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AASC STATEMENT

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September 11, 1992

Dear members and friends of the American Association of State Climatologists (AASC),

The National Weather Service (NWS) has embarked upon an ambitious effort to modernize its activities. This includes the acquisition and use of a number of new kinds of observational equipment. These changes are of great interest, since AASC membership has always relied extensively on data gathered by the NWS for service and research activities in applied meteorology and climatology. That dependence will continue, and so it is vital that we strive to ensure that new developments continue to provide measurements that are reliable, accurate and consistent with the past.

Two NWS networks, which together provide much of the surface data used for monitoring climate, are undergoing change. The first provides the hourly surface airways observations from (primarily) NWS and Federal Aviation Administration (FAA) sites. The change involves automating measurements as much as

possible with the Automated Surface Observing System (ASOS). The second network provides simpler, but extremely useful, information from the large number of cooperative stations. Again, the change involves introducing automation, as much as retention of accuracy and consistency will allow. The ASOS program is well under way, with commissioning of the first four operational stations taking place on September 1, 1992. Hundreds more will be commissioned in coming months. The opportunity for active involvement by the applied climate community in the ASOS program has been limited and did not arise until late in the process. The Cooperative Modernization, on the other hand, is at a much earlier stage of development, with consequently greater opportunity for involvement by interested parties.

Because of our concern for data quality and that artificial discontinuities will be introduced into the national climate records, we have been following these developments closely. At the recent AASC annual meeting in Bowling Green, Kentucky, statements regarding the future of these

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networks were offered for consideration. The statements were prepared by the chairmen of the Committee on Automated Data (Doesken-chair, Crawford, Williams, Purvis, Stoffel, Robbins, Redmond) and the Committee on Cooperative Program Modernization (Redmond-chair, Robinson, Muller, Knapp, Doesken). These were endorsed for publication at the business meeting, subject to revision and approval by the Committees and the Executive Board.

The statements are offered now for your consideration. Your responses are most welcome. Plans are also being made to submit these statements to key personnel in NWS, NOAA, FAA, Department of Commerce, and Congress and to submit them for publication in the Bulletin of the American Meteorological Association and the National Weather Digest.

Sincerely,

The Executive Committee of the American Association of State Climatologists, Charles Wax, President

Climatic Data and the Transition to ASOS (Automated Surface Observing System).

A position statement of the American Association of State Climatologists.

September 1992

Introduction

The American Association of State Climatologists (AASC) is a professional organization committed to the collection and appropriate ap-

plication of climate information for the benefit of our nation. While often taken for granted, consistent long-term climatic data from all areas of the United States serve as a resource of great value. Beginning with real-time applications such as weather forecasting and aviation operations, the use of climate data only expands with time. Historic data are used daily in operating businesses; developing; manufacturing and marketing products; managing resources; designing and building structures; and in planning for the future. Researchers in countless fields utilize recent and historic climate records to learn about the climate system and the intricate interrelationships between climate and the world we live in.

Since the first networks of weather stations were established in the 1800s, there have been occasional modifications made to standard weather instruments and some revisions to standard observational procedures. But considering how much the world has changed over the past century, weather observations and climate monitoring have remained remarkably unchanged. The result is a 100+ year data record of considerable consistency for many locations across our country. The clearest indication of technological advances during the past century has not been evidenced in instrumentation but rather in weather station location. Numerous station moves, necessitated by growth, development and land use changes, and the transition from predominant agricultural weather services to aviation weather services, have compromised long-term consistency of some of our climate records.

The National Weather Service (NWS) stands ready to launch a new

era in weather data collection and climate monitoring. Beginning in 1992, and continuing for the next three to five years, the Automated Surface Observing System (ASOS) will systematically replace manually-observing weather stations at hundreds of locations across the United States. This new array of electronic sensors continuously monitoring many meteorological elements represents the single greatest change in weather data collection in the history of our nation, both technologically and in location.

The AASC supports the efforts to modernize the NWS and recognizes the importance of automating portions of our nation's primary network for collecting and disseminating surface weather observations. The AASC also applauds the efforts to develop a standardized nationwide network capable of round-the-clock monitoring of important weather elements.

Because of the potentially large number of ASOS installations nationwide, the system uniformity, the planned maintenance, upkeep and documentation, and the advanced communications and data access, ASOS has exceptional potential to serve as a multi-purpose network meeting both operational data requirements for aviation and forecasting and also the more stringent but general long-term climate data requirements. To this end, the AASC recommends that active steps be taken to assure that ASOS becomes a viable climate network. The imminent implementation of the ASOS at hundreds of airport locations across the United States adds urgency to these recommendations.

As an organization, the AASC is in general agreement with recommen-

dations put forth by the National Research Council's Committee on National Weather Service Modernization. However, the AASC desires to focus attention on particular issues which may have the greatest impact on applied climatology as seen from our perspectives in the States.

AASC Recommendations

1) ASOS Modifications

a) NWS modifications to the ASOS hygrothermometer, HO-83, should be completed promptly and introduced uniformly at all ASOS sites. Reducing RMS error to less than 0.9°F under worst case climatic conditions (high solar radiation, low wind) is necessary and achievable.

b) All ASOS raingages should be equipped with wind shields to ensure comparable performance in all climatic regions. This is especially important due to the extreme open exposure required for most ASOS sites. The type of wind shield provided by the contractor, which is planned to be included at a portion of the ASOS sites, may be adequate for nationwide use, but performance characteristics of this new Alter-like wind shield must be known and documented.

c) ASOS must include a better quantitative measure of precipitation than what can be provided by a heated tipping bucket raingage if it is to meet the most basic requirements for climate. An alternate precipitation gage should be used in all climates where at least 5% of annual precipitation falls as frozen precipitation in any given year. Where possible, a secondary precipitation gage should be operated to ensure quantitative

measurements are possible during times when ASOS is inoperative.

d) The measurement of the duration of sunshine, which is planned to be added at some ASOS sites, is useful but inadequate for most climate applications requiring sunshine information. It would be far better to add measurements of solar radiation to the ASOS array. For the sake of continuity, minutes of sunshine could be estimated from solar radiation observations. Solar radiation, either alone or in combination with other ASOS measurements, can also add significant and valuable information about cloud characteristics and lighting conditions important to climate and also to aviation.

2) Data Continuity Evaluations

a) Sufficient overlap of ASOS observations and conventional surface observations under various and differing climatic conditions must be maintained to ensure adequate data resources to complete data continuity evaluations. A minimum of one complete year of overlap should be required for the fundamental observed elements of temperature, dew point, wind, precipitation, visibility, cloud amount, pressure, current weather, and obstructions to vision.

b) The first priority in completing and publishing analyses of data continuity should be directed toward the basic measurements of temperature and precipitation because of their extensive use in applied climatology.

c) Data continuity studies of all other fundamental observed elements affected by the ASOS transition should be undertaken and completed.

3) ASOS Documentation

a) The highest standards of station history documentation, including station location, instruments, and equipment calibration information, must be maintained through all stages of the ASOS transition. Maps or video images showing exact location of each sensor, surrounding natural features, runways, access roads, and distances to nearest buildings or significant obstructions should be prepared for each observation site and updated as changes warrant. This documentation must be easily available to data users through appropriate means.

b) All important details of the ASOS transition ranging from equipment and firmware changes to software development should be assembled, thoroughly documented, historically preserved and easily available to data users.

c) The results from all data continuity studies should be published in NOAA technical reports and conference proceedings, and key results appear in peer-reviewed scientific publications. A single volume or monograph containing significant results from all ASOS-related data continuity studies to provide historic documentation should be assembled.

4) General

a) Specific NWS policy regarding official snowfall, snowdepth and water equivalent measurements for ASOS cities is a necessity. The general view, that the Cooperative Network will compensate for gaps in city snowfall records, is inadequate unless specific enhancements in the Cooperative Network are mandated.

b) The remainder of ASOS implementation and future ASOS modifications should be carried out in a manner consistent with the recommendations of the National Research Council's Committee on National Weather Service Modernization and the Climate Research Committee.

c) Coordination with the ASOS Climate Working Group must be continued until the ASOS transition is complete and the results of data continuity studies are known and accepted.

d) The National Weather Service should approach the modernization of the NWS Cooperative Network in a manner which is compatible with ASOS and utilizes the experience gained through the ASOS transition.

Summary

Accurate measurement of surface weather conditions is something our nation takes for granted. It is a resource traditionally available to the entire public. Yet, few realize how difficult it is—manually or automatically—to accurately and consistently observe the weather. Assembled over time, these records become the resource that provides the climate information an information society needs and expects.

The implementation of ASOS inevitably will introduce discontinuities into our nation's climate record. If ignored and overlooked, these discontinuities could compromise climatic analyses and applications for decades to come. However, if these changes are identified and thoroughly documented by the NWS and the many users of NWS data, most negative impacts from this landmark modernization can be minimized. Em-

phasis can then be directed toward utilizing the vast new data resources that ASOS will provide. If collected carefully and combined wisely with the information from other new and existing data sources, ASOS data should spawn a new era for applied climatology.

Modernization of the National Weather Service Cooperative Observer Network

A position statement of the American Association of State Climatologists

September 1992

In 1991 the National Weather Service celebrated the 100th anniversary of the establishment of what has come to be known as the cooperative weather network. The original charge of the network was to provide "such meteorological observations as may be necessary to establish and record the climatic conditions of the United States". The effort is "cooperative" because the observers supply the labor and time for the observations while the government supplies the equipment and subsequent data management.

The cooperative network complements the network of National Weather Service first order locations. The latter record detailed weather information with high frequency at a small number of sites, usually less than a few hundred at any given time. The cooperative network provides much simpler information, but at about 10,600 present sites, and a total of about 25,000 historical sites.

Data and information derived from the cooperative network continue to be extremely beneficial to the nation, with applications to a very wide range of issues. Hundreds of thousands of requests for such information are received each year by climate centers at national, regional, and state levels. The United States has received an enormous return on the relatively small investment in this network.

The cooperative network was not originally designed specifically to monitor climate change. Nonetheless, this activity has left us far longer climate records than any other source, and has provided the most useful data for studies of climatic change and variability. Although other federal and state organizations are making weather observations on regional and state scales to assist with specialized resource management decisions, the National Oceanic and Atmospheric Administration is the only federal agency with a primary charge to monitor and record the state of the atmosphere. We feel strongly that this NOAA-supervised network should continue to serve its multi-purpose role as the principal source of information about the most basic climate elements, with upgrades to function as much as possible as a true climate network.

Although this network has functioned well over the past century, several social and technical issues have made it increasingly difficult for the rising expectations of users of the network to be met: a decline in volunteerism; urban-rural population migrations and a more mobile society; an increased emphasis on the value of a person's time, hence increased desire for automation; and increased needs

for faster access to and processing of the information, standardized observation times, and data and information in digital form.

As this network enters its second century of existence, the National Weather Service has prepared a plan to significantly upgrade and revitalize the cooperative network. This plan has the following goals:

- 1) Prevention of further degradation of the national climate data base in quantity or quality;
- 2) Consolidation and national standardization of methodologies for making automated surface climate observations;
- 3) Development of specifications for a low-cost, standardized, accurate, and reliable weather/climate observation system, followed by subsequent testing, evaluation, production and deployment as replacements for the current system;
- 4) Timely and efficient acquisition of the data generated by the system, and rapid quality control and dissemination to users;
- 5) Introduction or improvement of automation in all aspects of the observational process where it can be shown that the quality of observations will be equal to or greater than those of present methods;

As part of the modernization and restructuring of the National Weather Service a number of significant changes are being introduced throughout the agency, many of them fueled by technological advances and innovations. During this period it is important that the cooperative program—

small in budgetary terms, but large in national value—continues to receive the attention it deserves. Toward this end we offer the following recommendations.

1) Constituent participation in certification processes

The National Weather Service is required to certify that modernization will not result in any degradation of weather services to the affected area. As recommended by the National Research Council (*Toward a New National Weather Service--2nd Report*, March 1992), user groups should participate in this certification process. As one of the many services it provides to the nation, the National Weather Service maintains the cooperative network. Data users in applied and basic climatology should be consulted to ensure that modernization of the cooperative network provides the high-quality climate records, consistent with the past, that are needed to better characterize climate fluctuations and assess whether the nation's climate is undergoing long-term changes.

Although the management of the cooperative program resides within the National Weather Service, its beneficiaries consist of citizens in almost every sector in the nation. To ensure that all of these interests are adequately served, the National Weather Service should actively solicit input and guidance throughout this process from users and their representatives; in other NOAA line agencies; non-NOAA federal agencies; universities; climate centers at state, regional, and national levels; and the private sector.

2) Cooperative Program Managers

At present, a Cooperative Program Manager at selected offices of the National Weather Service is responsible for the oversight and maintenance of approximately 200 local stations. These individuals play a key and usually underappreciated role in keeping the entire network functional. We are greatly concerned that this responsibility, heretofore invested in one person, will be split or diluted among additional personnel. Thus this responsibility would be subject to the negative effects of frequent staff turnover, periodic office personnel shortages, insufficient training, and reassignment and re-prioritization of local Weather Forecast Office duties. Whatever local management arrangement is adopted, at a minimum it should provide at least the current level of service and attention—itself only marginally sufficient at present. Because most of the use of the data is retrospective, the effects of changes in network management—as reflected in data quality and completeness—are not likely to be apparent to the user community for several years. The efficacy of new arrangements should thus be monitored for several years.

3) Field Testing

Before deployment, new instrumentation should be field-tested over the entire range of climate extremes expected to be encountered. The behavior of new data acquisition systems relative to that of present observing systems should be established for a wide range of weather and climate conditions. This would provide calibration for techniques to ensure future temporal consistency. The

continuity issues which arose in the 1980s during the deployment of the MMTS (maximum-minimum temperature system) at about a quarter of the nation's sites should be anticipated and avoided.

4) Progress Reports

Regular progress reports and presentations on the status of cooperative network modernization should be provided to the applied climate community. Results of tests and evaluations should be submitted to peer-reviewed journals. The assistance of university researchers and state and regional climate centers to help conduct tests should be solicited.

5) Relationship to ASOS

The cooperative network and ASOS will together constitute the backbone of the future national surface climate program. The development of these two efforts should be coordinated as much as possible.

Historical data from the cooperative program constitute an irreplaceable and extremely valuable resource for the nation. To ensure the continued vitality of this program, the AASC encourages a careful and well-coordinated effort to modernize the cooperative network in a way that preserves its best features while responding to the demands and opportunities brought about by continuing technological advances.

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