

Transitioning from Research to Operations: An example of moving the Dynamic Drought Index Tool to the Regional Climate Center's Applied Climate Information System

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This document shares activity related to project supported by the NOAA Transition of Research Applications to Climate Services (TRACS) program. The Dynamic Drought Index Tool (DDIT), developed by the Carolinas RISA allows the display of multiple drought indices for different time scales and across user-specified regions. The TRACS project is designed to expand DDIT coverage from the Carolinas to the states served by the Northeast and Southeast Regional Climate Centers, to integrate it with the near-real time Applied Climate Information System (ACIS) database, and to adjust the interface and functionality of the tool to ongoing user response.

Development and refinement of the DDIT

A first step in the transfer process required movement from a developer's computer to a virtual server. In collaboration with our colleagues at the Climate Assessment for the Southwest (CLIMAS), we established a virtual server to establish a collaborative programming environment, and to resolve compatibility issues on a server not used operationally, insuring that potential errors do not risk damage or interruption to the adopting institution's information technology system. This remote host server/remote institution system reduces costs associated with the use of the substantial hardware required for decision support tools. For adopters it eliminates maintenance costs and security risks – because the remote system does not interact with the adopter's system. Despite operating system differences, transfer of code to the virtual server proceeded smoothly, because of the DDIT's open-source and cross-platform resources. Functionality of the DDIT such as exporting maps into ESRI Shapefiles, overlaying maps into Google Map as KML format, exporting SVG maps into JPEG files, etc. were implemented successfully. Currently the integration of DDIT with the University Arizona's Climate Information Delivery and Decision Support System (CLIDDSS) is being tested.

Lessons: Use a virtual server first for collaborative programming and testing. Applications with open-source code are easier to transfer.

Compatibility with existing and evolving data bases

Transitioning the DDIT to an actual climate service requires more than the refinement of the technical functions of the tool described above. Operational climate services entail efficient generation, management, and dissemination of climatic data. Data, and the methods for its extraction, need to be easily accessible, and data base design must accommodate multiple applications. An essential part of any software transfer is documentation of its data and programming structure. In preparation of the DDIT transfer to the Northeast Regional Climate Center (NRCC), we created several documents regarding the structure of DDIT, software required for it, the list of drought

indices used, procedures for their calculations, and examples of essential processes. In some cases, the structure of the DDIT conflicted with ACIS. For example, the DDIT was originally designed to work from station data, while ACIS is migrating to data stored on a grid. Extensive discussions and testing were required to determine how changes in inputs and data storage altered results and efficiency. We have decided to store only gridded daily precipitation and temperature data available on the server, and to return spatial feature-averaged drought index values to the users by calculating them through web services. Intermediate gridded drought index values may be calculated for some drought indices with recursive characteristics such as Palmer Drought Index (e.g., January values for every ten years for monthly time scale) and saved for later use to reduce calculation time. These changes will help the DDIT evolve into a more operation-friendly application. They also demand investigation of how choice of data sets and spatial data handling influence output of drought indices. To this end, we explored different grid resolution and procedures for data aggregation. Reaching consensus on appropriate input data types and detailed calculation procedures in operation mode required extensive discussion, and was among the most challenging parts of the transition.

Lessons:

It's always helpful to know where an application will ultimately reside. When possible, program applications to fit a structure used by this host, and/or one that is broadly established.

The testing required to alter data formats or analysis methods will be time consuming, but will reveal sensitivities of the application.

Programs written for research purposes are not always the most efficient. They often unintentionally incorporate features that facilitate research outcomes at the expense of expedient operation response (e.g. a program that may take two minute to run in research mode is not problematic, however in operational mode on the web, such software would be viewed as slow). Engagement of operational data providers is essential at the earliest stages of a project to identify and develop specifications and methods that address such operational constraints.