

# Report on PyCPT training for Ethiopia National Meteorological Agency and Regional Meteorological Service Centers experts, January 2021

Asaminew Teshome

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## **1. Introduction**

Ethiopia is located in the Horn of Africa within 3–15° N and 33–48° E, bordered with Eritrea to the north, Djibouti to the east, Sudan to the west, Kenya to the south, and Somalia to the south and east. It covers an area of about 1.14 million square kilometers (944,000 square miles), the country's topography is characterized by high and rugged plateaus and peripheral lowlands. Elevation in the country range from the 160 meters below sea level (northern exit of the Rift Valley) to over 4600 meters above sea level (of northern mountainous regions).

Ethiopia has three climatological rainy seasons, namely February–May (FMAM, known as Belg in Ethiopia), June–September (JJAS, known as Kiremt), and October–January (ONDJ, known as Bega). Improving and providing accurate, reliable weather and climate forecasting is very important for different socio-economic activities. The Ethiopian National Meteorological Agency started seasonal forecasting since 1987 and the seasonal forecast methodology is mainly dependent on ENSO phenomena and selection of analogous years. The need for the seasonal climate prediction is to issue the coming/expected probability of amount and distribution of rainfall over Ethiopia. In Ethiopia especially, disasters, mainly in the form of droughts and floods, have been a major and persistent challenge to the management of water resources, agro-economic development, livestock management and food production. Therefore, accurate, reliable weather and climate prediction is mandatory for various governmental and non-governmental organizations including policy makers and planners. Various scholars/researchers are evaluated the forecasting skill and performance of NMA and they found that the forecasting system is biased toward the near-normal category. Therefore, there is a need to improve the seasonal forecast system by using the PyCPT NextGen approach, which is rendered by the National Meteorological Agency of Ethiopia.

## **1.1. Description of PyCPT NextGen approach**

Training on weather forecasting tools and techniques is a fundamental requirement for meteorological services to improving the accuracy and reliability of weather and climate forecasts. These tools greatly support the generation and packaging of forecasts that are destined towards the public consumption.

The Next Generation (NextGen) multi model approach is a systematic general approach for designing, implementing, producing and verifying objective climate forecasts. It involves the identification of decision-relevant variables by stakeholders, and analysis of the physical mechanisms, sources of predictability and suitable candidate predictors (in models and observations) for key relevant variables. In those cases, when prediction skill is high enough, NextGen helps select the best dynamic models for the region of interest through a process-based evaluation, and automizes the generation and verification of tailored multi-model, statistically calibrated predictions at seasonal and sub-seasonal timescales.

Ethiopia's National Meteorological Agency (NMA), under the support of the International Research Institute for Climate and Society (IRI), through the project Adapting Agriculture to Climate Today, for Tomorrow (ACToday), decided to address the concerns of its stakeholders like governmental and non-governmental organizations by conducting staff training to improve the generation of reliable and accurate weather and seasonal forecasts.

## **1.2. Objective of the training**

The following key points are main objectives of training:

- Improve accuracy of weather forecasts by Improve accuracy of seasonal forecasts.
- Enhanced packaging of weather forecasts using flexible information by enhanced packaging of seasonal forecasts using flexible format information.
- To access the predictability skill of the North American Multi-Model Ensemble over Ethiopia in different seasons.

## **1.3. Expected outcomes:**

- At the end of the workshop, participants will have skills to
- Independently, Install and operate PyCPT to calibrate CHRIPS forecasts
- Understand the principles of generating tailored forecasts for climate services
- Understand seasonal forecasting procedures and techniques by using PyCPT tool.
- Understand the whole process of the PyCPT scripts
- Experience sharing of within their staff members regarding PyCPT tool

Following the workshop, participants communicated a deepened understanding of the principles of generating tailored forecasts for climate services, as well as the development of skills to independently install and operate PyCPT to calibrate CHRIPS forecasts and apply seasonal forecasting procedures and techniques by using the PyCPT tool.

## **2. Budget source for the training**

I tried to access all means of finance to cover the daily allowance of participants from Regional Meteorological Service Centers. Finally, I wrote a strong concept note for Climate Change, Agriculture and Food Security (CCAFS) about the objectives of the training and description of PyCPT NextGen approach, which is developed by IRI. So, the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) in East Africa supported the cost of the workshop. The interactive training took place from January 11-15, 2021 in NMA HQ, Ethiopia, with the participation of twenty six (26) participants are drawn from Regional Meteorological Service Centers (RMSC's). To this end, I served as a bridge to collaborate with CCAFS and NMA in different climate related tasks.

## **3. Participants of the workshop**

For the NextGen PyCPT seasonal training Twenty six (26) participants are drawn from Regional Meteorological Service Centers and from NMA head quarter. Most of the participant are from Meteorological Forecast and Early Warning Directorate, public relation departments and higher officials from NMA.

## **4. Methods of the workshop**

During the opening remark, I tried to describe the objectives of the workshop and the importance of PyCPT/NextGEN approach for improved seasonal climate prediction of NMA.

The workshop of the PyCPT training opened by the Director General of National Meteorological Agency Mr. Fetene Teshome. Mr. Fetene clearly stated that conducting training on different software's and packages are very important to improve the skill of forecast services of NMA. Moreover, he mentioned that NMA is working closely with various national and international organizations, which includes International Research Institutes of Colombia University. The Director General stated that IRI works closely with NMA for the past several years mainly on the enhancing of national climate services in Ethiopia by constructing the map room systems. The map room highly helping NMA to provide different climate products and it fills the gap of the Meteorological data in Ethiopia. Finally, the Director General Mr. Fetene Teshome wishes a fruitful workshop for all participants.

After the opening, remark of the Director General of NMA the organizers of the PyCPT training assessed/inspected the status of participant's laptops. Then after configuration of different packages and systems on individual laptops. The NextGEN approaches needs knowledge that is more advanced on Linux system and we configured the Linux operating systems on individual participants of the workshop.

- Processing of dynamical forecasts using the Python Climate Predictability Tool (PyCPT) package. Including:
- Introduction to CPT, the software operation and the purpose of calibration;
- Downscaling of model outputs using Canonical Correlation Analysis;
- Tailored forecasting for climate services;

- 1) Skill assessment of each real-time NMME models which includes (CMC1-CanCM3, CMC2-CanCM4, NCEP-CFSv2, COLA-RSMAS-CCSM4, GFDL-CM2p1-aer04, GFDL-CM2p5-FLOR-A06, GFDL-CM2p5-FLOR-B01, NASA-GEOS2S).
- 2) Compare PCR and CCA w.r.t non-calibrated model.
- 3) Flexible representation of forecast.
- 4) Real time forecast script.
- 5) Use PyCPT for all above.
- 6) Data formatting and analysis packages like grads and climate data operator tool /CDO/

## **5. Closing remark of the workshop**

Before the closing remark of the PyCPT training individual participants were presented their assignments which is on PyCPT. Moreover, Dr. Tufa Dinku a scientist from IRI interviewed participants about the status of the training in terms of their understanding in configuration of PyCPT system/scripts as well as producing of output from PyCPT NextGEN system. Finally, the deputy director general of NMA Mr. Kinfu Hailemariam described that training on the forecasting system is very important to enhance NMA's service. Moreover, he mentioned that exercising and applying and operationalizing the PyCPT NextGEN approach is very helpful and mandatory at NMA HQ and RMSC.

## Annex A: Program of the PyCPT training



### Program for PyCPT NEXTGEN training for experts from Regional Meteorological Service Center and NMA HQ

**Place of the workshop: Adama/NMA HQ**

**Time and Date: 11-15 January 2021**

Time	Activities	Responsible	Facilitator
08:30-09:00	Opening Remark	Mr. Fetene Teshome DG of NMA	Asaminew Teshome
09:00-09:15	On-going Seasonal forecasting projects in the region including PyCPT	Dr. Teferi Demissie	
09:15-10:00	System configuration and installation of PyCPT on individual laptops	Jemal Supported by: Asaminew/Aderajow Sinegorgies/Bekele	
10:10-10:30	Tea/Coffee break	Training directorate	Diriba Muleta
10:30-12:30	System configuration and package installation of PyCPT on individual laptops	Adrajow Supported by: Jemal/Asaminew Sinegorgies/Bekele	

12:30-13:30	Lunch Break	Private	
13:30-17:30	Introduction to PyCPT tool	Asaminew Supported by: Aderajow/Jemal	
Day Two: Practical session of PyCPT			
08:30-17:30	Describing the different components of PyCPT script and Generating Forecast and skill assessment of PyCPT product	Aderajow Supported by: Asaminew/Jemal	
Day Three: Continuation of day two			
08:30-17:30	Visualization and interpretation of products and skill assessments using PyCPT  NB: Lunch break 12:30-13:30	Asaminew Supported by: Aderajow/Jemal	
Day Four: Assignment for individual experts			
08:30-17:30	Individual assignment and producing result	Asaminew/Aderajow/ Jemal	
Day Five: Assignment for individual experts			
08:30-17:30	Presentation of individual assignment	Individual experts from RMSC and NMA HQ	Asaminew Teshome



## Annex B: List of participants

No	Name	Department
1	Endeg Aniley	WARMSC/Bahirdar
2	Hiwot Taye	WORMSC/Jimma
3	Lubaba Mohamed	EARMSC/Kombocha
4	Shimlis Shiferaw	Gambela RMSC/Gambela
5	Zerihun Bikila	ECORMSC/Adama
6	Gebreyohanes G/Silasie	Afar RMSC/Semera
7	Kefiyalew Ayele	SNNPR RMSC/Hawasa
8	Ashenafi Muluneh	Somali RMSC/Jijiga
9	Demissie Tadesse	SORMC/Balerobe
10	Sinegorgis Gurmu	NMA HQ/ICT
11	Bekele Kebebe	NMA HQ/MFEWD
12	Mesay Tolosa	NMA HQ/MFEWD
13	Bekalu Tamene	NMA HQ/MFEWD
14	Henock Hailu	NMA RMSCCD
15	Tamiru Kebede	NMA HQ/MFEWD
16	Ajebush Gochawu	NMA HQ/MFEWD
17	Deriba Muleta	NMA HQ/MEDTD
18	Chali Debele	NMA HQ/MFEWD
19	Asaminew Teshome	PyCPT coordinator
20	Jemal Seid	PyCPT coordinator
21	Aderajow Admasu	PyCPT coordinator
22	Dr. Teferi Demisse	PyCPT Coordinator
23	Fetene Teshome	DG of NMA
24	Kinfe Hailemariam	DDG of NMA
25	Ahmedin Abdulkerim	NMA/PR
26	Hirut Alemu	NMA/PR

## Annex C: Participant's photo

