

2004 Satellite Direct Readout Conference: A Decade in Transition

**December 6 -10, 2004
Miami, Florida**

NOAA Summary Report

Acknowledgements

The National Oceanic and Atmospheric Administration (NOAA) Satellite and Information Service and the NOAA National Weather Service were pleased to host the 2004 International Satellite Direct Readout Conference: A Decade in Transition. This conference provided a forum for an exchange of information between the environmental satellite users of direct broadcast and the Agencies that provide these services. As a result, over 200 participants from 29 countries attended the conference. The focus of the event was to ensure user readiness for upcoming changes to environmental satellite systems. Presentations were delivered by representatives from international governments, industries, educators, and amateur organizations, spotlighting their activities, plans and future programs. The conference afforded the rare opportunity of personal contact and technology transfer between government, industry, and academia and others interested in environmental satellite direct broadcast services. The worldwide interest in satellite direct broadcast continues to open up new avenues of communications.

The conference organizing committee would like to express our appreciation to the sponsors whose support made this conference possible. First of all, to the NOAA participants, including the National Weather Service, the Satellite and Information Service (NESDIS) and its Office of System Development (OSD), Office of Satellite Operations (OSO), Office of Satellite Data Processing and Distribution (OSDPD), and Office of International and Interagency Affairs (IIA). To the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Integrated Program Office (IPO) and the National Aeronautics and Space Administration (NASA), we offer our thanks for your funding, your support, and your participation. For the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and the World Meteorological Organization (WMO), we offer our gratitude for your participation and for your support in assisting us in presenting a broader perspective of the future to a worldwide audience. And, finally, we wish to offer our gratitude to the many people on our Organizing Committee and our support staff, who provided their time and dedication to ensure that this conference was a success.

We offer our appreciation to the session chairpersons for organizing interesting and exciting sessions, to all of our speakers who willingly shared their knowledge and experiences with us, and to the exhibitors for their outstanding exhibits. We also appreciated the excellent facilities and services provided by the Hilton Miami Airport hotel staff. Most of all, we wish to express our appreciation to those of

you who participated, giving us your time, your attention, your interest, and your feedback to help us provide a smooth transition to new technologies over the next decade.

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Executive Summary

Introduction

The National Oceanic and Atmospheric Administration (NOAA) Satellite and Information Service hosted the **2004 Satellite Direct Readout Conference: A Decade in Transition**, at the Airport Hilton Hotel in Miami, Florida, December 6-10, 2004. The National Aeronautics and Space Administration (NASA), NPOESS Integrated Program Office (IPO), a tri-agency team consisting of NASA, NOAA and Department of Defense, and the NOAA National Weather Service also made significant contributions in planning, financial and meeting support. This conference was the latest in a series of cooperative international satellite user forums among NOAA, NASA and the user community that were initiated in 1980.

This conference was organized to benefit users of environmental satellite direct broadcast data and for those operating their own satellite data receiving stations. It also provided a forum to help NOAA customers prepare for upcoming changes in direct broadcasts from NOAA satellites. This conference continued discussions initiated during the **2002 Satellite Direct Readout Conference for the Americas** with an expanded scope to include all global users who receive data directly from NOAA's environmental satellites.

Conference Goals

The goals of the conference were developed to ensure user readiness for upcoming changes to environmental satellite systems and to facilitate discussions and information sharing among environmental satellite operators and the user community. It also provided users the opportunity to provide feedback on upcoming satellite changes, engage in two-way communication with NOAA and NASA scientists and managers and the user community, as well as provided NOAA the opportunity to inform users of the innovative new changes in direct readout technologies and new applications coming within the next decade.

The conference format consisted of four general themes organized around International Cooperation, Polar Systems, Geostationary Systems, and the Global Observation System. Discussion sessions were also used to address specific topics along with opportunities for conference attendees to circulate through conference exhibits. Conferees were also able to post questions and comments on a large bulletin board called the “wall of wonder.”

In addition to speakers representing NOAA satellite programs, representatives from other hydro meteorological agencies, NASA, research organizations, universities, the WMO, and EUMETSAT participated. There were numerous opportunities to exchange information with colleagues and for open discussions with speakers as well as NOAA program managers and especially for NOAA to listen to the user community.

Conference Activities

Over two hundred participants from 29 countries participated in the conference. Many of them participated in the 2002 International Direct Readout Conference, while some had come for the first time. In addition to keynote addresses, plenary sessions and a few concurrent workshops, multiple activities were scheduled to promote information sharing, networking, collaboration and problem solving. Multiple themes generated during the conference include:

- 1) A need to assess resources available worldwide and identify gaps that exist in order to have better and timelier data. Pooling of these resources could result in cost savings and improved output.
- 2) A need for strategic planning at organizational, country, regional, and worldwide levels to anticipate deployment of new and emerging technologies and sharing of best practices.
- 3) A growing awareness of what environmental information is being collected and studied, and how it is interrelated to other systems that are dependent on each other and have direct impact on safety, sustainable development, and ecological health.
- 4) A heightened awareness of the participants' responsibility as global stewards and advocates for increased availability and dissemination of climate and oceanic information. This role will become even more important as individuals and their governments understand how integrated observing systems can bring benefits to daily living.
- 5) A continued concern regarding greater needs of satellite observation data for countries in the southern hemisphere.
- 6) An emerging reality expressed by many countries facing an aging talent pool that there is insufficient interest in technical professions needed to fill future human capital needs.

- 7) A need for continued technical training and improved communications within the environmental earth observation community.

Conference Recommendations

A number of excellent ideas and recommendations emerged from the conference dialog sessions and breakouts. Better communication, improved training, regional observation centers and the application of observation data for the health of the Earth system were a few of the concepts presented and discussed. Specific short term, mid term and long term recommendations can be found under the Participant Recommendations section of this Summary Report.

Areas for improving future conferences were also identified and discussed. One excellent suggestion was to add smaller workgroup meetings where more specialized information and training can be explored in more detail. These smaller groups could also meet outside the conference to develop and set action plans into motion and report on their successes at the next conference.

Conference Summary

The 2004 Satellite Direct Readout Conference confirmed the value of targeted user meetings and identified the need for continuing these types of conferences on a periodic basis. Participants unanimously agreed that the conference was a success and that they each took away a large volume of information that will benefit them and their organizations in preparing for satellite service transitions into new technologies.

The conference further helped identify common needs and areas of possible future cooperation as well as opened up idea-sharing for action plans. There was a general agreement that improved communications and information sharing among countries is an area that all need to continue addressing.

Several vendors also displayed and demonstrated their equipment and services at the conference and many of them made productive connections with the user community they support. It was also practical to see active Low Rate Information Transmission (LRIT) systems in operation and

capturing “live” data from the GOES-East satellite. These demonstrations helped confirm the many discussions on current technology transitions.

Overall, participants displayed a spirit of willingness to overcome economic, political, cultural or other challenges in order to collaborate for the common good.

Next Steps

NOAA Management will assess conference recommendations and evaluate how they can be incorporated in future actions. These recommendations will also be considered as NOAA implements GEOSS objectives and special projects. For example, many of the conference recommendations are being incorporated into the newly announced “Earth Observation Partnership for the Americas.” NOAA will continue to look for opportunities to put conference recommendations into action.

NOAA is currently planning a follow-on international satellite conference in the spring of 2007 and has begun evaluating alternate locations to expand outreach efforts. Conference attendees expressed an interest in moving the conference away from the Holidays and exploring alternate locations. Results of our evaluations on timing and location will be posted on the conference web site when they are available.

Conference Activities

The 2004 Satellite Direct Readout Conference brought together over 200 professionals from 29 countries to discuss current and future uses of satellite and other observation systems.

The Conference consisted of large group presentations, a few concurrent sessions, and a variety of conference community activities designed to encourage the free flow of ideas and information and foster networking opportunities for future linkages

This report is a summary of the conference community activities. These activities included an area for informal congregation from Monday at registration until Thursday afternoon called the “Wall of Wonder.” This activity was designed to provide a forum for participants to share ideas and ask questions. This allowed organizers, presenters, participants and vendors to know what issues, needs and talents sharing interests were present. The congregation area had three questions around attendees’ expectations and four questions about attendees’ resources. (See summary, Appendix A.)

This place for informal congregation helped shape side discussions and meetings. For example, one side discussion resulted in an impromptu lunch time meeting held between NOAA and representatives from Latin America. (See attached summary, Appendix B.)

The area was also used as an opportunity for the facilitator to obtain informal feedback on how the conference was going and to help connect individual participants with NOAA experts or other participants for networking.

Four facilitated discussions were held as follows:

- A) Wednesday, December 8, 4:15-5:00 p.m. — **User Needs for Direct Readout from Polar Orbiting Satellites**
- B) Thursday, December 9, 10:30 a.m. - noon — **Current and Near-Term GOES**
- C) Thursday, December 9, 3:15-5:00 p.m. — **GOES User Readiness**
- D) Friday, December 10, 10:30-11:45 a.m. — **Action Planning**

Discussion A – User Needs for Direct Readout from Polar Orbiting Satellites

The purpose of this discussion was two-fold: (1) to collect information from the users about their needs and current resources; (2) to answer questions or concerns.

Since specific information was needed that did not lend itself to a large-group format, a questionnaire was distributed at registration and participants were encouraged to bring it to this discussion as a kick-off to the discussion. (See questionnaire summary in Appendix C.)

Discussions were held in small, mixed groups to foster dialog between attending nations and NOAA personnel. Each table had a set of discussion questions to help guide them and a note taker using a “workbook” designed to capture their answers. (See “workbook” summaries in Appendix D.)

Discussion B – Current and Near-Term GOES

The purpose of this activity was to ensure participants learned 10 key pieces of information related to the transition to the new satellite systems. Special attention was paid to important milestone dates and critical resources that must be in place for the transition to occur.

To encourage greater participation, four “expert stations” were set up in the corners of the room and participants were broken up into four groups to complete a “scavenger hunt,” the purpose of which was to get answers to the 10 critical questions and expand on the topics as needed. (See Appendix E.) The four “expert stations” were:

- 1) Current GOES – Cindy Hampton, George Serafino and Pablo Clemente-Colon
- 2) GOES N,O,P – Tim Schmit and Sandra Cauffman
- 3) LRIT/EMWIN – Bill Johnson, Jeff Manning, Angelo Wade and Martin Yapur
- 4) GOES DCS – Kay Metcalf, Bill Brockman, Eric Madsen and Jim Wydick

This forum assured that participants obtained key information and had the opportunity to ask specialized questions in a smaller group. After the “fair,” a large-group question-and-answer period was held.

Notes from those discussions have been compiled. (See Appendix F.)

Discussion C – GOES User Readiness

The focus of this discussion was to look at current and future GOES applications. Attention was paid to: what the best format would be for the data, what training, equipment or other requirements need to be addressed, and how to best collaborate.

Participants met in smaller work groups and completed a workbook of answers to the structured questions. (See Appendix G.)

Discussion D – Action Planning

This structured discussion was focused on synthesizing the information covered over the week and proactively identifying short- and long-term actions that could be taken.

Participants were introduced to a change management model and asked to strategize how to disseminate what they learned to their subordinates, peers, superiors and other key parties.

An example of the type of regional cooperation desired was brought up with the upcoming Conference on Floods in September 2005 to be held in Costa Rica. NOAA also announced a desire to have a similar conference within the next two to three years. (See Appendix H.)

Announcements were then made about the need for a structured inventory format. NOAA agreed to provide the format and distribute the findings. There are special concerns about making sure their countries can budget and plan appropriately for upcoming changes.

Participant Recommendations

Short Term

- 1) **System Inventories:** Participants agreed to complete and return an integrated inventory of existing systems using a NOAA-generated format.
- 2) **Sharing contact information:** Sharing contact information to facilitate local and regional cooperation. NOAA will share available information with participants. Participants will reach out to organizations in their countries that were not present at the conference.
- 3) **Information dissemination:** Posting the notes and presentations from this meeting and finding ways to make NOAA's website more interactive with tools such as threaded discussions or question-and-answer pages. Additionally, continue to find other cost-effective ways to share information and collaborate.
- 4) **Action planning:** Participants acknowledged a need to go back to their countries and bring key people together to develop an action plan to prepare for emerging technology and human capital needs. Further discussion with the WMO and other organizations will be pursued.

Mid Term

- 1) **Establish Regional Observation Centers:** Participants were interested in exploring the possibility of regional observation centers that could provide more cost-effective and efficient ways to share data. This was seen as of particular importance to smaller countries that may lack resources. FX-Net was one idea discussed. NESDIS's "Earth Observation Partnership for the Americas" was another step in that direction.
- 2) **NOAA Expert Visits:** NOAA experts were invited to visit other countries to gain more awareness and understanding about what

individual countries need and what they may have available to share.

- 3) **Training Needs:** Possible actions include regional training on specialized topics; train the trainer events for universities and other local channels for professional development and greater use of web-based training.
- 4) **Establish Contact Liaisons:** Point persons or liaisons in organizations would help handle transition concerns for changing satellite systems with NOAA.
- 5) **Tackle Language Barriers:** Actions discussed included everything from keeping a “live” list of technology acronyms on the website to make sure everyone is familiar with relevant language of the new technology. The other issue was translations of already existing materials. Questions were raised about countries volunteering to assist in the translation with the understanding that translation itself is a profession. More discussions are needed to identify the best way to break the language barriers.
- 6) **Individual Advocacy:** Participants acknowledged their roles as advocates in helping their countries understand the potential implications for aviation, marine, climate, transportation, agriculture and other applications for the new technologies. This would then lead to training people in these arenas on how to use the information.

Long-Term

- 1) **Active Contributors:** Shift away from passive receivers of information disseminated to users to active contributors of information, technology and talent.
- 2) **Collaborative Relationships:** Broader application of observation data in the health of the earth system as a whole through collaborative relationships with other disciplines.

Wall of Wonder Comments

December 6-9, 2004

What brings you to this conference?

- To learn about the new satellite technology and be able to apply it in my country, Guatemala, for the good of its population.
- - The kind invitation from its organizers.
- My participation to train in SAT MET in the University of Costa Rica WMO-RMTC. Costa Rica
- To learn about changes in satellite technology. Mexico, SMN
- To learn when is the EARS retransmission expected to be available in the southern hemisphere. Alejandro Muñoz, Chile
- - To learn about the future NOAA satellites
- Update knowledge and explore new possibilities for teamwork. Cotlier, UNR, Argentina
- To update knowledge and get awareness of the latest changes and improvements in satellite technology. Venezuela
- The possibility of learning about changes in technology, its new uses, the support that could be obtained to upgrade the current equipments, and to learn about the work being done in other countries. Diego Sarmiento, CVC, Colombia
- The “Mainstreaming Adaptation to Climate Change in the Caribbean” (MACC) project is the third in a series of climate change adaptation initiatives that have taken place in the Caribbean since 1998. Central to this capacity building mandate of the project is the establishment of regional data collection networks for vulnerability assessment and adaptation planning. As a DCS client I am attending the meeting to develop awareness of the short, medium & long term changes for the GOES system and the implications of these changes for the maintenance, upgrading & expansion of the MACC network. Leslie Walling
- - To learn about the current status of POES/GOES.
- Gather information about the evolution of NPOESS/GOES – NEXT/METOP.
- To learn about new available products.
- To be prepared for changes.
- To search for cooperation opportunities.
- To learn about training opportunities. Saldivar, SMN, Argentina
- To learn about new products and satellites in order to plan a better use for them.

- To learn about the new technologies of the future, to establish them in my country, Spain. Oscar Ohic
- To learn about the satellites' products and services. G. García D., Ecuador

What is the one question you want to make sure you get an answer to?

- - We will have the capability to receive raw NPOESS data?
- It will be important to maintain research activities in meteorological satellites around the world.
Luiz Machado
- Can we have the necessary software before satellite be launched? Luiz Machado
- Is it possible to use GOES-11 for rapid scan mode and leave GOES-12 for globe scan each 30 minutes? Luiz Machado
- Can we have a list of key persons responsible for NOAA services? Luiz Machado
- For how long will the GOES equipments with 100 bps in reception and transmission be operational? How will the migration be carried out? Gustavo Muñoz
- How can we store satellite developments? Luiz Machado
- How will we be able to gain access to training in management of water-meteorological systems, from measurement in the field up to delivery of the product (for example, short range caudal forecasting)? Gustavo Muñoz
- Regarding Pacific coverage,
 - When will MTSAT begin operations?
 - Will NOAA continue GOES operations to that time?
 Pitz
- For the Latin American group, it would be convenient to have, before Friday, an exchange procedure to trade information and opinions. Brahim Nazarala, DOA, Chile
- When will the GOES channels be switched from 100 bps to 300 bps? Mexico, SMN
- Is it possible South America run a grand segment to operate spare satellites? Luiz Machado
- Is it possible for Reception Stations of GOES-12 information (the communication platform) to adapt in the future to GOES-R? Venezuela
- Can NOAA provide a complete TBUS Data Base for each satellite during the serving time?
- Detailed solution to the question: What exactly hardware and software requirements will be necessary for next NPOESS, NPP generation satellites?

- What are the advantages of the NPOESS over the GOES system?
- Is it possible South America receive MSG? Luiz Machado
- Why does EUMETSAT charge a user fee when the U.S. provides data for free and US & EUMETSAT are partners? Mitch Roffer
- Why does EUMETSAT encrypt? F. J. Bell
- How can we get better GOES schedule below ZCS? Luiz Machado
- Regarding TBUS database, we found for some satellites in some periods there were no TBUS data available; for example, NOAA 9 during 1993. How can users get those archived TBUS DATA for those periods? Ji Chen, Canada
- Why does NOAA not encrypt (and ensure better service for non-USA users)?
- In the case of DCP, what technical changes are foreseen in the near future, so that users can adopt preventive measures? Brahim Nazarala, DGA, Chile
- Is it possible for NOAA to do visits to water-meteorology sites, so they could have a better understanding of our needs and customs? How could they effectively support these users? Xiomara Sanclemente
- Is there an image or any available information giving depth of snow? Brahim Nazarala, DGA, Chile
- As we look at bringing NPOESS data to South & Central America, we need a better understanding of the organizations and agreements that already exist.
For example, in the US, the Air Force, Navy, and NOAA each have a WX service that uses the same data but produces specialized products. Universities also produce products. Do similar arrangements exist in your country?
Example: I know that economic/trade groups exist (MERCOSUR, I think). Do these groups extend to data exchange?
What sort of data exchange mechanisms exist intra/inter country - broadband, high speed internet, DSL, etc.?
John Cunningham, NPOESS SPD

By noon Friday this conference will have been a success if...

- We (NOAA) should schedule a “Direct Readout Users” Workshop 6 to 12 months after this conference to foster continued discussions about future cooperation. The “workshop” results could be briefed at the next Direct Readout conference in 2006. Keep the ball rolling! P. Wilczynski, NPOESS IPO

- - I hope to have support for training & strengthening technically the people who work with images & data.
 - Accomplish updating DCGS DCS with NOAA's help.
- Success if I can meet with representatives from countries in Spanish-speaking countries in the continent to talk about the next regional training event on SAT MET, sponsored by WMO to take place at the RMTC, Univ. of Costa Rica in March 2005.
- If I can identify supporting sources to technically strengthen the personnel at IDEAM. Xiomara Sanclemente
- What are the necessary modifications that should be made to the POES/HRPT receptors for the reception of the Metop Series (EUMETSAT)? Alejandro Muñoz, Chile
- If:
 - We define how we prepare to face the future changes.
 - We plan common strategies for the reception/processing and distribution of the data.
 - We plan how to train the personnel of the SMHN in the utilization and processing of the satellites.
 Saldivar, SMN, Argentina
- - We get support to train and technically strengthen the personnel in charge to work with the images and the data.
 - We achieve an agreement to update the DEGS, DES system, with the help of NOAA.
 - We have a future contact to make the change of channels from 100 bps to 300 bps.
 - We get support in the follow-up duties to the RAW and its quality.
 - Telnet channel to consult the RAW of our stations.
 Diego Sarmiento, CVC, Colombia

How would you expect NOAA to help your nation in order to use satellite data?

- Training to better use satellite data. Mexico, SMN
- The project, in collaboration with the University of the West Indies, has begun to downscale global general circulation models for climate change scenario development. Historical satellite data (meteorological) can assist in statistical downscaling by filling spatial gaps where data cannot (PFO) or is not collected, e.g., at points in the central Caribbean Sea remote from land, also for countries with short meteorological data returns. Collaboration with the Caribbean's regional climate change adaptation initiatives to develop capacity in the use & manipulation of data products for baseline development & vulnerability assessment. Leslie Walling, MACC Project
- - Training
 - Technical support
 - Software
 - Visits to our locations to better assess our needs

- To continue cooperating with:
 - CIRA – University of Costa Rica
 - Virtual Lab WMO and WMO Satellite Program
 - Continue with the cooperation
Costa Rica
- Technical assistance and training. G. García, Ecuador
- Training
 - Technical assistance
 - Cooperation and transfer of technology agreement
 - Equipment donation or credit terms to have DCP/DRGS
Diego Sarmiento, CVC, Colombia

What could you suggest to make easier the usage of satellite data in your nation?

- To have a better communication framework among the nations using satellite data. Mexico, SMN
- To make access easier it would be necessary to have a uniform format, of the type BUFR. It could be BUFR,2 or BUFR,3, etc., and since each center creates its sub-center, it would be very easy to decode it for its use.
- To establish regional centers to generate data at the request of the countries that form it, and to determine a broadcast system via internet and an alternative one (for example, VSAT 64/128 Kbps). Saldivar, SMN, Argentina
- Do not encrypt data paid for out of public taxes. F.J.Bell, GEO

How does your nation use satellite data (e.g., weather forecasts, severe weather warnings, precipitation & water resources management, aviation, observation of climate trends, fisheries, oceans)?

- Principal uses:
 - Meteorological vigilance
 - Derived products
 - Support of Volcanic Ash Advisory Center at Buenos Aires (VAAC-BUE) before WMO-OACI
 - Integration of data with:
 - SFC data
 - Soundings
 - Models
 - Radar
 - Public Services
 - Precipitation estimates

- Prevision of floods (in study)
Saldivar, SMN, Argentina
- From my point of view we use:
 - NOAA Imaging
 - Oceanic investigation
 - Agriculture
 - Monitoring fires and floods
 Cotlier, Argentina
- They are used for:
 - daily weather forecast
 - monitoring of severe weather phenomena (hurricanes, depressions, storms, etc.)
 - predictions of trends for the rainy season based on the information on temperature anomalies from the North Atlantic sector.
 Venezuela
- In the Cauca River Valley (Colombia), we use the data for weather forecasts, to generate warnings against possible natural disasters, hydrology, precipitation, climatic trends and dam management on the Cauca River. Colombia
- It is used for:
 - Detection of forest fires
 - Volcanic eruptions
 Juan José Sinay, Guatemala
- The data from the satellites is used to manage the water resources at the Panama Canal, also for hydro-meteorology. Panama
- It is used mainly for:
 - weather forecast
 - severe warnings
 - aviation
 Alejandro Muñoz, Chile
- It is used:
 - in all the fields described in the question
 - research (precipitation forecasts)
 - education
 Costa Rica
- It is used mainly for weather forecast, warnings against severe weather phenomena, vegetation index, forest fires detection, precipitation estimates. Mexico, SMN
- - Weather forecast
- Climate forecast
- Aeronautical meteorology
- Warnings for floods, droughts, frosts, mud slides, fires

- Fluvial and maritime navigation
Colombia, IDEAM

What are the technologies your nation counts on for satellite data?

- The company C.V.G. EDELCA currently has 45 stations to transfer real time information via GOES. Venezuela
- - 4 GUAR receptors
- 3 HRPT receptors
- Terascan 3.2 software from Seaspace Co.
- Wide band internet
- DCP receptor
Alejandro Muñoz, Chile
- Direct Readout
GOES GUAR
POES HRPT
Via FTP (CONAE)
MODIS
Distribution of the information:
 - Internet (partial)
 - Intranet (total)
 - VSAT (total)
 Saldivar, SMN, Argentina
- - RAMSDIS Systems
- Direct reception SM Nal
- Internet
Costa Rica
- Mexico has a monitoring net made up of the following:
 - Receptor stations for satellite images
 - Meteorological radars
 - Automatic stations
 - Radiosonde stations
 - Conventional stations
- GVAR Direct Readout from IPS of California. (Panama Canal Authority)
- - We now have:
 - Eighty 300-pbs stations
 - Sixty-five 100-pbs stations
 - In 2005 we will install 155 new 300-bps stations that have already been acquired.
 - We have a ground station for reception of images and data.
 - VISAT
 Colombia, IDEAM

- Internet
Ground stations for reception/TX (METLAB, AFTN, RAMSDIS).
Guatemala

What are your nation's resources for training personnel?

- The English-speaking Caribbean has three campuses of the University of the West Indies, the Caribbean Institute of Meteorology & Hydrology, the Caricum Caribbean Climate Change Centre, and a number of national (PTO) universities that are involved in various aspects of the relevant sciences. Leslie Walling, MACC Project
- We count with scarce resources to train personnel in satellite data, but we are counting with NOAA's help to train them. Mexico, SMN
- - The Meteorological Service of Argentina is RNTC, and it counts with the necessary framework and personnel for it.
- Since 1968 it dictates courses annually for satellite data interpretation, among other courses. Saldivar, SMN, Argentina
- How can we gain access to training to upgrade the level of satellite information processing?
Alejandro Muñoz, Chile
- The resources are very few, the personnel does not have the technical capability to incorporate the new changes. That is why we require assistance to upgrade our information processing capabilities. Diego Sarmiento, CVC, Colombia
- We count with very few trained personnel in the new technology and we don't have the resources to send our engineers to train abroad. That is why we depend on international cooperation for this purpose. Colombia, IDEAM
- - Center for Meteorological Training (RMTC), University of Costa Rica
- Ramsdis Systems
- Cooperation with CIRA and Satellite Program WMO
Costa Rica
- Very limited! The personnel gets training thanks to international organizations such as NOAA, for which we are very thankful. Guatemala
- We do not have training resources. To do it, we need an invitation from an international organization such as NOAA. Ecuador

Latin American “Side Meeting”

Outcomes from the Latin America side meeting held during the 2004 Satellite Direct Readout Conference in Miami, FL

During the 2004 Satellite Direct Readout Conference held in Miami, Florida, December 6-10, 2004, a suggestion was made that the representatives from the Latin American countries attending the conference meet for a side discussion with NOAA representatives, Eric Madsen from the Satellite and Information Service and Jennifer Lewis from the National Weather Service, to discuss ways NOAA can help the user community in Latin America in the transition to the new NOAA satellite systems that will be coming on line over the next decade. The side meeting took place during the lunch break on Wednesday, December 8. A list of those people who attended is attached.

The meeting was opened with a brief description of an initiative that NOAA is developing for Latin America and the Caribbean to help in the transition to the new NOAA satellite systems, NPP, NPOES and GOES-R. The discussion that followed identified several areas where NOAA could be of assistance during the transition: access to current and future data, data and product distribution, training, centralized information source and point of contact, and the enhancing the role of the WMO.

Access to current and future data

The main issue that was discussed under this heading was the problem that in several of the larger countries there are several government agencies that have data reception capabilities but they do not share their capabilities, data or products with each other. The need to upgrade systems to receive the new NOAA satellite data was seen as a possible catalyzes to overcome the lack of internal cooperation within some countries. NOAA may help to bring together these users through various trainings and user group forums.

The NOAA initiative was viewed as one way to start the process of internal collaboration off by NOAA developing an inventory for each country on what agencies and organizations, civil, military and private, have satellite reception, processing and/or utilization capabilities and in what state of use they are in. At present many users are not fully aware of what capabilities exist amongst the users in their home countries or in the regions.

Another issue that came up under this heading was that there are a number of countries in the regions that do not have any satellite data reception capabilities. Possible solutions were discussed and will be covered in the next section.

The countries who have satellite data receiving stations expressed the concern about the cost for upgrading their receiving stations for the new NOAA satellite systems. Any financial and technical assistance that could be given would be appreciated. In addition, the participants mentioned that political will to provide additional funding often did not exist because the value of satellite data and products to national economies is not well understood in many political

circles. NOAA assistance in sharing how they express the value of these services to USA economy could help these organizations appeal to their leaders for the needed resources to improve their capabilities.

Data and Product Distribution

There were a number of good ideas that came under this heading. Currently, the Global Telecommunications Systems (GTS) is used to distribute data and products between meteorological services. Although this system is in need of an upgrading because its reliability varies from country to country, it was felt that an improved GTS could be an efficient way to distribute data and products between the various countries, particularly those that do not have direct reception capabilities. Each country could make their products available via the system.

One idea for an upgraded GTS would be to make it a nodal system with large servers in the bigger countries to facilitate the transfer of data and products. This possibility would also allow for a back-up system in that each node would be able to back up the other nodes in case one was to go down. Such a system would also help to get data a multiplicity of organizations and institutions such as national weather services, universities and civil aviation authorities.

It was pointed out by several participants that in order to improve any country's ability to use satellite data it is necessary to have access to both the raw data and to have open data processing software architecture. Also, giving the user the ability to select the information or products they wanted instead of receiving all the raw data seemed most desirable for some users with lower capabilities.

Training

It seemed that the need for training in data use and applications is not only universal but that there is also a general lack of resources to get the necessary training. One idea was to have regional training centers where several services and other satellite data users could pool their resources in order to have training and research facilities readily available to them. Currently, there are training centers in Argentina, Brazil and Costa Rica and elsewhere that could serve as regional training centers and there is currently some regional training taking place at these centers.

All of the countries represented strongly urged the translation of current NOAA distance training modules into Spanish. All agreed that translation of the material meant more than just the language but also the examples used so that they more accurately represent the conditions in each country. Just about all of the representatives expressed an interest in being involved in this project.

Centralized Information Source and Point of Contact

In order to develop an inventory of each country's capabilities and resources, there is a need to identify in each country a person to act as a Point of Contact (POC). The POC would assist NOAA in determining what different groups, private, civil, and military, use NOAA and other satellite data.

One suggestion for a centralized information source would be for Eric Madsen of NOAA Satellite and Information Service to act as the focal point with Jennifer Lewis of NOAA National Weather Service as backup. A web page where the country inventories and other information could be placed for each access was discussed. Such a web page would help keep NOAA and the Latin American and Caribbean countries informed of what each other is doing.

Enhancing the Role of WMO

It was noted that the World Meteorological Organization (WMO) is an excellent resource for sharing information about earth observations and training. However, although the WMO has good contacts throughout the region, it primarily works with meteorological organizations and has limited contacts with non-meteorological satellite data using organizations. For this reason the WMO should not be used as a sole source for contacts in the region. A NOAA initiative could help to bring more players (institutions and agencies) to the table.

List of Attendees to the Latin American Breakout Session

SOUTH AMERICA

Argentina

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CENTRAL AMERICA**Costa Rica**

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United States

Acronym: NOAA
Agency name: National Oceanic and Atmospheric Service

**2004 Satellite Direct Readout Conference
Wednesday, December 8, 2004
Polar-Orbiting Satellite System
Questions for the Direct Readout Community**

RESULTS

- 1. Names and locations (these have been entered into the NOAA User Data Base).**
- 2. Please check the user category that best describes your activity:**

3. Please indicate your current Direct Readout capability for receiving data from polar-orbiting satellites (check all that apply):

4. What is the location of your Direct Readout Ground Station (DRGS) and antenna?

NOTE: Users responded with latitude and longitudes and NOAA has included this information in its User Data Base.

5. Please provide manufacturer information for your Direct Readout ground system:

6. What is the physical size (diameter) of the antenna on your Direct Readout ground station?

Do you use a tracking antenna?

Does your Direct Readout ground system receive...?

7. Which polar-orbiting environmental satellites do you receive data from (check all that apply)?

8. What data types do you receive (check all that apply)?

9. To what product level do you process your polar-orbiting satellite data (check all that apply)?

10. For your operations, what are your latency requirements for data from polar-orbiting satellites?

11. For what purpose, either operational or research, do you use data from polar-orbiting satellites (check all that apply)?

Do you use data from overhead passes only for local/regional purposes?

Do you access and use stored data for global purposes from other sources for multiple adjacent orbits that you can't receive via Direct Broadcast from your station?

12. Do you use processing software that has been developed by... (Check all that apply.)

13. Do you plan to have a direct readout capability for polar-orbiting satellites in the future? (Check all that apply.)

14. Which future polar-orbiting satellites are you planning to receive data from?

15. In the future do you plan to operate a ground station for...?

16. Which of the NPOESS Environmental Data Records (EDRs) are of most interest to your operations and/or research? (Check all that apply.)

17. Do you have Internet access at your organization?

Is your Internet access via...?

18. Do you obtain products from polar-orbiting satellites over the Internet?

Where do these products come from?

**Polar-Orbiting
Satellites
Discussion Workbooks**

Raw Notes from Participants' Workgroups

1. In your opinion, do you see a need for more Direct Readout receiving stations in your geographical area?

- Yes. Australian NRT coverage is not as complete as we need for forecasting (e.g., cyclones) and fire detection.
- No
- Yes. Central America does not have access to polar satellites.
- No, but as a US citizen, direct data are important for (1) emergencies, (2) trip planning--rush hour, aviation travel, ? planning.
- Yes, to cover more high-latitude area.
- Yes. I currently have GVAR and would like to have polar ground station or polar data from other services.
- Yes
- No. What my county has is sufficient.
- We need to know first what the derivative products from these polar satellites are and disseminate at a county level (Venezuela).
- Argentina -- No, Atmospheric Sciences Dept. at University already has a receiving station. Need help to upgrade. Exchange with other institutions is in delayed mode with met service--do not give data to other institutions.
- CSIRO -- Yes, Australia is large, connectivity is poor.
- Argentina -- Rosario Univ., they have their station send data to neighbors, Association of University. of Montevideo, 5 universities from Argentina, 1 Brazil, Paraguay, Uruguay, data from Porto Alegre's ground station as well--real time data.
- USA -- Yes, more for others.
- C. America, Caribbean -- Yes. No access now to polar satellite
- Uruguay -- Do not use polar system, but if had a station would use it.
- Argentina -- Yes, in Antarctica.
- Italy -- They have POES stations in Italy.
- Yes, for Guatemala & Mexico.
- No

2. When Internet bandwidth increases, do you and your organization plan on accessing polar-orbiting satellite data remotely from a central repository via the Internet or via a Direct Readout ground station?

- Yes. For many applications we do this already.
- Through the Internet.
- Yes. I would wish to access through the Internet.
- Both, to complement each other.
- Increased band width.
- Through our ground station through direct readout.
- Through the Internet.
- Argentina -- Buenos Aires, 15-30 min., yes. Rosario, yes if 30 or less minutes time.
- Australia -- Yes. Bandwidth not a problem. It is cost on Internet time.
- USA -- No answer.
- Central America -- Yes.
- Uruguay -- Not ?.
- Argentina -- Has own POES satellite but will also access NOAA via Internet.
- Italy -- Could be useful to have access via Internet.
- Mexico -- DRGS
- Guatemala -- Initially through the Internet, but later their own DRGS as budget allows.
- Over time we see a shift from direct readout primary/reachback secondary to reachback primary/direct readout secondary if/when sufficient comm bandwidth exists and latency is below a critical threshold.

3. If global data repositories, such as NASA's Earth Observing System (EOS) Data and Information System (EOSDIS) and the NASA Distributed Active Archive Centers (DAACs) or NOAA's Satellite Active Archive (SAA) were to make data freely available within 24 hours of acquisition from the satellite, and your Internet network bandwidth were large enough, would this meet your real-time or near-real-time Direct Readout processing needs? If not, what are your data latency requirements for data from polar-orbiting satellites? What level of data processing do you need (raw, Level-1, Level-2, higher level product)?

- 24 hours would be OK for most applications. We really need level-1 for local product generation.
- No. I would need data 2 hours after observation. 24 hours is too long.
- Yes, level-2.
- L-1, L-2 within 1-2 hours of satellite overpass but prefer as soon as possible!
- (1) Yes, it would. (2) Within 15 minutes. (3) We would look at all.
- 1-A
- We need to elevate our current processes to at least level 1B.
- Yes.
- Argentina, BA -- Level 1. No, 24 hours is too much.
- Costa Rica -- Would like to have some products.
- Rosario -- Yes, Level 1B
- Australia -- Yes for products + a level 1 in less than 24 hours. No for raw data.
- Uruguay -- For forecasting 24 hours is too late. Not using POES.
- Argentina -- For forecast 24 hours is too late, but for research or long-term research 24 hours is just fine. Level-0→2.
- Italy -- Could be useful if comparable with near-real time depending on the distribution method→for level 2 products→for comparison with what we have produced with level 0 data we receive directly.
- Mexico -- 24 hours is not good enough. 3 hours would work. Raw.
- Guatemala -- More processed data. 1 hour.
- 24 hours may be okay for science, but not for military/tactical applications.

4. Do you believe there can be globally-linked Direct Readout ground systems for near-real-time access by everyone within the next ten years? If not, what do you see to be the obstacles to this implementation?

- Yes, but politics/institutional issues will be a problem.
- Yes. Obstacles will be institutional.
- Funding. Integrating challenges would rather have control than making it happen.
- Yes, using ADD other servers and optical fiber leak as an option.
- Yes, I believe it is possible; however, there are areas that can or may be selectable to avoid excess information or information of no relevance.
- Yes, I think so.
- The only obstacle we see is the capacity and speed of our communication lines.
- Yes. The challenge will be establishing agreements between our countries and each organization.
- Yes, but impediments: institutional jealousies of/mistrust competition; fear of not getting what you need in time for need; \$; politics.
- Yes, it can be.
- It is possible
- Limiting factor in Latin America, money or level of technology in each country → availability.
- In Europe the data can be broadcast over commercial satellites now.
- Yes.
- Remote/isolated users including mobile military will not be hooked into fiber backbones. Hence they would need high bandwidth comms with sufficient bandwidth allocated to WX satellites in order for this scenario to work.

5. How do you go about obtaining your science algorithms for data processing? Are these algorithms developed internally at your organization, purchased from commercial sources, or are they obtained through collaborations with other institutions, universities, or commercial organizations?

- Self developed.
- (1) Developed in my organization; (2) Purchased; (3) Collaboration with other universities.
- Collaboration with other institutions and universities.
- Adopt government and develop internally. Algorithms with partnerships with other governments, institutions and universities.
- We obtain from commercial sources and US government agencies like NOAA.
- Already developed and those we develop ourselves.
- Commercial sources.
- We buy from commercial sources.
- In the three ways: (1) developed by own organization; (2) purchased; (3) in collaboration with other universities.
- Argentina -- All of the above.
- Uruguay -- Obtain from other organizations either free or low cost.
- Italy -- All of the above.
- Guatemala -- Given through WMO, NASA, NOAA; negotiating with Eumatset.
- Mexico -- WMO, NOAA, some purchases from other Mexican organizations.
- Yes. Use combination of in-house development, commercial & collaboration.

6. When you develop or receive a new science algorithm, do you run the algorithm in standalone form or do you incorporate it into a data processing system?

- Both
- I incorporate in our processing system.
- Develop new science algorithm that can be easily converted to other processing system.
- Stand-alone form at present.
- To a data system.
- In any of these forms. Depends on what we need at the moment.
- I incorporate to a processing system.
- Both.
- Argentina -- First test run it alone, then incorporate it into their processing system.
- Uruguay -- Not using POES.
- Italy -- Test alone, then put into processing system.
- Guatemala -- Don't know.
- Mexico -- Incorporate.
- Incorporate it into a multi-satellite/multi-mission system.

GOES Information Fair “Need to Know” Questions/Answers

1. What is LRIT?

The digital Low Rate Information Transmission (LRIT) data originates from the National Weather Services (NWS) and from NOAA image-processing facilities. The LRIT digital WEFAX data products will be similar to the current analog service and are planned to improve the quality of the current WEFAX data products. The LRIT is an international standard for data transmission that is supported by all operational geostationary meteorological satellites flown by the United States, European Space Agency, Japan, China, and Russia. The LRIT system will contain significantly more meteorological data, imagery, charts, and other environmental information than the analog WEFAX system from the previous generation of GOES satellites.

2. What is EMWIN?

The Emergency Managers Weather Information Network (EMWIN) is a direct service that provides the data user community with weather forecasts, warnings, and other information directly from the National Weather Service (NWS) in almost real time, to more than 10,000 users in 35 countries. The MEWIN is a fully operational service supported by the NWS in partnership with the Federal Emergency Management Agency (FEMA) and other public and private organizations. Additionally, everyone with an appropriate receiving system and a personal computer can be an EMWIN user.

3. When is GOES-N scheduled to be launched?

We do not presently have an official launch date. The estimated launch date is, however, no earlier than mid-April 2005.

4. Are there any changes for Data Collection System (DCS) users with the launch of GOES-N,O,P?

Yes, the GOES-N,O,P satellites will support the use of Data Collection Platforms that operate at 300 bits per second, and 1,200 bps and use 8-PSK modulation. The previous generation of satellites was used to support DCPs that operated at 100 bps.

5. Name 3 current GOES products.

- 1) Imaging data products
- 2) Sounding data products
- 3) Solar X-ray imaging data products and space weather information that is collected by the various sensors on the satellite

6. Name one advantage of GOES LRIT over GOES WEFAX.

The LRIT system provides digital data products and will provide more information to the data user community than can be provided by the analog WEFAX system.

7. Name one change with GOES-N.

GOES-N will provide improved data products and services because of changes that have been made to the Image Navigation and Registration (INR) system, Data Collection System, and LRIT System. GOES-N will also have a new Solar X-Ray Imager (SXI) instrument that will assist in providing space weather forecasts.

8. Name one important factor for how NOAA determines when to retire a spacecraft.

A spacecraft will be retired when it can no longer provide the Imaging data products that are required by the data user community, or when the propellant on the spacecraft can no longer support the station keeping requirements of the satellite.

9. What is the GOES eclipse season?

The solar eclipse season is a result of the declination or position of the sun relative to the earth being zero degrees at the start of the spring and autumn seasons of the year. The spring vernal equinox season starts approximately on March 21 and has a duration of 92.77 days. The autumnal equinox season starts approximately on September 23 and has a duration of 89.85 days.

10. Why are GOES images impacted during eclipse season?

Because of the relative geometry of the sun, earth and the GOES satellite, the sun will produce solar radiation into the scan cavity of the Imager and Sounder instruments and this will produce interference with the imaging and sounding data products. The GOES satellites are located above the equator at zero degrees latitude, and the declination of the sun relative to the earth is also at zero degrees relative to the equator.

Key Issues Collected by NOAA Staff at “Expert” Fair Stations

Expert Station #1 Comments:

1. How does one obtain McIDAS software, and what is the cost?

First off, anyone wishing to learn more about McIDAS and the procedure for obtaining the system should contact the Space Science and Engineering Center (SSEC) at the University of Wisconsin. The web address is <http://www.ssec.wisc.edu/software/mcidas.html>. Click on Purchasing Information, under which you'll find an email address for further information (mcinfo@ssec.wisc.edu). In general, the client for accessing McIDAS data on any distributed server would be available free of charge assuming a "sponsor" can be identified. This sponsor would be responsible for providing client upgrades in lieu of SSEC. If a prospective user has their own antenna which they are using to capture the raw GVAR data, then a special PC card will need to be purchased from SSEC to perform the decoding of this data.

2. Where can one obtain information on Snow Depth and other snow parameters

Try the National Snow and Ice Data Center (NSIDC) at <http://nsidc.org/>.

Expert Station #2 Comments:

- 1) They want GOES Sounder coverage.
- 2) They don't want to be affected by RISOP over the US. They want more rapid scan imagery.
- 3) Want access to the information on upcoming changes. One idea was a Spanish (and other) language web page.
- 4) At least one country in our group wanted examples from the generation of some products, so they could have a starting point for either new products or customizing/localizing existing products.
- 5) Of course the need for training was loud and clear. Not just for the national met centers, but all satellite.

Expert Station #3 Comments:

1. Rapid scan with high spatial resolution would be valuable, especially for mountainous areas and for generating precipitation estimates;

- a. Note.... They did not define “rapid scan” (One normal operating mode for GOES-R is 5 minute full disk....is that good enough?)
2. Regarding how much data/information is needed:
 - a. “If it’s accessible, we will use it.”
 - b. They need more “information” from GOES-R, but less than a full data set.
3. Dedicated use of older/ retired satellites from other countries for Central and South America operations would be very valuable.
4. Comment from a Canadian participant: Direct Broadcast involves a one-time cost to upgrade ground stations, but reliance on internet, would involve numerous upgrades and changes.
5. They envision distance learning produced by COMET and EUMETSAT to be their main sources of training.
 - a. COMET should translate modules and adapt them for regional applications.
6. GOES Users’ Conferences are valuable for information exchange, but translators are needed.
7. Regional satellite workshops would build awareness of local decision makers on the value of GOES information.
8. Visits from NOAA would help build awareness of the value of GOES.

Expert Station #4 Comments:

Rapid Scan data important for nowcastings, thunderstorm monitoring, flash flood forecasts, precipitation estimates, etc,

Some smaller countries have little beyond basic met services. There is a need for specific forecasting and data for Aviation, Agriculture, Traffic, Marine, etc, Training is needed beyond data and forecasting.

Regional Centers – where data can be shared (shared cost) – Countries can “pull” data when needed rather than have large amounts of data pushed at them.

Training: COMET very important. Case studies very important. NASA/NOAA could help in formatting case studies...CIMSS – work with Central and South American to develop webcast for training/learning. Many haven’t heard of VistaView. Training also needed for climate and modeling.

Web Portals should be developed for countries to access. (SatChat)

Need better ways to prepare South and Central American countries to receive and use GOES/POES satellite data (before GOES R and NPOESS)

Need to increase the expertise of instructors at Universities in the countries.

NOAA Post Issues

Great need for continual contact with users for both current information and future information about new systems

Need better planning for continuing information flow.

Need to know more about DVB-S Technology

Panama Canal Authority had some specific questions about the new DVB-S broadcast and their effect on the existing systems. The information they learned will more than make up for the cost of the trip.

The Navy must soon make the decision whether or not to participate in the NEXRAD OPUP program in light of the availability of radar data on NOAAPORT and requested information about the NOAAPORT receivers.

Additional Comments

Before 2013, 100 band transmitters may need to be moved to lower channel #'s. NOAA will notify users in time to make these changes during scheduled maintenance.

GOES
User Readiness
Discussion Note Taker
Workbooks

Raw Notes from Participants' Workgroups

1. How does your nation use GOES data (e.g., weather forecasts; severe weather warnings; precipitation & water resources management; aviation; observation of climate trends; fisheries; oceans)?

- Mexico -- All of them, WX forecast warnings, imagery; precip.; plans for NWP; SST; aerosols (via fires)
- Colombia -- Most of the above + Imagery! (Hyro models)--river levels, prep--80% from hydroelectric & wind power.
- Bolivia -- WX forecasting, satellite imagery. Aviation uses.
- Bahamas, CPTEC/INPE, MACC -- Current source GVAR & METLAB system donated by Nat. Weather Service. Use all of the products listed
- El? (Brazil) -- Using local products (wind-IR & WV channels) (precipitation) Impact: Good. Have mountains, infrastructure to work with data. Have a super computer.
- MACC: DCS.
- FTP service - current POES data - out ? (1B Data).
- Direct.
- Change models in anticipation of the extreme increase in the volume of info.
- Change how execute models in anticipation of GOES R data.
- Base instrument data raw 1B.
- More data is not better.
- Argentina -- All these applications mentioned.
- Chile x 2 -- Weather, climate warning, hydrology, DCS
- Germany
- Navy -- Mission planning & flight safety, ship routing.
- Frequently web-based information is used rather than DR.
- All uses above and more in all nations.
- Better time & space resolution will provide more information for convective processes in mountain country and for all.
- Uruguay -- Gets data by Internet.
- Argentina -- Has a lot of uses for GOES application for emergencies. Real-time data is important.
- Brazil -- Raw data is also used.
- Southern Hemisphere requires more frequent images to develop products and to initialize NWP.

- Is there a “dead” satellite that could be used to scan South America? Can be operated by S.A. space agencies.
- Now casting.
- Mexico – Weather, warning, PP, hydro, climate
- Argentina – All _ hot spots, snow, ice, floods, pollution
- Guatemala – Fire, volcanic ash, vegetation, blooms
- Ecuador – Nino/Nina, SST, aviación/civil, academia
- We use GOES data for weather forecasts, severe weather warnings, aviation or all of the above listed items.
- Caribbean group – Via DCS models. Want products for open areas – 30 year baseline statistical
- Bahamas – Have GVAR Metlab Sat locked to NOAA webpage.
- Brazil -- ?
- Bahamas uses GVAR.
- Weather forecast, precipitation and winds (IR, WV) locally (South America)

a. What impact will the improved capabilities of GOES-R (more bands, finer resolution, 5x faster scanning) have on your nation’s applications of satellite data and products?

- Big impact, good, wonderful, great.
- Columbia/Bolivia -- Full disk. Get a lot more info.
- Bahamas -- Would be of tremendous value to have higher resolution & more bands.
- Not possible to know impact of improvements & new applications in GOES R at this time.
- Argentina -- Some improvements, for example, snow melt.
- Chile -- MODIS(?) experience will transfer for Navy
- Help with the software algorithms in a package.
- General improvement
- It would open a whole new world of data and product possibilities in forecasting, severe weather warnings, to say the least. It can also apply in other areas of agriculture & fisheries.
- Caribbean Group -- ?
- Bahamas – Tremendous value
- Brazil – Treatment of mountains
- Bahamas would like more for agriculture and fisheries.
- Precipitation, winds - mountain

b. What impact will the increase in data (about 12x) have on your infrastructure? How can NOAA help you to get ready for this data volume?

- Possibly need regional center, grab/filter data for your needs.
- Possibly need human resources to better understand.
- We are looking for means to capture & need our data & utilize it over a long-term period.
- Processing will become more of a problem.
- Requires a complete change of equipment to accommodate the order of magnitude of data volume.
- NOAA can help with training & some infrastructure assistance.
- Training on Digital Image Processing prior to GOES R.
- Canada – Volume, formats
- Increase storage capacity
- Training
- We are in a transition state now where we are looking at implementing database & archive systems. NOAA can help as its assistance would be tremendous in any of these areas.
- Caribbean Group -- Help with vulnerability.
- Bahamas -- Agriculture, fisheries, ...?
- Brazil – Have super computer.
- Yes, we have infrastructure.

2. What sectors in your nation (government; university research; industry such as electric power, agriculture, transportation [aviation, trucking]) benefit from current GOES data? Will any additional sectors benefit from GOES-R data?

- Mexico -- All above. Search-n-Rescue.
- Colombia -- GOES-R: GLMM, natural disasters, flash floods
- MACC Project -- MET service & survey dept. & entire nation x12 will be the end beneficiary.
- Bahamas -- Agriculture, Transportation, Tourism, Fisheries.
- Belize/Cipitec -- Has projects in all of the listed areas: power, agriculture, transportation & research.
- Chile -- All except electric power.
- Argentina -- All except electric power, including military.
- Navy -- Other sectors? More research in Agriculture & Oceanography; Health and Fisheries as well. More irrigation planning.
- More info on how others (NOAA) dealt with loss of the 12 um on the Imager.
- Need most all products/data that cover the regions.
- Some low-rate data is fine (to get started). Add some sounder data as well.
- Medical – health
- Actividades humanas
- Fisheries
- Tourism
- Hidrology
- Geology
- Aquiculture
- Deforestation
- Aquifers
- Forest management
- Ecosystems
- Tropical rainforests
- Habitat/environmental
- Search & rescue
- Yes, agriculture & fisheries.

- Caribbean Group – Sea land data for Met services & to _____, survey dept.
- Bahamas – All, fisheries, currently & in future.
- Brazil -- AI
- CDS: Sea level & met data. Fisheries to benefit. Brazil has supercomputer.
- Research, electric power, agriculture, transportation, aviation, trucking: just in forecast.

3. How much GOES satellite data does your nation need (now and in the GOES-R era), e.g., imagery at GVAR level? more? much more? How many products?

- Brazil -- How much GVAR is needed = more if available.
- Bahamas -- More.
- All available imagery and products. But more important to increase level of information, not just data.
- Training is also needed to better use the information.
- Regional server is suggested to help manage huge amounts of data - this regarding archived data. What about timeliness? 1 sectors: weather services, training sector.
- Volume of data is so large can overwhelm our systems if it happened today.
- Internet has not kept the pace with the increase of bandwidth requirements.
- Balance: cost of communication, cost of acquiring own receiving station
- 5 minutes
- Rapid scanning
- More
- I believe it is just a little inadequate just now. In short, we have not really taken all into account.
- Bahamas – More _____. Don't know for sure what want.
- Brazil – If more, only on GVAR – think it would help.
- Don't eliminate possibilities. People want to have options. Basically more data is required.

4. How does your nation undertake satellite meteorology training?

- MACC – Comet is considered to be a potentially valuable tool.
- Chile & Argentina – University-level Met courses.
- Argentina – Supported by space agency
- Navy has their own training programs.
- Argentina, Costa Rica RMTCs – Comet courses, website – main source of training courses – in English
- Invest in distance learning? Yes & applications from the S.H., intervention on Latin American teachers, translate & adapt
- CONAE y Univ. of Buenos Aires – Many contribute to create case studies – resources limited. How to create case studies?
- Comet – Assist RMTCs to create their own webcasts.
- MACC – Not involved in this, but nations served ____ meteorologist.
- Brazil – INPE, graduate degree holders
- Bahamas -- ____ seriously. Did have relationship with CMI. _____.
- Bahamas wants it. Use to use CMI in Barbados. CMI doesn't address marine.
- MACC was a special interest project.
- In Peru need training to data satellite to multiply the _____.

a. Does your nation use web-based training, or classroom training, or correspondence courses?

- Less formal training—on the job. Some need to leave the country—more for a few W.S. folks.
- Bahamas – CIMH Caribbean Institute of Meteorology and Hydrology, American University, classroom & correspondence
- MACC -- CIMH & US universities
- Brazil – IMPAC, master's & bachelor's in meteorology (U. of Sao Paulo) & data satellite.
- Classroom in Argentina & Chile & Navy.
- Navy also beginning to use the web.
- Some Internet training used in Chile.
- VisitView
- Comet
- WMO

- Eumetsat
- Classroom
- Brazil – Yes, _____.
- Bahamas – Not web. NOAA _____ - Train the Trainer.
- Bahamas uses classroom. Has seen train the trainer. Brazil uses web based. Caribbean has group travel.
- Não.

b. What are the most urgent needs in training right now?

- Image interpretation
- Acquisition & evaluation
- How to use & find existing products.
- More in the local language! Can Pet-Rica help?
- Sat. data assimilation.
- Formalize relationship for others to . . . into a local language.
- Bahamas – Training in marine meteorology
- MACC – Modeling/development of climate models.
- Peru – Needs training in all areas.
- Chile – Quantitative use is greatest need. (Qualitative use is now needed.) (In GOES-R era the problem will be worse.)
- Argentina – The level of the instructor must be increased so they can teach a better quality, more intelligent course.
- Both training and processing
- Marine forecasting
- MACC – Climate modeling.
- Brazil – 1st training course coming in 2005.
- Bahamas -- _____ Meteorol! (Meterol. over the ocean).
- Bahamas - marine meteorology. Brazil would like across the _____ training. Caribbean would need climate modeling.
- In Peru, people that understand data satellite.

c. Do you use VISITview? Have you heard of it?

- Yes, but V.V. needs to be in the local language.

- MACC – No.
- No. Heard of it today.
- Some yes, some no.
- RMTc Argentina, Canada, CONAE, Uruguay, Brazil INPE – No.
- RMTc Costa Rica, USA NOAA, Comet – Yes. I consider Visit an excellent tool for training.
- No.
- MACC – No.
- Brazil – Yes, but don't use yet.
- Bahamas – Yes, just learned about COMET – just heard. Will look into.
- People are just learning of this and COMET. Brazil had some _____ Peru in COMET. University of Sao Paolo has it starting. Caribbean never heard of VISITview. Peru needs everything.
- No. No.

**5. How can NOAA and other nations work together, to get ready for GOES R?
 – What sort of earth science satellite data collaborations can you suggest
 be undertaken between U.S./NOAA and your nation?**

- Conferences, regional workshops
- CAL modules
- Need help to be able to present to others the importance of satellite data.
- Formalize language protocol (flp) bet countries.
- Need more alg. tested/valuated over non-US areas.
- Some useful softward (level 1, 2 processing, etc.)
- IGRPP (Int. GOES-R Processing Package)
- Portal on GOES-R info – progr, info, sharing, faq, ask questions
- GOES-R User Group (email?)
- More information groups to the GUC.
- Belize – Country-by-country assessment. Country meetings in each country.
- MACC – Product awareness building; preparation for current users; collaboration & capacity building in regional climate model development.
- Training and information about the GOES program in a timely manner.
- Common hardware among various satellites for receiving station.
- Comm. data policies.
- Regional centers may provide the possibility for effective training.
- Argentina – If we are not ready, we don't know what we need.
- Products
- Internships
- Recommendation: Bring people for training.
- Re-train people with new techniques.
- Language is an issue.
- Facilitate discussions. Not sure at present.
- MACC – Product _____ of existing products.
- Brazil – NOAA needs to visit and see how nation does its work. Need to plan while still go _____ special _____. More collaborations in place. NOAA _____ in the country 1-2 days.
- Bahamas -- _____ discussions. Get met services _____ together.

- NOAA needs to visit and assess each place in Brazil. Simulated data could be useful but it's far off. Caribbean would like more product information and then import if GOES-R. Bahamas more discussion. Brazil would like collaboration. Caribbean: capacity building and sharing models.
- Visit all the countries to feel what is going on. Meeting, in the country.

**6. Are you receiving satellite data from: NOAA _____ NASA _____
Europe _____ Japan _____ Other _____**

- NASA, Europe, Japan, Chinese, GOES
- NOAA, NASA, some from Europe
- NASA, MODIS
- Bahamas – 99% NOAA
- Chile – Only NOAA
- Argentina – Europe, NASA, NOAA, Argentina, Landsat
- Germany – All providers
- Navy – All providers
- NOAA
- MACC – NOAA mostly, some MODIS.
- Brazil – None at moment. Future – spatially referenced info.
- Bahamas – NOAA 99%.
- NOAA 99%. Caribbean uses just MACC data specifically.
- NOAA

What is your preferred data format?

- Raw data (georeferences and calibrated), GVAR
- Internet
- MACC – Spatially referenced
- Bahamas – Imaging & Alpha; CDF, HDF, GRID vs. other formats
- NOAA data
- Bermuda: Imager/Alpha. Brazil doesn't know what data it uses. MACC (Carib.) doesn't use much data _____.

Flipchart Notes from Action Plan and What Was Learned Discussion

- (Tell their boss) about changes with GOES and that we have to be ready.
- Need to develop a “shopping list.”
- Learned that a recent 20-day move may have affected their function (Panama). Caution to others to check with NOAA for these types of service disruptions.
- Increased quality and quantity of information is going to require increased training (Argentina).
- Relearning and expansion and storage of data.
- Must do inventory of our users and infrastructure 2013 (2005 Wefax).
- Land station. Plan acquisition.
- Plan for and budget adequately (Colombia).
- Lots of web-based information and training already available.
- Need to impact change early (US).
- Would like to share resources with public organizations and universities. Need to collaborate to use data more effectively (Argentina).
- Share with colleagues.
- CD of Conference can be copied and shared with colleagues (US).
- Help us know about your human resources as well as other resources (US).
- Has been 2 years since last conference, which helped plan for what is coming in 2005 (Chile).
- Increased challenge is training.
- Need to focus on international resources. Need to inform colleagues back home of information, key dates and opportunities.
- We know we need to do an inventory. Can we get a format so we all do the same thing? Propose a language-friendly format and access of summary (Mexico). Note: Jennifer will send you form.

- FX system not expensive. Can we start to pilot one server with Panamá, Costa Rica and Colombia? (Panamá)
- Collaboration is what will help us get the information to users the “last mile”! (US)
- Regional centers to acquire equipment and distribute information. What is WMO role?
- Pacific Regional Environmental Program is a good example of collaboration between governments, Communication Committee, emergency services, meteorologists, etc. Help with financial challenges of smaller countries.
- Wefax/LRIT will require money to make changes.
- As volume of sales increases there should be a market incentive for cost to go down.
- We need to support each other’s efforts.
- We will write some articles based on new information we received. We may begin to do radio spots to raise awareness. (Mexico)
- Is there something NOAA is planning to do with space trash? As we plan we should be concerned about our children and grandchildren’s future. (Comment on NORAD tracking debris and role as earth stewards.)
- Begin strategic planning for 2012. Set a short-term and a strategic plan. (Ecuador)
- Will share the 2005 Launch of GOES N and advocate its advantages to our government. (Bolivia)
- Reminder of NOAA/USAID Flash Flood Conference in Cost Rica in September 2005.
- Recommend more specialized breakouts at next conference and web-based training on data management