Weather Radar In182a

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Next Generation Weather Radar (NEXRAD) Cambridge University Press Information on airflow in six New England thunderstorms was obtained from quasi-horizontal observations by a single Doppler radar. Radial velocity fields in four of the storms showed well organized patterns throughout an appreciable range of height. Vertical cross sections of the horizontal component field, coupled with some reflectivity information, provided a basis for inferring regions where vertical motion was strong. Computed horizontal flow fields consistent with the observed component fields showed environmental flow basically through the storm except at mid-levels.
Federal Plan on Supporting Research in Surface-based Weather Radars Springer Weather radar is a vital instrument for observing the atmosphere to help provide weather forecasts and issue weather warnings to the public. The current Next Generation Weather Radar (NEXRAD) system provides Doppler radar coverage to most regions of the United States (NRC, 1995). This network was designed in the mid 1980s and deployed in the 1990s as part of the National Weather Service (NWS) modernization (NRC, 1999). Since the initial design phase of the NEXRAD program, considerable advances have been made in radar technologies and in the use of weather radar for monitoring and prediction. The development of new technologies provides the motivation for appraising the status of the current weather radar system and identifying the most promising approaches for the development of its eventual replacement. The charge to the committee was to determine the state of knowledge regarding ground-based weather surveillance radar technology and identify the most promising approaches for the design of the replacement for the present Doppler Weather Radar. This report presents a first look at potential approaches for future upgrades to or replacements of the current weather radar system. The need, and schedule, for replacing the current system has not been established, but the committee used the briefings and deliberations to assess how the current system satisfies the current and emerging needs of the operational and research communities and identified

potential system upgrades for providing improved weather forecasts and warnings. The time scale for any total replacement of the system (20- to 30-year time horizon) precluded detailed investigation of the designs and cost structures associated with any new weather radar system. The committee instead noted technologies that could provide improvements over the capabilities of the evolving NEXRAD system and recommends more detailed investigation and evaluation of several of these technologies. In the course of its deliberations, the committee developed a sense that the processes by which the eventual replacement radar system is developed and deployed could be as significant as the specific technologies adopted. Consequently, some of the committee's recommendations deal with such procedural issues.

Applications of Weather Radar Systems Ellis Horwood

This report discusses and summarizes the weather-radar operational policies and procedures of eleven U.S. commercial airlines.

Weather radar observations Elsevier

This 2001 book provides a detailed introduction to the principles of Doppler and polarimetric radar, focusing in particular on their use in the analysis of weather systems. The design features and operation of practical radar systems are highlighted throughout the book in order to illustrate important theoretical foundations. The authors begin by discussing background topics such as electromagnetic scattering, polarization, and wave propagation. They then deal in detail with the engineering aspects of pulsed Doppler polarimetric radar, including the relevant signal theory, spectral estimation techniques, and noise considerations. They close by examining a range of key applications in meteorology and remote sensing. The book will be of great use to graduate students of electrical engineering and atmospheric science as well as to practitioners involved in the applications of polarimetric radar systems.

The Fortieth Anniversary History of Weather Radar Research in the U.S. Air Force National Academies Press

Design concepts and test results are summarized for a Doppler weather radar system suitable for precipitation measurements over a wide span of radial velocities and slant ranges, even in the presence of ground clutter. The radar transmits two uniform pulse trains at 2.710 and 2.760 GHz. Uniformly spaced pulses permit ground clutter cancellation of up to 50 dB to be achieved with a three-pole elliptic filter. Pulse spacing at one frequency is consistent with long-range coverage in reflectivity, while spacing of the second is consistent with a wide unambiguous velocity measurement span.

Computer Software for the Assessment of Growth Histories of Weather Radar Echoes

The frequency and probability of radar echoes of convective clouds over the United States are presented. Analysis of three years of observations from a 31-station WSR-57 weather radar network indicates that at all altitudes, radar echo probabilities are greatest over Florida and the Gulf coast, generally decreasing northward over the United States. Also, largest probabilities for most layers and locations occur in summer. Echoes have been reported up to at least 70 kft in May, June, and July, and up to 60 kft in winter. Diurnal variations reveal greatest probabilities between 1600 and 2100 LST in all regions. Largest mean monthly 3-hour values are 85 percent, and the

maximum mean daily range is roughly 65 percent in the southeast during the summer months. The probability of an echo-free horizontal view near the earth's surface for a 100-mile range is also presented. Tabulations of echo-free sectors, as percent of the 360-degree radar scope, show that the probability of obstructions to a horizontal view increases generally from northwest to southwest during all seasons. The probability of having no echoes is greater in winter than in summer except along the Pacific coastal region. Diurnal variability is larger in July than in January. (Author)

Hydrological Applications of Weather Radar

A functional description of an automatic radar system performance monitoring network is presented. A network of microprocessor controlled monitoring units were interfaced to various sensors at key areas in a Doppler weather radar in order to collect system status information and display it at a central point near the operator's console. This status information is displayed on a color terminal in a way that allows the systems operator to verify the proper operation of the radar with just a cursory glance at the terminal. Fault location and fault tolerant techniques were employed to provide the system user with quality assured data.

Next Generation Weather Radar (NEXRAD)

Doppler Radar and Weather Observations deals with the use of Doppler radar to make observations of a variety of weather phenomena such as tornado vortices, hurricanes, and lightning channels. Topics covered include electromagnetic waves and propagation; weather echo signals; Doppler spectra of weather echoes; and meteorological radar signal processing. Rain and turbulence measurements are also considered, along with observations of winds, storms, and related phenomena. Comprised of 11 chapters, this book begins with an introduction to weather radar principles and how the radar parameters and signal characteristics relate to the target's meteorological properties. The effect of the atmosphere on the path of the signal is then examined, together with techniques used in extracting a target's properties from its echoes. The radar signal path from the transmitter, through the antenna, along the beam to the target, and on its return to the receiver is also discussed. Subsequent chapters explore the discrete Fourier transform and its application to weather echo signals; the weather Doppler spectrum and the signal processing methods used to derive its principal moments; range and Doppler velocity ambiguities as they pertain to distributed targets; and the limitations imposed by antenna sidelobes, ground clutter, signal decorrelation, and power. A comprehensive treatment of pulse compression and the Doppler processing of frequency modulated signals is given. This monograph should be of value to oceanographers, meteorologists, atmospheric scientists, and radar engineers, as well as students and researchers interested in Doppler radar principles.

Satellite Weather Radar

This fully illustrated volume covers the history of radar meteorology, deals with the issues in the field from both the operational and the scientific viewpoint, and looks ahead to future issues and how they will affect the current atmosphere. With over 200 contributors, the volume is a product of the entire

community and represents an unprecedented compendium of knowledge in the field.

Next Generation Weather Radar (NEXRAD)

A guide to the ways in which radar is used to address practical problems in meteorology, hydrology, and the environmental sciences, this book supplies sufficient theory to explain how radars function. The emphasis is on the characteristics of the data obtained from radar and how this data can aid an understanding of specific real life applications. Applications include the accurate forecasting of rainfall and other severe weather, the use of radar data as an input for forecasting models, the understanding of the problems of airborne pollution, and how to specify and install radar systems at remote sites.

Radar in Meteorology

As part of a program to improve short-range forecasts of weather conditions at aircraft terminals, a digital radar system was established at Air Force Geophysics Laboratory, Bedford Mass. The system, consisting of AN/FPS-77, digital interface, microwave transmitter-receiver, video integrator and computer, was installed in late 1972. Since that time the system has been used in conjunction with a network of 26 automated weather stations to make experimental forecasts of visibility and severe-weather conditions. The radar output of digital maps of radar intensity was found to be very convenient, but the inability of the radar to detect small water droplets limits the use in low visibility forecasting primarily to heavy rain storms and snow storms. In severe storms modest success was attained forecasting gusts, using digital maps. The large amounts of weather information from the network and radar frequently saturated the forecaster making forecasts at 15-min intervals, and relief was sought in the form of objective aids. Preliminary relationships between radar intensity, extinction coefficient (visibility) and rainfall rate have been formulated. In addition, a technique was developed using digital radar maps to obtain motion vectors and make probability forecasts of severe weather conditions. The calibration procedure relies on intensity of ground targets (hills and towers) for day-to-day relative calibration, and absolute calibration has been limited to Z-R relations. (Author).

Weather Radar Manual

A comparison is made between Doppler and conventional radar as a tool in operational forecasting of hazardous weather. Estimates are given of the cost increment of Doppler capability above the basic radar cost. The advantages and limitations of dual-Doppler and multi-Doppler networks are also considered. The evidence leads to the firm conclusion that, for operations in areas subject to the threat of tornadoes, hurricanes, and other damaging windstorms, the cost increment of single-Doppler radar capability is more than justified by its advantages over conventional radar. On the other hand, dual-Doppler capability is not recommended for operational use, although it is an excellent research tool.

Next Generation Weather Radar (NEXRAD)

The problem of making radar measurements of meteorological phenomena such as rainfall, clouds, and ice crystal formation from a satellite is discussed. The main problem areas are obtaining sufficient signal-to-noise ratio within the weight limitation of the satellite system and avoiding ground

clutter when scanning any significant angle off nadir. Sufficient signal-to-noise ratio to detect heavy rainfall at 35 GHz is available for a downlooking only system within the weight power limitation of the Military Meteorological Satellites. An arrested aperture doppler system to reject ground clutter at large scan angles off nadir while detecting rainfall by doppler due to its vertical motion is suggested.
Weather Radar Manual (WBAN).

Weather Radar Observations
Weather Radar Technology Beyond NEXRAD
Next Generation Weather Radar (NEXRAD)
Next Generation Weather Radar (NEXRAD) Product Description Document
Federal Plan for Weather Radars and Remote Displays
Doppler Radar Meteorological Observations: System concepts, responsibilities, and procedures