SUMMARY OF PRESENTATIONS AT THE NWA ANNUAL MEETING SALT LAKE CITY, UTAH, OCTOBER 8–11, 1991

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At the request of Sol Hirsch, NWA Executive Director, I assembled a team of people to document the sessions at the Fall, 1991 NWA Annual Meeting. Their writeups, edited for consistency, are intended only to provide an introduction to the papers, especially for those people who were unable to attend the meeting.

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- Ron Alberty, NOAA/OSF, Norman, OK
- Elizabeth Morse, NOAA/NWS Western Region Headquarters, Salt Lake City, UT
- Ron Holle, NOAA/NSSL, Boulder, CO
- Eli Jacks, NOAA/NWS Headquarters, Silver Spring, MD
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- Paul Croft, Rutgers University, New Brunswick, NJ
- John Jarboe, NOAA/NWS Training Center, Kansas City, MO
- Joe Schaefer, NOAA/NWS Training Center, Kansas City, MO

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1. Broadcasters' Session

LeAnn Pope (Mississippi State University) presented the results of a survey completed by more than 300 television viewers in a wide variety of markets across the country. Her presentation, entitled "Viewers Perceptions of Meteorology and Broadcast Meteorologists: A Coast-to-Coast Survey," reported about attitudes regarding broadcast meteorologists and weather knowledge. Among the most interesting findings were those that confirmed that weather was a topic of great interest, and among the top reasons people watch television news. While viewers have unrealistic opinions on how much time is allotted to weathercasters, viewers also indicated they desired comprehensive weather reporting. Unfortunately, the survey also indicated the public is not as well informed about weather as we might like.

Dean Jones and **Mark Binkley** (Mississippi State University) reported on "Forecasting Freezing/Frozen Precipitation in the Mid-South." Jones discussed his ongoing study of freezing/frozen precipitation amounts in a study area that encompasses much of the deep South. His focus was on events in which reported precipitation was not easily explained by the existing synoptic situation. Jones has developed an extensive system for classifying these events, taking into account all possible combinations of precipitation as they move across his area.

Dave Freeman (WHIO-TV, Dayton, Ohio) addressed "Reporting of UV-B Values." Freeman discussed his station's experience reporting Ultraviolet (UV-B) levels using the Sunsor Scale as part of his weathercasts. He gave a brief explanation of Sunsor's attempt to devise a scale for reporting UV that is easily understood by the public. The presentation also included a videotape of a three part series done by Freeman explaining what UV is, its health threats, and how atmospheric conditions affect UV-B reaching the earth. Also, special attention was paid to increasing sensitivity to minorities in reporting UV-B levels. This included a discussion of the six skin types recognized by dermatologists, and descriptions to aid individuals in classifying themselves.

Ron Alberty (NOAA/OSF) presented a paper entitled "NEXRAD Status Report and Its Impact on Broadcasters." Alberty gave an excellent overview of the current status of the WSR-88D, and how continued development will affect broadcast meteorologists. The discussion included information about how WSR-88D data will be distributed through the three selected private contractors. WSI, Alden and Kavouras will offer "pass through" of raw data, as well as added value products. Alberty cautioned broadcasters to be selective about which products are aired, as the viewing public may not be able to understand some of the more complex displays.

Lori Pate (TVIV-TV, Denver, Colorado) discussed "Effective Weather Graphics." Pate presented a videotape containing both good and bad examples of television weather graphics. She offered several practical suggestions on presenting clean, yet interesting, graphics that effectively communicate weather information.

Kent Ehrhardt (WPTV-TV, West Palm Beach, Florida) presented information about "The New NWA Seal Criteria." Ehrhardt gave an overview of plans to tighten up the criteria for earning and keeping the NWA Seal of Approval for both Radio and Television Weathercasters. The goal of the effort is to significantly improve the worth and standing of the Seal in the eyes of the viewing public. Applicants will have to submit a tape of their on-air performance for judging, and earn a passing grade of 75% on a written test. Seal recertification will take place every three years and includes a requirement for continued education and/or professional meeting attendance.

The session ended with a panel discussion concerning "The Interaction Between NWS and Weathercasters." **Mark Eubank, William Alder, David Toronto, Todd Glickman** and **Glen Gerberg** participated. The discussion centered on the key relationship between the two groups of people during times of severe weather. Considerable emphasis was placed by all parties on the need for weathercasters to refrain from issuing their own weather "watches" and "warnings." All felt that these terms have special significance and should only be used when issued by the NWS. The panel discussion was well-received and served to emphasize the necessity of a partnership between the NWS and the broadcast community.

2. Session 1—The Forecasting Environment/ Advanced Workstations. Session Chair—Jack Hales, NWS/NSSFC

The session began with a challenging presentation by **Louis Uccellini** (NOAA/NWS, NMC) on "Future Trends in Synoptic and Mesoscale Meteorology." Uccellini reviewed how synoptic meteorology has evolved from the 1950's, when synopticians were classified as being "artistic" in performing large-scale analyses of observations. In contrast, 1990's synopticians have expanded their perspective to propose cause-effect hypotheses for smaller-scale features and to offer sequential arguments to explain rapidly evolving weather systems.

Uccellini postulated that these facts represent a revolution in the science that has lead to more forecast specificity in both space and time. He further asserted that this developing skill is based principally on diagnostic studies that rely on both research and operational numerical model data sets.

Uccellini further argued that the shear magnitude of information inherent in these various numerical models demand the availability for computer-driven workstations in the forecast office. These workstations must provide system and applications software for effective visualization capabilities, perhaps include expert systems availability, and allow for interactive diagnostic analyses. The latter includes capabilities permitting the forecaster to remain focused on meteorological reasoning while examining rapidly developing weather systems.

Issues raised by Uccellini included:

a) How can meteorologists avoid the trap of "video hypnosis" in the workstation environment? These users must have advanced synoptic training and experience with model output.
b) Where will these users get trained and educated? What is the role for COMET?
c) How can meteorologists retain appropriate focus on the "big picture" while they attempt to mentally assimilate the flood of both large and small scale information from ASOS, profilers, GOES, and NEXRAD?

These questions evoked a lively exchange with the audience and many potentially fruitful suggestions were discussed.

Dennis McCarthy (NOAA/NWS, WSFO Norman) then discussed "National Weather Service Modernization Activities in Oklahoma." Several activities are underway including incorporation of WSR-88D (NEXRAD) data into Pre-AWIPS workstations, installation of several early ASOS sites, restructuring forecast and watch areas, and use of limited profiler data. The next several months promise to be very busy but extremely vital times in the Oklahoma area.

Joan Brundage (NOAA/FSL) presented a very interesting discussion on "Operational Support to Pre-AWIPS at the Denver WSFO." The Forecast Systems Laboratory (FSL) continues to provide all operational support to the data acquisition, product preparation, and workstation support for Pre-AWIPS activities at the WSFO. In addition, FSL is heavily involved in implementation and support of the forecaster workstations used in Norman, OK for risk-reduction activities there.

Brian Heckman (UCAR/COMET) presented an introduction to the COMET Interactive Multimedia Computer Based Learning (CBL) effort. COMET'S involvement in "Operational Forecaster Education and Training Using Interactive Multi-Media Computer-Based Learning" is a cornerstone of the NWS modernization program. The first CBL module, entitled "Workshop on the Fundamentals of Doppler (radar) Interpretation," focused on WSR-88D interpretation and use. The second module entitled "Boundary Detection and Convection Initiation," addressed techniques to detect boundary-layer convergence zones and the resultant impact on zero-to-one hour forecasts of convective initiation.

Scott O'Donnell (NOAA/FSL) read a paper on "Hydrologic Functions for the Modernized NWS Weather Forecast Office Workstation." Experimental real-time integration of river stage, and precipitation gage measurements, Doppler radar observations, and satellite imagery is providing forecast and warning capabilities previously not possible. The paper described several capabilities developed at FSL and implemented at Denver, CO and Norman, OK. Particular attention was focused on hydrologic components of the workstations.

3. Session 2—New Techniques/Local Modeling. Session Chair—Joe Schaefer, NOAA/NWSTC

The session began with a presentation by **Mark Mathewson** (NOAA/FSL) entitled "The New Approach to Forecast Preparation in the AWIPS Era." This paper discussed the Gridded Representation of Analyses and Forecasts (GRAF). GRAF is a graphical forecast preparation system that the NWS plans to implement as a part of AWIPS. The forecaster will manipulate digital data and graphics to create a three-dimensional meteorologically consistent depiction of future atmospheric states. The computer will then automatically produce the various types of forecasts that are needed from this forecast database.

Peter Stamus (NOAA/FSL) gave the next talk which discussed an operationally oriented analysis project. The title of the presentation was "The Local Analysis and Prediction System: An Overview." The acronym for this is LAPS. LAPS produces hourly three-dimensional analyses from a combination of all available observations (including aircraft data, profilers, etc.) and a prediction model. The output is used at the Denver NWS Forecast Office.

"Mesoscale Analysis and Modeling of Hydrometeorological Processes for Western Utah" was the title of a presentation by **Elford Astling** (U.S. Army Dugway Proving Ground). A boundary layer model has been developed for the Dugway area. This area features rather extreme conditions, with excessive solar radiation, rough terrain, and extreme variances in albedo as the salt cover over the surface of the desert changes in very short periods of time. Verification data sources include a wind profiler and surface mesonet stations.

A presentation on "The use of Passive Microwave Retrievals of Environmental Products in an Operational Environment at NOAA" was given by **Sheldon Kusselson** (NOAA/NESDIS). The paper discussed the various near real-time operational products that are produced. NMC is experimenting with using satellite produced surface wind speed analyses and total precipitable water charts to initialize their models. The Climate Analysis Center is studying using satellite derived rainfall rates as a diagnostic tool. The Synoptic Analysis Branch is evaluating a new snow cover analysis.

Bill Lerner (NOAA/NWS Headquarters) presented some very thought provoking flash flood verification statistics in a presentation entitled "The National Weather Service Flash Flood Verification Program." The methodology and philosophy of verification as well as results were covered.

"Air Weather Service Support to Operations Desert Shield and Desert Storm" was discussed by **Jerry Riley** (Air Force/Scott AFB). The presentation style was a combination travelogue/documentary that concentrated on the contributions that the more than 500 AWS people made during the action. The meteorological problems related to a deployment in that desolate portion of the world were many, but the ingenuity of the personnel helped to overcome them.

4. Session 3—NEXRAD/Profilers and the April 26 Storm. Session Chair—Joe Kendall, NOAA/OSF

Ron Alberty (NOAA/OSF) spoke on "NEXRAD Program Developments and Functions of the WSR-88D Operational Support Facility." Four WSR-88Ds in the limited production phase—Norman, OK; Melbourne, FL; Sterling, VA; and Altus AFB, OK—have been delivered. Eglin AFB, FL; St. Louis, MO; Dodge City, KS; Houston, TX; Keesler AFB, MS and the National Weather Service Training Center (MO) radars will make up the rest of the limited production phase. These radars will be commissioned between June and December, 1992. The full production phase of the contract, which covers the remaining 155 radars, will begin in July, 1992.

The Operational Support Facility (OSF) has been tasked to provide operations training, WSR-88D baseline software maintenance and software enhancement, and real-time support for installed radars. The latter duty is accomplished through a 24-hour hotline.

The WSR-88D has four levels of archive capabilities. Archive II may be the most important for research work, since it archives the digital database from the radar data acquisition unit. The archive medium for archive II will be 8 mm metal particle tape. It has not yet been determined where archive II tapes will be stored or how people will be able to access the archived data.

Several examples of WSR-88D performance were discussed. In the April 26, 1991, McConnell AFB/Andover/Wichita tornado event, reflectivity and velocity data were very useful in issuing timely warnings. On May 3, 1991, precipitation products derived from NEXRAD algorithms were used as the basis for flash flood warnings.

Les Lemon (UNISYS Corporation) presented a slide show entitled "WSR-88D Potpourri: Capabilities and Applications." This included various weather events between April and September, 1991. Cold fronts, gust fronts, hail, microbursts, and tornadoes which had been well depicted in WSR-88D returns were shown. Also, examples were given on the use of the radar to find the freezing level and to determine higher altitude winds.

A question was raised about the use of the WSR-88D algorithms for less intense storms. The algorithms will not work in every case because they may require data from a greater volume than will be obtained from a weak storm system. The algorithms, however, should not be thought of as "stand-alone" programs; the radar operator should have enough knowledge to make determinations from the radar data without relying exclusively on the algorithms.

Daniel Berkowitz (NOAA/OSF) presented a "Preliminary Analysis of the WSR-88D Hydrological Package." The WSR-88D precipitation processing subsystem, currently under development, involves four steps. These steps are: quality control, converting reflectivity and other data into rainfall rate estimates, developing rainfall accumulation figures, and adjusting the output for bias. Three types of information packages are being worked on: one-hour and three-hour rainfall accumulations and storm totals. All three will be provided as graphics; the one-hour accumulations also will be available in digital format.

Tim Crum (Air Force/OSF) discussed "Regionalization and Enhancement of WSR-88D Algorithms." NEXRAD algorithms, initially developed in the mid-to-late 70's, were frozen during the early 80's. They were based on limited developmental data sets and were not regionalized. As the WSR-88Ds are deployed, the algorithms will need to be regionalized and, in some cases, modified or changed.

Each WSR-88D will have about 11,000 adaptable parameters. Some will be set by the Operational Support Facility, some will be set by the contractors, and others will be set locally. Any changes to algorithms beyond what is possible from setting the adaptable parameters will need to be agreed to by the user agencies at a Configuration Control Board. In order to regionalize the algorithms, operational experience with the algorithms, verification or ground-truth data, and archive II data will be needed.

Harold Brooks (NOAA/NSSL) talked about "Applications of Profiler Demonstration Network Data in Forecasting Severe Convection." Two examples of tornadoes passing near a profiler were shown. In one case there was a helicity change. In the second case (April 12, 1991), no detectable environmental change was noted. "Why?" queried Brooks. Three reasons were proposed: (1) we don't understand the environment as well as we need to in order to interpret the profiler data correctly; (2) the profiler spacing may not be as dense as is needed; (3) a variety of profiler problems, including data aliasing, data type (consensus average versus "crude average"), algorithm shortcomings, and data availability, might have contributed to the missed diagnosis on April 12.

Gerald Klazura (NOAA/OSF) presented "Assessing Low-Level Wind Field Development Using WSR-88D and Profiler Data." This was another examination of the April 26, 1991 severe weather case. The 12-hourly rawinsonde readings well before and well after the event showed little change. The study showed that WSR-88D and profiler data may be used to modify hodographs and to monitor storm-relative helicity.

5. Session 4—Lightning/Satellite/Radar Technology. Session Chair—Ron Holle, NOAA/NSSL

Don MacGorman (NOAA/NSSL) briefly reviewed earlier studies relating lightning to tornadoes before lightning network data became available. His paper entitled "Observations of Lightning in Tornadic Storms: A Review." described how cloud-to-ground (CG) flash rates often decrease early in the life cycles of mesocyclones and tornadoes in Oklahoma, then increase again later. In-cloud lightning increases during the storm. Models are being used to demonstrate how these factors interact.

David Knapp (Air Force/Global Weather Central) addressed "Operational Use of Lightning Detection Data as a Short Term Forecast Aid for Predicting Tornadic Thunderstorms." Knapp studied CG lightning relative to tornadoes from 1 hour before to 10 minutes after the tornado event. Of the storms that were dominated by positive flashes, all were observed on the Plains, and ⅓ occurred on 26–27 April, 1991. Negative flash—dominated storms were widely scattered east of the Continental Divide. The most specific signature was a positive flash peak, followed by a lull in activity, then a large increase in positive flashes as the tornado developed. Attempts to correlate flash features with location of the tor-

nado, echo height, and other features were generally not successful, but flashes appeared to be a good identifier of severe weather.

Randy Lascody (NOAA/NWS, WFO Melbourne) discussed "Relationship of Hail to Lightning Strokes in a Central Florida Thunderstorm." Lascody described a severe weather event which occurred on April 23, 1991. On that day, an apparent supercell near Melbourne produced large hail. Strong southerly flow occurred ahead of a cold front advancing from the northwest. There was a notable decrease in lightning stroke count about 20 minutes before the severe weather, and the flash map indicated that the storm turned to the right where it became severe. Such a storm, with strong vertical wind shear, occurs only every other year, on the average, over peninsula Florida.

Gary Ellrod (NOAA/NESDIS) described "Improved Techniques for Detecting and Analyzing Fog at Nighttime Using Goes-VAS Infrared Imagery." Ellrod's approach uses the difference between 3.9 and 11.2 micron channels to make an estimate of fog thickness and an assessment of how early the fog will break in the morning due to surface heating. At present, the application is limited by the single polar orbiter satellite pass at 0930 UTC.

Joe D'Aleo (WSI Corporation) reviewed "Weather Dependent Rainfall Estimation from Composite Radar." He applied the technique to the 100 different Z-R relationships that have been developed. Of these, the Marshall-Palmer is the most frequently used. Radars across the country were composited for a large number of cases; ground clutter and other false echoes were removed; then comparisons were made with gage rainfall. A single-site radar was found to be within a factor of 2, most of the time, with errors up to a factor of 5 at some times. The general data sample, however, showed that radar estimates averaged within 20% (an underestimate) for a 2-month period. This allows for reliable large-scale estimates of precipitation using radar data from the existing network.

6. Session 5—Case Studies of Significant Weather Events. Session Chair—Ed Carle, NOAA/NWS, WSFO Salt Lake City

Lance Bosart (State University of New York at Albany), the keynote speaker for the session, discussed "The Evolution of Tropical Storm Agnes into an Extra-tropical Cyclone" that produced copious amounts of rainfall. The key element to the discussion was that Agnes did not curve westward into Pennsylvania, as is suggested in much of the literature. Instead, the system died out as it moved into southeastern New York State and reformed inland along a strengthening baroclinic zone. The heaviest rains actually occurred in the surface northwesterly flow, as warm tropically-enhanced air wrapped around the developing surface low.

Ron Holmes (NOAA/NWS, WSFO Denver), presented results from his analysis of a March, 1991 snowstorm that affected parts of Colorado and New Mexico. Over three feet of snow fell in the Sangre de Cristo Mountains of southern Colorado. Using Mesoscale Analysis and Prediction (MAPS) software, he was able to use a suite of detailed, diagnostic grid point models to show the combination of surface convergence, modest 700-mb temperature advection, 500-mb vorticity advection, and a strong 300-mb jet streak that led to strong upward vertical motion in the affected region.

Larry Dunn (NOAA/NWS Western Region Headquarters) discussed a snowstorm that deposited heavy amounts of snow over a 36-hr period across the Denver area during Christmas 1987. In particular, he noted that the NCAR CP-2 radar indicated a banded structure to the precipitation, and that such bands are common in all major snowstorms. The radar's velocity patterns indicated "Evidence of Ascent in a Sloped Barrier Jet and an Associated Heavy Snow Band." The ascent in the jet was the proposed mechanism for the snow event.

Mike Conger (NOAA/NWS, WSFO Salt Lake City), presented a paper entitled "NGM Model Output Error and the Effect on Forecasting Great Basin Cyclogenesis: A Case Study." In showing an example of heavy rainfall that occurred on October 25–26, 1989, Conger showed how the NGM missed the presence of enhanced upper level jet streaks in northern Utah, and greatly underestimated the strength of the 700-mb temperature gradient. The combination of these NGM errors resulted in a forecast of only light precipitation in an area where significant rainfall actually occurred.

Sheldon Kusselson (NOAA/NESDIS) discussed "Using Instability Bursts to Forecast a Local Heavy Rain/Flood Event in Montana." He emphasized that instability bursts can be predicted if the forecaster closely follows stability parameters such as Theta-e, lifted index, and moistening and warming of the atmosphere, in combination with satellite signatures such as tropical and polar moisture plumes.

Mike Mogil (NOAA/NESDIS) discussed several cases where severe weather was noted across the Washington, DC and mid-Atlantic areas. Using satellite imagery, mesoscale surface analyses, and extensive upper air and sounding analyses, he compared the situations and highlighted similarities and differences between warm and cool season events. Cool season severe weather events tended to have lower tops, but still recorded other classical severe weather radar signatures (e.g., LEWPs, bow echoes). In particular, he noted that the presence of a comma-shaped cloud structure, regardless of its scale and season, was noted in all cases studied. The most significant severe weather (strong straight-line winds and some tornadoes) was found just ahead of the nose of the dry slot.

Gene Hafele (NWS/Johnson Space Flight Meteorology Group), explained the use of a Global Profile Archive to support Space Shuttle missions, mainly forecasts for overseas emergency landing sites. This archive contains gridded fields from NMC's Aviation Model (0000 UTC run only) for 12-hr periods out to 10 days for each sigma level in the model. Forecasts produced from these data include thermodynamic diagrams and meteograms for a variety of parameters. Hafele mentioned that the Spaceflight Meteorology Group has been moderately successful in producing tailored forecasts from these model data.

7. Session 6—Southwest Monsoon and Fire Weather. Session Chair—Brenda Graham, NOAA/NWS/WSFO Salt Lake City

The first three papers described different aspects of the SWAMP (Southwest Area Monsoon Project) research effort.

"Large-Scale Meteorological Conditions Associated with Precipitation Peaks in the Arizona Monsoon," was presented by **Ken Howard** (NOAA/NSSL). Howard described some of the logistical problems experienced by the researchers during SWAMP. Some of these involved daytime temperatures in excess of 110°F and strong dust storms. The "Monsoon Index" (MI) was described, and information gleaned from the SWAMP Project was compared with 30 years of climatol-

ogy. Four types of MI's were identified with implications for use for forecasting.

"Terrain Influences on Arizona Thunderstorms During the Summer Monsoon: A Case Study During SWAMP," was presented by **Jack Hales** (NOAA/NWS, NSSFC). This paper discussed and documented a case where initial conditions were not favorable for thunderstorm formation, yet storms developed anyway. A network of soundings and other observation data during SWAMP revealed that the diurnal windflow patterns allowed thunderstorm formation over high terrain in Central Arizona during the day.

Additional cooling aloft, surface heating, and an influx of moisture at lower levels allowed the storms to drift southwestward over the desert areas later in the day and during the evening.

"Diurnal Lightning Patterns in Arizona During the Summer Monsoon" was presented by **Andrew Watson** (NOAA/NSSL). This continued the previous presentation. Watson noted that the monsoon season was defined by high surface dew points (usually >55°F), and occurred, on the average, between July 8 and August 16. The geography of Arizona, particularly the Mogollon Rim which bisects the state from the northwest to the southeast, was discussed. Lightning data were studied on a daily, diurnal, and annual basis to try and understand potential causes for storm formation and movement. Results to date were found to be inconclusive, and not as useful for operational use as was hoped for.

Bernard Meisner (USDA/Forest Service) discussed "Extended Forecasts of Fire Weather Research at the Riverside Fire Lab." Meisner noted the ongoing need for extended forecasts by fire weather managers for staffing and planning. The Lab's forecasts were discussed, previous forecasts were verified, and plans described for future research activities.

"Meteorological Conditions and Unusual Nocturnal Fire Behavior: A Look at the 1990 Awbrey Hall Fire," was presented by **John Saltenberger** (NOAA/NWS, WSO Salem). In discussing the Awbrey Hall Fire, 1990, Saltenberger noted that dry antecedent conditions, combined with high daytime temperatures and low dew points, set the stage for a high fire danger. Although, the fire was spotted and fire crews were on the scene very early in the fire's life, it grew quickly and was out of control through the afternoon and evening. The fire died down and was able to be contained only after the Haines Fire Index showed that meteorological conditions became less favorable for fire formation and growth.

8. Session 7—NWS Modernization and Training. Session Chair—Larry Burch, NOAA/NWS/WRH

Jim Travers (NOAA/NWS Headquarters) began the session by discussing "NWS Products and Services During the Modernization." Area Weather Updates (AWU), Enhanced Terminal Forecasts (ETF), and restructured marine forecasts will rely heavily on the new data products provided by modernization's satellite, Doppler radar, profiler, and mesoscale observation network. The AWU will contain a concise description of the current local hydrometeorological conditions as well as a short-term forecast. The AWU statement will be valid for up to a 2-hour period (and possibly as long as 6 hours). The Central Region is currently producing AWU-like statements and the Eastern Region is interested in doing the same. The EFT, currently being tested at three NWS offices, provides 24-hour specific terminal forecasts in a more timely and reliable manner. Updated EFT's are issued as necessary in a highly detailed format.

Eli Jacks (NOAA/NWS Headquarters) detailed issues relating to "Training and Professional Development and the Modernization and Associated Restructuring of the NWS." The NWS-based program to address these issues attests to the recognized need for updating the knowledge and skills of NWS forecasters. It would permit forecasters to maintain currency in meteorology, become involved in operational research, and incorporate hydrometeorological and other new data sources into the forecast process. It would be accomplished through cross-training in all WFO tasks. Centralized training towards these goals will be provided by COMET, OSF, and the NWSTC. Probably the most ambitious training effort ever attempted by NWS, COMET will use multi-media resources as a cornerstone of the training process. There are concerns that sufficient funding and resources (including providing enough instructors) will not be available. The effectiveness of the program cannot be predicted, but allowance for modifications while in progress should ensure success.

Gene Auciello (NOAA/NWS Headquarters) followed with a presentation on "A Strategic Plan for Collaborative Research Between NWS Operational Offices and Universities." The plan emphasizes operational research involving the new and improved data sets provided by modernization. Research will be coordinated between universities and WFO's and RFC's by the Science and Operations Officer (SOO) and the Development and Operations Hydrologist (DOH), respectively. Specific local forecast and operational problems will be handled in Experimental Forecast Facilities (EFF) by operational, research, and academic meteorologists and will require intensive cooperative arrangements. This strategic plan should improve warnings and forecasts and allow for the assessment of the forecasting system and procedures themselves. An integral part of the EFF will be cooperation and/or collocation with universities and other research sites. Currently, EFF's are located in Denver, Norman, and Kansas City (NSSFC) with one proposed for FY93 at NMC. It is unclear at this time how training for these offices will be conducted and by whom.

Rich Wagoner (NOAA/FSL) provided insight to "The NWS Science and Operations Officer: A Bridge Between the Operational and Research Communities," by focusing on the philosophy and intent of the position. The SOO will serve as a "scientific conscience" for WFO's by providing staff training and by being a liaison for, and initiator of, operational research. He explained that the SOO is a necessary focal point in the modernized NWS so that new data sources and technologies may be rapidly assimilated into the work environment. The SOO position will allow for a greater percentage of science to make its way into NWS forecasts. The SOO will serve as program leader and mentor, but also perform administrative duties, work shifts, and handle other responsibilities. A "superman" of sorts, the SOO must also possess strong interpersonal skills. Recruitment of SOO personnel is in progress and several are currently being trained in a focused residence course at COMET.

Bill Bonner (UCAR/COMET) provided a "COMET Program Update." He emphasized how COMET was working to fulfill its mission of improving operational weather services through education and training, and through interaction between operational and academic meteorologists. Currently, the Residence and Outreach Programs are active with several universities and will provide for the initiation and development of partnerships between NWS and university leaders. The eight week COMAP Training Course for SOO's

is currently underway and is being offered as graduate level training. Concurrently, computer-based learning modules are being developed for use in on-station training. Future plans of COMET include development of a hydrometeorology course, a forecaster's research data library, and international contacts and activities.

Joe Kendall (NOAA/OSF) gave an overview of the key role of "Training WSR-88D Operators" during modernization. Major training tasks include mesoscale and stormscale meteorology, systems operations, and the operational use of algorithms, data and analysis products. Although class size is currently being minimized to ensure interaction between instructors and "students," future class sizes may be much larger. The training program is four weeks in length (160 course hours), half of which is lecture, and the other half of which is hands-on work and interactive computer-based training. The program objective is to train all forecasters, not just staff focal points in each WFO. There is a lack of regional case studies at this time, but this will improve as Archive II data become available from different parts of the country.

9. Session 8—Hydrology and Verification. Session Chair—Robert Tibi, NOAA/NWS/WRH

Dan Phillips (Salt River Project, Phoenix) reported on "Operations and Planning During Roosevelt Dam Modifications." Although the Salt River Project (SRP) handles multipurpose water reclamation efforts for the Greater Phoenix area, its six reservoirs were built during the first half of the century. Updated hydrometeorological studies completed within the past ten years indicated that the Roosevelt Dam could not contain or pass very large flood flows. It was decided to increase the height of the dam by 77 feet as part of a three year project. However, this could significantly impact the water supply in the Phoenix area as the SRP tries to balance flood control and water supply for drought periods. Extensive use of hydrometeorological monitoring systems over the watersheds and new medium to long-range forecasting tools will be employed during the construction phase. This will enhance decisionmaking until the dam has been rebuilt and water storage has returned to optimal levels.

Robert Davis (NOAA/NWS, WSFO Pittsburgh) presented a paper about the "Flash Flood Data Base for the 90's." Based on several years of experience using RADAP II data, WSFO Pittsburgh has developed a system for using radar rainfall estimates displayed on small stream basins to aid in the issuance of flash flood warnings. There are over 400 flash flood prone basins in western Pennsylvania. The Forecast Office has prepared extensive computer data bases for each of these. Data such as stream basin boundaries, stream basin areas, length of the stream, and slope of the stream and valley walls are readily available to the forecasters. Meteorological data, such as basin average rainfall and runoff, rainfall duration, and maximum basin rainfall are obtained from the RADAP. This system could be adapted for use on the WSR-88D, provided new ground truth comparisons are established.

Robert Jackson (NOAA/NWS, WSFO Seattle) provided "A Discussion of the November 1990 Flooding in Washington State." Jackson discussed antecedent conditions that led to the flooding. Although September was dry (8% of normal rainfall), October recorded almost twice normal rainfall. This set the stage for two events which accounted for all of November's flooding rains. Both November rains occurred with a broad flat ridge over the eastern Pacific with a jet axis (winds above 150 knots) over Washington. A series of fast-moving shortwaves impacted the area, each producing heavy rainfall. Although the storm rainfall fit the "once in twenty-five years" category, flooding was at the "100 year" level due to antecedent conditions. It was suggested that WSR-88D algorithms allow for longer period storm total precipitation to account for these types of events in the western United States.

"Forecasts of Rapidly Developing Cyclones in the NGM" was discussed by **Robert Oravec** (NOAA/NWS, NMC). Forecasts of rapidly developing cyclones within the NGM forecast domain were examined for the two cool seasons of December 1988–May 1989 and November 1989–May 1990. The results showed the following:

—the majority of rapidly developing cyclones tended to occur in the western Atlantic,
—the NGM is more likely to detect rapid cyclogenesis in the December–February period,
—the aviation model has a better probability of detection (POD) than the NGM at 36 hours, but is poorer at 48 hours,
—the NGM seems to predict rapidly developing cyclogenesis too far to the west of where it actually occurs, which could be tied to thickness forecast errors,
—the NGM rarely forecasts a rapidly developing cyclone to fill.

10. Poster Sessions and Demonstrations

In addition to the oral presentations, a large number of poster papers and several computer demonstrations with hydrometeorological applications were presented at the Meeting. Abstracts for these presentations were published in the May 1991 *Digest*.

POSTER SESSIONS

Daniel Berkowitz—NOAA/OSF—"Using the WSR-88D as a Convective Forecast Tool"

Edward K. Berry—NOAA/NWS/WSO Dodge City, KS "The Pratt/Stafford County, Kansas "Event of April 28, 1991 "Landspout" or "Tornado"

J. Brent Bower—NOAA/NWS/TDL—"Case Studies of New NGM MOS Guidance for Major Thunderstorm and Severe Weather Outbreaks in the Spring of 1991"

Larry E. Burch—NOAA/NWS/WR—"Forecasting Evapotranspiration in Central California"

R. B. Chadwick—NOAA/ERL/FSL—"The Wind Profiler Demonstration Network"

Les Colin—NOAA/NWS/WSFO Boise, ID—"Summer Convection Under an Upper Level Ridge"

Paul J. Croft—Rutgers University—"Temperature and Precipitation Prediction for Cranberry Bogs"

Paul F. Eyssautier—NOAA/NWS/WSFO Great Falls, MT—"Performance of NGM and Aviation Models in Predicting the Development of Spring Storms"

Peter Felsch—NOAA/NWS/WSO Santa Maria, CA—"Stratus Surge Prediction Along the Central California Coast"

Rodger R. Getz—NOAA/NWS/Southeast Agricultural Weather Service Center—"The Alabama Freeze Alert Program"

Brenda Graham—NOAA/NWS/WSFO Salt Lake City, UT—"Technology's Role in Fire Weather Field Operations"

John A. Hart—NOAA/NWS/WSFO Charleston, WV—"The Derecho Event of 9 April 1991"

John A. Jannuzzi—NOAA/NWS/WSFO Portland, OR—"An Examination of Big Change Temperature Events"

John M. Jarboe—NOAA/NWS/Training Center—"Some Limitations on the Use of Helicity as a Tornado Forecast Parameter"

Lee Kelley—NOAA/NWS/WSFO Anchorage, AK—"Cold Advection Mesoscale Winds at Kodiak, Alaska"

Dr. Gerald E. Klazura—NOAA/OSF—"Description of Winter Prediction Characteristics in the Upper Colorado River Basin"

Richard Leblang—NOAA/NWS/WSFO Bismarck, ND—"Two Applications of Historical NMC Gridded Data on CD-ROM"

Ray Lundy—Solus Systems, Inc.—"The Portland State University MetNet Project"

Steve Markkanen—NOAA/NWS/WSFO San Francisco, CA—"An Analysis of the California Deep Freeze of December 1990"

Dan McCarthy—NOAA/NSSFC—"Mesoscale Examination of Downburst Producing Thunderstorms Across South Central Kansas"

R. McQueen—NOAA/NWS/WSFO Denver, CO—"The DARE Workstation Up Close and Personal"

Dr. Donald H. Nyquist—Mississippi State University—"Origination of Continental Polar Air Masses in the Valleys of Southwest Montana"

Steven F. Piltz—NOAA/NWS/WSO Tulsa, OK—"The Northeastern Oklahoma Tornado Outbreak of 26 April 1991: An examination of Vertical Wind Profiler, NEXRAD, and Storm-Relative Helicity Data"

Ronald M. Reap—NOAA/NWS/TDL—"Lightning Strike Distributions Associated with Synoptic Map Types Over Florida"

Dr. Joseph T. Schaefer—NOAA/NWS/CR—"A Reanalysis of the Geographic Distribution of Severe Thunderstorm Reports and Warnings"

HARDWARE/SOFTWARE DEMONSTRATIONS

Barbara McGehan—NOAA/ERL/FSL—PC Workstation

Andy Morin—NOAA/CNRFC—ALERT/DATACOL Hydrometeorological Workstation

William Korotky—NOAA/NSSFC—The SHARP Workstation

Brian Heckman—UCAR/COMET—The COMET CBL Workstation

Richard Ochoa—NOAA/NWS/WSFO Boise, ID—Portable PC Forecast Workstation

Thomas J. Egger—NOAA/NWS/WSFO Boise, ID—HYDROTOOLS and Weather Tools