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Workshop report: Climate Data Tools Training at AGRHYMET

August 2016

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for Climate and Society**
EARTH INSTITUTE | COLUMBIA UNIVERSITY

Climate Data Tools Training at AGRHYMET Niamey, Niger, August 2016

Workshop Report

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Abstract

For more than three years, International Research Institute for Climate and Society (IRI) has collaborated with the AGRHYMET Regional Centre to improve of quality, accessibility and availability of climate data in West Africa. A training workshop on quality control methods for climate data and combination ground stations data with satellite rainfall estimates products using the earlier version of Climate Data Tools (CDT) was conducted for AGRHYMET staff in Niamey in July 2013. Since 2013, several improvements have been made on CDT and new features were added to facilitate the manipulation and visualization of data and generation of merged data. The present training came as the continuity of activities aimed at increasing the technical capacity of AGRHYMET staff to generate merged rainfall and temperature products with the new version of CDT. The main purpose of the training was to expose the participants to the new features of CDT, in order to strengthen capacity to conduct a quality control procedure for climate data at the level of their database, and combine ground stations data with global proxies (satellite rainfall estimates data and reanalysis product).

Keywords

Quality control; Merging; Satellite Rainfall products; Reanalysis; Climate Data Tools;
Capacity building

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Acronyms

AGRHYMET AGRiculture, HYdrology, METeorology Regional Centre

CDT Climate Data Tools

IRI International Research Institute for Climate and Society

NMHS National Meteorological and Hydrological Services

Introduction

For more than three years, International Research Institute for Climate and Society (IRI) and CCAFS have been collaborating with the AGRHYMET Regional Centre to improve quality, availability, and accessibility and of climate data in West Africa. A training workshop was conducted for AGRHYMET staff in Niamey in July 2013, on quality control methods for climate data and combining ground stations data with satellite rainfall estimates and climate reanalysis products using the earlier version of Climate Data Tools (CDT). Several improvements have been made to CDT since 2013 with new features to facilitate the manipulation and visualization of data and generation of merged datasets.

The training workshop described in this report was a continuation of the earlier training activities aimed at increasing the technical capacity of AGRHYMET staff to generate merged rainfall and temperature products with the new version of CDT as well as being able to build the capacity of NMHS staff from the member countries. The over goal of the training was to build AGRHYMET's capacity in generating quality climate datasets accomplished through following objectives:

- Revise the main concepts behind data quality control and combining data from stations and global proxies (satellite rainfall estimates data and reanalysis product);
- Install the latest version of CDT at AGRHYMET;
- Introduce trainees to the latest version of CDT;
- Perform quality control on station data; and
- Combine station data with satellite and reanalysis proxies.

The training workshop, under the CCAFS-led Africa Climate Services project, and part of the ENACTS (Enhancing National Climate Services) program lead by IRI. ENACTS is an ambitious effort to simultaneously improve the availability, access and use of climate information by working directly with National Meteorological and Hydrological Services (NMHS), and Regional Climate Centres such as AGRHYMET. Capacity building, i.e. training, is the main component of the ENACTS effort.

Program Overview

Ten individuals from the AGRHYMET Regional Center attended the training (Appendix 1). The participants have a strong background in data manipulation and data processing, and some participants have already attended the workshop held on July 2013, so the training activities were conducted successfully.

AGRHYMET maintains the complete climate databases of the 13 member countries of CILSS (Permanent Interstates Committee for Drought Control in the Sahel) and has a strict policy regarding those data. Following relatively lengthy negotiations, IRI has been allowed to use a sample of data from a zone with a dense network of stations covering a period of 5 years, and the entire data available for Chad (rainfall and temperature) to target practice in quality control and merging.

The two-week training program (Appendix 2) had the following main components:

- ***Quality control of station data.*** Data quality control is a critical component of ENACTS. Thus, significant amount of time is spent on this aspect of the training. Trainees will first be introduced to the need for quality control of climate data, different types and sources of error with examples and different approaches to quality control of climate data. Then trainees will spend a couple of days performing actual quality control using IRI's Climate Data Tools (CDT).
- ***Satellite rainfall estimation.*** An overview of satellite remote sensing, different satellites and sensor types, and the use of the different sensors for rainfall estimation is presented and discussed.
- ***Climate Reanalysis Data.*** Climate reanalysis data are used for interpolating temperature data. Thus, a brief introduction is provided on the concept of climate reanalysis products.
- ***Interpolation of climate data.*** The trainees are introduced to different interpolations methods, and their strengths and weakness. Then they will explore different interpolation methods and the different factors that may affect interpolated values using their data and the CDT tool.
- ***Combining satellite data with station measurements.*** The trainees will be exposed to some merging techniques and then will be shown how using auxiliary information, such

as topography for temperature or satellite rainfall estimates for rainfall, could improve the quality of the interpolated values.

The training was mainly focused on practical work. At the beginning of each theme, a brief overview of the methodological approaches used by CDT were presented and followed by a discussion. Having been introduced to the methodology used by CDT, the participants went to the practice in order to become familiar with CDT by working on data. The full training agenda is available in Appendix 2.

The last day was devoted to discussion on training effectiveness and on CDT possible improvements. Participants stated that they are able to do quality control on the whole set of database at AGRHYMET disposal, and generate merged rainfall and temperature products.

Conclusion

Several AGRHYMET staff asked if IRI could enhance CDT to be a comprehensive tool for data analysis, visualization and presentation. They are familiar with GIS software and have some difficulties in manipulating merged data from CDT, which are in NetCDF file format. However, CDT is not developed to be software for data analysis and visualization. Instead CDT's merged output data are intended for use in the IRI's Data Library or other GIS software. Although CDT has its own data visualization menu, those functions are still rudimentary tools to help users through the process of quality control and merging. Therefore, some improvements still need to be made to CDT, and particularly the ability to handle different input and output data formats. Overall, the majority of participants indicated that the aim of the training was mostly achieved and met their expectations.

AGRHYMET is currently conducting quality control on the whole set of databases at its disposal to generate merged rainfall and temperature products over the 13 countries of CILSS. However, AGRHYMET did not give any deadline for when those products will be ready. Therefore, it could be useful to establish regular communication to know the progress of the work. AGRHYMET has also expressed its strong desire to continue to work in close collaboration with the IRI, especially in the exploitation of the Data Library. Specifically, AGRHYMET would like to put their new merged data in the Data Library, and also provide them with an insider view of the functionality of the Data Library. These activities would

strengthen their capacity to analyse climate data, and enable the production of climate information of relevance to users.

Appendix 1. Participant List

Participant	Title/Organization/Area of Interest	Gender
ABDOU Ali	DIR/AGRHYMET/Expert hydrologue	Male
AGOUMO Alio	DIR/AGRHYMET/Assistant SIG-TDT	Male
ALHASSANE Agali	DIR/AGRHYMET/Expert Agronome	Male
MAIJIMAA Boubacar	DIR/AGRHYMET/Stagiaire	Male
ABOUBAKAR Hadiza	DAT/AGRHYMET/Assistante Base de données	Female
NAMODJI Lucie	DIR/AGRHYMET/Assistante climato	Female
SEYDOU B. Traoré	DIR/AGRHYMET/Expert agrométéo	Male
HAMATAN Mohamed	DIR/AGRHYMET/Expert BD-RE	Male
MINOUNGOU Bernard	DIR/AGRHYMET/Assistant hydrologue	Male
SOUMANA M. Salamatou	DIR/AGRHYMET/Stagiaire	Female

Appendix 2. Training Program

Week 1
Monday 15 August
<ul style="list-style-type: none"> • Meeting with the participants • Discussion on the content of the training and the data to be used • Discussion on data availability at AGRHYMET
Tuesday 16 August
<ul style="list-style-type: none"> • Software installation • Introduction to CDT main menu • Review of existing data formats • Introduction to CDT data format • CDT data manipulation and conversion
Wednesday 17 August
<ul style="list-style-type: none"> • Introduction to CDT quality control approach • Application on specific cases (Rainfall and Temperature)
Thursday 18 August
<ul style="list-style-type: none"> • Introduction to CDT homogeneity test functions • Homogeneity check: Rainfall & Temperature
Week 2
Monday 22 August
Merging: daily rainfall (discussion on methodologies, application and quick comparison)
Tuesday 23 August
Different satellite rainfall estimates products & CDT merged rainfall outputs versus stations rainfall data
Wednesday 24 August
<ul style="list-style-type: none"> • Merging: Temperature • CDT merged temperature outputs versus temperatures station data
Thursday 25 August
CDT gridded data outputs manipulation <ul style="list-style-type: none"> • Extraction, format conversion, climatologies computation
Friday 26 August
Discussion on CDT future improvement and on the aspects of the training Presentation of accomplished work