# GIS ENHANCEMENT OF CLIMATE PREDICTION CENTER'S AFRICA FEWS-NET PRODUCTS

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## 1. INTRODUCTION

To better represent meteorological and climatic data, the Famine Early Warning System Network (FEWS-NET) group at NOAA's Climate Prediction Center (CPC) has implemented Geographic Information Systems (GIS) technology into its operational workplan. This has allowed for increased accuracy and more precise spatial representation of data with a decreased production time. Scripting techniques have allowed the creation of files compatible with numerous software packages and thus the overlaying of parameters is easily accomplished. In the spirit of the FEWS-NET project, GIS data created at the CPC may be shared with its partners and vice versa. This paper will briefly describe past and present efforts using GIS, product examples of currently operational products, and future directions.

## 2. BACKGROUND

While GIS technology has been available for a number of years, the FEWS-NET group at the CPC has been slow to embrace it for a number of reasons. Until recently, the overall structure of the software was not easily compatible with meteorological and climatic data types, and the support was lacking to enable a thorough usage of the technology. The United States Geological Survey (USGS), a FEWS-NET Africa partner, has been familiar with GIS techniques for quite a long time however, and recent cooperation has facilitated increased usage in the project. While previous endeveaurs at CPC FEWS-NET rarely deviated from the creation of static imagery, a new direction has emerged as a trend toward more routine and automated product generation.

## 3. CURRENT PROJECTS

The use of GIS software has enabled a more accurate spatial representation of meteorological and climatic trends over the African continent by increasing the ability to compare similar datasets.

### 3a. *Africa Weather Hazards Assessment*

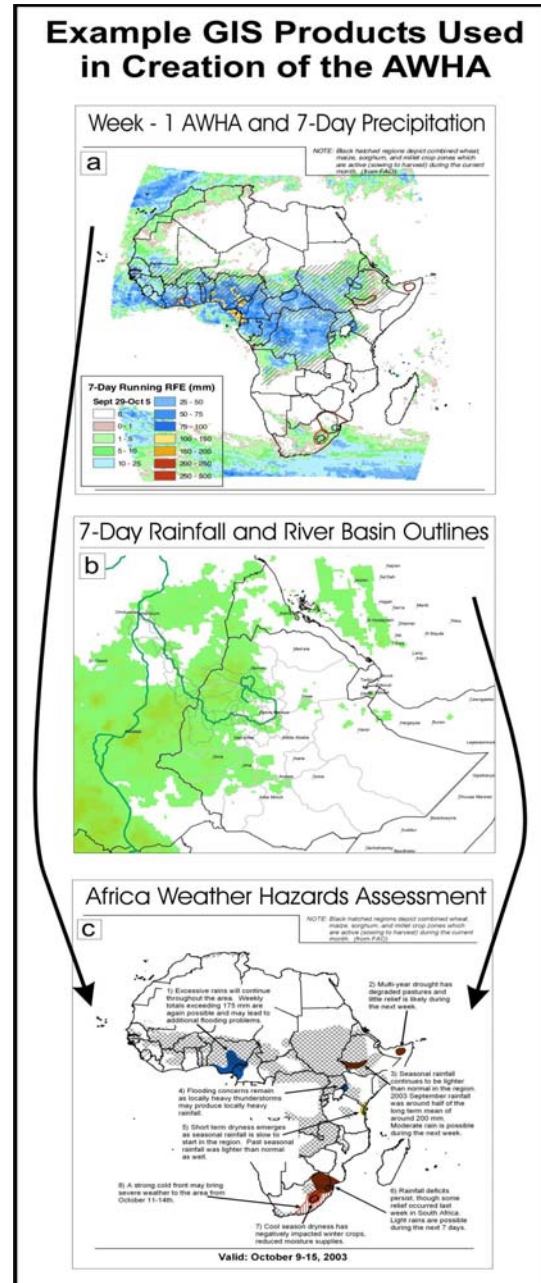Figure 1 depicts an example of CPC's Africa



Figure 1: GIS-formatted inputs into CPC's AWHA. Shown are: a. 7-Day accumulated rainfall overlaid upon the past assessment; b. Catch basins with recent precipitation; c. Final Africa Weather Hazards product.

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Weather Hazards Assessment (AWHA) and relevant inputs applied in formulating the product. Since the goal of the weekly AWHA is to provide an initial warning of flooding and drought with respect to food security concerns throughout the continent, a rapid assessment of the situation is needed. Through the use of GIS techniques, relevant products may be easily compared in a technique that gives a most straightforward picture and resultant analyses may be disseminated in a clear and concise manner. In the example shown in Figure 1, products a and b are used to determine that flooding in western Ethiopia along the Blue Nile is no longer a concern, and the region should be removed from the assessment. By examining recent 7-day precipitation in the region, it can be seen that although locally heavy rains were noted in the area, Nile basin accumulations were low and thus river levels are not expected to rise. Fostering the idea of information sharing, similar products using GIS techniques from cooperative organizations are used routinely in the weekly assessments.

### 3b. *Operational Cyclone Monitoring*

In recent years, the Climate Prediction Center has been monitoring Indian Ocean cyclones for benefit of FEWS-NET partners to provide early warning monitoring of events which may impact the African continent. In the past, CPC members accomplished this task by manually disseminating official cyclone bulletins from the Joint Typhoon Warning Center (JTWC) via email, though this required 7-day-a-week observation. Using automated GIS scripting techniques, a system has recently been implemented that accomplishes the task without supervision. On a hourly basis, data is downloaded from the JTWC, reformatted, and ingested into GIS. Figure 2 shows an example of output graphics that are disseminated via email and the internet. While the processing time needed to create these graphics has decreased from that of manual times, the main benefit seen is the lack of supervision needed during automated processing. The scripting code which creates each product is written in the AML language and is specifically made for implementation with the Environmental Systems Research Institute (ESRI) GIS software, ArcGIS.

Two graphics are created for each automated run of the GIS code: 1) basinwide cyclone summary, and 2) individual cyclone zoom-in. While the basinwide product gives the user an overview of the current cyclone activity, each active cyclone is detailed in a zoomed graphic. Both products have the advantage of being very accurately represented geographically, and each zoom-in provides additional data, including forecast track, recent 6-hourly trends, and latest position and intensity. To accompany each graphic, a GIS-formatted dataset exists that will allow users to retrieve this data and overlay it upon parameters of their choice. A benefit of the technique used here is that the code may be easily transferred to incorporate other cyclone basins worldwide.
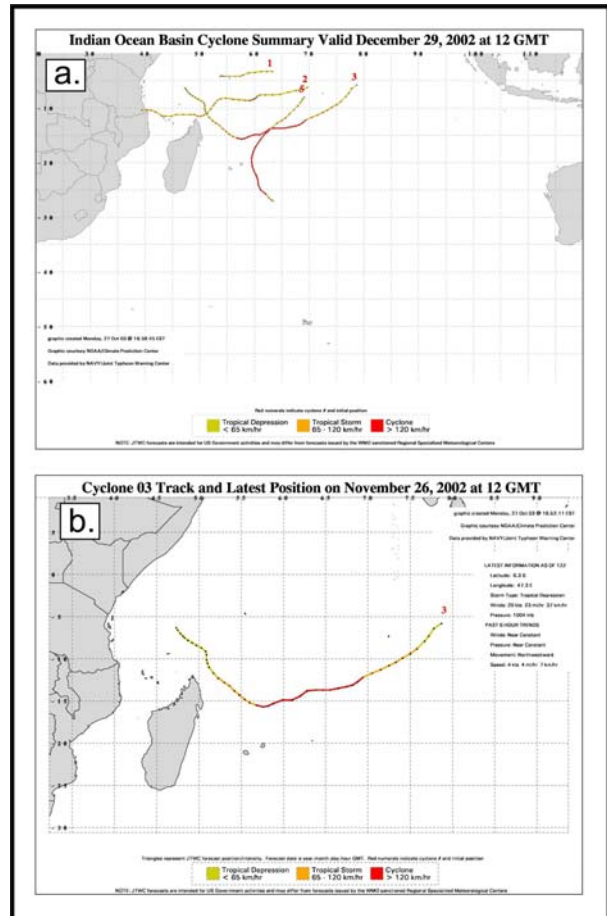


Figure 2: Indian Ocean cyclone tracking graphic. a) Basinwide storm summary; b) Zoomed image with additional information. Both products are fully automated via ESRI's AML scripting format.

## 4. FUTURE DIRECTIONS

It is obvious that though the Climate Prediction Center's FEWS-NET group has only recently begun implementing GIS technology into its operational requirements, many possibilities exist for future work. Perhaps the most beneficial element of GIS is the ability to readily share information between partners. Due to the fact that a free software package is available which allows the user to import, overlay, and recalculate GIS-formatted files, the transfer of information becomes a simple task. In the future, this will allow the CPC group to share automatically generated files with FEWS-NET partners around the globe, in a manner that will benefit all parties involved.