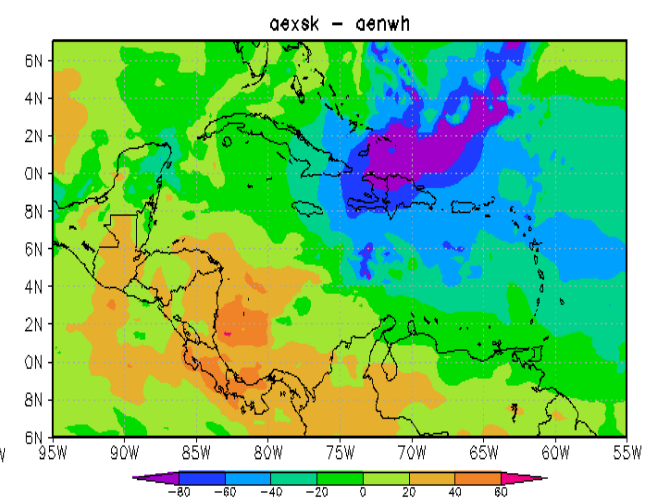
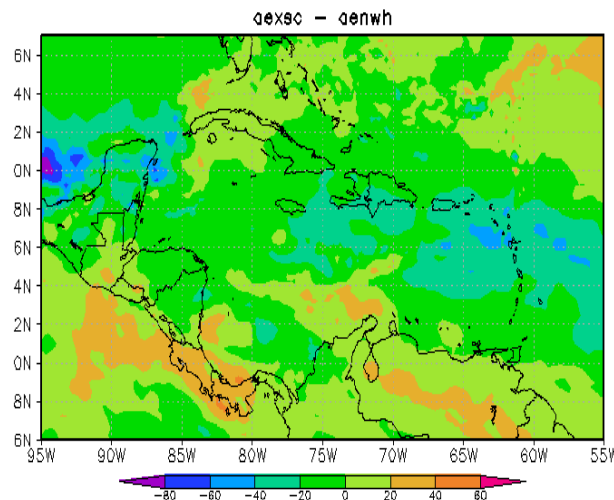
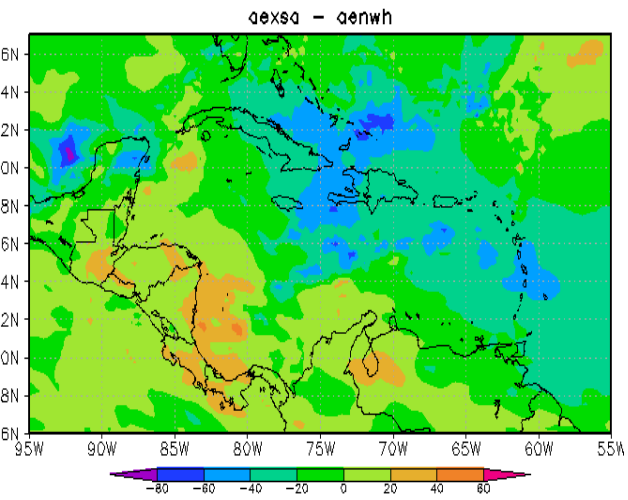
aexsl - aenwh



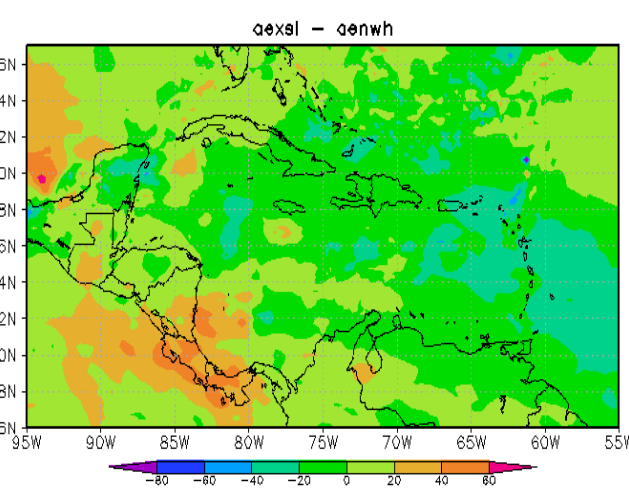
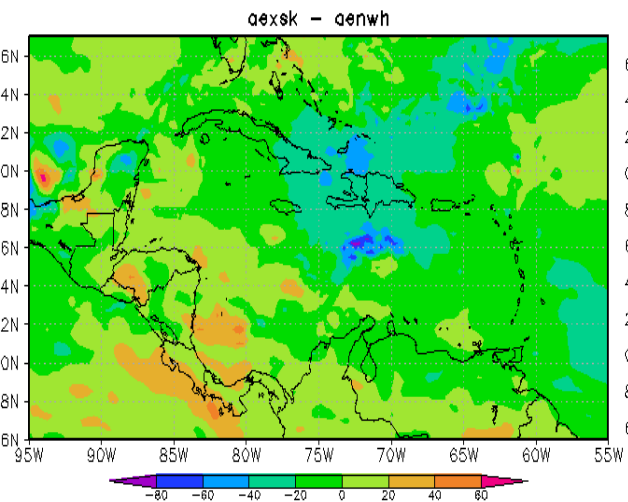
Precipitation

Change PPE - Unperturbed





NDJ

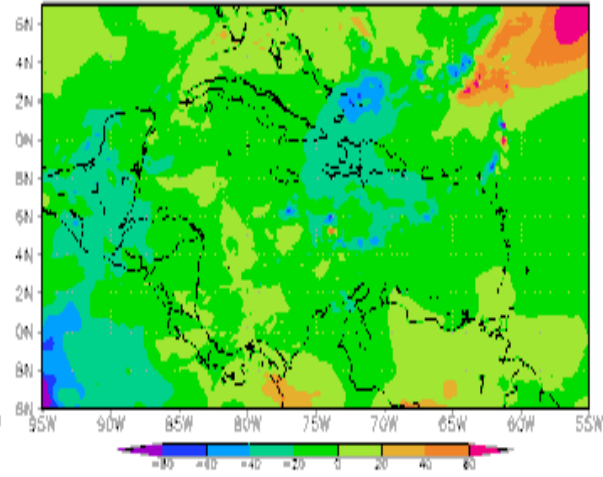


Precipitation

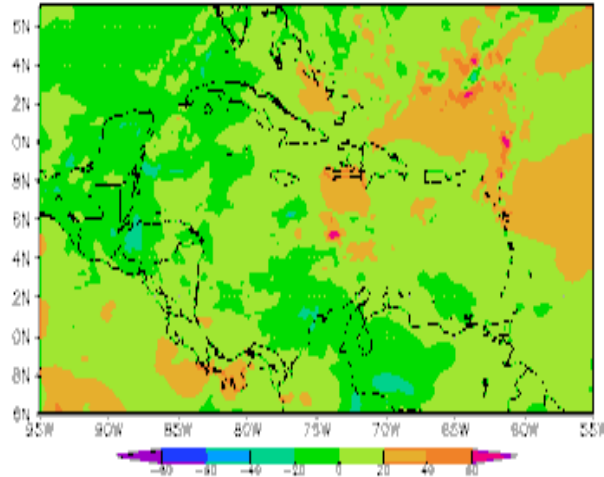
Change PPE – Unperturbed



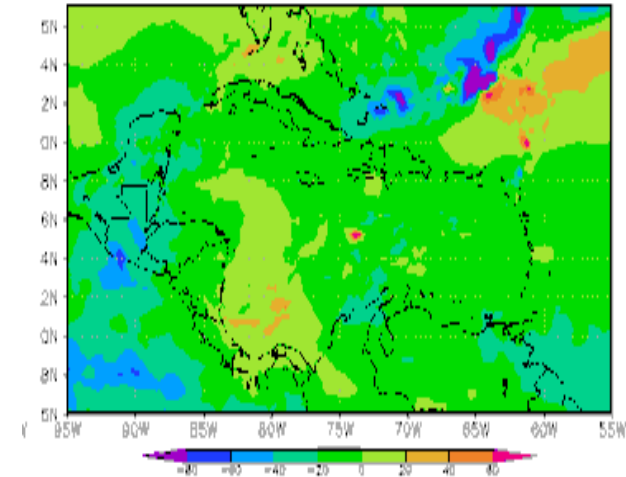
qexsa - qenwh



qexac - qenwh

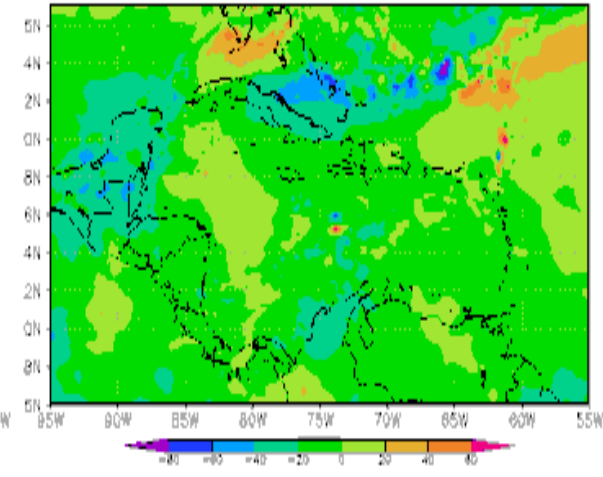


qexsk - qenwh

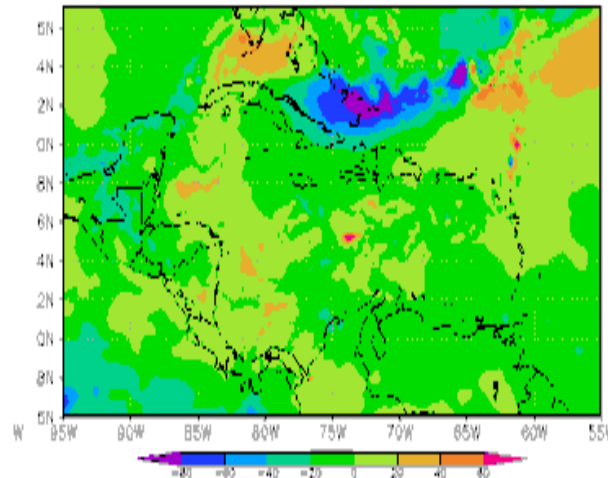


ASO

qexsk - qenwh



qexel - qenwh



Precipitation

Change PPE – Unperturbed





RESULTS – STD

Experiment	TEMP		PRECIP	
	Baseline	2010-2040	Baseline	2010-2040
AENWH	1.39328	1.47631	72.9847	81.8656
AEXSA	1.54016	1.57338	60.0554	61.8229
AEXSC	1.46343	1.52714	72.1651	79.081
AEXSK	1.43049	1.46452	62.7956	61.3507
AEXSL	1.57493	1.65586	72.8827	74.444
AEXSM	1.51436	1.59074	61.0807	61.8817





CONCLUSION

- Initial results are within the range of expected projections from previous modelling studies for the region.
- Preliminary results also shows the value of the PPE methodology
 - Expansion of available projections using existing resources.





ANTICIPATIONS

- Inclusion of robust statistics
- Analysis of other variables
 - Winds, Pressure Fields ..etc
- Extension of analysis to the end of century
- Possible use of RCMET





Thank you

