

Chronology for Forecast Systems Laboratory

- S Oct 1988 - The Forecast Systems Laboratory (FSL) was established in October of 1988 with the mission to transfer advances in science and technology to the nation's operational prediction services. It became one of the eleven labs that make up NOAA's Environmental Research Laboratories (ERL).

- S 1990 - There was a major effort within the laboratory to reorganize away from the pre-existing program structure to a truly integrated laboratory. Along with the new structure, laboratory personnel developed science and operating plans. The new organizational structure was approved by J.O. Fletcher, and was been implemented. FSL consisted of six divisions: Facility Division; Demonstration Division; Modernization Division; Systems Development Division; Aviation Division; and the Science Division.

- S 1990 - Mesoscale and Local Scale Analysis - The analysis and prediction program was addressed in two domains. The Mesoscale Analysis and Prediction System (MAPS) was for a 5000 km by 5000 km area centered around the 48 conterminous states, while the Local Analysis and Prediction System (LAPS) was for domains of 500 km by 500 km. In the MAPS effort, an isentropic coordinate model is used for four dimensional assimilation and short range forecast. During FY 1990, the basic MAPS system was installed at the National Meteorological Center (NMC) for use by the National Weather Service (NWS). Within FSL, the upper air analysis was run on a three-hour cycle, and was being extended to a one-hour cycle. The LAPS system was being used for high resolution atmospheric diagnosis, and is testing models for very short range prediction.

- S 1990 - DARE System - During FY 1990, the DARE system, which was originally developed and built by PROFS, continued to operate at the NWS Forecast Office (WSFO) in Denver. This system was used by NWS to prepare for its modernization in general, and the Automated Weather Interactive Processing System (AWIPS) in particular. The system integrated all types of weather data, and allows forecasters rapid and easy access. Within FSL, there was a major emphasis to use the DARE system to do short range forecasting. Major improvements to the system included a general ability to use gridded model data for high resolution isentropic analysis.

- S 1990 - Norman System - In FY 1990 an advanced system, similar to DARE, was developed which would subsequently be operated by the NWS in their Norman Forecast Office. The system was designed to receive its real time national data from Washington, and its local radar data from the NEXRAD system. Thus, it tested the data delivery systems which

were to be used in the modernized NWS as well as the new operational concepts related to the NWS field restructuring.

- S 1990 - Profiler Demonstration Network - The Profiler Program Office was in the process of installing a 30 station network of 405 MHz Profilers in the central United States. These systems provided accurate winds from the surface up to 18 km, and have recently been shown to provide excellent lower tropospheric temperature soundings when equipped with radio acoustic sounding system (RASS) units. The Profiler data was routinely transmitted to NWS and the research community.
- S 1990 - Forecasting Exercises - FSL initiated and participated in a number of weather forecasting exercises. These include the "shootouts," which compared artificial intelligence methods of short range forecasting, and the Winter Icing and Storm Project (WISP). FSL continued its daily weather discussion, and other activities leading toward an Experimental Forecast Facility.
- S 1990 - Aviation Gridded Forecast System - During FY 1990, a plan was formulated to develop high resolution predictions of atmospheric primary variables, such as momentum, mass, and moisture, and to convert these to aviation fields, such as ceiling, visibility, icing, and turbulence.
- S 1990 - UNIX Workstation - FSL developed a meteorological workstation for use on personal computers (PCs). The system used the UNIX operating system, and provided many of the functions found in the DARE system, such as an advanced user interface and high resolution displays.
- S 1990 - FSL continued to generate interest from other federal agencies, educational institutions, private industry, the media, and the general public. FSL's Visitor and Information Service Office arranged visits for over 1200 visitors during FY 1990. Foreign visitors included scientists from as far as the USSR, China, South Africa, and many European nations, and as near as Canada.
- S January 1991 - The pre-AWIPS system was installed in Norman, Oklahoma in January 1991. The staff at Norman was trained on the workstations and began using them in March to perform their forecast duties. An interface to the WSR-88D Doppler radar was also developed and tested.
- S January 1991 - In January 1991, the spatial resolution of MAPS was increased from 80 km in the horizontal and 18 levels in the vertical, to 60 km in the horizontal and 25 levels in the vertical. MAPS began to provide six-hour forecasts.
- S 1991 - The Denver AWIPS Risk Reduction and Requirements Evaluation (DARE-II) Project continued to support all forecasting and warning functions at the Denver WSFO. The existing system was upgraded to

provide a third workstation with the capability for animation and fast image loading.

- S 1991 - Beginning in July 1991, MAPS began to incorporate aircraft data from United Parcel Service. This markedly increased the number of Aeronautical Radio, Incorporated [ARINC] Communications Addressing and Reporting System (ACARS) reports received at night.
- S 1991 - An expert system to provide forecast guidance for the prediction of severe downslope winds was completed and installed at the Denver National Weather Service Forecast Office (NWSFO). The system was used operationally at Denver during the 1990-1991 windstorm season.
- S 1991 - The Local Analysis and Prediction System (LAPS) was used during a convection forecasting experiment called Zcast-91 to quantify the improvement in forecasts of radar reflectivity. Output from several models was used to develop three-dimensional visualizations on Stardent computers.
- S 1991 - The AI Project conducted Shootout-91, a comparison of systems that forecast severe weather. The experiment built on a similar exercise held in 1989 and was a joint venture of NOAA's Forecast Systems laboratory (FSL), National Severe Storms Laboratory (NSSL), National Environmental Satellite and Data Information Service (NESDIS), and National Weather Service (NWS).
- S 1991 - Twenty production profilers were installed and began operating during the fiscal year. This brought the total in the network up to 24 out of the planned 30. Real-time hourly data from 22 of the profilers was sent to the NWS for distribution to forecasters and was found to be extremely useful. The data was also sent to Unidata for distribution to universities and researchers.
- S 1991 - FSL initiated and participated in a number of weather forecasting exercises. These include the "shootouts", which compared artificial intelligence methods of short range forecasting, Zcast-91 and Stormscale Operational and Research Meteorology Fronts Experiments Systems Test (STORM-FEST), a multiagency field project. FSL continues its daily weather discussion, and other activities leading toward an Experimental Forecast Facility (EFF).
- S 1991 - The Joint Forecast System Project between the Central Weather Bureau (CW&) of Taiwan and FSL/NOAA became official after the formal cooperative agreement between FSL and CWB was approved in June 1990. This agreement provides a framework through which FSL/NOAA can provide:
 - technical expertise;
 - training and scientific exchange activities to CWB in areas of mutual meteorological interest;
 - forecast systems development.

- S 1991 - Towards the end of FY1991, a major transition effort was initiated. The goal of this overall effort is to change the FSL Central Computer Facility from the proprietary DEC VAX/VMS environment to Open Systems based on Portable Operating System Interface for Computer Environments (POSIX) and other existing and evolving standards.
 - S 1991 - Thin-wire Ethernet cabling was installed on the second, third, and fifth floors of RL-3, while a twisted-wire Ethernet was successfully implemented in the basement of RL-3. These extensions of the network ensured that all FSL offices now have network access.
 - S 1991 - A 1.54 Megabit per second (Mbps) TI link was installed to the Internet backbone at the National Center for Atmospheric Research (NCAR) Mesa Laboratory. This enhances FSL's access to the NSFnet/Internet wide-area-network. The new link is in addition to FSL's Ethernet connection to the University of Colorado for alternate Internet access. Also, the network interconnect between RL-3 and Park Place was upgraded to a TI link.
 - S 1991 - The facility was upgraded with a Digital Equipment Corporation (DEC) dual-processor VAX 6000 Model 520 (2 x 13 million instructions per second [MIPS]) vector computer. A new DEC SA800 12-gigabyte (GB) storage array was installed on the Central Facility VAXcluster. Four 5-GB 8-mm cassette tape drives were installed on the VAXcluster.
 - S 1991 - FSL's Visitor and Information Services Office arranged visits for over 1200 visitors during FY1991. Foreign visitors included scientists from China, Australia, Taiwan, France, United Kingdom, Brazil, Nigeria, Switzerland, New Zealand, Hungary, and Italy. The Visitor and Information Services Office also arranged or helped with many conferences and meetings. Numerous presentations were made to area schools and community groups in Colorado, impacting 700- 800 students and adults.
- March 1992 - LAPS and the participation of FRG meteorologists were important elements during the Stormscale Operational and Research Meteorology-Fronts Experiment Systems Test (STORMFEST), conducted from 1 February through 15 March 1992. STORMFEST gathered data to investigate and better understand the growth and patterns of fronts and precipitation of winter weather. The full suite of LAPS' products was generated for the STORMFEST domain, demonstrating the ability of LAPS to run in areas outside Colorado.
- S June 1992 - The RUC began running a continuous 3-h cycle at NMC in June 1992. FSL and NMC began evaluating the grids from the RUC.
 - S 1992 - A study of the effect of wind pro filer data on short-range forecasts was completed. Running parallel cycles of MAPS with and without pro filer data showed that the profiler data had a relatively small but consistently positive statistical effect on forecasts of winds and heights.

The effect was more pronounced when active weather systems passed through the Wind Profiler Demonstration Network (WPDN).

- S 1992
 - Data from Shootout-91 were analyzed. Shootout-91 was an AI (artificial intelligence) exercise which compared systems that forecast severe weather. Three artificial intelligence systems, a system based on a numerical data assimilation model, and teams of human forecasters made daily forecasts of severe and significant weather for Oklahoma and northeastern Colorado. Oklahoma forecaster teams generally did better than either Boulder forecasters (who worked individually) or the expert systems in forecasting spring weather in Oklahoma.

- S 1992
 - The LAPS suite of gridded analyses was improved and continues to be available on FSL's Denver AWIPS Risk Reduction and Requirements Evaluation (DARE) workstation. The complete surface analysis package is available to the Denver NWSFO.

- S 1992
 - The use of LAPS and the participation of FRG meteorologists were important elements during the Stormscale Operational and Research Meteorology-Fronts Experiment Systems Test (STORMFEST), conducted from 1 February through 15 March 1992. STORM-FEST gathered data to investigate and better understand the growth and patterns of fronts and precipitation of winter weather. The full suite of LAPS' products was generated for the STORM-FEST domain, demonstrating the ability of LAPS to run in areas outside Colorado.

- S 1992
 - In cooperation with the Massachusetts Institute of Technology (MIT), FRG implemented LAPS on a UNIX-based platform, a LAPS version referred to as Terminal LAPS (T-LAPS). T-LAPS, which demonstrated the portability of LAPS code, uses a nested grid system to provide enhanced wind analyses for a typical airport control tower region of responsibility. T-LAPS was operational during the summer of 1992; this was the first time that data from the Weather Surveillance Radar (WSR88D) and the Federal Aviation Administration (FAA) terminal Doppler weather radar were combined and used outside those systems.

- S 1992
 - Acquisition of IBM RISC 6000 systems allowed real-time forecasting on a routine basis. LAPS analyses at 10-km resolution were used to initialize the Colorado State University Regional Atmospheric Modeling System (CSU-RAMS) for several winter and summer cases. Results from these runs demonstrate that fine-scale features that significantly modulate intense weather events (winds and snow) can be resolved and could be used to enhance local forecasts. Three-dimensional visualization of LAPS analyses and RAMS forecasts using the Advanced Visualization System on Stardent computers demonstrated the immense potential of super-minicomputers for running numerical models and viewing their output.

- S 1992 - Effort began to convert the facility and its users from proprietary Digital Equipment Corporation VAX/VMS computers to open systems.

- S 1992 - All 30 wind profilers that were installed by contractors were accepted, along with their required communication links. Data from 29 production wind profilers and one prototype were routinely being sent to the NWS Telecommunications Gateway for distribution to forecast offices, the private meteorological community through the NWS Family of Services, Unidata for distribution to university and other research users, Global Telecommunication System for distribution to international users, and NCDC for permanent archiving. A transition plan for the WPDN from a demonstration network to a network managed by NWS was developed, at the request of the DOC, and submitted for approval.

- S 1992 - Profiler data, available at a 91 % rate during the 6-week period, was provided to STORM-FEST.

- S 1992 - The PC workstation software was ported to a new UNIX operating system.

- S 1992 - An interface to the first WSR-88D Doppler radar was installed at Norman. This interface integrates local radar data into the pre-AWIPS workstations. It also provides all the control functions needed to interact with the WSR -88D Radar Product Generator. A second WSR -8 8D radar was connected to this interface during the latter part of the year, providing radar coverage over the entire area of responsibility.

- S 1992 - The data acquisition for the ISPAN central feed of satellite data was completed with the addition of large-scale satellite imagery.

- S May 1993 - In May 1993 the NWS redirected support work from the DARE-IT to the development of the new FX-ALPHA. After this date only essential upgrades were made to the existing DARE-IT systems. All new development, including those products developed but not yet installed in DARE, were incorporated into the FX - ALPHA.

- S 1993 - The first version of the general user emergency management dissemination system was designed, built and installed in the Boulder Emergency Management Center, and five months later an improved model replaced the first. The meteorological information displayed on the system was studied and assessed for its potential use. These studies were done by researchers from Colorado State University as well as City of Boulder and Boulder County users.

- S 1993 - A major upgrade to MAPS, the largest since 1991, was implemented this year. This upgrade included a modified vertical coordinate (the hybrid-b system), the introduction of surface fluxes and an initialization scheme into the forecast model. The new vertical coordinate gave much higher resolution near the ground, but improved forecasts at all levels. The addition of realistic surface fluxes of heat and moisture

(including the effects of parameterized clouds) improved both forecasts and high-frequency analyses, especially in the lower troposphere. The dynamic initialization scheme reduced noise during the first few hours of MAPS forecasts.

- S 1993 - The new hybrid-b version of MAPS was transferred to the National Meteorological Center for final pre-implementation testing as the Rapid Update Cycle.
- S 1993 - Analyses and forecasts from MAPS have been used in a variety of projects associated with FSL's Aviation Division, including products for the Aviation Gridded Forecast System and the Advanced Traffic Management System, and experimental analyses and forecasts for the Aviation Forecast Verification Program. MAPS participation in the verification program has included rerunning a number of cases from the February-March 1992 Stormscale Operational and Research Meteorology Fronts Experiment Systems Test (STORM-FEST) special observing program using the hybrid-b version of MAPS.
- S 1993 - The CSU-RAMS model ran once a day, producing a 12-hour forecast that began in the morning and ended about sundown. The model forecasts were presented at the daily weather briefings in the FSL Forecast Center.
- S 1993 - A complete version of LAPS was ported to the University of Oklahoma to support the Verification of Tornadoes Experiment (VORTEX) for 1994 and 1995.
- S 1993 - The division expended a major effort in support of the continuing FSL transition toward Open Systems computing that began in Fiscal Year 1992. The objective was to migrate the FSL computer facility and its users from proprietary Digital Equipment Corporation VAX/VMS computers to Open Systems. The facility comprised more than 200 computers ranging from micros and minis to a supercomputer-class Massively Parallel Processor (MPP), mass-storage devices, data-ingest interfaces, local area networks, external communications links, and display devices. During the year, over 10% of the VAX processors were decommissioned, and replaced with UNIX workstations and servers. A major upgrade of the network was accomplished by implementing high-speed [100 megabit per second (Mbps)] Fiber-Distributed Data Interface (FODI) backbone.
- S 1993 - The PC workstation was installed in the Longmont, Colorado, Air Route Traffic Control Center (ARTCC) to test the Aviation Gridded Forecast System concepts. A significant accomplishment was the development of a high bandwidth, real-time data interface between the PC and the NIMB US data distribution system. This interface provides routine distribution of real-time meteorological data from FSL to the workstation over a 1.5 MHz (TI) communications link. The PC workstation configuration, consisting of a Sun 670 server and 80486

PC running UNIX SVR4, was installed at the COMET training facility in Boulder.

- S 1993 - The initial phases of FSL's X-window (FX) workstation development were completed.
- S 1993 - A functional prototype of the AGFS workstation was implemented at the Center Weather Service Unit (CWSU) at the Denver Air Route Traffic Control Center. A large suite of weather products and observations were integrated on this workstation. In addition to traditional weather products, CWSU meteorologists use the experimental AGFS workstation to access observations such as Doppler radar, wind profilers, and a mesoscale-surface observing-network. National-domain analyses and forecasts generated by MAPS were also accessible as well as hourly upper-air analyses generated by LAPS.
- S 1993 - The Nearest Neighbor Tool (NNT) was developed. The NNT significantly advanced the ability to develop parallel finite-difference weather models. The NNT also provides source code portability between a large subset of existing MPPs and networked workstations through the use of a portable communications and input/output layer to the target machines.
- S 1993 - An era came to a close as the DARE-II system at the Denver WSFO was connected to the WSR-88D, the operational Doppler radar. For more than 10 years, data from research radars provided vital support to NWS operations at Denver, particularly severe weather warnings; the new operational Doppler radar will continue this support.
- S Aug 1994 - The National Weather Service and the Office of Oceanic and Atmospheric Research were engaged in the design, deployment, and assessment of the WPDN since 1987. The Wind Profiler Assessment Report and Recommendations/or Future Use, 1987-1994 was published in August 1994. The meteorological assessment demonstrated that wind profiler data lead to significant positive benefits to a broad spectrum of NWS forecasts and warnings.
- S Sept 1994 - A major milestone occurred on 27 September 1994 when RUC went into official production at NMC. FSL and NMC collaborated in the testing, evaluation, and implementation of RUC. An independent evaluation by NMC showed that RUC is achieving its goal of producing accurate analyses and short-range forecasts at a high frequency.
- S 1994 - Testing has started for the next version of RUC. This version, RUC- II, includes higher vertical, horizontal, and temporal resolution and improved physics parameterizations. It had 40-km resolution with 40 levels running on a 1-hour update cycle with cloud microphysics, atmospheric radiation, and a multilevel soil model in the forecast module.

- S 1994 - A great deal of effort went into porting LAPS to new locations and providing support to the users. Off-site installations included Seattle, Washington; Atlanta, Georgia; and Norman, Oklahoma. The platforms included Sun, IBM, HP, and Cray. A complete version of LAPS was ported to the University of Oklahoma to support the Verification of Tornadoes Experiment (VORTEX) for 1994 and 1995.
- S 1994 - An assessment of the Mark-IVB satellite data system and associated software was completed. Mark-IVB was an advanced meteorological workstation developed by Lockheed Corporation to be used primarily by the U.S. Air Force. It ingested, stored, processed, and displayed various satellite data, such as GOES and TIROS. In a 6-month qualitative evaluation of the Mark-IV analyses, Mark-IV was compared with MAPS using the DARE II workstation. The results showed good agreement for temperature and height but only marginal agreement for wind.
- S 1994 - The FSL 100 megabits per second (Mbps) Fiber-Distributed Data Interface (FDDI) backbone ring was completed. The resultant "ring-of-trees" network consists of six FSL division 10- Mbps Ethernet subnet trees connected to the FDDI backbone ring.
- S 1994 - The Demonstration Division continued to operate and maintain the WPDN and supply upper-air and surface data to a wide range of users. All 32 profiler sites operated and routinely sent data to the Profiler Control Center (PCC) in Boulder. The hourly-averaged profiles were sent to the NWS Telecommunications Gateway (NWSTG) for distribution to the regional NWS AFOS circuits and the National Meteorological Center. The datasets continued to be available to 135 universities, the private sector subscribers, the government research community, and the World Meteorological Organization (WMO) community. All six-minute and hourly-averaged profiler data were archived by the National Climatic Data Center. Users received hourly wind data at a rate of 88.3% averaged over all sites, communications at a rate of 98.3%, and the hub computer availability at a rate of 96.9%.
- S 1994 - A version of MAPS became operational at the National Centers for Environmental Prediction (NCEP) as the Rapid Update Cycle (RUC). The RUC has a unique role within the National Weather Service (NWS) in that it is the only operational system that provides updated national-scale numerical analyses and forecasts at less than a 12-hour frequency.
- S 1995 - A version of the Rapid Update Cycle with 40-km horizontal grid spacing and 40 levels in the vertical, was developed and preliminary testing began in real time. Concurrent with development of the 40-km MAPS/RUC, initial tests were made of a 1-hour assimilation cycle for MAPS, with a new analysis being produced every hour based on the latest data and the previous 1-hour forecast.

- S 1995 - The LAPS analysis and prediction was integrated into the WFO-Advanced workstation. Each of LAPS twice-daily runs on the WFO-Advanced workstation produced a prediction out to 18 hours.
- S 1995 - Researchers completed the first year of an Environmental Science Data Integration and Management (ESDIM) project to prepare the full period of Hourly Precipitation Data (HPD) observations (about 50 years) for inclusion on a Hydrology CD-ROM set.
- S 1995 - The Facility Division (FD) managed the computers, communications networks, and associated peripherals that FSL staff use to accomplish their research and systems-development mission. The FSL Central Facility comprises 51 computers ranging from micros and minis to a supercomputer-class Intel Paragon Massively Parallel Processor (MPP), mass-storage devices, data-ingest interfaces, local-area networks, external communications links, and display devices. An additional 556 Internet Protocol (IP)-capable hosts serve the other five FSL divisions and the International Program.
- S 1995 - FD network management staff continued to upgrade and expand the FSL network and its connection to the outside world via the Internet. In addition to the 262 UNIX and 18 VAX/VMS computers, there were 120 PCs and 27 Macintoshes on the FSL network. The FSL main 100 megabits per second (Mbps) Fiber-Distributed Data Interface (FDDI) ring was upgraded with the installation of an Optical Data System (ODS).
- S 1995 - Demonstration Division staff continued to operate and maintain the NOAA Profiler Network (NPN) and supply upper-air and surface data to a wide range of users. All 32 profiler sites are operating and routinely sending data to the Profiler Control Center (PCC) in Boulder. The data from each site are transmitted to the Profiler Hub computer system, within the PCC, for processing and quality control. The hourly-averaged profiles are then sent to the NWS Telecommunications Gateway (NWSTG) for distribution to the regional NWS AFOS circuits and NCEP. The datasets continue to be available to about 130 universities, the private sector subscribers, the government research community, and the World Meteorological Organization (WMO) community. All six-minute and hourly-averaged profiler data were archived by the National Climatic Data Center.
- S 1995 - Development of the Aviation Weather Network (AWN) was completed and underwent real-time testing for the Advanced Traffic Management System (ATMS). The AWN consists of data ingest and product generation subsystems that produce real-time imagery, graphics, and textual weather information which are critical to aviation.
- S 1995 - The WFO-Advanced two-dimensional display system (D2D) was developed into a system nearly capable of supporting NWS field operations during the course of this fiscal year. The D2D supported a

real-time exercise from August 1-24, with forecasters participating from FSL, Denver, and Norman.

- S Sept 1995 - For the first time, an end-to-end the AWIPS Forecast Preparation System (AFPS) was demonstrated at the AFPS Forecaster Working Group (AFWG) meeting in September. Starting with first-guess forecast grids based on the Model Output Statistics (provided by the Techniques Development Laboratory), Rapid Update Cycle, and Nested Grid Model, AFWG members prepared zone forecasts using the TDL Interactive Computer Worded Forecast (ICWF) text generators.
- S 1995 - Two major AWIPS Enhancement Research (AER) reports were written this year, focusing on refinements to the AWIPS design that would reduce program risks by better utilizing advanced technology. An AWIPS Technology Analysis was prepared, providing a thorough examination of how available technology can be most effectively utilized within the AWIPS program. And a document offering suggestions regarding a viable AWIPS User Model was created for the purpose of assisting the AWIPS Graphical User Interface (GUI) design team.
- S 1995 - The International Project was elevated to Program status, making it the equivalent of a division within FSL
- S 1995 - By the end of the fiscal year, 2100 schools were registered for the GLOBE Program. Version 1 of the GLOBE software for both the World Wide Web (WWW) site and PC workstations was finalized and released. The CD-ROM GLOBE software was made available to schools that have high-end PC workstations.
- S Aug (?)1996 - The LAPS team worked with the Peachtree City Weather Forecast Office staff and the IBM Corporation to install the first true operational application of LAPS for ingesting standard and supplemental surface observations, plus the data from wind profilers installed specifically for the Olympics held in Atlanta, Georgia, in 1996.
- S 1997 - A new version of the RUC, RUC-2, was transferred to NCEP during Fiscal Year 1997 and was scheduled for operational implementation at NCEP in early Fiscal Year 1998. The RUC-2 was the 40-km version of MAPS, developed and extensively tested at FSL, which produced new three-dimensional analyses and short-range forecasts every hour (compared to every 3 hours in RUC-1). This new version was a significant advance over RUC-1, not just in assimilation frequency, but also in resolution, types of data assimilated, and model physics. These changes allowed the RUC-2 to more accurately represent significant weather systems across the United States in all seasons.
- S 1997 - The LAPS package was incorporated as an integral element of the WFO- Advanced workstation. LAPS was successfully ported to the

AWIPS contractor in Build 4.1. It ran as an application within AWIPS and allowed a variety of gridded fields to be combined with satellite imagery and radar on state and local scale displays. The LAPS in AWIPS serves the LDAD system operating outside the AWIPS network.

- S Jan (?)1997 - The AWIPS Build 3.0 (prerelease) workstation software was demonstrated at the AMS 13th Interactive Information and Processing Systems Conference held in Long Beach, California. The software was executed on a K200 data server and two J200 dual display workstations. A T1 communications link to a Satellite Broadcast Network (SBN) acquisition system at FSL provided the real-time synoptic data for the workstation. In addition to the T1 link, the system received real-time radar data from the Oxnard, California, radar site over a dedicated 9.6 Kb/s line.
- S 1997 - Version 1 of the Real Time Verification System (RTVS) was completed and implemented in the NWS Aviation Weather Center (AWC) Experimental Forecast Facility. This version included the capability to assess the quality of AIRMETs (for icing, turbulence, and IFR conditions) and AIV (aviation impact variables) algorithms (for icing and turbulence conditions). Voice pilot reports and surface observations were used as verifying observations.
- S May 1997 - The DARE system at Denver was removed in May marking the end of nearly 8 years of service. The system lasted twice as long as its planned lifetime, and even more remarkable is that very little maintenance was required during the last 4 years.
- S 1998 - GLOBE includes 6500 participating schools from 80 countries, 10,000 GLOBE-trained teachers, and two million observations in its data archive. As a leader in the GLOBE program since its inception five years ago, FSL worked with GLOBE management in Washington in sponsoring science education workshops, developing curricula, and training teachers (K-12). FSL developed the first GLOBE workstation and data processing center, and continued using advanced features to enhance the data center and the GLOBE Website.
- S Mar 1998 (?) - Five NOAA research laboratories including FSL and the Denver Weather Forecast Office moved into the David Skaggs Research Center (DSRC) at the 325 Broadway Department of Commerce site.
- S April 1998 - 40-kilometer RUC-2 at NCEP was implemented operationally at NCEP
S on 6 April 1998.
- S 1998 - At the U.S. Air Force Weather Agency (AFWA), FSL implemented analysis and prediction capabilities to support operations in 10 global theaters. The work involved making LAPS relocatable and resizable "on the fly," robust with respect to varying data densities, and connectible to the MM5 Version 11 parallel model.

- S 1998 - FSL upgraded the FSL network backbone to the high-speed Asynchronous Transfer Mode (ATM) technology. The new switched (not shared) ATM network backbone provided an order-of-magnitude improvement from the previous shared 100 megabits per second (Mbps) Fiber-Distributed Data Interface (FDDI) ring.

- S 1998 - The WFO-Advanced Local Data Acquisition and Dissemination (LDAD) became an integral part of AWIPS. LDAD provided NWS forecasters nationwide access to detailed local mesoscale observations that enhance federal observing systems. By integrating local and federal observations together, forecasters could closely examine local weather conditions to produce more detailed regional weather forecasts.

- S 1998 - AWIPS 4.0 proceeded through a series of test steps leading to its deployment in the middle of the fiscal year. The changes included a revised inter-process communications, revised user interface, and the Local Analysis and Prediction System (LAPS).

- S Sept 1999 - The Alaska 449-MHz Profiler Network became operational and was turned over to NWS. The three Alaska profiler sites were at Talkeetna, Glennallen, and Central. The sites were equipped with GPS precipitable water vapor systems, surface meteorological sensors, as well as FTS-2000 data communications.

- S Dec 1999 - The Massively Parallel Processor (MPP) was installed. This system, which was built by HPTi Corporation and named Jet, was installed in December, and announced in a press conference on 26 April 2000. The initial machine, HPTi ACL/256, consisted of a 277-node Alpha-Linux cluster using 667-MHz Compaq processors, a Myricom Myrinet interconnection network, a 100 Terabyte Mass Storage System, and a 600-Gigabyte Storage Area Network. An upgrade to the compute portion of the system later this year will more than double the compute capacity. Upgrades over the next two years will increase the system's current compute power more than eight times. The Mass Storage will be upgraded to 200 Terabytes and the Storage Area Network to 2 Terabytes. When fully configured it will consist of over 1,500 processors with a peak speed of over 5 trillion arithmetic calculations per second. It brings FSL into the ranks of NOAA supercomputing, and will allow rapid advances in a number of areas. These include the development of very high-resolution mesoscale models. Since it will be running at resolutions as small as a kilometer, the availability of the HPTi supercomputer will be crucial to FSL's role in the development and testing of WRF. A second very important use for Jet will be in testing future observing systems. Finally, FSL will be participating, along with NASA, NOAA NCEP, and NOAA NESDIS, in an effort to develop and improve techniques for better use of satellite data in numerical weather prediction.

- S 1999 - With the move to the DSRC, the FSL network advanced from primarily shared 10-Mbps Ethernet desktop connectivity to switched (non-shared) 10- and 100-Mbps connectivity. This network was augmented by two new 10-Gigabit per second (Gbps) ATM switches.

- S 1999 - The RUC/MAPS group started a project with the National Renewable Energy Laboratory for using wind forecasts from RUC to produce experimental forecasts of the potential for wind power generation. The high vertical resolution of the RUC near the surface and high accuracy of surface winds made the RUC a good source of model guidance for this problem.

- S 1999 - LAPS was successfully ported to the AWIPS contractor in build 5.0. Thus the LAPS package was incorporated as an integral element of the WFO-Advanced workstation. It ran as an application within AWIPS and allowed a variety of gridded fields to be combined with satellite imagery and radar on state- and local-scale displays.

- 1999 - In conjunction with the Forecast Research Division, the Facility Division implemented RUC-2 model backup capability for NCEP, where it resides as part of the suite of operational weather models run by NWS.

- 1999 - The Operations staff supported the real-time Central Facility for 16 hours a day, seven days a week.

- S 1999 - In support of the FSL user community, the Facility Division operators answered routine facility, data, and systems-related questions, and performed the following specific tasks: (1) oversaw the daily laboratory-wide computer system backups amounting to 400 GB of data, (2) serviced approximately 60 user requests for data compilations, file restoration, and account management, (3) created a Web database of more than 60 pages documenting the procedures for maintaining the Central Facility real-time datasets, (4) performed an FSL-wide inventory of over 400 hardware components for the database project, and (5) assisted in facilitating approximately 30 video teleconferences.

- S 1999 - FSL accommodated more than 732 visitors, not including visits arranged directly with FSL staff. Usually the "educators and students" category constitute the largest number of visitors, but last year the "general public" category led with 261 visitors; trailing slightly was "government visitors" at 249. There were 113 educators and their students, 49 foreign visitors, 60 visitors from the private sector, and 49 foreign visitors, including representatives from China, Australia, Taiwan, Canada, United Kingdom, Hungary, and Korea. (The number of visitors last year decreased substantially from the years before as a result of disruption to normal operations during the relocation of FSL.)

- S 1999 - The first operational version of FX-Net was completed. An initial version of this system was installed for evaluation by the Meteorology

Department at Plymouth State College, New Hampshire. Professors there were able to test the system for use in a new teaching laboratory being built in support of the New England Climate Initiative. Additional development of FX-Net yielded a system that is successfully being used in the undergraduate curriculum at Plymouth State College .

- s Oct 1999 - The Alaska 449-MHz Profiler Network became operational in October 1999, and has recorded data availability to the NWS of over 90% since June 2000, and over 98% since August 2000.
- s 2000 - A PC/Linux version of the AWIPS workstation was developed and demonstrated.
- s 2000 - The Rapid Update Cycle (RUC) model was ported from 40-km resolution to 20-km resolution.
- s 2000 - Jet supercomputer was upgraded from 270 processors to 540 processors.
- s Mar 2000 - A special RUC assimilation cycle was run January-March 2001 in support of the PACJET experiment, a field experiment investigating intense low-level wind and precipitation patterns in vigorous U. S. West Coast winter storms. The RUC cycle featured a domain extending west to as far as 148°W, forecasts out to 36 hours every 6 hours, a 10-km nested grid with forecasts out to 24 hours, and assimilation of experimental GOES rapid-scan (GWINDEX) cloud-drift winds. The RUC forecasts showed very good accuracy, pronounced local orographic effects, and were used as part of the forecast guidance for planning flight missions in the NOAA P-3 research aircraft.
- s Mar 2000 - The DTF3 and DTF5 turbulence algorithms were evaluated during the Turbulence Intercomparison Experiment conducted from 16 January – 31 March 2000.
- s May 2000 - Flight tests were performed in December, April and May with the PII-LF (4.6-m diameter) and PII (4.9-m diameter) balloons. In the May test, the balloon descended on its hemispherical shell while achieving an appropriate descent speed of 3.5 — 4.0 ms⁻¹. The May flight test also validated the FSL instrument package in the air.
- s 2000 - To implement the transition of the Alaska profilers to the NWS, a Memorandum of Agreement was signed by NWS headquarters, the NWS Alaska region, and the Office of Oceanic and Atmospheric Research/FSL for the implementation, support, maintenance, and operation of the profilers.

- s 2000 - The initial "alpha" version of MADIS was completed and tested by FSL users.
- s 2000 - NWS commissioned the AWIPS system nationwide and decommissioned the AFOS (Automation of Field Operations and Services) system.
- s 2000 - The first in a series of software deliveries for AWIPS build 5 was completed. This version provides unique localizations to meet the needs of the NWS National Centers for Environmental Prediction (NCEP), which deal with a much larger area of responsibility and issue an entirely different set of products than is required at the local weather offices.
- s 2000 - The GLOBE Program grew from 500 U.S. schools in 1995 to more than 10,000 participating GLOBE schools located in 97 partner countries in 2000.
- s 2000 - In support of CWB's new supercomputer and related high-performance computer activities, FSL used the SMS tool to parallelize CWB's typhoon model, the Typhoon Forecast System (TFS).
- s Sept 2000 - An operational version 2.0 of FX-Net released in September 2000. Risk reduction studies and the design of a robust operational server and client version were part of this development.
- s Nov 2000 - FX-Net was selected as the official forecaster workstation to support weather forecasting at the 2002 Winter Olympics outdoor venues in Salt Lake City. In this scenario, the FX-Net server is located at the NWS Western Region headquarters in Salt Lake City. Forecasting offices at each of the five Winter Olympics outdoor venues will be equipped with FX-Net PC clients. With strong support from the NWS staff, an FX-Net server was installed at the Western Region headquarters. High-speed communication lines were installed to connect the server with the outdoor venues' forecasting offices. FX-Net was successful in its debut at several pre-Olympics trials held in November 2000.
- s 2000 - During FY 2000, the Visitor Program office accommodated at least 2,323 visitors, not including visits arranged directly with FSL staff outside this office. The largest category of visitors came from academia, educators, and students, numbering 1,039. Other visitors included 603 from the general public, 543 from government, 76 from

the private sector, and 62 from foreign countries, including Australia, Denmark, Hungary, Indonesia, Israel, Japan, Korea, and Taiwan.

- s May 2001 - Major milestones were met with the completion of FX-Net version 3.0, released in May 2001, and with version 3.1beta, completed in November 2001. Version 3.0 presented a new direction for the FX-Net: instead of a specific WFO localization, FX-Net focused on a non-localized national display which included the 120+ WSR-88D radar sites located in the lower 48 states.

- s 2001 - The Facility Division was reorganized and renamed the Information and Technology Services.

- s 2001 - The FSL High-Performance Computing System (HPCS) underwent several upgrades last year, including an interim addition of a 280 compute processor platform. Additional storage was made available to the user community, with the total available storage now about 2.4 TB. A 12-TB storage system obtained from the Bureau of Census is being designed for the HPCS.

- s 2001 - The FSL local area network (LAN) underwent a significant. Four Marconi Communications 20-Gigabit ESX-3000 ATM/Ethernet Campus Switches were installed to improve management of the distributed ATM LAN Emulation services that underpin the FSL network core, an extension of the dual ATM OC-12 (2 x 622 Mbps) links from the core to the edge, provision for additional ATM and Ethernet port capacity, and a four-fold increase in performance over legacy Fast Ethernet edge modules. During 2001 network port, device, and link capacities were available to support 202 FSL employees. The network utilized 518 total links, comprising 430 user links and 88 network device links.

- s 2001 - The availability of hourly NPN winds to the NWS remained high through 2001, averaging about 95%.

- s 2001 - Two additional NPN sites (Neodesha, Kansas, and Jayton, Texas) were equipped with RASS for temperature profiling this past year. Eleven NPN sites now have RASS capabilities, typically providing measurements up to 2.5 — 4 km above the ground.

- s 2001 - Initial field testing of the Linux version of D2D was completed at the Boulder Weather Forecast Office. By the end of 2001, the National Weather Service had installed a Linux workstation at each of its field offices.

- S 2001 - The Emergency Manager Dissemination System (EMDS) was integrated into AWIPS build 5.1.2 for operational release to WFOs nationwide.
- S 2001 - The initial version of MADIS was released to the public during 2001, and now supports observation distributions to government, research, and educational institutions, as well as several private companies. Organizations already receiving MADIS data feeds include NWS forecast offices, the National Center for Atmospheric Research, and the NWS National Centers for Environmental Prediction. All MADIS subscribers had access to a reliable and easy-to-use database containing real-time and archived datasets.
- S 2001 - The Scalable Modeling System (SMS) was used to parallelize 1) an atmospheric chemistry code (NALROM) for the Aeronomy Laboratory, 2) a version of the Princeton Ocean Model for the Environmental Technology Laboratory, and 3) the Hybrid Coordinate Ocean Model for Los Alamos National Laboratory.
- S 2001 - An end-to-end Real-Time Verification System (RTVS) was delivered to the AWC. Three modules were implemented at AWC, including real-time processing of the AWC icing and turbulence forecast/observation pairs using AWC decoded data, storage, and access of the data through the RDBMS and display through a newly developed Web-based graphical user interface.
- S 2001 - Since its initiation, the GLOBE Program has grown from 500 U.S. schools in 1995 to more than 12,000 participating GLOBE schools located in 97 partner countries today.
- S 2001 - During 2001, Visitor and Information Services program office accommodated at least 1,882 visitors, not including visits arranged directly with FSL staff outside this office. Because of heightened security later in the year, the number of visitors, particularly those from schools, was down. The largest number of visitors came from academia, educators, and students, numbering 892. Other visitors included 408 from the general public, 423 from government, 67 from the private sector, and 92 from foreign countries, including Hungary, the People's Republic of China, India, Taiwan, Australia, Korea, Japan, Thailand, Algeria, New Zealand, Hong Kong, Republic of Armenia, and Finland.
- S Jan 2002 - Capitalizing on major development work at FSL, the National Weather Service began installing two Linux-based workstations at each of its Weather Forecast Offices around the country in January 2002. Eventually these workstations will replace the Hewlett-Packard

hardware which inaugurated the Advanced Weather Interactive Processing System (AWIPS) era. The highly robust Linux was developed in an open-source environment and runs on nonproprietary hardware

- s April 2002 - A major revision to the RUC system including 20-km horizontal resolution was implemented at NCEP on 17 April 2002, culminating a four-year development and testing activity. The higher horizontal resolution of the new version takes advantage of the improved computing capability at NCEP on its IBM SP computer. This new version has four key aspects: finer (20-km) horizontal and vertical (50 levels) resolution, an improved version of the RUC forecast model, assimilation of GOES-based cloud-top pressure, and use of an improved version of the RUC optimal interpolation analysis.
- s May/June 2002 - FSL participated in the International H₂O project (IHOP). Different versions of mesoscale models - run in real time - were used to aid in the nowcasting and forecasting effort to support IHOP operations.
- s June 2002 - The maiden flight of the 60-ft diameter GAINS Prototype III (PIII) balloon occurred on 21 June 2002. This flight met several development objectives, including launching the PIII balloon, floating it at altitude for more than eight hours, transforming the balloon envelope into a deceleration device, achieving a safe descent rate, tracking the balloon from an aircraft; forecasting balloon trajectory before launch, updating balloon landing position during flight, and recovering the balloon and payload.
- s July 2002 - A new FX-Net/AQ client was successfully released in July 2002, just in time to support the real-time forecasters who participated in the NOAA New England Forecasting Pilot Program: High-Resolution Temperature and Air Quality (TAQ) field experiment during the summer of 2002.
- s July/Aug 2002 - From 30 July - 1 August 2002, a workshop entitled "Making Verification More Meaningful," cosponsored by FSL and NCAR and funded by the AWRP program, brought together an international group of researchers and operational meteorologists and hydrologists. The workshop focused on the development of advanced diagnostic verification approaches, operational and user issues, observational concerns, and verification of ensemble forecasts.
- s Summer 2002 - MM5/chem was run in real time at FSL in support of the New England Temperature and Air Quality (TAQ) pilot experiment. MM5/Chem is a next-generation coupled weather/air quality numerical prediction system. In this system the chemical kinetic mechanism is embedded within the meteorological model structure, and thus the integration of the chemistry is performed as part of MM5.

- S 2002

 - FSL ran a special high-resolution version of the RUC model and distributed forecast fields to the NWS Western Region Headquarters for real-time AWIPS display at local offices in support of PACJET 2002. The special PACRUC configuration consisted of a 10-km grid covering all of the NWS Western Region, nested within the CONUS 20-km RUC domain.

- S 2002

 - The WRF and a number of other models were run in support of the International H₂O Project experiment, a field program to study atmospheric water vapor centered over Oklahoma during early summer 2002. FSL modeling resources were also used to run ensembles of models at high resolution during the Temperature and Air Quality Pilot Program, centered over New England. This program is leading to a rapid technology transfer (to the National Weather Service) of the capability for real-time air quality forecasts.

- S 2002

 - FX-Net has become the workstation of choice of the National Interagency Fire Center in Boise, Idaho, and at 11 Geographic Area Coordination Centers throughout the country. Meteorologists used FX-Net close to home last summer in fighting Colorado wildfires during an unprecedented drought.

- S 2002

 - The number of Cooperative Agency Profilers, most of them sampling the boundary layer, has grown to over 60. The number of ground-based GPS sites estimating total column water vapor now exceeds 200. More than 5,000 new surface mesonet observations have been added to the FSL hourly collection. After performing quality control checks, FSL forwards all these data to the National Centers for Environmental Prediction (NCEP) for use in operational models.

- S 2002

 - NOAA Science On a Sphere (SOS)TM received major exposure during the past year. SOS is a powerful educational tool for projecting geophysical, other planetary, solar, or lunar data onto a sphere. The current prototypes are 5 - 6 feet in diameter. First field tested with hundreds of students and their parents at the Broomfield Heights Middle School last summer, SOS has since been an attraction at the annual meeting of the American Meteorological Society in Long Beach, California, the NOAA Science Center in Silver Spring, Maryland, and, most recently, at the National Cable and Telecommunication Association meeting in Chicago, Illinois.

- S 2002

 - FSL ran a special high-resolution version of the RUC model for three different special experiments over the last year. First, FSL distributed forecast fields to the NWS Western Region Headquarters for real-time AWIPS display at local offices in support of the PACJET 2002 (Pacific Landfalling Jets) experiment. Special 10-km RUC forecasts were also produced for the May - June 2002 Central Plains International H₂O

Project (IHOP-2002) to the NWS Storm Prediction Center in Norman, Oklahoma. Finally, the 10-km RUC was moved to a domain covering the northeastern United States in support of the Temperature and Air Quality (TAQ) experiment in summer 2002.

- S 2002 - An assessment of the value of data from the NOAA Profiler Network (NPN) on weather forecasting was completed. A series of experiments were conducted using the RUC20 model in which various data sources were denied to assess the relative importance of the profiler data for short-range wind forecasts. Average verification statistics from a 13-day test period indicate that the profiler data have a positive impact on short-range (3 - 6 hour) forecasts over a central United States subdomain that includes most of the profiler sites as well as immediately downwind of the profiler observations.
- S 2002 - The availability of hourly NPN winds to the NWS remained high through 2002, averaging about 95%. During the past year, the NPN data never fell below 90%.
- S 2002 - GPS Surface Observing System (GSOS) packages were installed at 5 Nationwide Differential GPS sites and at 25 U.S. Coast Guard and U.S. Army Corps of Engineers Maritime Differential GPS sites. That brought the number of "backbone" sites in the network to 110, with a goal of 200 sites nationwide by 2005.
- S 2002 - 2002, the LAP Branch developed a LAPS system to improve the accuracy of middle-level and high-level parachute delivery of logistical material to military units (Precision Air Drop Systems, PADS).
- S 2002 - An integrated local data assimilation and forecasting system was installed at both ranges in support of the Air Force Range Standardization and Automation (RSA) program designed to modernize and standardize the command and control infrastructure of the two U.S. Space Launch facilities (ranges), located at Vandenberg Air Force Base, California, and Cape Canaveral Air Station, Florida. The system produced hourly LAPS analyses and a new MM5 forecast run every 6 hours on a triple-nested domain with 10-km, 3.3-km, and 1.1 km grid spacing, respectively.
- S 2002 - In collaboration with NCAR, LAP Branch scientists began designing an ensemble of mesoscale models to support a Federal Highways Administration (FHWA) road weather project. The ensemble includes multiple models (MM5, RAMS, and WRF) with lateral boundaries provided by multiple large-scale models (AVN, Eta, and RUC) that run at relatively high spatial resolution.

- s 2002

 - In support of the NWS upgrades to the D2D meteorological display and text components of the AWIPS Weather Forecast Office (WFO) system, AWIPS Build 5.2.1 was installed at most NWS field offices in the summer. The final development of Build 5.2.2 was completed, tested, and installed during 2002; this work concludes the mandate by Congress to complete the initial AWIPS system capabilities including interactive forecast preparation, severe weather reporting, service backup, and radar display functions that replace the WSR-88D Principal User Position (PUP) displays. The first operational build, OB1, was developed, installed, and tested at FSL as well. Similar support activities were carried out in 2002 for the RSA program and a customized AWIPS setup for the Johnson Spaceflight Center.

- s 2002

 - The major MSAS accomplishment in 2002 involved the initial development of software upgrades necessary to increase grid resolution and vary domain boundaries for MSAS on the AWIPS system. These upgrades were delivered with AWIPS Build 5.2.2, and include the incorporation of a customization script that allows each NWS WFO to specify the domain and resolution of their local MSAS systems, and also to specify the analysis grids desired by their forecasters.

- s 2002

 - GLOBE Program had grown from 500 U.S. schools in 1995 to more than 12,000 participating GLOBE schools located in 101 partner countries.

- s 2002

 - In meeting the goals to improve forecasting capabilities at KMA during 2002, four major tasks were completed: Upgrade of the FAS nowcasting system, implementation of the Local Analysis and Prediction System (LAPS), implementation of the Mesoscale Analysis and Prediction System (MAPS) Surface Analysis System (MSAS) quality control and monitoring system, and provision for forecast training and risk reduction.

- s 2002

 - FSL participated in the Technology Day which showcased real-time demonstrations of FSL research projects.

- s 2002

 - The Visitor and Information Services program accommodated at least 1,452 visitors, not including visits arranged directly with FSL staff outside this office. The largest category, 645 visitors came from the federal government. Other visitors included 373 from academia, (educators and students), 205 from the general public, 101 from the private sector, and 128 from foreign countries, including Taiwan, Singapore, Korea, China, Hong Kong, Columbia, New Zealand, Japan, and Australia.

- s November 2002 - FSL accepted a major upgrade to its high-performance computing system, comprising 768 nodes with dual Intel Pentium processors rated at 2.2 Ghz. Also during that month, it was ranked #8 on the Top500 List of the World's Fastest Computers, and now serves more than two dozen external users representing most of the line offices within NOAA.

- s December 2002 - The latest LAPS software code, run on Linux PCs, was delivered to CWB in December 2002. This software includes an improved cloud and precipitation analysis package as well as the MM5 model with the Hot Start code.

- s March 2003 - The Federal Highway Administration supported a collaborative effort between FSL and NCAR to field test a model-based system for snow plow operators that helps them decide when to plow and what chemicals to spread on the road surface. This Maintenance and Decision Support System was successfully tested in Iowa in February and March 2003.

- s May 2003 - Three-dimensional variational analysis became operational in the 20-km version of the Rapid Update Cycle.

- s 2003 - GPS Surface Observing System (GSOS) packages were installed at 5 Nationwide Differential GPS sites and at 25 U.S. Coast Guard and U.S. Army Corps of Engineers Maritime Differential GPS sites. This brought the number of "backbone" sites in the network to 110.

- s 2003 - GLOBE Program grew from 500 U.S. schools in 1995 to more than 12,000 participating GLOBE schools located in 101 partner countries

- s 2003 - During 2003, the Office of Administration and Research accommodated at least 1,612 visitors. The largest category, 662 visitors, came from academia (educators and students). Other visitors included 462 from the federal government, 204 from the private sector, 178 from the general public, and 105 from foreign countries, including China, Australia, Africa, Korea, and Taiwan.

- s June 2004 - Under development at FSL since 2001, Science On a Sphere™ was shown to thousands of viewers, children and adults, at its home location at NOAA's David Skaggs Research Center in Boulder. Since its 2002 public viewing at the NOAA Science Center, it has been exhibited at numerous scientific and educational conferences around the United States. NOAA was invited to exhibit Science On a Sphere™ at the Sea Island G-8 Summit June 4–10, 2004,

- S summer 2004 - Both WRF and RUC with 20-km and 13-km horizontal resolution provided 48-hour forecast grids for NOAA's New England High-Resolution Temperature Program (NEHRTP) during summer 2004.
- S 2004 - The final phase of a three-year project to convert the FSL network from Asynchronous Transfer Mode (ATM) to Gigabit Ethernet (GigE) was completed. A one-time funding opportunity allowed FSL to take advantage of matching funds from the NOAA Boulder Network Operations Center (NOC) to obtain an array of six GigE network switches.
- S 2004 - The required number of systems administrators is also determined by the number of network devices managed and the number of systems administrators per division. The ratio of devices to systems administrators is 125:1, which represents the number of networked systems that a single systems administrator can effectively administer. The main issue in managing these devices is IT security.
- S 2004 - In 2004, the Office of Administration and Research accommodated at least 4,020 visitors. This significant increase from the previous year related to several special events: the Department of Commerce 50th Anniversary celebration; the formal arrangement between NOAA and the Boulder Valley School District to give 8th graders the opportunity to visit the NOAA Boulder campus for educational presentations, demonstrations, and hands-on learning experiences; the Annual Workshop for Local Weather Observers; and special requests to see NOAA's new educational and outreach tool, Science On a Sphere™. The largest category, 2,706 visitors, came from academia (educators and students). Other visitors included 448 from government, 239 from the private sector, 577 from the general public, and 50 from foreign countries, including China, Australia, Africa, Korea, and Taiwan.
- S 2004 - Evaluation of the WRF-Chem model was performed using a 2-month testbed dataset obtained during the 2004 New England Air Quality Study (NEAQS-2004). During this time period, an intensive meteorological and air quality observation and modeling program took place in New England. WRF-Chem was used to produce real-time forecasts at FSL.
- S 2004 - The availability of hourly NPN winds to the NWS continued to increase, increasing slightly during 2004 to an average of 96.4%.
- S 2004 - Eleven NPN sites have RASS capabilities that typically provide temperature measurements from about 2.5–4 km above the ground.

- S 2004 - The Alaska 449-MHz Profiler Network operated continuously and delivered data to the NWS for the past five years.
- S 2004 - The installation of GPS Surface Observing System (GSOS) meteorological packages at three Nationwide Differential GPS sites and four U.S. Coast Guard sites during 2004 brought the number of “backbone” sites in the network to 117.
- S 2004 - FSL’s Meteorological Assimilation Data Ingest System (MADIS) made great progress this year in a number of different areas. Its surface station reporting has reached almost 15,000 stations, providing a national mesonet that is very valuable for weather diagnosis and prediction.
- S 2004 - During 2004, AWIPS Operational Builds (OBs) 3 and 4 were deployed, and the development for OB5 was completed. Development versions of AWIPS Operational Builds (OBs) 3, 4, and 5 were installed on FSL test systems. AWIPS OB3 was deployed to most NWS field offices in spring 2004. AWIPS OB4 was installed at most NWS field offices in 2004.
- S 2004 - FSL developed the Advanced Linux Prototype System (ALPS) software to assist in the transition of field systems from Hewlett-Packard workstations and servers to Linux PCs.
- S 2004 - FSL staff remotely updated (on a weekly basis) Taiwan's LAPS software code on the CWB computer with the latest MM5 Hot Start model and multiple background model options. FSL completed the transition of the 15-km Nonhydrostatic Forecast System (NFS), the Typhoon Forecast System (TFS), and the Global Forecast System (GFS) into our shadow system.
- S 2004 - FX-Net for Fire Weather at the National Interagency Fire Center (NIFC), the latest version of the FX-Net Client, was installed at the Bureau of Land Management (BLM) Federal Test Center in Lakewood, Colorado.
- S October 2004 - Two versions of the Volcanic Ash Coordination Tool (VACT) software were delivered, users were trained, and feedback was gathered. Version 2.0 of the VACT software was developed and installed on all client and server systems. Radar datasets were reduced to include just the Alaska and Seattle radars. Version 2.1, installed in October 2004, included training, user feedback, and enhancements.

- s January 2005 - During 2004, the contract for the High-Performance Computing System (HPCS) was extended for two years. Work in this area involved decommissioning the Alpha-processor-based portion of the HPCS in September 2004 and implementing a major upgrade. The upgraded HPCS, based on the Intel EM64T (64-bit Xeon) system comprising 608 3.2 GHz CPUs, was accepted in December 2004 and entered into production January 2005.

- s March 2005 - The Weather Research and Forecasting (WRF) model Developmental Testbed Center (DTC) is a new distributed facility consisting of nodes in Boulder, Colorado, at FSL and the National Center for Atmospheric Research (NCAR), and at the Naval Research Laboratory (NRL), in Monterey, California. The DTC was established so the numerical weather prediction (NWP) research and operational communities can interact to accelerate testing and evaluation of new models and NWP techniques having promise for operational implementation at some point in the future. Idealized, retrospective, and real-time forecast methods are used for this purpose. The DTC Winter Forecast Experiment (DWFE) ran from 15 January to 31 March 2005, and was the first real-time NWP experiment ever conducted by the DTC. The model ran over a large domain (the 48 states) at high resolution (5 km).

- s April 2005 - NOAA installed a permanent SOS system at the National Maritime Center (Nauticus) in Norfolk, Virginia. Nauticus is a maritime-themed science center featuring theaters, aquaria, and a variety of hands-on exhibits.

- s June 2005 - A new major revision of the Rapid Update Cycle was implemented into operations at NCEP. The 13-km RUC replaced the previous 20-km RUC, including increased horizontal resolution but also major improvements to its data assimilation and numerical prediction model components. New observation types were added to the hourly assimilation in the RUC cycle – GPS precipitable water, mesonet, and METAR cloud observations – the first time any of these observation types have been used in any NCEP operational model. The 13-km RUC implementation is probably the most significant change in the RUC model for its combined analysis/model effects on moisture/cloud forecasts since 1998.

- s October 1, 2005 - FSL became the Global Systems Division (GSD) of the Earth System Research Laboratory (ESRL)