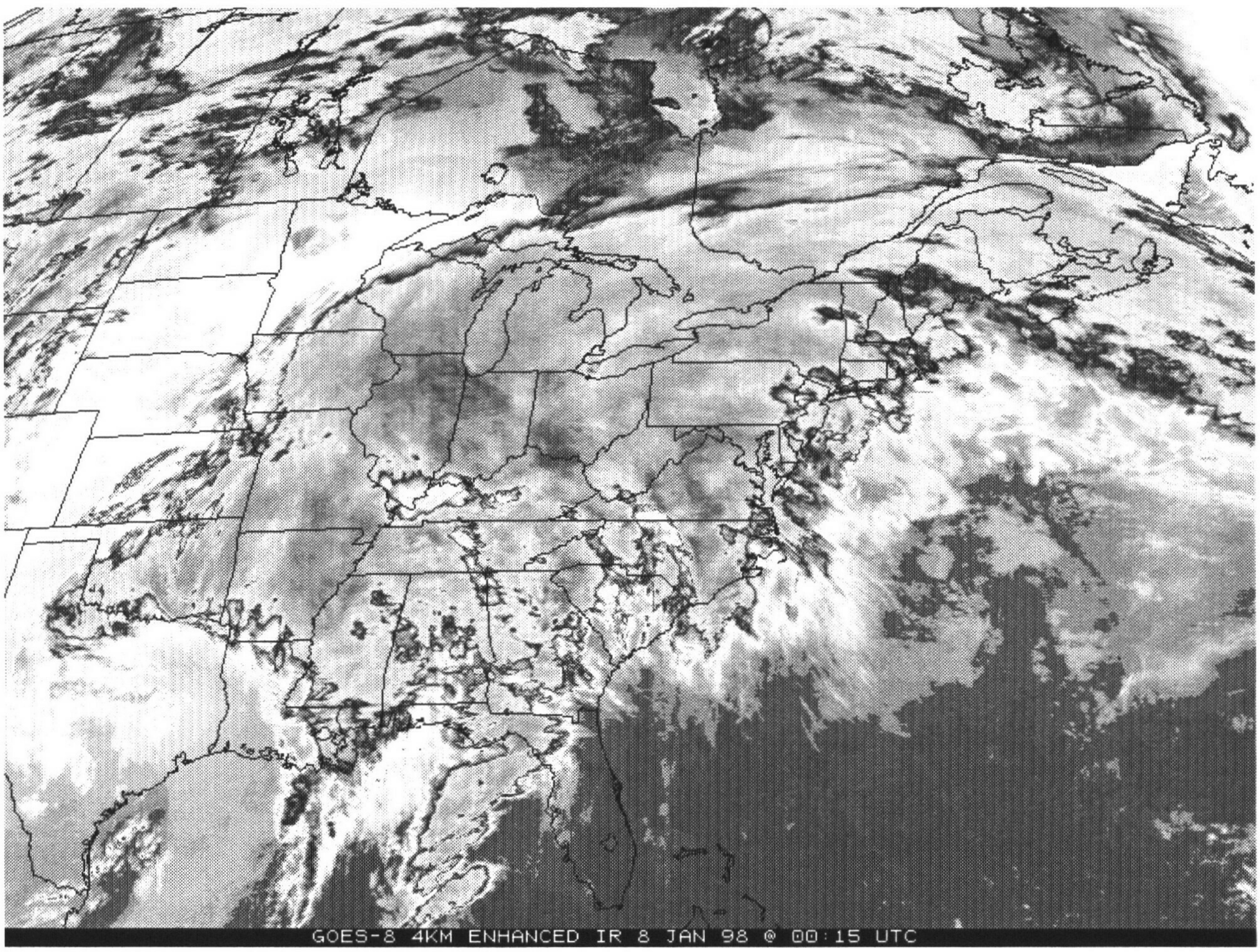
WINTER
1997

Volume 21
Issue 4

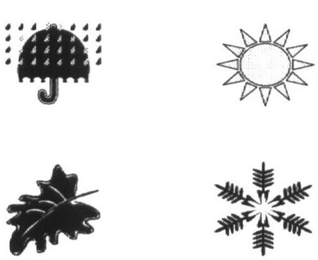
The State Climatologist



Published by the National Climatic Data Center in cooperation with the American Association of State Climatologists

CONTENTS

On the cover: GOES-8 satellite image - storm producing flooding/ice storms; January 8, 1998



Highlights from Vermont Climate Symposium

Dr. Lesley-Ann Dupigny-Giroux
Vermont State Climatologist

The climate of Vermont and the surrounding regions is best described as changeable or variable. Localized events such as severe thunderstorms and flooding, as well as the effects of teleconnections (patterns that take place in remote locations that in turn produce effects locally), all contribute to the variability of the local regime. Within this context, and in order to place this inherent variability within the framework of ongoing needs and future impacts, a symposium was convened on December 2, 1997, at the University of Vermont. Under the auspices of the Office of the State Climatologist and the Vermont Agency of Natural Resources, members of the climate and meteorology communities assembled to discuss the issues of concern for Vermont.

Goals Addressed

The following goals were identified by the symposium steering committee as guidelines for the ongoing dialogue of climate and meteorology issues:

1. To foster communication among agencies, commissions and academic institutions.

2. To identify and prioritize the needs of climate/meteorology professionals.

3. To understand the issues of climate and climate changes within the Vermont context.

4. To document climate change in Vermont, paving the way for incorporation into institutional and policy-oriented frameworks.

5. To find ways of supporting data availability over the long term.

6. To develop a sustainable plan that would facilitate continuity in terms of data availability and interaction among groups.

(Continued on page 3)

(Continued from page 2)

Proceedings

Over the course of the morning session, a number of presentations were given on topics that included:

Meteorology and Vermont Forest Ecosystem Monitoring - Dr. Tim Scherbatskoy

NWS station data availability via Voyager Exploration software at VforEm - Phil Girton

Data collection and applications - An overview of the NWS/ Burlington International Airport - Paul Sisson and Chuck McGill

Meteorological data and computer systems at Lyndon State College - Peter Schmid

Micro-meteorological applications for tree physiology and ecology - Tim Wilmot

High elevation data analysis - Charlie Cogbill

Project Atmosphere - Gib Brown

Remote sensing applications - From High Arctic to Vermont - Dr. Gerry Livingston

The Northeast Regional Climate Center - An Overview - Keith Eggleston

The status of climate in Vermont - Dr. Lesley-Ann Dupigny-Giroux

The afternoon session took the form of two break-out groups who were charged with the tasks of identifying the questions surrounding the status of climate in Vermont; the local impacts of teleconnections; as well as addressing the ongoing needs of meteorology data users across the state.

Summary of Key Concerns

The following areas were identified as action issues:

1. Updating the database of Vermont weather sites.

2. The archiving of weather data and the creation of a centralized Web site to facilitate their distribution.

3. The necessity for high elevation data sites with a real-time capacity.

4. The desirability of accessing private data sources.

5. The promotion of data collection over the long term.

6. The measurement of climate variables in addition to the traditional meteorological parameters.

7. Identifying and documenting the projected changes in the climate and providing public outreach of the resulting products.

8. The synthesis of historical information.

9. To identify and prioritize key variables (of a hydrology/ biology/climate/meteorology nature) that are currently not well represented.

Concluding Remarks

This symposium represented the first in a series of meetings designed to showcase weather-related activities around the region, and to facilitate interagency collaboration. The complete version of the proceedings is available from the Vermont State Climatologist. To request a copy or for more information, please contact:

Dr. Lesley-Ann Dupigny-Giroux
Vermont State Climatologist
University of Vermont
Department of Geography
Old Mill Building
P.O. Box 54170
Burlington, Vermont
05405-4170
(802) 656-3060 (phone)
(802) 656-3042 (facsimile)
ldupigny@zoo.uvm.edu

Computing ETo Under Nonideal Conditions

Donald T. Jensen
Utah State Climatologist

Improvement in water use and water conservation is more important than ever. Where irrigation is required for crop production, there may be serious over pumping of ground water. Crop yields can be increased by improved water management and conservation. Water can be better managed and conserved by making computation of crop water requirements easier and more reliable.

The Food and Agriculture Organization of the United Nations (FAO) has proposed a version of the Penman-Monteith (PM) combination equation for computing reference crop evapotranspiration (ETo). By definition, the FAO Penman-Monteith (FAO-PM) method includes the requirement of an actively growing grass crop completely shading the ground and with adequate water. Most reference methods presume that the weather measurements are taken over the same type surface. Several states have established programs for collecting data and publishing ETo values. However, many of the sites fail to provide the required "reference" environment. Possible causes include soil water management, insufficient density of planting, and inadequately irrigated or well-watered fetch.

Many irrigated sites are surrounded by dry land. Frequently, they are irrigated after the vegetation has been stressed. Use of relative humidity (RH) and air temperature (T) data from non-irradiated and inadequately irrigated weather stations may introduce a bias in the computed values for ETo. The calculations are used to represent conditions of irrigated or other well-watered environments.

Vapor pressure deficit, air temperature and wind speed values are all modified when measured in a non-reference environment. Global solar radiation is not modified. However, measured values for solar radiation are not always reliable and are often not available. Measurement of RH by electronic sensors is commonly plagued by errors.

For generally moist areas and for well-watered sites, average daily dewpoint (Td) approximately equals the daily minimum temperature (Tn). In arid areas there can be as much as a 4-5 degree Celsius difference between measured Td and Tn. However, for moist areas the FAO-PM equation can be simplified by substituting the minimum temperature for the dew point temperature. Using Tn instead of Td eliminates the need for RH

(Continued on page 5)

(Continued from page 4)

measurements. The ETo values computed by substituting Tn for Td approximate those from well-watered sites.

Substituting Tn for Td does not solve other problems in using the FAO-PM equation. Many stations lack the intensive data required by the FAO-PM. In other cases, the accuracy of the measured weather data may not be reliable. The 1985 Hargreaves equation (ETH) is one of the simplest and most reliable of the empirical equations. This equation requires measured values of only maximum and minimum air temperatures (Tx and Tn) and computed solar radiation from geographical location.

Results showed that ETH gives similar values relative to FAO-MOD for weather stations in Utah (27), Kansas (16), and Oklahoma (38) for 1994. The differences among the estimates appeared to stem from interactions between wind and air temperatures, but were well within the limits that can be explained by the quality of the data.

The conditions of aridity or humidity of the general surroundings of the weather station have an important influence on the weather measurements at the site of recording. In the collection and recording of weather data, the environment of the station and water management is extremely important but seldom mentioned. In addition, it is difficult to maintain standard reference conditions at a weather station. In practice, most of the weather data available are reported from non-reference, non-agricultural sites. The intensive data required for the FAO-PM model (including measured solar radiation, wind, vapor pressure deficit or relative humidity) may not be available in many parts of the world.
The FAO has proposed an improved standardization of ETo for estimating crop water requirements. The use of this improved reference is limited due to the availability and the quality of the required weather data. The RH data are most frequently of questionable quality and the use of Td=Tn in the equation eliminates the need for measured values of RH.

It is proposed that the use of a simpler procedure that requires only air temperature and precipitation be used. The differences in ETo values computed from different methods frequently may be no larger than those introduced in the measuring and recording of the weather variables.

For the complete article, refer to the Journal of Irrigation and Drainage Engineering, September /October 1997, pps. 394-400.

Donald T. Jensen
Utah State Climatologist
Utah Climate Center
Utah State University
Logan, Utah 84322-4105

The Passing of a Giant

Richard M. Davis
National Climatic Data Center

Mr. Raymond L. Joiner passed away January 8, 1998. He retired from the National Climatic Data Center (NCDC) as a Digital Systems Advisor in 1980. Ray was a true Giant in the data processing arena, bringing to NCDC a wealth of knowledge and dedication to the concepts of computing climatological data.

Ray started his government career in 1934 as a mail clerk in the Department of Agriculture in Washington, D.C. His annual salary was $600. He soon became a statistical clerk and worked in several agencies until he began working for the Weather Bureau in 1941. Here he discovered his true vocation, as he became fascinated with the use of punched cards for data processing and statistical analysis.

He was instrumental in all phases of implementing card processing techniques at the New Orleans Tabulation Unit, later to become the National Weather Records Center, and eventually NCDC. He, with the encouragement of Director Les Smith, along with Dr. Harold Crutcher, worked unceasingly to make the Center the leader in data processing. That he was successful in this endeavor was evidenced by the fact that in the 1950's and 1960's, people from National Meteorological Services all over the world came to study and learn the art of modern data processing from NCDC.

There was little Ray couldn't accomplish through "programming" of IBM 407 boards. Ever looking forward, Ray was instrumental in NCDC receiving a UNIVAC computer in the mid-1950's. This was soon followed by the IBM 1401 and then the various Honeywell systems, the RCA-Spectra third generation computer, and finally the UNISYS. Ray's gut-level knowledge of how computers really work made him invaluable, as programmers struggled with new and different programming techniques and base systems. At heart he was a machine-level programmer, and he could read and decipher machine code as easily as most people do COBOL or FORTRAN. This knowledge also allowed him to write programs that could not be handled any other way during those days. As technology exploded, Ray remained at the forefront of his profession.

Ray's quest for knowledge did not stop at the punched card. In 1958, he successfully completed a meteorological course in thermodynamics to go along with his other scholastic endeavors in climate analysis and statistics. In the mid-1960's, Ray became the first person in Western North Carolina to receive certification as a Professional Data Processor and Programmer. Recognition came in the form of the Department of Commerce Silver Medal in 1967 for his contributions to data processing, and then in 1971 the Department's highest award - the Gold Medal, for exceptional service and leadership to the Nation and the International Community in development of automated systems for the processing of climatological data.

Ray was never too busy to stop what he was doing and help with a problem. On more than one occasion, he saved meteorologists from making big mistakes in their approach to a program. It was usually a pretty gentle "I don't think you really want to do that" that did the trick. Couple this with a genuine desire

(Continued on page 7)

(Continued from page 6)

to help people, to instruct others, to pass along his know-ledge and gentle spirit, and you have a true Giant that has passed from the scene. He will be missed by all whose lives he touched. Ray was a colleague, he was a mentor, he was a friend. I'll miss him, but am ever so thankful that our paths crossed. On the day of his death, when I sent an E-Mail message to all employees at the National Climatic Data Center, the subject line said simply "The Passing of a Giant." For Ray truly was a Giant in the world of data processing.

El Niño Winter Summary

The first two months of 1998 were the warmest and wettest in the 104-year record of temperatures and precipitation measurements for the contiguous 48 states. During the period January - February, the national average temperature was 37.5 degrees F compared with a normal of 32.1 degrees F. The previous record was 37.0 degrees F in 1990. For precipitation, 6.01 inches fell, compared with a normal of 4.05 inches. The previous record was 5.7 inches in 1979.

For the winter (December through February) as a whole, however, temperatures and precipitation were not as extreme, due to December being somewhat cooler and drier (as a national average) than January and February. The winter of '97-'98 was the second warmest on record and the seventh wettest. The normal national average temperature for the winter months of December, January, and February is 32.3 degrees F. This winter's figure was 36.4 degrees F. The record was 36.6 degrees F set in 1991-1992. For the three-month period, the normal precipitation value for the country is 6.35 inches. This winter's figure was 7.96 inches, compared with the record 8.5 inches in 1932-1933.

California and North Dakota had their wettest February on record. Florida, Maryland, Nevada, Rhode Island, and Virginia had their second wettest February since records began in 1895. The warmest February on record took place in much of the upper Midwest and parts of the east including Minnesota, Wisconsin, Illinois, Michigan, Ohio, Pennsylvania, and Connecticut. Nationwide energy savings were estimated at 10 percent (i.e., 10 percent lower heating costs as compared to normal winter).

Information on El Niño can be found by accessing the NCDC Home Page on the World Wide Web at: www.ncdc.noaa.gov/

The
State Climatologist

now on-line at:

http://www.ncdc.noaa.gov/ol/climate/aasc.html#stc

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND
INFORMATION SERVICE
NATIONAL CLIMATIC DATA CENTER
FEDERAL BUILDING
151 PATTON AVENUE, ROOM 120
ASHEVILLE, NORTH CAROLINA 28801-5001