Summary of Alejandro Gutierrez's Visit to Nicaragua, El Salvador, Honduras, and Guatemala (May 29 To June 1, 2000)
RONMAC Project

Objective of trip was to:
1) Provide national agencies with an overview of RONMAC.
2) Obtain a general vision of country-specific technical and institutional aspects.
3) Obtain other necessary technical information.

Mornings were spent meeting with institutional authorities, and afternoons were spent meeting with the technicians directly involved in station operation

Nicaragua (May 29, 2000)

Institutional Aspects

Attending the Meeting:
1- Pedro Miguel Vargas Carvajal, Subdirector of INETER.
2- Luis Palacios, Director of Water Resources
3- Mauricio Rosales, Director of Meteorology
4- Sergio Cordonero, Hydrographic Direction, Water Resources
5- Sergio Caramagna, Director of the OAS-Nicaragua National Office

INETER is responsible for tidal stations in Corinto, Sandino and San Juan del Sur. In addition, it is planning to increase the current network with stations on Caribbean coast (Puerto Cabezas and El Bluff – in front of Bluefields). The stations currently in use do not fulfill all of the requisites of a tidal station, as some lack tidal gauges with the necessary level of surveying and reliable data quality. INETER's reactivation/replacement/maintenance activities in the Caribbean are limited. INETER brings together the available sea level data from the tidal stations as well as from meteorological stations, although they lack the necessary capacity to carry out sufficient archiving and quality control activities.

Currently, a priority action facing INETER is training in station maintenance, data quality control, information preparation for submission to global databanks, and attainment of products of national utility (e.g. tide tables, basic sea level data, etc.). Accordingly, in terms of the sustainability of the network, policies that encourage the incorporation of professionals in the fields of physical oceanography and marine meteorology would be beneficial. The Department of Water Resources of INETER does have a team dedicated exclusively to the processing of this type of information. INETER also emphasized the importance of capacity building for national decision makers.

INETER believes that NOAA must share in permanent maintenance of the Network in order to ensure sustainability: "as they share in the benefits, they must also share in the costs of these benefits." Additionally, the general public must understand the national benefit of the RONMAC. This may require a parallel education program which will also help to ensure the RONMAC's sustainability. INETER has the general impression that NOAA's work in Nicaragua is lacking clarity. Specifically, the plan of action is confusing and unclear which results in multiple and inconsistent visits by a large number of NOAA representatives.

Short-Term Recommendations

1- Training: The aforementioned training must be provided to technicians from the Hydrographic Direction of the Department of Water Resources of INETER as well as to technicians from the Department of Meteorology/INETER.
2- Siting of RONMAC Stations: It appears that Corinto is the appropriate site due to its relatively large archive of in situ data and the fact this is site is the geodetic reference point for Nicaragua. Regardless, it must be pointed out that INETER already has tidal stations in operation at Corinto, which may mean that an alternate site could be identified. Sandino also has a relatively long archive of significant data, nevertheless, the longitude of the series of other in situ variables, such as wind, favor the placement of a second tidal gauge on the Pacific Coast of San Juan del Sur. Puerto Cabezas, on the Caribbean coast, seems to be one of the most appropriate sites for permanent sea level observation. El Bluff, located on the cape north of Bluefields Bay, is the other site that INETER has included in its future plans for incorporation into its national network. A significant inconvenience that INETER faces regarding Caribbean stations is the cost of relocating officials and technicians to that region.

El Salvador (May 30, 2000)

Attending the Meeting
1- Ricardo Zimmerman, Director of the National Meterological Service (SMN).
2- Pablo Ayala, Meteorology Department, SMN.
3- Luis Edgardo Hernández Rodezno, National Geographic Institute (IGN).
4- Enrique de la O Lemos, IGN.
5- Dr. Meyer, Director IGN (in attendance at the end of the morning meeting).
6- La Autoridad Portuaria Nacional (CEPA) was invited but not in attendance at the meeting. Pablo Ayala served as their representative for this meeting.
7- José Luis Chea, Director of the OAS-El Salvador National Office.
8- Representative of the OAS- El Salvador National Office.

Institutional Aspects

Different from Nicaragua and Guatemala, but like Honduras, sea level and related variable observation has not been integrated with meteorological and other related observation activities. In other words, the sea level observation has been the exclusive task of the IGN. The IGN has been responsible for observation and archiving of sea level data. This work is carried out by Luis Edgardo Hernández Rodezno, who is responsible for the maintenance of the only station in operation and archiving its data. He needs training in both of these tasks as well as in quality control, application of the data, and data preparation for submission to databanks, etc. The IGN is able to maintain the station in Acajutla, but has limitations in the processing of data due to equipment. Sea level data lack the quality control established by the TOGA Sea Level Center (TSLC) in Hawaii.

In terms of sustainability of the network, both on the national and regional levels, national policies to provide for additional technical capacity (eg oceanographers) in physical oceanography and marine meteorology would be beneficial.

If one were to replace only one tidal gauge unit in El Salvador, Acajutla is the obvious choice, given its continual operation since the 1940s. Regardless, it is important to highlight the comments made by Mr. Zimmerman in which he mentioned duplication of project objectives on the part of NOAA and the fact that this station is already projected to be replaced by NOAA/NESDIS.

The port of Cutuco – La Unión –, whose observation was discontinued in the 1980s, has been a geodetic reference point for both NOAA and GLOSS. Accordingly, the placement of a tidal gauge at that spot may be beneficial.

Short-Term Recommendations

1- Training: Training for Luis Edgardo Hernández Rodezno and designated employees from the Meteorology Department is both imperative and essential. At least two employees from each institution should be trained.
2- Siting of RONMAC Stations: Due to the longitude of the present data series, the climatological location of the site, and already existent work routines, it is recommended that a new station be placed in the port of Acajutla.
3- Division of Labor: Given the experience of the IGN and the SMN, teams from both institutions should be integrated into the project. This will help to guarantee the maintenance of both air and water sensors, quality control for data, functioning communications system, and information exchange among the international scientific community.

Honduras (May 31, 2000)

Attending the meeting

1- Arturo Pineda, Responsible for the Calculation Section of the National Geographic Institute (SC/IGN).
2- Virgilio Alvarenga Noriega, Chief of the Geodetic Department of the IGN.
3- Dolores Castellón, Chief of the Planning Department.
4- Marvin Rodney Díaz, SC/IGN.
5- Edmundo Paguaga, SC/IGN.
6- Pamela Avilés, SC/IGN.
7- Gerardo Aceituno, SC/IGN.
8- Pedro Efrén Reyes, Representative Héctor Flores, Director of the National Meteorological Service of Civil Aeronautics (AC).
9- Guillermo E. Molina López.
10- Absent: Puerto Cortes National Port Authority.

Institutional Aspects

In Honduras, water level observation has not been integrated with meteorological and other related observation activities. It has been the exclusive responsibility of the IGN. Currently, the only two tidal gauges in operation are in Puerto Cortés and Enecán - San Lorenzo, Golfo de Fonseca. The technicians responsible for maintenance and archiving need additional training. The training should especially focus on quality control, practical application of the data, and data preparation for eventual submission to global databanks. Currently, the IGN carries out routine maintenance on the tidal gauges in operation. The AC is experiencing economic limitations in terms of its maintenance of meteorological stations. Sea level data lack the quality control established by the TOGA Sea Level Center (TSLC) in Hawaii.

In terms of sustainability of the network, both on the national and regional levels, national policies to provide for additional technical capacity (e.g. oceanographers) in physical oceanography and marine meteorology would be beneficial.

There is not an official connection between COPECO (Comité de Emergencias Local) and the IGN, although the AC is in communication with COPECO.

Short-Term Recommendations

1- Training: Train designated technicians from the Calculation Section of the IGN and the Meteorological Service of the IGN.
2- Siting of RONMAC Stations: The recommended sites are: Puerto Cortés, Puerto Castilla and Enecán - San Lorenzo.
3- Division of Labors: Given the experience of the IGN and the SMN, my recommendation is that teams from both institutions be integrated into the project. This will help to guarantee the maintenance of both air and water sensors, quality control for data, functioning communications system, and information exchange among the international scientific community.

Guatemala (June 1, 2000)

Attending the meeting

1- Eddie Sánchez, Director of INSIVUMEH
2- Mario Roberto Bautista, Responsible for Meterology.
3- César A. George R., Supervisor of the Synoptic Meteorological Network.
4- Alberto Hernández, Respinsible for Maintenance.
5- Pedro Tax, Coordinator of the Department of Hydraulic Services.
6- Luis Santos, Supervisor of the Hydrological Network.
7- Fulgencio Garavito, Coordinator of Climatic Investigation and Services.

Institutional Aspects

INSIVUME, similar to INETER in Nicaragua, encompasses the various offices responsible for meteorological and hydrological observation in Guatemala. In Guatemala, there are no tidal gauges currently in operation. Accordingly, the technicians have had limited, if any, experience with this sort of equipment and data.

In terms of sustainability of the network, both on the national and regional levels, national policies to provide for additional technical capacity (e.g. oceanographers) in physical oceanography and marine meteorology would be beneficial.

During my visit, I spoke with Sub-Director Sergio Hernández regarding the tidal gauge that was installed in Puerto Quetzal in 1993 by TSLC of Hawaii. It was clear to me that the reasons for the dismantling of the equipment in 1995, apart from the mechanical problems in the Fisher & Porter unit, were:

1- Scarcity of personnel specialized in this equipment.
2- Serious limitations in effective communication between INSIVUMEH, myself, and the TSLC. This is especially relevant today given the fact that currently this institution is still lagging in terms of its use of and accessibility to e-mail.

OBIMAR is the port authority. Although it has not been specifically involved tidal gauges in the past, it is evident that its involvement would be beneficial to RONMAC. This is due to enthusiasm and motivation, significant hydrological training, and military discipline on the part of its staff.

Short-Term Recommendations

Training: Train designated technicians from the Department of Hydraulic and Meteorological Services and OBIMAR.

Siting of RONMAC Stations: Due to available historic data, the availability of port authorities and personnel, and INSIVUMEH's experience with the sites, the recommended location for the stations are: Puerto Santo Tomás de Castilla -Matías de Gálvez- and Puerto Quetzal.

General Recommendation

Given the information obtained in these meetings, as well as my personal experience in Costa Rica, I would like to highlight the importance of an exhaustive revision of the historic benchmarks. This will enable us compare the historic and new series, while taking into account all geodetic factors.