

**REPORT ON TRAINING ACTIVITIES IN
COSTA RICA AND BARBADOS**

This document reports on training activities carried out by NOAA/NESDIS in Costa Rica and Barbados using the virtual laboratory concept. It also outlines an expanded plan for similar activity throughout the region for the coming years.

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1 INTRODUCTION

A demonstration project for Satellite Meteorology Applications focused at the Regional Meteorological Training Centers in Costa Rica and Barbados was undertaken in response to the 45th WMO Executive Council Report that strongly "supported the proposal that each satellite operator or group of satellite operators participating in the space-based sub-system of the Global Observing System (GOS) co-sponsor at least one of the specialized satellite applications training centres ("centres of excellence") strategically located around the globe with regard to the satellite training programme." NESDIS and NWS have utilized two NOAA Cooperative Institutes, CIRA (Cooperative Institute for Research in the Atmosphere at Colorado State University) and CIMSS (Cooperative Institute for Meteorological Satellite Studies at the University of Wisconsin), to initiate a demonstration project focused at the RMTCs in Costa Rica, a Spanish language RMTC, and Barbados, an English language RMTC in WMO Regions III and IV. These satellite focused RMTCs have been approached through the concept of a virtual laboratory which utilizes inexpensive personal computer technology and Internet for data distribution: it is modeled on the highly successful RAMSDIS program (see web address below for detailed information on RAMSDIS)

<http://www.cira.colostate.edu/ramm/ramsdisa.htm>.

With guidance from CIRA and CIMSS, the Costa Rica and Barbados RMTCs have and are participating in a demonstration, familiarization and training program in the use of satellite imagery. **We are in the midst of the third year activity** and plan to extend our activity to make satellite imagery available to WMO Region III and IV countries supported by the RMTCs. The proposed extensions are significant and activity will continue into year 4. The ideas for extended activity were spurred on by the successful 2-week training event held in Barbados in October 1998 and by the devastation caused in Central American countries following the path of Hurricane Mitch at the end of October 1998. During the training event RAMSDIS and RAMSDIS-Online were used in both the lectures and laboratory exercises. The participants from Regions III and IV were enthusiastic about the potential applications of the high resolution, multi-channel imagery and derived products and the easy usage of RAMSDIS and RAMSDIS-Online.

This document briefly describes training activities carried out under the virtual laboratory concept months and presents a brief summary of planned activities for the coming years.

2 THE VIRTUAL LABORATORY

2.1 Background and current status

The Virtual Lab concept that is being demonstrated in the Costa Rica and Barbados RMTCs has focused on using personal computers (PCs), case study data sets, and Internet connections to

demonstrate the use of digital satellite imagery. This pilot program to "train the trainers" in the interpretation and use of satellite imagery was initiated in June of 1996. Shortly thereafter, CIRA purchased and configured two "research" RAMSDIS units for the RMTCs in Costa Rica and Barbados, with CIMSS providing the McIDAS portion of RAMSDIS. Later that year, an "ingest" RAMSDIS was purchased and sent to the RMTC in Costa Rica.

Over the past few years, Costa Rica has used the "ingest" RAMSDIS PC system to receive real time digital GOES-8 imager data from a NESDIS server via the Internet. The reception of digital image data during the evening hours is excellent, but high daytime Internet traffic in Costa Rica puts a large strain on its reception during that time period. The Barbados RMTC does not have the Internet capacity to receive real-time digital image data, and special efforts (digital tapes, CDs, and ftp) are made in other areas to provide them with digital image data for use with their Research RAMSDIS. For both Costa Rica and Barbados, small amounts of digital image data pertaining to case studies or interesting weather events are made available on CIRA's ftp server. During the last year, non-digital imagery and animations have been made available to both Costa Rica and Barbados through a system known as RAMSDIS On-Line. RAMSDIS Online displays real time image products and Javascript animations from the RAMSDIS system. These real time loops consist of 480x640 pixel-sized GIF images, each of which is about 200 KB. Each of the animation loops contains between 8 and 24 images (2-5MB/loop). Through the RAMSDIS On-Line menu, tutorial information concerning the use of each product may be accessed. RAMSDIS On-Line may be accessed at

<http://www.cira.colostate.edu/RAMM/Rmsdsol/main.html>

where links can be found to RAMSDIS On-Line for Barbados and Costa Rica.

2.2 Research and training

2.2.1 Research

Since the inception of the program, many sets of retrospective digital satellite imagery have been provided to both Costa Rica and Barbados for use in the development of case studies. These covered heavy rain events associated with Hurricane Cesar and Mitch at different stages of development and heavy rains associated with major tropical waves. Other case studies demonstrated cycles of convective development over land and water, strong wind events, fire detection, and volcanic ash detection. The case studies have been used for training on the use of single and multi-channel imagery in detecting fog, water and ice cloud, and on the use of applications such as image averaging and determining cloud motion winds.

To supplement these case study data sets, a major effort was initiated in Costa Rica in November, 1996, which focused on developing monthly satellite climatologies of hourly visible and bi-hourly 3.9, 6.7, and 10.7 micrometer imagery. To supplement the loss of imagery due to slow Internet connections during the day, the hourly climatology imagery is sent to Costa Rica nightly. The case study data and satellite climatologies combined with the ingest capabilities in Costa Rica have demonstrated the value of digital satellite data and the success of that international effort in developing joint research projects. These activities will continue into the future.

2.2.2 Training

A WMO-sponsored 2-week satellite meteorology training event was hosted by Barbados during October 5-16, 1998. Eighteen participants represented 17 countries from the Caribbean, Central America, and South America (Antigua and Barbuda, St. Lucia, Jamaica, Trinidad and Tobago, Netherland Antilles and Aruba, Mexico, Belize, Honduras, Costa Rica, Panama, Columbia, Ecuador, Peru, Paraguay, Brazil, Suriname, and 2 from Barbados). Computers were used for hands-on laboratories, which were designed to complement the lectures. A web-based format with RAMSDIS Javascript animation was used for many of the lecture examples and lab exercises. At the end of the training, the students were given a CD containing the lecture material and the laboratory exercises. Another 2-week satellite meteorology training will be held in Costa Rica during December 6-17, 1999.

Other activities fostered by the virtual laboratory are evident in both Barbados and Costa Rica. In Barbados, the virtual laboratory has made it possible to use RAMSDIS quality GOES-8 data in a satellite meteorology course being offered at the Caribbean Meteorological Institute (CMI), as well as for detailed case studies. Satellite Meteorology efforts in Costa Rica are becoming more visible with the addition of a new course, 'Satellite Meteorology', for Master of Science students. Satellite imagery is also used to support other courses in Meteorology such as dynamic and synoptic meteorology, cloud physics, meteorological instruments, and observation methods. In the area of public outreach, a new course, 'Meteorological Satellites', is being offered to the general public through the University of Costa Rica 'Free Courses' program. The University of Costa Rica makes Javascript loops from the climatology images mentioned above, and displays them on their web-site

<http://ramsdisc.fis.ucr.ac.cr>

That imagery is utilized widely by professors for current weather examples that highlight concepts taught in class. A similar satellite climatology project was initiated for Barbados in February 1998.

3 FUTURE ACTIVITIES

With CIRA and CIMSS, the Costa Rica and Barbados RMTCs are participating in a demonstration, familiarization and training program in the use of satellite imagery. In cooperation with the RMTCs and the WMO, we hope to extend NOAA's activity to make satellite imagery available to WMO Region III and IV countries supported by the RMTCs. The ideas for extended activity were spurred on by the successful 2-week training event held in Barbados in October 1998 and by the devastation caused in Central American countries following the path of Hurricane Mitch at the end of October 1998. During the training event RAMSDIS and RAMSDIS-Online were used in both the lectures and laboratory exercises. The participants from Regions III and IV were enthusiastic about the potential applications of the high resolution, multi-channel imagery and derived products and the easy usage of RAMSDIS and RAMSDIS-Online. As indicated previously, RAMSDIS is an advanced, menu-driven analysis and display system which allows for real-time, digital, GOES imagery and derived products to be automatically ingested and displayed as static images or animations (which can be accessed by simply pressing a function key). Some of the easy-to-use menu-driven applications include color enhancements, which can be used to highlight cloud top features, storm motion, and feature arrival time at a specific location. Non-digital GIF images can be created from those displayed on the RAMSDIS units and can be viewed outside McIDAS on commonly used

Internet browsers. Java-script loops have been designed to view the imagery in a RAMSDIS-like fashion, thus creating RAMSDIS-Online. Both RAMSDIS and RAMSDIS-Online provide the ability for remote sites to share software and data on a low-cost platform, which is essential to joint research and training efforts.

The objective of the expanded activity is to make satellite imagery more readily available through the Internet to WMO Region III and IV countries for demonstration, familiarization and training. This task, as currently envisioned, will proceed in two phases. In the first phase, the goal is to distribute satellite imagery through RAMSDIS-Online. Image sectors will be generated at CIRA in GIF format, and sent to servers in Barbados and Costa Rica. Participating countries from Regions III and IV will receive a PC and be able to download the imagery from the appropriate servers and display the imagery on their own systems via the RAMSDIS-Online format. In the second phase, the goal is to make digital satellite data available (in McIDAS format) to the participating countries, and to upgrade the software on their PCs to include full RAMSDIS capabilities. This upgrade will enable the countries to manipulate the satellite data and develop new applications, in addition to viewing the imagery. To accomplish this goal, the incoming GOES GVAR data signal available at Costa Rica and Barbados will be converted to McIDAS format. Once the McIDAS imagery is available at Costa Rica and Barbados, the RAMSDIS-Online sectors can be generated directly (rather than being transferred from CIRA). When the participating countries have been upgraded to full RAMSDIS capabilities, they will have full access to the digital data through Internet connections to Costa Rica and Barbados.

With the distribution of higher resolution satellite imagery and satellite products to Region III and IV countries, training efforts and the development of training materials will continue. A WMO sponsored 2-week training event is scheduled in Costa Rica in December, 1999. That venue will be used to complement and enhance the training capabilities to be delivered with the RAMSDIS units.