Cooperation Project in Central America

Central America is a territory of ap proximately 524.000 km², lying in the tropics of the American Continent. A mountainous chain, running across Central America, forms two watersheds: one at the Pacific and the other at the Atlantic.

70 % of the runoff of Central America comes from its Atlantic watershed, in which less than a third of the population lives. Six out of seven capital cities of Central America are situated in the Pacific watershed. Hurricanes, tropical storms, cold fronts, storm surges, and droughts appear constantly in the area, harming its socio-economic development and creating an urgent need for the countries to have reliable hydrological and meteorological services.

It became evident by the end of the 1980s, that the National Services in the region were not able to meet the challenge posed by the difficult geophysical conditions. Consequently, the Project for Rehabilitation and Improvement of the Meteorological and Hydrological Services of the Central American Isthmus was established.

In order to lay the foundation of socio-economic development in the area, the Project was designed to support the countries in the region through enabling their Services to offer reliable and updated hydrological and climatological data to various user sectors, e.g. agriculture, communications, industry, transportation and fishing.

The main objective was to strengthen the basic weather-forecasting services, as well as hydrological networks in each country. The implementation of a new telecommunication system was considered the most important goal at regional level. The Project included economic and technical support as well as training of personnel.

The Project began in 1991, financially supported by the Ministry for Foreign Affairs of Finland within its development co-operation programme. It was implemented by the Regional Committee of Hydrological Resources (CRRH), whose headquarters are situated in Costa Rica. The project was executed by the National Meteorological and Hydrological Services of Belize, Costa Rica, EI Salvador, Guatemala, Honduras, Nicaragua and Panama, with the collaboration of the Finnish Meteorological Institute (FMI) and the World Meteorological Organisation (WMO).

The total budget of the Project 1991 - 1995 amounted to USD 10.5 million, of which the counterpart budgets of the countries were a total of USD 1.2 million and the rest was financed out of Finnish development cooperation funds. The implementation period was prolonged by two years up to the end of 1997.

CRRH had the responsibility of ensuring the development of the project within its proposed scope. The Committee's role as a co-ordinator was of great significance, since it facilitated constant communication with each country as well as monitoring that the objectives were fulfilled or reoriented according to the needs outlined.

The Finnish Meteorological Institute was responsible for providing the National Services with the equipment and checking out that the right technical specifications were fulfilled. Furthermore, it coordinated the equipment installation with CRRH and the Services.

The World Meteorological Organisation was in charge of carrying out the train-

ing programme and hiring the experts. WMO was supported in each country by the United Nations Development Programme (UNDP).

The Project had a Coordination Body, whose members came from the Meteorological Services of the Isthmus, the Ministry for Foreign Affairs of Finland, the Finnish Meteorological Institute and WMO. The Coordination Body met during 1991 – 1995 annually, analysing and making decisions on priorities with regard to each country.

The Ministry of Foreign Affairs of Finland, FMI, WMO, and the Secretariat of the CRRH formed a Core Group, whose role was to take corrective financial or technical decisions whenever needed. ◆

Achievements

The execution of the Project was a success. The Project increased dramatically the density of hydrological and meteorological networks in the Isthmus. Years ago, most of the National Meteorological and Hydrological Services faced serious difficulties in attempts to fulfil their tasks. Difficulties arose, for instance, within the processing, storage and transmission of meteorological and hydrological data. In addition, the staff of the Services in the area needed further training.

The Services in the region have today the capacity to produce well-processed data for their users. A modern satellite-based communication system was established in the area, ensuring the timely availability of reliable data that is both accessible and exchangeable. The staff have received adequate training for maintaining hydrological and meteorological services.

The Project has permitted Central America to play a more preponderant role in the Regional Weather Watch of the WMO Global Observing System. The new strategic data for weather forecasts were collected from the stations in Coco's Island in the Pacific off Costa Rica, Half Moon Caye and Hunting Caye on the coast of Belize, and Puerto Cabezas on the Atlantic coast of Nicaragua. The weather alert system was improved. The amount of the available data for the study of climate change have been increased and its quality has been enhanced.

The network of basic stations was rehabilitated through the application of modern and automated measurement facilities and coupled with the efficient national data collection and exchange system. The upper-air station network was rehabilitated through the installation of new systems in San Jose, Costa Rica and Puerto Cabezas in Nicaragua. Agrometeorological and marine meteorological observation stations were established. Telecommunication facilities were enhanced through the provision of the satellite based telecommunication system which permits the rapid exchange of observational information within the WWW. A new data management system was established, permitting the storage of old information. Various training programmes were carried out. The preconditions of the development of hydrological and meteorological applications were created.

The influence of the Executive Secretariat of the CRRH has increased in the region in the field of water and climate. The CRRH is participating actively in the activities developed in the region by the Central American Integration System (SICA). In connection of the Central American Commission of Environment and Develop-

ment (CCAD) the CRRH is preparing studies on climate change, water resources, agriculture and sea level change. Universities and governmental and non-governmental organisations are participating in these studies. As the Central American Focal Point for the Inter American Dialogue on Water Management and the Inter-American Water Resources Network the CRRH will assist the Organization of the American States (OAS) in the coordination of the activities on water resources generated in the region. All in all, one of the main contributions of the Project has been the stimulation of governments' interest in the role of the National Meteorological and Hydrological Services in the socio-economic development of the Isthmus. As a result, the governments have offered the Services the support required in the implementation of the Project.

The evaluation seminar on the impact of the Project was held in Panama City, Panama on April 15-16, 1996. The seminar consisted of the Directors of the National Meteorological and Hydrological Services, the representatives of the Ministries of Foreign Affairs, Planning, Finance, Energy, Science, Technology and/or Transportation of the countries in the Central American Isthmus and Finland as well as the representatives of CRRH, WMO and FMI. The achievements of the National Meteorological Services of each country presented at the seminar are reflected on pages 20 - 27.

The improved Natural Disaster Preparedness in the Central American Isthmus was analyzed during the XXX Ordinary Meeting of the CRRH held in San José, Costa Rica, on September 23-27, 1996. Hurricane Cesar, which formed in the southeastern Caribbean affected Panama, Nicaragua, El Salvador and Guatemala while crossing the Central American Isthmus on July 28, 1996. The meeting noted that the meteorological and hydrological prevention process during Cesar in July 1996 was much better than in October 1988 with hurricane Joan, whose trajectory was very similar to that of Cesar:

- In 1988 the international communication of the National Meteorological Services was slow (75 baud) and the national communication in bad shape. In some countries there were virtually no meteorologists or technicians. The meteorological and climatological data bank was inactive in most countries. Meteorological observation networks were poor in 50% of the region. Requesting special meteorological information was very difficult. The National Meteorological Services had difficulties in advising the authorities and population.

- In 1996 the international communication of the National Meteorological Services was sufficient (9600 baud) and the national communication could be carried out by HF-radio, fax and telephone connections. In all countries there were enough meteorologists and technicians. The meteorological and climatological data bank was in very active use in all countries. The coverage of meteorological observation networks was acceptable for the region. Requesting special meteorological information was easy through the new satellite-based telecommunication systems of the countries. The National Meteorological Services could better prepare the authorities, local emergency committees and people.

Additional financial support has been allocated from the Finnish development cooperation funds for 1999 to complete the consolidation programmes of technology transfer, based on the coordinated requests of the countries presented at the XXXI meeting of the CRRH in 1997. ◆

Belize

One of the main objectives with regard to Belize was to increase the network density, standardise the instrumentation and raise the number of parameters measured. Two automatic weather stations were installed on offshore islands. They provide data for monitoring coral bleaching, sea level rise, and also for tracking storms and for specialised forecasts and advisories for tourism. The data from these stations are fed into the numerical weather prediction models and climate centres. This is done in order to support the World Weather Watch.

All the existing stations were upgraded. The meteorological network density was increased from 11 stations to 35. The present-day number of stations enables monitoring of the climate everywhere in the country, as well as the issuing of specialised forecasts to the banana and citrus industries. The number of hydrological stations was increased by ten. The data produced in these stations are used for the operation of the new hydroelectric facility and for irrigation studies, watershed management, the preparation of environmental impact assessments (EIAs) and for flood warnings.

The climate data management system (CLICOM 3.0) and the hydrological operational multipurpose subprogramme (HOMS) improved the capacity to meet the data requirements of agriculture, aviation, engineers, environmentalists, investors, insurance companies, the military, researchers, students, tourism, the hydroelectric facility, etc.

The new satellite-based telecommunication system installed in December 1995 has improved the delivery of products to users considerably and the observational data produced by the National Meteorological Service is now available to the Global Telecommunications System on a regular basis. More accurate forecasts can be produced in consequence of the access to the data bank of numerical weather prediction products from the World Weather Centre. Longer forecast periods will be available. This is of great value to agriculture, contractors, tour operators and the users of water resources. The International Airport will also be connected to the system to facilitate the distribution of weather products to aviation.

In summary, the Project was very successful in Belize. The number of meteorological observing stations increased by almost 50%. All stations were rehabilitated and more than half of the hydrological stations were automated. More products of higher quality are disseminated to the public. This has had a positive impact on virtually all segments of the economy of Belize. This is especially true of tourism and agriculture, the top two sectors bringing in foreign exchange. A stream of other projects have been implemented in Belize, building on the achievements of the Project of the Isthmus. These include the US Country Studies Climate Change Program, the OAS funded Storm Surge and Flood Plain Mapping Project and a coastal Zone project to address sea level rise. ◆

Costa Rica

As a result of the Project, the Services of Costa Rica are nowadays able to offer improved products to various user sectors. The products include the weather warning system, support to agriculture, the fishing industry and hydrological plants, as well as improved meteorological information for the use of air and maritime transportation.

The meteorological and hydrological observation networks were in poor condition before the Project and they were kept in operation with high maintenance costs. The strongest contribution of the Project was directed to the meteorological, hydrological and marine meteorological observation networks, acquisition of spare parts for conventional instruments, establishment of automatic weather stations in remote locations and the upper-air sounding system at the International Airport in San Jose. The Project was also crucial for the operation of the National Center for Solar Radiation run in cooperation by the National Meteorological Institute and the University of Costa Rica. Calibration and maintenance of the radiometric network are not the only activities of the Centre, but also research and training in solar radiation, climatological studies, such as mean monthly radiation charts, studies of architectonic design, climatic change, and human health, particularly in relation to harmful ultraviolet radiation.

The improvement of the infrastructure of World Weather Watch was carried out through implementation of the two-way satellite based telecommunication system to upgrade the obsolete CEMET circuit. The satellite-based telecommunication system permits not only the transmission and reception of meteorological data but also the provision of a series of products from forecast models, and information needed in the alert and warning services. Agrometeorological and marine forecasts have improved noticeably since the beginning of the Project.

The training programme of Class II and Class III meteorologists strengthened the capacity by 50%. The meteorologists are now working at the Instituto Meteorologia Nacional (IMN) in the fields of aeronautical meteorology, public information, climatology and at the Hydrology Dept. of the Costa Rican Electricity Institute in support of the hydroelectric operations.

Half of the technical staff of IMN were trained during the Project. The national observation network was thus rehabilitated and improved by about 25% and the meteorological telecommunication network as well as the upper air observing system by 100%. The data bases of the IMN and the National Radiation Center were also developed. ◆

El Salvador

The hydrological and meteorological services in EI Salvador were strongly affected by domestic conflicts in the 1980s. The number of personnel at the Servicio de Meteorologia e Hidrologia decreased drastically and the condition of meteorological, hydrological, telecommunications and data processing systems collapsed. The Project started in El Salvador in 1992.

During the four years of the Project, the observation network has been reactivated and strengthened with a total of 92 observing stations, 60 of which are pluviometric and 10 hydrometric stations. The reactivated stations are located in agricultural, cattle raising, fishing or industrial zones where the collected data are of great importance. In the areas where coffee, staples, and sugar cane are grown, meteorological records and outlooks of extreme temperatures and rainfall are provided to prevent crop damage.

The two-way satellite telecommunication system was installed at Ilopango Airport where the National Forecasting Center is located. The synoptic and aeronautical weather forecasts as well as warning services of natural disasters have been improved.

The introduction of the climate data management system CLICOM and agro-climatic and hydrological models has improved the processing of meteorological and hydrological data.nand OEthenal of ne.f90.00060.125er

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Guatemala

After the termination of the Central American Hydrometeorological Project (PHCA) in the sixties, working conditions began to deteriorate in the Meteorological and Hydrological Service of Guatemala. This was largely due to the economic crisis and hence to the lack of the sustained funding necessary to the maintenance of the networks as well as to the acquisition of new equipment. Guatemala's participation in the Project in 1992 made launching a rehabilitation plan possible. The activities were mainly focused on the rehabilitation of hydrometeorological networks, strengthening of telecommunication networks, training of technical and professional staff and the improvement of data management systems.

The rehabilitation of the networks was carried out to improve the quality of data provided in the synoptic and aeronautical services. The national data collection and telecommunication systems as well as instrumentation were renovated at nine stations. The quality of observations and information on visibility and the cloud base were improved through the installation of new measuring systems at the Aurora International Airport in Guatemala City. Meteorological instrumentation was renovated and reactivated at 22 stations located in the main agricultural zones. Spare parts and accessories for five years' use were also provided to the stations.

The regional meteorological information and telecommunication system was renovated by the new two-way satellite system which guarantees regionally and internationally a high degree of continuity of data and information flow as well as of data exchange. The obsolete CEMET system constituted earlier an obstacle to the provision of synoptic and aeronautical meteorological services, especially in rainy seasons.

The training programme was directed to the training of technical staff in the fields of synoptic and aeronautical meteorology as well as hydrometric services. One of the two persons trained at WMO Class II level is in charge of the applied synoptic-aeronautical research, the other is responsible for the maintenance and calibration of meteorological instruments. Twelve weather station and three climate station observers and two members of the Puerto Quetzal Maritime Observation Dpt., located on the Pacific coast, were trained at WMO Class III level. Training was given by the regional experts of the Project in the fields of climate data management, statistics and hydrological models to eight, five and nine professionals respectively.

The Project has undoubtedly fulfilled the expectation of a complete rehabilitation of the meteorological and hydrological services. It has been an important element in the reinstatement of the hydrometeorological network. ◆

Nicaragua

The Meteorological Service of Nicaragua was running the operation of hydrometeorological networks, data management, etc., at only half capacity before the Project. Most of the instruments were in poor condition, obsolete or discarded for lack of spare parts. In addition, the war and natural disasters worsened the situation. During the Project, the meteorological networks underwent a significant growth of almost 350%. The number of different kinds of stations increased from 97 to 338. The meteorological telecommunications system was completely modernised both at the national and international level. With the training of 102 persons the Project created a high level of know-how as a result of which the meteorological and hydrological data bases were strengthened.

A large part of the achievements and success attained through the Project is due to the interest and responsible attitude of the Government of Nicaragua. Its financial support for the reinstallation and construction of meteorological and hydrological stations amounted to USD 470 000 in addition to the support to operating expenses. The national meteorological network extended its coverage to the whole territory. Earlier the coverage of the network was concentrated in the Pacific region. The expansion of the network has considerably improved the Service's capacity to produce reliable meteorological and hydrological information, facilitating national development planning in the sectors of power generation, water resources, irrigation, agricultural production, environment, reforestation, civil defence, etc. The upper-air station in Puerto Cabezas has made it possible for international cargo planes to land at the local airport, thereby giving impetus to the economic recovery of the North Atlantic region of Nicaragua. For the first time valuable services are being offered to the small-scale fishing industry.

Warning services are also being provided to the local population. The climatological stations constructed in Waspán, Solentiname and Estancia Cora are supporting the cultivation of staple grains as well as nontraditional products. The agrometeorological station of Montelimar was rehabilitated to support the operation of a sugar mill. The synoptic stations of Bluefields and San Carlos were re-established in 1995. The stations, have increased air flight safety on the Atlantic Coast. The San Carlos station is very important for the environmental management of the watershed of the San Juan River and it will also enable the provision of information for navigation between GranadaOmetepe-San Carlos on Lake Nicaragua and for tourism on the San Juan River.

The Project accomplished part of the rehabilitation of 43 hydrological stations by providing the stations with flow rate measurement equipment. This has been of great significance to the generation of hydroelectric power, as well as to the inventory of the hydrological resources. The provision of 30 three-band transceiver radios has significantly increased the volume of hourly meteorological data collection, strengthened the national Weather Watch and given support to natural disaster reduction.

The implementation of the new two-way satellite telecommunication system which replaced the obsolete CEMET network was initiated in December 1994 and the system has been operating since its installation in November 1995. After the completion of the broadcasting facilities and the installation of the software Version 2.0 in June 1996 the system reached its full op-

erational level. A refresher course on the new system was held in July-August 1996 in all the countries in the Central American Isthmus.

The training component of the Project was one from which Nicaragua benefited most. The Meteorological Office of INETER organised two national technical training courses for Class IV and III meteorologists. 37 technicians were trained as Class IV meteorological observers; 17 trainees became Class III technicians. These courses were attended by personnel from the National Autonomous University of Nicaragua (UNAN), the Aquatic Resources Research Center and from the Civil Aeronautics General Directorate. The course for Class IV meteorologists raised the technical level of more than 30 observers. As a result, the codification of observations and information has improved significantly. The university level training programmes in the University of Costa Rica were attended by 9 Class II and 3 Class I meteorologists. Personnel prepared basic national climatic surveys of drought and EI Nino and took part in the time quality control and air quality monitoring in the urban area of Managua. The Class I meteorologists reinforced the Synoptic and Aeronautical Department, participating in the exploitation of the two-way satellite telecommunication system and the climate data base. They have been assigned tasks related to different WMO technical commissions.

The Project has played a fundamental role in the accomplishment of a national meteorological and hydrological data base. Before the Project there was no reliable data base for data collection or quality control. In April 1996, the data base consisted of about 60 000 records of daily data and more than 20 000 records of monthly data. The implementation of the CLICOM system made it possible to record data for the publishing of the Meteorological Tide Tables from 1991 onwards. The recording and publication of Psychrometric Tables and bulletins on climate, agrometeorology, atmospheric impurities and rainy seasons will follow. The Central American Meteorological Bulletin was also initiated with the assistance of the Project. A four year bilateral environmental project with Nicaragua was launched in July 1998. ◆

Honduras

Hydrometeorological services are carried out by four national institutions in Honduras. The National Meteorological Service, Servicio Meteorologico National (SMN), is responsible for the management of the nation's meteorological information. The Head Office of Hydrological Resources is in charge of the management of surface water and has also a network of climatological stations at national level. The National Electric Company has a hydrological division in charge of several hydrometric networks located in watersheds, with hydropower development projects under way. The National Autonomous Aqueduct and Sewer Service is responsible for the management of underground water at the national level.

The Project has improved the quality of meteorological and climatological services of SMN by 50% and the Head Office of Hydrological Services by 15%.

The observing networks have been rehabilitated. The number of stations has increased from 180 to 227 and two new synoptic stations have been established.

The computer centre of the National Meteorological Service was completely renovated and modernised and a data base was created. The data base includes a series of 14 synoptic and 40 pluviometric stations, over 57 000 records of daily data, monthly, decennial, normal and extreme means, as well as the quality control of each parameter. The preparation of time series, of daily data, thermodynamic diagrams, time series of monthly data, frequency distributions, wind roses, etc., is in operation.

The quality of forecasts has improved through the establishment of a new two-way satellite telecommunication system. This 100% improvement is based on a large increase in the number of products available to meteorologists. Greater effectiveness was also achieved in international telecommunications. In addition, quickened preparatory measures in synoptic and aeronautical meteorology resulted in better weather forecasting.

Having completed the manpower development programme, Honduras now has a qualified personnel of 83. A meteorologist completed a course at university level and 22 staff members received training at Class II in meteorology. The progress achieved through the placement of qualified personnel has been indisputable. ◆

Panama

The political crisis in the late 1980s decreased the number of qualified personnel in the National Hydrological and Meteorological Services, and worsened the condition of the observation networks.

Two automatic meteorological systems were established in the stations in Guararé and Divalá with the help of the Project, to improve and expand the agrometeorological network in the area where corn and bananas are produced. The climatological network within the range of 440 and 2200 meters in altitude was strengthened; the stations in Nueva California and the Antón Valley, which have rainfall data from a period of over 30 years were provided with basic meteorological instruments. This gives support to agriculture and tourism, the main segments of the economy in these regions. In addition, the stations will develop the hydrological resources assessment and recognition of wind power potential. The station in Antón Valley will also improve the utilisation of data for the environmental impact assessment of the exploitation of geothermal power. Most of the network's evaporation measuring equipment was replaced. Access to reliable information on evaporation is very important in the calibration of hydrological models and in determining the hydrological balance of the reservoirs generating electricity.

The modernisation of the hydrometeorological data base system was one of the main achievements of the Project. It was complemented through training, refresher courses and consultation services provided by a data processing expert. As a result, a more rapid and reliable service can be provided, which permits the Services to participate in other regional projects requiring large data volume management, e. g. the Mathematical Modelling Project for Flood Forecasting in Real Time (co-ordinated by CEPREDENAC under the auspices of DANIDA) and the research on the Vulnerability of Hydrological Resources to Climate Change (co-ordinated by CRRH under the auspices of USA).

The two-way satellite telecommunication system provided by the Project has modernised the communications between each country in the Central American Isthmus and the World Meteorological Center in Washington. The meteorological data produced in the Central American countries is thereby available for global numerical weather forecasting models. This has improved the use of the models in predicting tropical weather conditions. The local short-term and medium-term forecasts in Panama are expected to improve significantly as personnel master the handling of the information and products available. The products from the World Area Forecasting System are of direct benefit to the aeronautical meteorological service.

The synop observation network was significantly improved as a result of the installation of an automatic meteorological system at the Enrique Malek International Airport serving the city of David. The station is providing data for the database.

As a result of the training programme, one professional was completing the graduate course in meteorology at the University of Costa Rica and five Class II and four Class III meteorologists participated in the regional training courses of the Project. They all work in the Meteorological Service in the fields of climatology, agrometeorology, synoptics, aeronautics, or in data management and quality control. The new systems were included in special technical training and on-the-job training. ◆

Hurricane Mitch

The powerful hurricane Mitch affected seriously Central America on 21-31 October 1998. The national meteorological services reported on October 21, 1998 on the presence of tropical depression no. 13 in the western Caribbean. The first advisory and subsequent watch and warnings were sent to the national emergency commission, government authorities, the Red Cross, the media and others. Mitch affected the northern coast of Honduras, with winds between 250 and 300 km/h, for about 30 hours and storm surges of 10/15 meters high. Heavy rainfalls, especially in Honduras and Nicaragua, of between 1000 and 1500 mm accumulated in around four days are equivalent to the total rain accumulated during 8 or even 12 months. Mitch has been classified as the deadliest Caribbean hurricane in more than two centuries.

Hurricane Mitch was reported in real-time and in the monthly bulletins in October-November 1998 in detail by the national meteorological services in the Central American isthmus. A detailed report on the rainfall and cyclone activities in Nicaragua in 1892-1998 was published in December 1998 by INETER, the national meteorological service of Nicaragua. A draft summary report on the role of the NMSs during Mitch and the strength of the hurricane was compiled by the regional committee CRRH in early January 1999.

The development and movement of hurricane Mitch from 21st October to 5th November 1998 was the following as presented under the headline "the hurricane called Mitch" in the monthly weather bulletin of the national meteorological service of Belize, October 1998:

"Mitch formed in the SW Caribbean Sea from a tropical wave about 360 miles south of Kingston, Jamaica, late on the 21st October 1998. The system initially moved slowly westward and intensified to a tropical storm. Mitch then moved slowly northward, then north-northwestward on the 23rd and 24th and gradually strengthened. Mitch became a hurricane early on the 24th. Later that day, as Mitch turned toward the west, it began to intensify rapidly. In about 24 hours its central pressure dropped by 52 Mb. Further strengthening took place and the central pressure reached a minimum of 905 Mb about SW of Swan Island on the afternoon of the 26th. This pressure is the fourth lowest ever recorded in an Atlantic hurricane this century – tied with Camille in 1969.

This also represents the lowest pressure ever recorded in an October hurricane in the Atlantic basin this century. At this peak intensity, Mitch´s one-minute maximum sustained surface wind was estimated at 180 mph. A category five hurricane on the Saffir/Simpson scale.

Mitch began to weaken gradually after passing Swan Island on the 27th, as it moved westward then southwestward toward the bay islands of Honduras. The center passed very near the island of Guanaja, wreaking havoc there as well as on the neighboring island of Roatan. From mid-day on the 27th to early on the 29th, the central pressure rose 59 Mb. The center of the hurricane meandered near the north coast of Honduras, then it moved southward and inland, weakening to a tropical storm on the 29th. Mitch moved slowly over Honduras and Guatemala on the 30th and 31st and weakened further to a tropical depression. The weakening produced torrential rains over portions of Honduras, Nicaragua, Guatemala, El Salvador and Belize. The associated floods were devastating in Honduras and Nicaragua.

Although Mitch originally dissipated near the Guatemala/SE Mexico border on

Sunday afternoon, November 1st, the remnants continued to produce locally heavy rainfall over portions of Central America and eastern Mexico during the next couple of days. Mitch re-emerged as a low-level circulation in the Bay of Campeeche. An airforce reconnaissance aircraft reported tropical force winds and a central pressure of 997 Mb in that area. Mitch had regenerated into a tropical storm on the afternoon of the 13th November, some 55 miles WSW of Campeeche, Mexico.

Mitch weakened to a tropical depression early on the 4th as it moved inland over northwestern Yucatan. The center re-emerged over the south central Gulf of Mexico by midmorning on the 4th, regaining tropical storm intensity. Mitch then began to accelerate toward the NE as it interacted with a cold front moving through the southeast gulf of Mexico. Mitch made landfall on the morning of the 5th over SW Florida near Naples, with maximum sustained winds near 60 mph. Mitch then moved offshore southern Florida by midafternoon of the 5th, and became extra tropical."

WMO arranged a coordination meeting for emergency assistance in San José, Costa Rica, on 19-20 January 1999 with international financing agencies, national meteorological services in the Central American isthmus and in the Caribbean countries and with WMO/VCP donors. The international support programme for 1999 will be defined in detail before the next hurricane season (June 1999). The regional support programme of the Project for 1999 coordinated by CRRH is foreseen to be partly readjusted, accordingly. ◆