

Notes and news

Contributions to the notes and news section are welcome. They should be sent to: Meteorological Applications, Met. Office College, Shinfield Park, Reading RG2 9AU, UK (Fax +44 (0) 1344 85 5410, E-mail: rwridaway@meto.gov.uk.)

Experimental model forecasts conditions every 10 kilometres

The National Weather Service (NWS) in the USA has begun testing a new experimental computer model that will assist forecasters to predict weather conditions across the western United States with more detail than ever before. The model, known as the Eta-10, allows forecasters to monitor the development of weather systems down to a 10-km grid.

The western region was selected for the test because it encompasses a wide variety of climatic areas. Testing the models at desert, coastal, and high-altitude sites will also help forecasters analyse high-resolution grid models.

The experimental Eta-10 Model is a refined version of the current Eta Model developed by the National Center for Environmental Prediction (NCEP). The first operational implementation of the Eta Model began in 1993 as an 80-km grid. Currently, the NWS runs the Eta Model operationally at both 29- and 48-km grid resolution. Forecasters put the new, experimental 10-km model to a test during the 1996 Summer Olympics to generate weather forecasts for specific sporting events.

NCEP ran the experimental model for three months to complete a thorough evaluation of the model. After the three-month test period, the model will be used occasionally to help forecast critical weather events, such as severe thunderstorms in the Midwest during the spring and summer and winter storms in the Pacific Northwest and Great Lakes regions.

When the new model becomes fully operational, the NWS intends to run the model four times a day, providing forecasts out to 48 hours for all of North America.

Conference of Commonwealth Meteorologists

The Conference of Commonwealth Meteorologists was held at the Met. Office College, Reading, UK, from 23 to

26 June 1997. Its theme was the 'Role and operation of National Meteorological Services'. There were 29 delegates representing 25 meteorological services. Amongst the topics discussed at the conference were:

- Role and benefits of a National Meteorological Service (NMS) to its country
- Co-operation and collaboration between NMSs
- Current structure of Commonwealth NMSs and recent or planned changes
- Changing roles and structures on NMSs and increasing need to manage resources and prioritise expenditure
- Observations and telecommunications
- Development of new types of service, including climate and seasonal prediction services
- General forecast products
- Improving services and enhancing the profile of a NMS

It is intended that the next conference will be held in four year time.

John Wallace and Bert Bolin elected to the National Academy of Science

The following have been elected to membership of the National Academy of Sciences in the USA.

- John Wallace of the Department of Atmospheric Sciences and Director of the Joint Institute for the Study of the Atmosphere and Ocean at the University of Washington, USA.
- Bert Bolin, Chair of the Intergovernmental Panel on Climate Change and Emeritus Professor of Meteorology at Stockholm University, Sweden.

The pair were among 60 new members and 15 foreign associates from 11 countries who were selected for membership in recognition of their distinguished and continuing achievements in original research.

News from EUMETSAT

The June edition of *IMAGE*, produced by EUMETSAT, has been issued. It deals with European and international news about satellite meteorology. Some of the topics covered in *IMAGE* are as follows.

- There has been a five-fold increase in the number of winds per month produced by the EUMETSAT Meteorological Products Extraction Facility (MPEF). The increase was a result of the combined effect of upgrades to the Cloud Motion Winds (CMW) product and the introduction of the High Resolution Visible (HRV) winds.
- Six European Satellite Application Facilities (SAFs) are planned. These will be 'centres of excellence' which encourage new applications of satellite data. The first SAF was set up in Madrid in December 1996; it is dedicated to the support of nowcasting and very short range forecasting. A SAF for ocean and sea ice products started in April 1997 and a SAF for ozone monitoring is expected to be set up later this year.
- A EUMETSAT Forum in Africa has been held in Harare, Zimbabwe, to discuss topics such as the transition to Meteosat Second Generation and MDD products.
- John Morgan, the first Director of EUMETSAT, has been awarded the Cross of the Order of Merit by the President of Germany for services to international co-operation in Europe.
- A dedicated User Service has been set up to deal with on-line (immediate) and off-line (longer term) enquiries. The on-line service includes a helpdesk for providing assistance to users (Tel: +49 (0)6151 807369, Fax: +49 (0)6151 807304, E-mail: ops@eumetsat.de).

NWS dissemination technology conference looks to future

The NWS held a four-day conference in April to consider how technologies might affect dissemination of weather service data to the public and private sector.

A keynote speaker at the conference was Joe Coates, the author of the book *2025: Scenarios of U.S. and Global Society Reshaped by Science and Technology*. Coates said that looking to the future is important in any endeavour, but must be viewed in its proper perspective. He suggested that the reason so many companies fail and why government agencies have problems is because of poor leadership. The one common characteristic that goes with those failures, he explained, is that the leaders had assumptions about the future that were 'unsound.'

Coates indicated that there were three areas in which there is a need for improved information from the NWS. Better services are needed for:

- Small organizations of all sizes, from small businesses down to the farms.
- All of rural America ('80% of the people in this country live on 20% of the land and 20 % of the people live on 80% of the land').
- The health sector.

He listed a number of maladies, such as asthma and arthritis, where weather has an influence and explained that the NWS has largely ignored this constituency. He did not blame the NWS entirely, saying the medical community has failed to emphasize the need for improved forecast data that might help people suffering from these maladies. He said that there is a need for providing weather information in 'smaller plots' for activities such as recreation, sports, agriculture, and farming.

Coates pointed out that the private sector has not filled the vacuum left by NWS reductions in capability and cited the storm in Florida that destroyed \$300 million dollars of the citrus crop. 'The private sector was not able to produce the information produced by NWS. It fell flat on its face, and \$300 million dollars went down the tube.' He said that the NWS needed to make more long-range forecasts on a more continuous basis in spite of the fact that their predictive accuracy might not be as high percentage-wise as the short-range forecasts.

The general conclusions agreed upon by participants by the end of the conference were that:

- NWS data has to be an 'open' system, available to everyone.
- Emergency managers need greater use of the Internet.
- Greater use needs to be made of satellites in the dissemination of weather information.

Air travel savings 'could total billions of dollars'

New weather analysis techniques could shorten air travel journeys dramatically and save the industry billions of dollars, according to The Met. Office. Bob Lunnon, Head of Aviation Applications Research at The Met. Office, has estimated that savings could be seven times higher than previous studies had shown.

At the moment, on a given day, airlines have little flexibility in their choice of routes. Given freedom to fly any route, airlines could sometimes save up to an hour on the London to Tokyo journey, cutting costs by \$180 million per annum between Europe and South East Asia alone. Similar flight time savings are possible on most flights of over 14 hours duration.

Increasingly, aircraft can 'talk' digitally to ground stations via satellites, allowing reporting of their precise positions. This enables aircraft to depart from current air lanes in safety, to fly routes closer to those The Met. Office has shown will save most time and money.

The new techniques are being developed in readiness for airliner routing using enhanced Communications Navigation and Surveillance (CNS), which allows aircraft freedom to choose their own individual paths. Already the system is in use in some parts of the globe, and within a few years could become universal.

Function of the National Weather Service in the USA

The House Authorization Bill for the National Oceanic and Atmospheric Administration, includes a section amending the Organic Act of 1890, which created and defined the Weather Bureau, now the National Weather Service. The essence of the resolution, passed by the House Science Committee on 10 April 1997, is as follows.

(a) Duties of the National Weather Service

In order to protect life and property and enhance the national economy, the National Weather Service will be responsible for:

- Forecasts and serve as the sole official source of weather warnings.
- The issue of storm warnings.
- The collection, exchange, and distribution of meteorological, hydrological, climatic, and oceanographic data and information.

- The preparation of hydrometeorological guidance and core forecasts information.

(b) *Competition with the private sector*
The National Weather Service will not compete, or assist other entities to compete, with the private sector when a service is currently provided or can be provided by commercial enterprise, unless:

- The private sector is unwilling or unable to provide the services.
- The service provides vital weather warnings and forecasts for the protection of lives and property of the general public.

Satellite news

- GOES-K was launched from Cape Canaveral Air Station on 25 April 1997. It was then stored in orbit as GOES-10 with the intention that it would eventually replace either GOES-8 or GOES-9. However, there have been major technical problems that could be terminal. It is possible that NASA will accelerate production of GOES-L for launch in February 1999.
- The performance of HIRS (High Resolution Infra-Red Sounder) instrument on NOAA-12 is degenerating. This instrument provides data for input into NWP models. It is expected that NOAA-11 will be brought out of its standby state to provide HIRS-derived products.
- Feng-Yun-2b, the first Chinese geostationary meteorological satellite, was launched on June 1997 into orbit at 105° E.
- NOAA-K, which will become NOAA-15 in orbit, is scheduled for launch on 17 February 1998.
- On 30 June 1997 contact was lost with the Advanced Earth Observation Satellite (ADEOS) launched by Japan. It was expected that this satellite would provide oceanic surface wind measurements of wind direction and speed that would be used in NWP models.
- The Meteosat-7 launch has been delayed. The earliest firm launch slot date for Meteosat-7 is now 15 October, although 2 September has not been dismissed as yet. Launch vehicle availability and flight readiness of the spacecraft will determine the launch date.

Joanne Simpson Honoured

Dr Joanne Simpson, the only woman ever to be elected president of the

American Meteorological Society, and Chief Scientist for Meteorology at NASA's Goddard Space Flight Center in Greenbelt, Maryland, USA has gained new recognition. She has had NASA's fastest supercomputer, the CRAY T3E, named for her. She was chosen for the honour for her pioneering work using computers in meteorological research.

Joanne Simpson was a pioneer in cloud modelling, producing the first one-dimensional model and the first cumulus model on a computer. She also led research into multi-cloud modelling. Her credits include more than 170 publications in the areas of tropical meteorology, tropical cloud systems and modelling, tropical storms, and tropical rain measurement from space.

The effect of 'urban forests'

NASA researchers are studying how 'urban forests' may allow cities to continuously grow while maintaining air quality and the environment, as well as lower cooling costs during summer months.

Dr Jeff Luvall and Dr Dale Quattrochi, from the Global Hydrology and Climate Center at the Marshall Space Flight Center, Huntsville, Alabama, USA are studying the urban heat island that has grown over Atlanta during the past 20 years. Their intention is to learn how rapid urbanization affects temperature and air quality, and what can be done to lessen the impact.

According to Quattrochi, the temperatures of artificial surfaces can be 20–40° F higher than those of vegetated surfaces. Consequently a heat island can be produced with temperatures 5–10° F higher than air temperatures over adjacent rural areas.

The two researchers found that city parks and other urban areas with trees and grass were cooler than areas associated with parking and a high concentration of buildings. This happens because 'green areas' dissipate solar energy by absorbing surrounding heat and using it to evaporate water from leaves, thereby cooling the air. Urban forests also help cool cities by shading surfaces like asphalt, roofs, and concrete parking areas, preventing the initial heating and storage of heat.

To determine the location of Atlanta's hot spots, a Lear Jet equipped with thermal imaging equipment flew over the metropolitan area. At the same time,

some Atlanta elementary students took temperature and moisture readings of different surfaces at their schools. The students will compare and verify their measurements with those recorded by instruments on the jet.

Information collected from the air study will allow researchers to understand the effect of tree cover on Atlanta's temperature and air quality. These findings also will provide Atlanta's urban planners a foundation to determine the benefits of developing and maintaining urban forests. Additional benefits may come from building plans that incorporate trees to shade roofs and reduce the heat load on houses and buildings, thus reducing power requirements.

Rosby-100

The international symposium 'Rosby-100' will be held in Stockholm, Sweden from 8 to 12 June 1998. It will commemorate the hundredth anniversary of the birth of Prof Carl-Gustaf Rossby. The symposium will have three main themes.

- Geophysical fluid dynamics.
- Numerical modelling of weather and climate.
- Global cycling of trace gases and aerosols.

There will be a special issue of *Tellus* containing papers presented at the symposium. For further information contact: Department of Meteorology, Stockholm University, S-106 91 Stockholm, Sweden.

Scientists make first dual-Doppler tornado intercept

NOAA has announced that a team of government and university scientists and student volunteers has observed a tornado close up with dual high-resolution Doppler radars, providing an unprecedented two-dimensional view of a full-blown tornado.

The team, called 'Subvortex' and based at NOAA's National Severe Storms Laboratory in Norman, Oklahoma, USA intercepted an F1 tornado on 26 May, southwest of Tulsa. The Subvortex scientists scanned the slow-moving tornado for 10 minutes with the two Doppler radars mounted on trucks. The team also photographed the tornado and made a variety of meteorological measurements in and near the storm with a mobile mesonet. A mobile mesonet is comprised of cars specially equipped to measure weather conditions.

The twin Dopplers on Wheels (DOWs) are unique truck-mounted research radars that can be positioned within a few kilometres of a tornadic storm to document in fine detail wind speeds and reflectivity. The radar scans the entire mesocyclone region (the area of rotating air) every 90 seconds, producing data that should provide major clues into how tornadoes form and persist.

Subvortex is a follow-up to the VORTEX tornado research project in 1994 and 1995, in which scientists intercepted ten tornadoes and studied them close up using a suite of instruments, including a prototype Doppler on Wheels. The new twin Dopplers being used in Subvortex are allowing scientists to get high-resolution radar coverage of tornado formation. Subvortex scientists are especially interested in the little understood rear flank downdraft region of a tornadic storm because it may play a key role in transporting rotation to the ground.

Chief Executive of the Met. Office

Julian Hunt ceased being Chief Executive of the Met. Office on 30 June 1997 having taken up the post in January 1992. During his period of office he has successfully established the Met. Office as a Trading Fund. This has required a completely different method of funding and an increased focus on meeting needs of customers both within government departments and in the commercial sector. At the same time he championed the need for a greater emphasis on quality improvement within the Met. Office and for staff to be outward looking. In international matters he has been very vigorous in encouraging co-operation, especially within Europe, and has made a full contribution to the activities of WMO. For the time being he will now concentrate on research into turbulence and related phenomena.

The new Chief Executive is Peter Ewins who has been Chief Scientist at the Ministry of Defence since 1994. He graduated in Aeronautical Engineering and has spent much of his career at the Royal Aircraft Establishment and the Defence Research Agency at Farnborough. He took up his new post on 1 August 1997.

Observations and models help explain atmospheric mixing

In a recent issue of *Science*, J. D. Mahlman, Director of NOAA's Geophysical Fluid

Dynamics Laboratory in Princeton, New Jersey, USA examines many of the mechanisms that control this mixing in the upper troposphere and the effects of the mixing on other atmospheric processes, including the impact of human sources of ozone and aerosols, the depletion of stratospheric ozone, and the effects of emissions from subsonic aircraft.

‘The effects of human-caused influences of ozone and aerosol concentrations in the upper troposphere are of current interest because of their potential contributions to climate change. For example, the sharp ozone losses observed in the lower stratosphere can influence chemical and climate changes in the upper troposphere by means of transport across the boundary between the troposphere and the stratosphere,’ Mahlman said.

A north–south ‘stirring’ of the atmosphere by cyclonic weather systems outside the tropics may also explain the sharp, meandering, and intermittent mid-latitude jet stream system that separates cyclones and anticyclones.

Although global, three-dimensional mathematical models have improved weather forecasts and climate simulations, Mahlman points out the chemical models depend on limited data from a small number of focused field experiments and on long-term measurements of chemicals in the atmosphere, wind, atmospheric pressure, and temperature from a few locations.

NOAA’s new hurricane jet expected to improve hurricane forecasts

NOAA has marked the beginning of the 1997 hurricane season by introducing a high-altitude Gulfstream-IV jet that is expected to improve landfall and intensity forecasts by up to 20%. The specially equipped jet, the first of its kind in the world, will carry out hurricane surveillance operations during this year’s season, which runs from 1 June to 30 November.

The use of new hurricane prediction models by the National Hurricane Center has reduced the errors in 24-hour landfall forecasts by more than 25 miles in the past three years. It is expected that the new G-IV jet will improve this forecasting accuracy even more. For every mile that is not ‘overwarned’ and evacuated, it is estimated there is a saving of as much as \$1 million.

Increasing coastal populations have put more people at risk during hurricanes, and barrier islands are especially vulnerable to rapidly rising waters known as storm surge. It is difficult to evacuate people from these areas because roadways have not kept pace with population growth. However, the G-IV jet will help forecasters predict the track of hurricanes and this will help coastal residents prepare for hurricanes.

Thunderstorm indices for Switzerland

In the March 1997 edition of *Weather and Forecasting* there is a paper about the comparison of traditional and newly developed thunderstorm indices for Switzerland. The authors of the paper are H. Huntrieser, H. H. Schiesser, W. Schmid and A. Waldvogel from the Institute of Atmospheric Science in Switzerland.

The authors examined the environment on thunderstorm days in Switzerland north of the Alps. Thermodynamic and kinematic parameters from a radiosonde were used to characterise the initiation of convection. The best parameters were evaluated using skill scores, probability distributions and mean temperature sounding and hodographs. It was found that:

- The Showalter index at 1200 UTC and the SWEAT index at 0000 UTC gave the best indication of whether a thunderstorm was expected or not.
- The modified CAPE_{CCL} gave the best indication of whether an isolated or widespread thunderstorm day was expected.
- A new SWISS index specifically for northern Switzerland (similar in form to the SWEAT index for the USA) gave the best results for a prediction of no, isolated or widespread thunderstorms.

The SWISS index depends upon the original Showalter index, the wind shear between 3 and 6 km and the dew-point depression at 600 hPa.

Affect of coastal growth on hurricane toll

In the past eight years, three U.S. hurricanes – Andrew (1992), Hugo (1989), and Opal (1995) – have produced a total of over \$40 billion in damage. However, according to a new study, this number does not reflect any unusual increase in hurricane strength or frequency. Instead,

it indicates that more and more Americans have put themselves and their property at risk by flocking to vulnerable coastal locations.

‘Normalized Hurricane Damages in the United States: 1925–1995’ was presented by Roger Pielke (NCAR, Boulder, Colorado, USA) and Christopher Landsea (NOAA/Atlantic Oceanographic and Meteorological Laboratory, Miami, Florida, USA) at the 22nd Conference on Hurricanes and Tropical Meteorology.

Pielke and Landsea note that a variety of sources have linked global warming to the past decade’s rise in hurricane damages. Yet most of the Atlantic hurricane seasons since 1970 have seen tropical cyclones occurring at a less frequent rate than the century-long average. Only in 1995 and 1996 (the two busiest consecutive seasons on record) was there a high frequency. Some climatologists now believe that a natural multi-decadal cycle will inevitably return to a period of increased Atlantic hurricane activity similar to the 1940s–1960s.

Pielke and Landsea examined landfalling U.S. hurricanes since 1925 and normalized their effects to 1995 values, taking into account three factors:

- Inflation.
- A disproportionate increase over time in the number of people living near the Atlantic and Gulf Coasts.
- Increase in material wealth held by the average household.

Through this analysis, Pielke and Landsea estimate that the 1926 Miami hurricane, which passed just north of Andrew’s track across south Florida, would inflict some \$72 billion in damages if it struck today. That storm was a category 4, one category below the strongest ranking on the Saffir–Simpson scale.

The analysis also shows that seven hurricane seasons between 1940 and 1969 would have produced damages of more than \$10 billion each had they occurred in 1995, while only three seasons since 1970 would have done the same.

If the normalization methodology is any indication, Pielke adds, ‘It is only a matter of time before the nation experiences a \$50 billion or greater storm, with multibillion-dollar losses becoming increasingly frequent. Climate fluctuations which return the Atlantic basin to a period of more frequent storms will enhance the chances that this time occurs sooner, rather than later.’

Aircraft soars to new heights

A NASA ER-2 aircraft, complete with a full array of science instrument packages has conducted its first operational mission at an altitude of 70 000 feet. The vehicle was deployed in Alaska for missions over the North Pole in support of a project known as POLARIS (Photochemistry of Ozone Loss in the Arctic Region in Summer

The first deployment of an upgraded ER-2 was conducted over the North Pole in May. The POLARIS mission is seeking to understand the fundamental chemistry that dominates the naturally occurring seasonal reduction of ozone over the pole in the course of the Arctic summer. Many of the chemical reactions in which project scientists are interested in occur at altitudes in the 75 000-foot range. Now, even a fully loaded ER-2 can operate approximately 2500 feet higher than previously possible due to lower fuel requirements and lighter aircraft weight. This increased altitude capability permits extension of in-place measurements for validating and upgrading existing models of the upper atmosphere.

Weather-piercing camera may reduce air traffic delays

Air traffic delays due to poor visibility caused by weather can be virtually eliminated if technology being developed by U.S. industry and government looks as good in the air as it does on the ground.

NASA's Langley Research Center, Hampton, Virginia, USA is working with a consortium led by TRW Space & Electronics Group that is preparing to demonstrate in flight a weather-piercing camera that has allowed researchers to see through fog, smoke, and clouds. 60 hours of test and demonstration flights are expected in September.

The camera 'sees' in the millimetre wave portion of the electromagnetic spectrum, a portion that is invisible to the human eye. It produces video images that enable a pilot to discern features like runways, obstacles, and the horizon.

These features are sufficient to safely land, take off, roll out, and taxi at any airline terminal, not just those at major airports that have costly systems to aid in low-visibility approach and landings. The camera is a passive sensor that does not emit signals in an airport environment, allowing multiple equipped aircraft to operate simultaneously on the ground without risk of interference.

In 1994, the TRW-led Passive Millimeter Wave Camera Consortium was awarded a multi-year, \$15 million cost-sharing contract to adapt this technology to an airborne camera for military and civilian users.

Special UV forecasts for skiers in Australia

The Bureau of Meteorology in Australia has launched a daily UV radiation forecast service for skiers. The alpine UV forecasts are an extension of the national UV service which since September 1996 has helped raise people's awareness of the danger of UV radiation. Although UV levels drop during the winter when the sun is low, altitude and snow reflection magnify risks in alpine regions.

The Bureau of Meteorology's calculations of the UV Index incorporate daily satellite measurements of stratospheric ozone, latitude, time of year and altitude. Because cloud is also a major influence on UV intensity, the forecasts include both 'clear sky' and 'cloudy' estimates. The UV forecasts were developed by the Bureau of Meteorology, and the Meteorology Cooperative Research Centre, based at Monash University.

Kanawha Institute offers recommendations for NWS

In a study of the National Weather Service (NWS) in the USA, the Kanawha Institute for the Study of the Future recommended that the NWS should:

- Work with designers and engineers at the research and development stage of new devices and systems in order to find mutual ways to integrate weather information into other activities (e.g. construction of ports, harbours, bridges, cockpits, transit systems, waste treatment systems, or power transmission facilities).
- Find ways to give greater saliency to weather forecasts.
- Seek feedback on the effects of removing or changing services from those affected.
- Make weather data available and accessible to developers of software programs which add visual and audio aids to make the information user-friendly.
- Introduce continuously updated weather information into new places where it can have an effect on public attitudes and behaviour and to bring it to groups of people where it can influence their decisions.

- Explore and experiment with the convergence of its integrated data systems with the expanding smart information systems in the private and public sectors.
- Educate the public and professionals to be able to interpret and use weather information more effectively in managing health, lifestyles, emergencies, potential threats, and opportunities.
- Review whether its services and products could be presented in a way more immediately usable by using appropriate language.
- Expand its dialogue with constituents because each can learn from the other; those who could benefit from weather data do not always know how to access or use it to fit their own needs.
- Make explicit attempts to provide low probability long-term forecasts, such as of a long winter or hot summer.
- Pioneer approaches to expanding information available to meet the needs of neglected markets, such as businesses needing localized or more continuous information.

The wettest June this century in England and Wales

Met. Office has confirmed that last June was the wettest this century in England and Wales.

- There was 133.7 mm of rain across England and Wales, making it the wettest June since 1860 when 150 mm of rain fell. Average June rainfall is 65 mm.
- There was four times as much rain in June 1997 than in the previous June when just 30 mm was collected.
- There was more rain in June 1997 than in the whole of the summer of 1995 when just over 70 mm fell.
- The period between April 1995 and March 1997 was the driest 24-month period for more than 200 years. However, June 1997 has been the wettest month since January 1995.

Day to combat desertification and drought

Professor G. O. P. Obasi, Secretary-General of the World Meteorological Organization (WMO), has issued a special message on the occasion of the third World Day to Combat Desertification and Drought. In his message he noted that:

- About 900 million people in more than 110 countries are suffering from the impacts of dryland degradation

and drought, with resulting economic losses of an estimated US\$42 billion a year.

- Arid, semi-arid and sub-humid drylands cover 40% of the Earth's land surface and as much as 70% (3.6 billion hectares) of these drylands suffer from degradation. Inappropriate management of agro-ecosystems compounded by severe climatic events such as recurrent droughts, have tended to make drylands increasingly vulnerable and prone to desertification.

To tackle this global environmental problem, the United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification particularly in Africa (CCD), was adopted and came into effect on 17 June 1994. As of 12 June 1997, 115 countries have signed and 77 countries have ratified the Convention.

Prof Obasi highlighted the fact that economic losses due to drought can amount to hundreds of millions of dollars:

- In Spain alone these losses amounted to US\$2.4 billion in 1995.
- Drought has been widespread in Asia, especially in parts of China, India and the Middle East.
- In the Summer of 1996, rainfall was 50% below normal in North America, where river levels and reservoirs remained unfavourably low in parts of USA and Mexico.
- A combination of abnormally high temperatures, little rain, 'dry' thunderstorms and occasionally gusty winds provoked wildfires which consumed 5.67 million acres (2.3 million hectares) across the USA by 1 September 1996.
- Early this year, exceptionally dry weather persisted in southwestern Europe, and fewer than 10 mm of rain fell between January and March 1997 in much of the Iberian Peninsula, France, and in parts of Italy.

Following the adoption of the 1977 UN Plan of Action to Combat Desertification, WMO adopted a Plan of Action on the meteorological and hydrological aspects of combating desertification particularly under the Agricultural Meteorological Programme and the Hydrology and Water Resources Programme.

Climate has a major impact on dryland soils, vegetation, water resources and human land use. This is among the reasons why the WMO/UNEP Intergovernmental Panel on Climate Change,

which provided the scientific assessment and advice leading to the UN Framework Convention on Climate Change, is currently addressing the desertification issue.

WMO issues statement on status of the global climate in 1996

The year 1996 was the eighth warmest on record since 1860 and the eighteenth consecutive year with positive global temperature anomalies, with a global mean surface temperature of 0.22° C above the 1961-1990 average, according to the annual statement issued by the World Meteorological Organization (WMO) on the status of the global climate.

The most predominant feature of 1996 was the extent and magnitude of heavy precipitation that affected many parts of the world, notably in southern Europe and parts of northern Africa and the Middle East which were deluged with record rainfalls early in the year.

In stark contrast to the very dry conditions that characterized most of the previous decade, the above-normal rainfall brought welcome relief to those in the Iberian Peninsula. 1996 was also the second consecutive year with above-normal hurricane activity with a near-record two-year total. The outstanding exception to these precipitation events was the severe drought experienced over much of northern Mexico and south-western United States during the first half of the year. Other highlights include the following.

- Although it was one of the coldest years in recent decades in some parts of the world, the global mean temperature was 0.22° C above the 1961-1990 base-period average compared to the record anomaly of 0.38° C in 1995; therefore 1996 was not as warm as 1995.
- The mature cold episode conditions, known as La Niña that developed in 1995 continued through April 1996 and enhanced rainfall over warmer-than-normal waters in the West Pacific; the relative cooling over much of Eurasia is attributed to dramatic shifts in atmospheric circulation patterns, particularly the strong change in the phase of the North Atlantic Oscillation.
- The ozone hole over the Antarctic was just as prominent as it has been in recent years with significant ozone

depletion over the northern hemisphere especially in Europe, the Arctic and northeastern Atlantic Oceans during the January-March period.

- For the first time since 1985, the snow cover over the northern hemisphere was above the median, totalling 25.4 million km². It ranked as the fifth snowiest in 24 years of the satellite record, particularly during the spring months from March to May and during the autumn months from September to November.

In the different regions of the world, 1996 was marked by the following

- Dry conditions occurred in Europe, from the United Kingdom across central Europe to Russia, with Belgium experiencing the driest year since 1833, and the third driest year for England and Wales since 1766.
- Copious amounts of rainfall brought much-needed relief to northwest Africa which had been plagued by extreme dryness for the past six years. In some areas, such as in Malaga, Spain, and Casablanca, Morocco, winter precipitation amounts more than doubled during the wet season.
- China suffered from the worst flooding in 50 years, resulting in more than 1000 deaths and property damage affecting at least 20 million people in the country. The Mekong Delta remained flooded for over a month, resulting in the loss of many lives.
- The Indian subcontinent experienced a wetter-than-normal summer monsoon and heavy flooding over its southern regions during the last three months of the year.
- Northern and Central South America had above-normal rainfall, inundating parts of Argentina, Brazil, Colombia and Paraguay.
- Although there was flooding in north-western USA, drought conditions prevailed in the southwest. During the period from October 1995 to May 1996, precipitation totals were the lowest in 100 years in Oklahoma and the second lowest in Texas and Arizona. The intensity of the drought severely affected the winter wheat crops and prompted wildfires. By 1 September, 22 945 km² of forests had been consumed by wildfire across continental USA, the greatest in the 19-year record. It was the warmest year in California since 1895, thereby contributing to forest fires.
- There were record snowfalls in early January over eastern USA. Measured totals exceeded 75 cm in Philadelphia, establishing a single storm record;

- most areas from Washington, DC to Rhode Island reported one of the five biggest snowfalls on record, forcing most airports to close; the snow depth in the city of Boston topped 76 cm for the first time in its history;
- Exceptional cold and snowy weather conditions affected much of South Africa during July, with temperatures dropping well below freezing and down to -10°C ; some parts of the country received their largest single snowstorm totals in 60 years.
 - Parts of Australia and New Zealand experienced excessive rains causing localized flooding in northeastern New South Wales and southeastern Queensland during April and May, annual rainfall totals in the western South Island of New Zealand reached as high as 3200–3870 mm, that is, 515–740 mm above normal.

Japanese and American scientists meet in Boulder

Scientists from the United States and Japan have met in Boulder, Colorado, USA in support of the 1997 Global Observation Information Network (GOIN).

The GOIN program fosters scientific cooperation and facilitates the exchange of environmental data and information critical to global change research, disaster and environmental monitoring, and operational environmental prediction and warning. The GOIN electronic network bridges the Pacific Ocean, enabling researchers and policy makers in the United States and Japan to access data from each other by computer.

GOIN participants use these data in their research, monitoring and prediction programmes. Data sets exchanged include:

- Oceanographic and deep sea data sets.
- Ionospheric sounding data and space weather forecasting data, used to determine environmental effects on man's technology in space.
- Geophysical data and topographic data, which are critical elements for better understanding of land cover and land use change and global environmental change.

Joe Friday

Elbert W. (Joe) Friday Jr, Director of the National Weather Service (NWS) in the USA, has been removed from his post and assigned to other duties within

NOAA. This move is associated with the budget shortfalls for the NWS. He served in the NWS, from September 1981 to March 1988 as Deputy and from March 1988 to June 1997 as Director. As Director he was responsible the architect of the modernisation programme of the NWS and has made a major contribution to international developments, especially within WMO.

Also the Department of Commerce has:

- Appointed Jack Kelly, former Director of the U.S. Air Force Air Weather Service, as a special advisor to conduct a rigorous evaluation of the NWS budget and operations.
- Appointed Robert Winokur, currently Director of NESDIS, as Acting Director of NWS.

National Weather Service marks 25th anniversary of Hurricane Agnes

When Hurricane Agnes came ashore 25 years ago in June 1972, there were record inland floods across northeastern USA, and with \$3.2 billion in property damage. Hurricane Agnes remained the USA's most costly natural disaster until Hurricane Andrew in 1992.

From 19–24 June, 1972, Agnes dropped as much as 19 inches of rain as she moved out of the Gulf of Mexico and across every state from Florida to New York. More than 210 000 people were forced to evacuate and 122 were killed. When the storm finally moved through New York and southern Canada and out into the North Atlantic, long-standing flood records were broken in six states.

Occurring early in the hurricane season (which runs from 1 June 1 to 30 November), Agnes achieved hurricane status for only a few hours, yet had a huge impact as she drew up moisture from the Atlantic Ocean. With heavy rains the week before and high runoff conditions maintained by a cold spring and cool early summer, the region was primed for disaster.

- With 50 deaths and \$2.3 billion in damages in Pennsylvania and 25 dead and \$7.4 million in destruction in New York, the two states suffered some of the storm's worst losses, Summer said, noting that the damage totals are in 1972 dollars. If the losses from Agnes were adjusted to 1997 dollars damages would eclipse \$10 billion.
- Destruction was also widespread

throughout Virginia, with 13 deaths and total damage estimated at \$222 million. Storm damages in Maryland, Delaware, and the District of Columbia were about \$110 million. There were 21 deaths in Maryland, one in Delaware, and none in the District.

- Other states affected by Agnes were New Jersey with one death and \$15 million in damages; North Carolina with two deaths and \$4.3 million in damages; and Ohio, West Virginia, South Carolina, and Georgia with no loss of life and varying degrees of damage. Florida suffered nine deaths and \$41 million in damage caused by high tides, winds and tornadoes.

Since dealing with Agnes, the National Weather Service (NWS) now has more powerful tools to aide their forecasts and warnings. As part of the NWS modernization effort, new technology such as Doppler radar, weather satellites, and automated river and rain gages are in place to help monitor severe weather. In addition, forecasters can now disseminate weather information to the public and emergency management community much faster thanks to advanced computer and communication networks such as NOAA Weather Radio and the NWS Family of Services.

Meeting of the Executive Council of WMO

The forty-ninth session of the Executive Council of WMO was held in Geneva from 9 to 20 June 1997. As well as considering reports about the various WMO programmes and Regional Associations, attention was given to discussing some of the major issues facing WMO, such as:

- International exchange of data and products
- Role and operation on National Meteorological and Hydrological Services
- Relations with other disciplines and programmes
- Structure of WMO
- Programme and budget for the financial period 2000–2003
- WMO Headquarters building

The next session of the Executive Council will be held Geneva in June 1998.

Are smog, smoke and sea spray delaying greenhouse warming?

Some 200 scientists from Europe and the United States joined forces this summer

to investigate how smog, smoke and other 'atmospheric aerosols' affect climate and the extent to which they may offset the greenhouse effect.

Manmade sources of atmospheric aerosols include smoke and fumes from industrial combustion, forest fires and automobile emissions. Natural sources include mineral dust, which is often transported over large distances, salt particles from sea spray, sulphur and other organic emissions from the ocean and land, and sulphur from volcanoes.

In the 2nd Aerosol Characterization Experiment (ACE-2), which lasted from 16 June to 25 July, scientists within the International Global Atmospheric Chemistry Project equipped a ship, and coastal and mountaintop sites in Portugal and on the Canary Islands and Madeira with the most advanced observational equipment to study manmade aerosols from Europe and natural dust aerosols from the Sahara. At the same time six research aircraft will performed dedicated flights to make measurements within these aerosol plumes and the surrounding clouds. The areas were also be monitored by satellites.

Aerosol particles primarily reflect sunlight and can also enhance the reflective properties of clouds, both of which result in a cooling of the Earth system. Scientists believe that the cooling by aerosols may explain why the observed increase in the global temperature is lower than that calculated by climate models considering the greenhouse effect alone.

ACE-3 is planned for the year 2000 and will focus on the region downwind of the rapidly increasing pollution sources in eastern Asia.

Arctic environment threatened

Ozone depletion, ultraviolet radiation, climate change and human-caused pollutants pose a more serious threat to the environment of the Arctic than previously believed, according to a report from the eight-nation Arctic Monitoring and Assessment Program (AMAP). The editor of the report is E. C. Weatherhead, a researcher at NOAA's Air Resources Laboratory in Boulder, Colorado, USA.

The report notes that, in addition to the long-term decline of ozone in the Arctic stratosphere, episodes of very low ozone have been observed. Of particular interest is the identification in the report of

two different types of ozone 'holes' or areas of decreased ozone concentration, in and near the Arctic. These two types of ozone holes include:

- Areas that are small (a few hundred kilometres), which are dynamic and are usually associated with the transport of low ozone air masses from lower latitudes.
- Larger holes (over a thousand kilometres), which develop within the Arctic vortex and are believed to be caused by several factors, including cold temperatures in combination with human-made ozone-depleting substances.

Both types of holes are most common in the spring and seem to be increasing in frequency and severity. The occurrence of these holes in springtime is particularly damaging because ecosystems and humans are more vulnerable to the effects of UV radiation at this time.

According to Weatherhead and her colleagues, the climate of the Arctic can influence the rest of the earth by increasing sea level through glacial melt, and by altering oceanic circulation which is responsible for transporting colder water from the Arctic to lower latitudes. Also recent increases in surface UV in winter and spring are believed to have adversely affected ecosystems, and human health in the Arctic.

The AMAP was established in 1991 to coordinate circumpolar Arctic pollution monitoring and assessment activities as part of the Arctic Environmental Protection Strategy. The eight circumpolar countries that take part in AMAP include Canada, Denmark, Finland, Iceland, Norway, The Federation of Russia, Sweden and the United States.

Expert trainers in satellite meteorology

Following the successful Core Trainers Course (CTC) in Niamey, Niger, the same course on satellite meteorology, this time conducted in English, took place recently in the Institute for Meteorological Training and Research (IMTR) at the Kenyan Meteorological Department in Nairobi.

Five trainers from the IMTR attended to achieve the status of expert trainers in satellite meteorology. An additional 15 meteorologists from other African countries also participated. Contributing to the course were lecturers from the UK Met. Office, the Spanish (INM) and

Dutch (KNMI) Meteorological Institutes as well as an expert from the South African Weather Bureau.

EUMETSAT intends to continue its efforts on the African continent. Preparations are already under way for the Regional Trainers Course (RTC) to be held at the Ecole Africaine de la Meteorologie et de l'Aviation (EAMAC) in Niamey, from 25 November to 11 December 1997. IMTR in Nairobi will be the venue for the English version of the Regional Trainers Course planned for early next year.

CAL development

CAL development is receiving considerable EUMETSAT attention is the African Satellite Meteorological Education and Training (ASMET) project. This project is largely funded by the German Gesellschaft für Technische Zusammenarbeit (GTZ), and focuses on the interpretation of satellite imagery in support of African meteorology. EUMETSAT is providing additional financial support, technical coordination and Meteosat imagery with help from the WMO and the Deutscher Wetter dienst (DWD). COMET, based at Boulder in the USA, will produce the CAL and help in the training of African meteorological developers. Future training material is likely to be produced by African experts in Niamey and Nairobi.

Boundary layer study

From 22 April to 22 May, low-flying planes and an array of new surface gauges in the Walnut River watershed east of Wichita, Kansas, USA, gathered data from the boundary layer as part of the Cooperative Atmosphere-Surface Exchange Study (CASES). The aim of the experiment is to investigate interactions between the boundary layer and the watershed.

CASES researchers will share their observations and findings not only with other scientists, but with students as well. Data collected in this first and future experiments in the multi-year project will be available on the Internet for use by students from middle schools through university graduate departments.

On the ground 12 small towers measured evaporation, heating, and friction inside a triangular area marked off by three boundary-layer profilers that measure wind speeds and temperature. The two

low-flying aircraft, equipped with computers and atmospheric sensors, flew in special patterns between 100 and 10 000 feet above the sparsely populated research area. Researchers are also released weather balloons at 1200 and 0300. daily from two of the three profiler locations.

More information about the experiment, including daily observations, can be found at:

<http://www.mmm.ucar.edu/cases/cases>

Improved TV and radio weather bulletins forecast after training

A two-week course was held in May 1997 at the BBC in London to develop the media weather presentation techniques of forecasters from Europe and the Middle East.

The BBC provided facilities for these workshops, which were funded by the WMO and the Met. Office under the Voluntary Co-operation Programme.

The workshops covered media relations and basic communication skills as part of the WMO's Information and Public Affairs Programme. The delegates come from: Armenia, Azerbaijan, Croatia, Estonia, Georgia, Jordan, Kazakstan, Latvia, Moldova, Slovenia, Macedonia, Lithuania and Slovakia.

This London-based course is part of a series organised by the WMO in regions around the globe. So far media training has taken place in Costa Rica, Singapore and Kenya.