

COOP MODERNIZATION: NOAA'S ENVIRONMENTAL REAL-TIME OBSERVATION NETWORK IN NEW ENGLAND, THE SOUTHEAST, AND ADDRESSING NIDIS IN THE WEST

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1. INTRODUCTION

NOAA's Environmental Real-time Observation Network (NERON) is a "system of systems" that collects, processes, and disseminates land-based observations to meet the nation's climate, weather and water needs. NERON also modernizes NOAA's Cooperative Observer Network by reporting, at a minimum, temperature, precipitation, snowfall, snow depth, and liquid water equivalent.

The modernization of the Cooperative Observer Network began with 103 operational stations deployed across the New England states and portions of eastern New York. Five-minute observations from these sites are available in real time following aggressive QC/QA procedures. This manuscript is intended to update the professional community on NOAA's plans for COOP modernization and the role that NERON will play.

2. COMPONENTS OF NERON

The primary sources of NERON data are the:

- Climate Reference Network (CRN)
- Modernized COOP Network (COOP-M), which includes the Historical Climate Network (HCN)
- Automated Surface Observing System (ASOS)
- Legacy COOP Network
- Non-NOAA platforms capable of producing climate-quality observations in real time and derived from partnerships with hundreds of stakeholders

As a system of systems, NERON provides quality-controlled and quality-assured, real-time data to decision makers involved in all six (6) societal benefit areas identified by GEOSS. For example, in support of societal benefits involving water, NERON is envisioned to be the surface data observation and collection system in support of the National Integrated Drought Information System (NIDIS), a major initiative of NOAA and the Western Governors' Association. NERON also supports all NOAA programs using land-based surface data. Many of these concepts are shown or inferred in Figure 1 below.

3. PHILOSOPHY OF THE MODERNIZATION

The operational requirements for NERON are long-standing, documented in the Cost and Operational Effectiveness Analysis (COEA) of June 2005, and reflected in the requirements process of the NWS known as Operations and Service Improvements Program (OSIP). NERON, as defined in the NOAA Observing System Architecture (NOSA), is the central component of the Integrated Surface Observing Systems (ISOS). In turn, ISOS is America's contribution to GEOSS.

The NERON Implementation Plan reflects requirements, documented in the COEA, for a network of surface observing stations at a nominal density of one station every 400 square miles. To meet this requirement, NOAA's strategy is to leverage existing networks and state-of-the-art, off-the-shelf technology through partnerships with other Federal, state, and private sector agencies, academia, and tribal nations. The priority is to modernize those sites considered critical to describing the variability of regional climate (e.g., HCN sites). Where partners do not exist, NOAA will purchase, install and maintain surface observing stations. Focusing on partners allows a quick and efficient implementation of NERON to turn stakeholders into "plank owners".

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NERON will be managed within NOAA via a partnership consisting of the NWS, NESDIS and

OAR. Dr. Ken Crawford is leading the management team for NOAA.

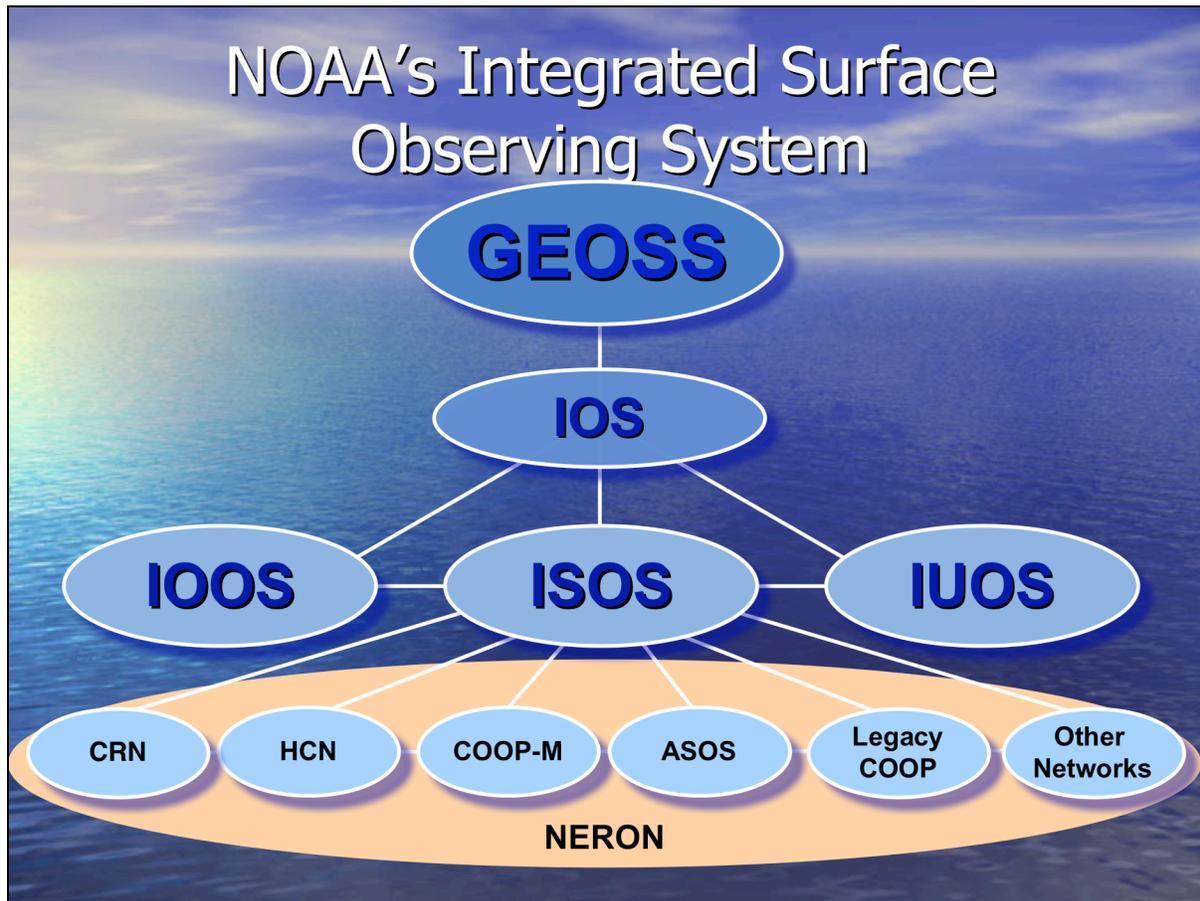


Figure 1. The relationship between COOP modernization, NERON, ISOS and GEOSS.

4. CRITICAL COMPONENTS OF NERON

Beyond the necessary documents that document and describe NERON, the program has two components that are critical to the success of NERON:

- Regional Site Selection Teams
- Data quality control/quality assurance and maintenance dispatch

These critical components are described below.

4.1 REGIONAL SITE SELECTION TEAMS

Among the most important of decisions that will be made during the modernization of the Cooperative Observer Network will be the complicated and lengthy task of site selections. While the regional teams must recommend only one automated COOP site for each grid square

(20 miles x 20 miles), the standards for selecting COOP sites to be modernized are detailed in several documents on the NERON Home Page (<http://isos.noaa.gov>). The design team for modernizing the COOP network believes that the standards for site and sensor operations are design criteria that must not be compromised. The goal is to have these standards adopted as broadly as possible.

To assist with this *arduous selection process*, Regional Site Selection Teams will be formed and organized around the domain of each NWS region. These multiple groups will participate in the process to recommend sites and site configurations to a Configuration Control Board that will become part of the national modernization. Core membership will be drawn from NWS Weather Forecast Offices (WFOs), River Forecast Centers (RFCs), NWS Regional COOP Program Managers (RCPMs), Regional

Climate Centers (RCCs), State Climate Offices (SCOs), the National Climatic Data Center, the United States Department of Agriculture (USDA), the state departments of transportation (DOTs), and other partners who choose to be involved in the modernization process. Other public and private sector partners will be invited into the core membership or will be invited to participate on an *ad hoc* basis as various private and public mesonetworks are considered for integration into

the modernized COOP network and into NERON. Because the NCDC has considerable experience with site selection procedures that were developed as part of the Climate Reference Network, their expertise is proving to be especially valuable as the initial Regional Site Selection Teams are launched.

To date, Regional Site Selection Teams have been hard at work in Georgia and in northern Alabama.

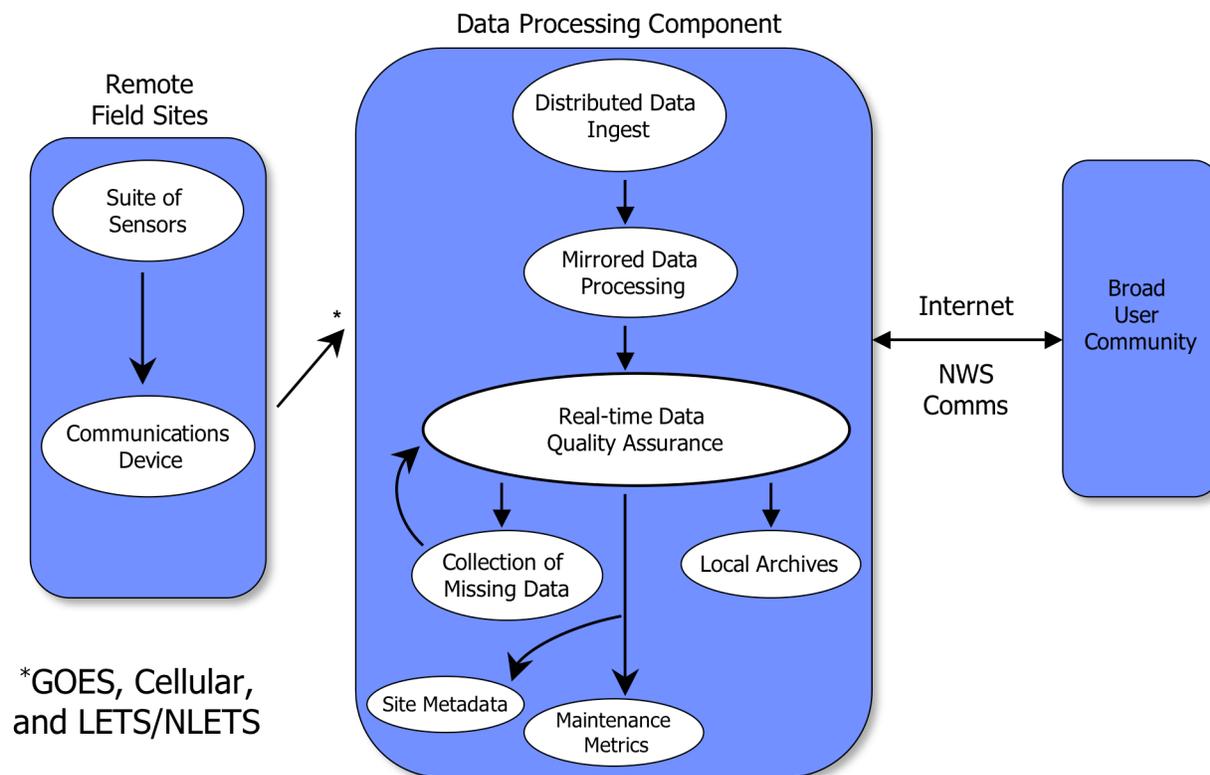


Figure 2. Overview of the data ingest and processing system for NERON.

4.2 DATA QUALITY CONTROL/QUALITY ASSURANCE AND MAINTENANCE DISPATCH

Quality Assurance (QA) and Quality Control (QC) of automated NERON/COOP data, defined below as separate processes, are fundamental components of COOP modernization, which is the foundation upon which NERON and ISOS will be built. They are part of the end-to-end modernized system being designed to produce reliable data on a reliable basis.

A quality assurance system is composed of proactive humans and automated software techniques that are used in real-time to detect suspect data from a failing (or failed) sensor. The

quality evaluation at the informed user level will supplement the QC system at a processing facility. While automated QC routines will be the overriding tool used, human intervention by personnel specially trained in data quality assurance is essential to override automated QC flags assigned to each datum. A critical component of rigorous QC/QA is the accurate flagging of data from the true start time of a data/sensor problem until the time the issue was resolved. Another goal of the QA system is to provide maintenance metrics to the Program Manager to improve the week-to-week efficiency in managing and maintaining the modernized NERON/COOP. The real-time QC system will be as rigorous as possible to produce automated

notifications that indicate system and site outages or suspected erroneous data. An example of how a real-time QA system could operate is exemplified by the dynamic procedures described by Brock et al. (1995), Shafer et al. (2000), Fiebrich and Crawford (2001), Hubbard (2001a-b), and Miller and Barth (2003). These concepts are illustrated in Figure 2 above.

Quality Control is a very similar process, except that it represents the post-processing, retrospective system used at NCDC. These rigorous QC techniques will be defined by NCDC prior to modernized COOP data entering the national archives.

It is important to note that original data must never be altered. However, QA flags assigned to each datum may be updated as often as deemed appropriate (e.g., late arriving data enters the network owner's archive, the data base at the operations and monitoring facility, or the national archives at NCDC). NOAA's partners (governmental and private sector) are encouraged to provide enhanced QA of their network data and to share their QA/QC techniques.

5. WHAT IS NEXT?

NERON expanded its work into Georgia and northern Alabama during summer of 2005 with the successful completion of ~200 site surveys and the collection of detailed metadata for these candidate NERON sites. During 2006-2008, NERON will undergo a westward expansion and a focus on the Historical Climate Network sites in New Mexico and Arizona, and possibly Washington, Colorado and Montana. This westward shift, limited by available funds, is a response to the Western Governor's Association and their plan for a National Integrated Drought Information System. By 2012, in excess of 1,000 modernized NERON/COOP sites will be operational.

6. SUMMARY

The modernization of the nation's Cooperative Observer Network began with the successful operation of 103 modernized sites across New England and portions of eastern New York. The reliable flow of reliable data is now occurring and all signs point to additional successes as NERON moves into FY06 and beyond. The only limitation during the years ahead will be the funds available to support modernized sites, new sites, and partner sites.

REFERENCES

Available on request