

17.4 CYBERINFRASTRUCTURE ADVANCES AT NOAA'S NATIONAL CLIMATIC DATA CENTER AND REGIONAL CLIMATE CENTERS: QUALITY FEEDBACK, ASSURANCE, AND DISSEMINATION

Timothy W. Owen *
NOAA National Climatic Data Center, Asheville, North Carolina

ABSTRACT

NOAA's National Climatic Data Center (NCDC) and the affiliated Regional Climate Centers (RCCs) have been working closely with climate community partners (including NOAA's National Weather Service (NWS)/Climate Services Division) to enhance its cyberinfrastructure for data quality assurance (QA) (through algorithms and feedback mechanisms) and data dissemination. With the maturation of its Applied Climate Information System (ACIS), the RCCs are synchronizing their near-real-time data ingest and dissemination capabilities with the NCDC archive to deliver end-to-end climate information.

Three critical cyberinfrastructure advances in the RCC-NCDC architecture warrant emphasis: i.) a formal data feedback mechanism for reporting data quality concerns; ii.) RCC-NCDC data quality assurance synchronization; and iii.) a web-based data query system for easy access to climate information by climate community partners and the public.

1. INTRODUCTION

NOAA's NCDC has been committed to extending its organizational infrastructure with affiliates and partners over the past two years. Key affiliates and partners in this endeavor are shown in Figure 1.

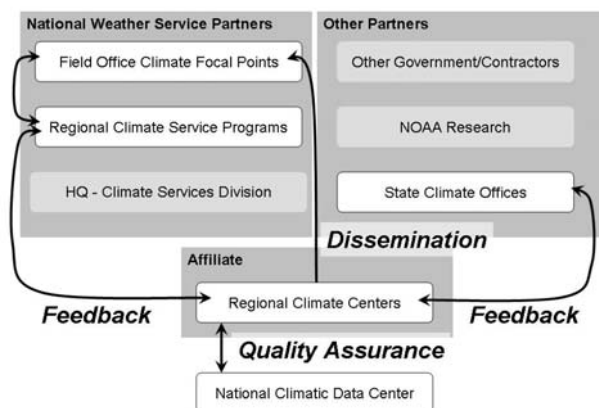


Figure 1. NOAA's NCDC and key affiliates and partners in organizational infrastructure efforts.

A hallmark of the enhanced infrastructure is the affiliated NOAA RCC's Applied Climate Information System (ACIS)¹. ACIS is an operational system that

* Corresponding author address: Timothy W. Owen, National Climatic Data Center, 151 Patton Avenue, Asheville, NC 28801; e-mail: Tim.Owen@noaa.gov.

redundantly ingests and processes climate information. ACIS information technology (IT) integrates real-time, preliminary, and archive-quality climatological data from the existing Cooperative Network. Recently, the system has developed a niche with its ability to process near-real-time Cooperative data, including rudimentary quality assurance, that are then transmitted in a community-recognized format. The system also has the capability to synthesize climate data from an array of additional NOAA and non-NOAA networks.

The RCCs have also developed a new web-based portal for data feedback that leverages partners in the climate community to provide user-driven quality assurance in synch with ACIS data dissemination. Together, this two-way climate information exchange strengthens opportunities for partnership collaboration in support of NOAA climate services.

2. DATA FEEDBACK

Systematic data feedback from climate data users to NCDC has long been challenging. The RCC data feedback web portal allows privileged users to submit error reports when erroneous data observations are identified in RCC or NCDC data sets. The system allows a user to describe the proposed error and attach supporting documentation describing why the data are in error as well as suggest proposed values for the erroneous observation(s). Accessibility in the current testing phase includes NCDC, RCCs, State Climatologists, and NWS personnel. It will likely be extended to include other major agency users.

The system uses open-source software modified to fit the specific needs of the climate data error reporting system. The Bugzilla reporting system by Mozilla has been modified and called 'Datzilla'. This data error reporting system allows web-based reporting of errors and tracking of submissions through pull-down menus that identify data sets, data source, status of the pending request, actions taken to correct the reported error, and a variety of other identifying features.

3. DATA QUALITY ASSURANCE

RCC-NCDC personnel have collaborated on quality assurance synchronization during the past year. In conjunction with NCDC's Integrated Surface Data Processing System (ISDPS), ACIS QA software that specifically addresses real-time data ingest processes² is being integrated into NCDC operations. The resultant synchronization is critical in assuring consistency between near-real-time data sources from the RCCs and final quality-controlled (QC'd) data archived at the NCDC. Both consistency and timeliness are a requirement of many data users³, and is also an NCDC

milestone for ISDPS as the four levels of QA/QC in Table 1 are fully established by Fall 2005.

In addition to data QA synchronization, joint RCC-NCDC climate services delivery through the NOAA/NESDIS e-Commerce System (NeS) is underway. The NeS system is active at NCDC and related customer service functions will be formally synchronized at the RCCs over the next two years.

Table 1. NCDC QA/QC Levels

Level	QA Description	Current	Future	Due Date
1	None (Real-time ingest)	Daily	Hourly	09/2004
2	Automated (Internal consistency, limits checks)	~5 Days after EOM	~1 Day after Receipt	09/2004
3	Integrated (Spatial, multiple sensor and model checks)	~20-45 Days after EOM	~10-15 Days after EOM	09/2005
4	Climate Research (Data homogeneity)	as required by USGCRP and CCSP	No change	-

EOM: End of Month; USGCRP: U.S. Global Change Science Program; CCSP: Climate Change Science Program

4. DATA DISSEMINATION

ACIS has existing capabilities to ingest, process, and manage large volumes of data in near-real-time at network distributed RCCs. This infrastructure has been utilized to disseminate climate information through a query system called xmACIS.

The web-based xmACIS system is designed for NWS field operations to provide summaries of climate information in tabular form. Queries can be made to obtain sequential data sets for stations or statistics associated with totals, averages, frequencies, extremes, normals, consecutive days, first/last dates, and almanac data. For example, in Table 2, xmACIS is used to provide both the 4 lowest extreme average minimum temperatures on January 20 in Washington, DC (the first of which forced an indoor inaugural) and the 4 longest durations of non-measurable precipitation at Fort Collins, CO.

Table 2. Sample xmACIS Output

WASHINGTON REAGAN NATIONAL AP (KDCA)		
Extremes		
Lowest Average Minimum Temperature		
Days: 1/20 - 1/20		
Length of period: 1 day		
Years: 1948-2004		
Rank	Value	Ending Date
1	-2.0	1/20/1985
2	8.0	1/20/1994
3	9.0	1/20/1984
4	16.0	1/20/1983

Fort Collins, CO (FORC2)
 Consecutive Days
 Precipitation < 0.01"
 Years: 1893-2004

Rank	# Days	End Date
1	77	2/12/1906
2	75	1/24/1936
3	62	1/18/1958
4	58	9/ 8/1960

End Date is the last day of the run.

Although xmACIS is similar to dissemination tools previously deployed at NWS field offices (e.g., XMClimate), this system queries the ACIS database, combining near-real-time RCC ingest with longer-term NCDC archive holdings. Thus, data management issues are resolved nationally, while the option of data error reporting through Datzilla is simultaneously available for national resolution.

As xmACIS provides easy access to the digital data holdings of RCCs and NCDC, imaged manuscript forms can likewise be accessed through NCDC's Web Search Store Retrieve Display (WSSRD) system, developed in conjunction with Information Manufacturing Corporation.⁴

5. CONCLUSION

NOAA's commitment to excellence in climate services is punctuated by its synergies with partners in developing data feedback, quality assurance, and dissemination infrastructure. This infrastructure is critical as regional decision support⁵ within NOAA expands in response to such activities as the Integrated Surface Observing System (ISOS), the Global Earth Observing System of Systems (GEOSS), and the emergence of a National Cooperative Mesonet (NCM).⁶ At the core of all of these activities is the fundamental need for efficient and effective management of climate services.

6. REFERENCES

- Information on ACIS can be found at: <http://www.rcc-acis.org/>.
- The reader is directed to the ACIS web site for descriptions of spatial quality assurance procedures by Hubbard et al., 2004 and You et al., 2004.
- The Weather Risk Management Association (WRMA) requested that NOAA's NCDC provide established QA/QC levels in order to settle reinsurance contracts.
- Information on WSSRD can be found at: <http://www.ncdc.noaa.gov/oa/climate/cdmp/wssrd.html>.
- Regional Decision Support is a component of NOAA's Climate Program, and is committed to:
 - A climate-literate public effectively incorporating NOAA's climate products into their regular operations;

- The nation's principal climate sensitive resource challenges and opportunities are identified;
- Regional and local decision makers have access to climate information, products, and support staff required to enhance public and private sector performance.

6. The reader is directed to the following web sites:

ISOS: <http://www.ncdc.noaa.gov/oa/isosmtg/isoswebsite.html>

GEOSS: <http://www.earthobservationsummit.gov/index.html>

NCM: www.nws.noaa.gov/om/coop/reference/PDP4COOP.pdf