NOAA GOES R Satellite User Feedback and Dialogue Session

NOAA Satellite Direct Readout Conference for the Americas

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Miami, Florida

prepared for

The Office of Systems Development
National Environmental Satellite and Data Information Service (NESDIS)
National Oceanic and Atmospheric Administration (NOAA)

by

Carol-Susan DeVaney
DeVaney-Wong International
4080 North 38th Avenue
Hollywood, FL 33021
(954) 967-6830

The following report has two parts. Part I summarizes key points discussed during the Friday morning December 13, 2003 GOES R panel discussion, audience dialogue, and the User Input Sheets distributed at the session. Part II is the raw, for the most part handwritten information on their countries' use of NOAA's GOES satellites relative to 6 issues raised that were submitted, collected, and translated to English (where necessary) from the User Input sheets sorted geographically. The entire conference lasted from December 9 thru 13, 2002. The GOES R session went from the afternoon of December 12, 2002 until about noon of December 13, 2002.

Part I – Key Points Summary on Nations' GOES Use

Input on GOES satellite use was received from the following 29 countries, which have been divided into regions.

South America
Argentina
Belize
Bolivia
Brazil
Chile
Ecuador
Paraguay
Perú
Suriname
Venezuela

Central America
Costa Rica
El Salvador
Honduras
Nicaragua
Panamá

North America
Bermuda
Canada
Mexico
United States

Caribbean
Antigua
Bahamas
Barbados
Cayman
Dominican Republic
Grenada
Jamaica
St. Lucia

Other
France
Turkey

Answers to User Questions

1. How is GOES important to your nation's forecasts?
   - All countries currently use GOES data and see it as an essential tool in their nation's forecasting capabilities.
   - There is a wide range of use of the data often dependent on how well GOES covers their area and their technical ability to utilize the data.
   - Depending on available data, it is an integral part of their forecasting and is especially important in aviation and severe weather situations.

2. What is your forecast modeling capability? Human based? Computers?
   - Most used a combination of computer and human based modeling. However, several had limited computer capabilities.
   - Depending on the financial, technical and training availability, the models varied greatly in sophistication. There was everything from using supercomputers to very limited computer capacity.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - The specific locations varied dramatically depending on the size of the countries and their budgets with Mexico identifying the largest number of sites 32 (1 per state) and some having as few as one.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Goes data was used for daily forecasting, aviation, precipitation predictions, hurricane and other severe weather predictions and warnings, environmental issues, maritime predictions, fire prediction, volcanic ash information. Application included all of the above and assistance to the needs of agriculture, insurance, fisheries, and others.

5. What are your sounder data needs?
   - Many countries did not use sounder data because of the current coverage area, but all felt like it would add a substantial benefit to their capabilities.

6. What are your timeliness needs—real time or delayed?
   - Except for research applications, the data is needed in real time.

Areas of Common Interest

- Need for more current aviation data coupled with easy-to-understand language and interpretive training for pilots.
- Most countries need enhanced equipment and training to effectively receive all current GOES data and future GOES-R data.
- Many saw increased need to better coordinate with all interested parties in their individual countries and bridge any turf issues.
- Interest in sharing research and knowledge between their countries.
- Saw need to have web-based data and bulletins translated into Spanish.
- Suggested an interactive section on the website in Spanish.
- General feedback that the conference had opened their eyes to potential gaps and future applications plus the need for coordination and cooperation.
- Many individual countries developing products that may be of use to others. Want ways to share knowledge.

User Input Comment Sheet Summary

GOES R Session

NOAA – Miami, Florida
December 13, 2002

Part II

Raw User Input Sheet data has been sorted by country and region.

South America

Argentina (2 responses)

1. How is GOES important to your nation's forecasts?
   - Very important. Just a few radiosondes at Southern South America, and no info over Pacific and Atlantic Oceans. We need high frequency of images and soundings from GOES.
   - Because of its temporal resolution, it is fundamental in the meteorological vigilance. This includes severe storms, flash floods, aviation, public information, fires, fisheries and monitoring volcanoes (VAAC sounds), etc.

2. What is your forecast modeling capability? Human based? Computers?
   - Computers – ETA model at present.
   - We have a 10 level model that is constantly being improved. An S61 processor. I will fill you in in more detail via email.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - In communications to NESDIS prior to the Miami conference, Argentina's National Meteorology Service identified the existence of three (3) GOES GVAR sites (Servico Meteorological Nacional in Buenos Aires, Instituto Nacional De Technologia Agropecuaria in Castelar prov, and University of Buenos Aires in Buenos Aires.
   - Need for GVAR site at Dept. of Atmosphere and Oceanic Sciences identified by the University of Buenos Aires.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Precip., aviation, volcanic ash, vegetation index.
   - We use all the information intensively for all kinds of uses: aviation, estimating precipitation, maritime predictions, numerical predictions.

5. What are your sounder data needs?
   - Vertical profiles to initialize regional and meso-scale models.

- To improve our forecasting models and to understand the vertical structure of the atmosphere.

6. What are your timeliness needs—real time or delayed?
   - Real time for some data. Near-real time (perhaps using Internet?) and delayed for most data, identified by university of Buenos Aires.
   - To meet needs of meteorological tasks and the governments' international responsibilities we would need real time - identified by Argentina's Government Met Service.

Belize (1 response)

1. How is GOES important to your nation's forecasts?
   - Satellite pictures has become an integral part of our daily forecast tools. It is used to give an instant view of exactly what is out there.

2. What is your forecast modeling capability? Human based? Computers?
   - Our forecast capability relies mainly on our human capabilities, with the assistance of forecast models available regionally and over the Internet.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - The main weather office is located at our International Airport and is the main focus of its existence, outside the hurricane season.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - We have relied on GOES imagery to assist in our hurricane preparedness. Aviation and our agriculture community has benefit from forecast prepared with the aid of GOES data.

5. What are your sounder data needs?
   - --

6. What are your timeliness needs—real time or delayed?
   - Real time is of most importance to our service, at this time. Research is planned for the near future, and delayed products will be needed.

Bolivia (1 response)

1. How is GOES important to your nation's forecasts?
   - It is very important because it helps us refine our forecasts.

2. What is your forecast modeling capability? Human based? Computers?
   - We use both computer and human based capabilities but it is limited.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - SENAMHI (Central and Regional) – (National Meteorology & Hydrology Service – Boliva)
   - AASANA

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - For forecasting of precipitation and general climate, to support aviation and fire detection.

5. What are your sounder data needs?
   - Yes, it is very important as we currently have no sounder equipment.

6. What are your timeliness needs—real time or delayed?
   - Our needs are very urgent for forecasting especially disasters such as drought and floods to support agriculture and other activities.

Brazil (1 response)

1. How is GOES important to your nation's forecasts?
   - GOES is being used by the various institutions working on meteorology, directly in terms of as frequent as possible imagery (multispectral).

2. What is your forecast modeling capability? Human based? Computers?
   - At CPTEC/INPE: GCM (COLA-CPTEC) and Regional Model (ETA), supercomputer SX-6 capacities, running operationally.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - There are several institutions in Brazil using satellite data, being able to process digital data for various applications.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Multiply: multispectral imagery, winds tracking, SST, precipitation (on tests), fires detection, solar energy assessment (which leads to net irradiation assessment ? evaporation assessment).

5. What are your sounder data needs?
   - Soundings can be assimilated in running GCM and ETA models. CPTEC/INPE is already assimilating TOVS soundings in ETA model. Radiance assimilation is being considered.

6. What are your timeliness needs—real time or delayed?
   - Real time, for assimilation of data in NWP models. Brazil has installed capacity for that. Also, same applications like precipitation assessment (monitoring), fire detection, etc. need real time data!

Chile (1 response)

1. How is GOES important to your nation's forecasts?
   - It is essential due to our geographic location and as the national weather service. Forecasting is our principal function.

2. What is your forecast modeling capability? Human based? Computers?
   - We have good equipment to use in global models MRF, ECMWF, AVN, etc. We are running MM5 but we are having problems getting it to 4KM (currently 12KM). We need a better quality computer.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - Primarily Santiago (33ºS), Puerto Montt (42ºS), Punta Arenas (53ºS), Antartica (62ºS), Isla de Pascua (110ºW, 20ºS), and Antofagasia (23ºS).

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Primarily forecasting and aviation. We have a deficit when it comes to predicting precipitation, potential fires, etc.

5. What are your sounder data needs?
   - Temperature, precipitation, contamination, smoke, vegetation index, ice, products for aviation like turbulence and icing…

6. What are your timeliness needs—real time or delayed?
   - Real time in a great portion of our activities.

I will send more detail via email

Ecuador (1 response)

1. How is GOES important to your nation's forecasts?
   - Because is an important tool for real and objective forecasts, and because we have no other options.

2. What is your forecast modeling capability? Human based? Computers?
   - We have people trained in USA and now we are using MMS model, PC grids, charts then. We use human people and computers.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - INAMHI (National Weather Service)
     INOCAR (Oceanographic Service)
     DAC (Aviation Civil)

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - We use for forecast, aviation, el niño forecast and other things (vegetation index, floods).

5. What are your sounder data needs?
   - This are very important in order to know all processes in atmosfera, addresses to numerical model and forecast.

6. What are your timeliness needs—real time or delayed?
   - Both real time and delayed.

Paraguay (1 response)

1. How is GOES important to your nation's forecasts?
   - Very important. We use GOES data to help predict weather and especially aviation. Also we use the images for weather alerts.

2. What is your forecast modeling capability? Human based? Computers?
   - We have human resources trained by NOAA that work with models processed in global forecasting centers and use products for general forecasting. Our computer capacity is not sufficient.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - The data necessary to detect fires, vegetation index and rain prediction. It would be necessary for monitoring the environment for things such as contamination. The places are the Weather Service, Universities and Power Institute.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - The application to aviation is done applying the visible or infrared image to describe cloud cover, rain or any other significant phenomena.

5. What are your sounder data needs?
   - Data for temperature, CO_2 measurement and ozone (O_3). Irradience (?) data.

6. What are your timeliness needs—real time or delayed?
   - The needs of Paraguay are in real time for the activities of the weather service and delayed time for research of different applications.

Perú (2 responses)

1. How is GOES important to your nation's forecasts?
   - The GOES images are very important for the weather predictions in my country especially regarding when El Niño affects the north coast. The inclusion of researchers in a numerical (?) model could be supported by GOES.

- The products of GOES are of first priority, because we have to see the synoptic systems as cold fronts over the Pacific Ocean and over South America coming to the Amazon region. Moreover, the convective clouds and the IC zone, etc.

2. What is your forecast modeling capability? Human based? Computers?
   - Primarily human based more than computer based. The lack of models is due to the poor technical and scientific training of the researchers.
   - Both, human based and using computers aviation numerical weather prediction of NOAA. Furthermore we run the GRADS.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - We are really needing data as we have very limited site data and limited researchers to interpret it. An example is that IGP, IMARPE, SENAMHI, DHM have GOES equipment (?).
   - All the options are needed, because each one is an element needing to be used, in order to have a complete idea about the actual weather conditions, in order to predict future conditions.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - At the (Labtel) Teledetection (?) Laboratory at the University of San Marcos, GOES data is used to study precipitation, cloud systems, and in the future to study air and water temperature.
   - We are using GOES data for predicting weather conditions for aviation purposes.

5. What are your sounder data needs?
   - They are necessary and important because understanding the atmospheric conditions of our country would help our forecasting.
   - We need sounder data from South Pacific and over the Amazon basin, because we don't have enough radiosondes in the area.

6. What are your timeliness needs—real time or delayed?
   - In Labtel the work with GOES data is not in real time.
   - We need real time data.

<u>Suriname (1 response)</u>

1. How is GOES important to your nation's forecasts?
   - We can only do it with information received via Internet (pictures, interpreted pictures and timeliness). For us this is very valuable information.

2. What is your forecast modeling capability? Human based? Computers?
   - None, no modeling. We just interpret existing information.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - The NMC situated at the intern. airport and the headquarters in the Capital of the country.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - We use the available data, gained via Internet for aviation and general forecast purposes.

5. What are your sounder data needs?
   - As a "general purpose" service we would like to be informed on forest fires besides normal precipitation, water vapor and lightning info.

6. What are your timeliness needs—real time or delayed?
   - We would like to have data in real-time because of short lifecycle and rapid development of the average heavy rainshower.

Venezuela (1 response)

1. How is GOES important to your nation's forecasts?
   - Because it is practically the foundation for our forecasts. (Area – ProG vutar, etc.)

2. What is your forecast modeling capability? Human based? Computers?
   - We do not use meteorological models. All the models used for forecasting are based on different products from the internet such as ETA, PCGRIB, and GOES water vapor and infrared images.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - In regards to aviation we have a satellite image receiver in Caracas, Venezuela. We do not work with GOES images as we would need equipment and training.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - It is used in aviation, environment, marine, and Edelca (which is the largest electrical generating company in Venezuela).

5. What are your sounder data needs?
   - We currently do not have sounder.

6. What are your timeliness needs—real time or delayed?
   - At least every 15 or 30 minutes if possible. This would allow us to monitor severe phenomena such as thunderstorms that emerge from related to temperature convection(?).

Central America

Costa Rica (2 responses)

1. How is GOES important to your nation's forecasts?
   - Of utmost importance. Forecasts without satellite information should be considered pre-historic.
   - We use it in our daily weather forecasts and forecasts for aviation (qualitative data to see features and movement of systems).

2. What is your forecast modeling capability? Human based? Computers?
   - The implementation/development of local models is incipient at the University of Costa Rica.
   - We use computers to access products from models. We are not running any model yet in the National Meteorological Institute of Costa Rica. We will be running the ETA models in some months.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - Ministry of Agriculture, State Universities, Airports, National Meteorological Service, Sea Ports, Instituto Costarricense de Electricidad (hydrometeorology of the country is taken care at ICE), Instituto Costarricense de Acueductos of Alcantarillador (in charge of water supply and drainage in towns and cities).
   - At the airports.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - For training at the Regional Meteorological Training Center; forecasting and information to the public at the Met Service; and for oceanographic purposes at Universidad Nacional de C.R.
   - For precipitation products. Hopefully in the future for fire detection and aviation.

5. What are your sounder data needs?
   - Soundings will fill a void. Soundings are scarce in Central America/Caribbean.
   - We only have a radiosunde once a day and we didn't have it until days ago, after a long period of time without soundings. We are interested in soundings from satellites if it is possible as input for the ETA model.

6. What are your timeliness needs—real time or delayed?
   - Near real time is appropriate for training. Archived data is important for case studies.
   - Real time.

El Salvador (2 responses)

1. How is GOES important to your nation's forecasts?
   - Essential.

- The satellite images obtained from GOES 8 are the base of our weather forecasting and one of our most important tools.

2. What is your forecast modeling capability? Human based? Computers?
   - None. We use packages such as MRF, AVN.
   - We use products from MRF, ETA, AVN and PCgridds.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - Civil Aviation Authority, a couple of universities.
   - National Earth Studies (CEPA), International Airport and National Emergency Committee (COEM).

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Rainfall forecasts, aviation forecasts, forest fires, public health.
   - We use it in all system detection including short severe storms (hurricanes, tropical waves, tropical storms).

5. What are your sounder data needs?
   - High priority as for wind aloft. A wind profiler or RAWIND unit would be the minimal unit.
   - If required at least during standard hours.

6. What are your timeliness needs—real time or delayed?
   - Cloud imagery (visible, IR, enhanced), each 30 min.
   - Satellite images every 15 minutes or every ½ hour and the rest of the information every 3 to 4 hours 5 or 6 times a day. When changes occur in 2003, let us know when we are affected.

<u>Honduras (1 response)</u>

1. How is GOES important to your nation's forecasts?
   - They are our most utilized images and we obtain it through RAMDIS, INTERNET and before STAR 4.

2. What is your forecast modeling capability? Human based? Computers?
   - All our predictions are based on computer data and our professional knowledge.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - Permanent Contingency Committee (COPECO), National Electric Company (ENNE), Office of Natural Resources.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Especially for hurricanes, aviation and forest fires.

5. What are your sounder data needs?
   - We currently have radio sounder but not the materials to use sounder..

6. What are your timeliness needs—real time or delayed?
   - For aviation and hurricanes we need real time.

Nicaragua (1 response)

1. How is GOES important to your nation's forecasts?
   - It is a very valuable information. We use this data for the weather forecast, hurricane surveillance, aviation service and the like. We disseminate the data received via RAMSDIS and via Internet.

2. What is your forecast modeling capability? Human based? Computers?
   - None, no modeling. We just interpret the information we receive through RAMSDIS and via Internet.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - In the capital city of Managua (at Ineteto) and in the International Airport in Managua. In the near future, we will need data in the airports in the Caribbean Coast (Bluefields and Puerto Cabezo).

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - For general forecast purposes, to give service to the aviation, to hurricane surveillance. (We disseminate the data through Internet from our website to the general public.)

5. What are your sounder data needs?
   - As a general purpose service. We would like to use for forest fires or for precipitation estimations.

6. What are your timeliness needs—real time or delayed?
   - We would like to have data in real time specially for hurricane surveillance.

Panamá (1 response)

1. How is GOES important to your nation's forecasts?
   - It helps us transmit our data from our automatic stations to our main station to be processed and serve as a tool for our synoptic (forecasts) and meteorologists in their predictions. We use the data from the images processed through RAMDIS.

2. What is your forecast modeling capability? Human based? Computers?
   - We have prediction models of hydrological(?) trajectories from several projects and workstations. We monitor for electrical generation and potential flooding alerts.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - We transmit the data to sites relevant to (electrical) power generation.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - The products from GOES via Ramdis are used to make aviation, meteorological, marine service, agriculture, tourism, health, insurance, construction, civil service protection and power plants.

5. What are your sounder data needs?
   - We need to improve the satellite images regarding precipitation, cloud cover, winds, air temperature and ocean surface temperature.

6. What are your timeliness needs—real time or delayed?
   - Our power plants need data every 2 or 1 hours, high resolution images every 5 to 15 minutes.

North America

Bermuda (2 responses)

1. How is GOES important to your nation's forecasts?
   - Due to our remote location in the Atlantic Ocean, models lose some integrity, making GOES our most useful tool.
   - Use it for most of our forecast. Important tool due to isolation of our island. Helps fill gaps in model weakness.

2. What is your forecast modeling capability? Human based? Computers?
   - Computers
   - Computers – direct and through the internet

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - --
   - One location – satellite, flexible to explore other options.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Precipitation, Hurricane Tracking, Aviation, Marine, Public Safety.
   - For many aspects of forecasting (hurricanes, precipitation, aviation, marine, frontal systems). Warnings, aviation & marine hazards.

5. What are your sounder data needs?
   - --
   - Do not have it. Would like to explore more.

6. What are your timeliness needs—real time or delayed?
   - Real time.
   - Real time.

Canada (1 response)

1. How is GOES important to your nation's forecasts?
   - It's very important to us. Important enough that we have redundant systems in place should one of our primary GOES receive systems fail.

2. What is your forecast modeling capability? Human based? Computers?
   - We run several models, global, regional, ensembles.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - The site I work at (Canadian Meteorological Center) is in Montreal, Quebec. We also have regional weather offices all across the country that also have their own GOES ingest systems (ground based GVAR antenna systems).

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - There are two areas where we use GOES data, feeding our models, and imagery. As a model input we use operationally a humidity profile generated from GOES imager data. We are also working on feeding GOES radiances directly into our assimilation cycle. Imagery is used in all our regional forecast offices where it plays a large role in their operations. We also feed several externals clients, some of whom are in the aviation field. It is also one of our most popular product suites on our public web site: (http://weatheroffice.ec.gc.ca/canada_e.html)

5. What are your sounder data needs?
   - We don't use the current GOES sounder, the coverage area is too small. We are much more interested in the GOES-R sounder and would very likely use it in our assimilation cycle.

6. What are your timeliness needs—real time or delayed?
   - Real-time.

Mexico (8 responses)

1. How is GOES important to your nation's forecasts?
   - Until now, we initialize our models with NOAA's AVN Aviation model data but we are interested in use directly satellite data (mesoscale models).
   - Very important and useful to civilian protect.
   - Very important. Most of the environmental monitoring is made using GOES imagery. but not only for operational purposes, research is actively participating to estimate rainfall for example.

- The satellite data from GOES are very important in Mexico for the development of meteorological bulletins.
- GOES is without doubt the main tool for forecasting in Mexico.
- Fundamental.
- GOES is important in the monitoring of hurricanes in the Atlantic and Pacific Oceans.
- For the receiving of the automatic platform data. This data allows us to make decisions in case of emergencies, hurricanes, floods, and to study and generate statistical data.

2. What is your forecast modeling capability? Human based? Computers?
   - Human based. In our group we are users of NWP, and we have access to a Origen computer with 64 processors, another with 44 processors. In the weather service is a Silicon-Graphics with 8 processors running only with numerical models.
   - We have a lot of capabilities, human and computational. In fact, we are working in the validation of the model outputs.
   - We run mesoscale weather models (MM5) and have a team of well trained people in this concept. For GOES we use for rainfall estimation and using GVAR/Sounder we developed an algorithm to compute temperature in the vertical. Now we are working with moisture retrievals.
   - The forecastings done in Mexico are primarily done by trained meteorologists who use the support of computer images.
   - We currently use MMS and human based predictions.
   - Weak, human based. Computers structure is enough.
   - MMS and forecasting personnel like meteorologists.
   - We process the data using computers. We get basic data and products that are then distributed through the web page.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - There are 32 sites (one per state) with this kind of necessity.
   - The regional offices
   - Surface data (very important, GOES data, radar data, model data. It does pretty much depend on the scale of the phenomena. Because of the topography, Mexico needs high resolution data, in order to predict short term weather events.
   - Aviation and navigation in ships like the marine sectors in Mexico.
   - In Mexico we need to incrementally increase our use of GOES products. Currently its primary use is tracking systems, forest fires and volcanic activity.
   - High mountains. Satellites are the unique observation platform for such isolated places.
   - Our main station is in our capital city. Other critical sites are the Yucatan and Baja California peninsulas.
   - Due to the need to support and prevent damage from earthquakes or hurricanes, we need at least three reception sites of direct platform data. They would be located in north, central, and southeast Mexico.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Precipitation estimates, storm tracking, hurricane tracking, navigation.

- All of them: precipitation, hurricane, aviation, volcanic ash monitoring, fire detection, real time monitoring of cloud activity, real time transmission of weather and aerosols information.
- Precipitation (QPF), hurricane monitoring, Sounder capabilities
- Hurricanes, precipitation, aviation and maritime (?)
- We use GOES for tracking hurricanes and identifying precipitation zones, forest fires, and deforestation.
- Uses [?] mainly to hurricane & aviation. There is no research using GOES. We do not have real-time reception of GOES data.
- For predicting hurricane paths, monitoring hurricanes, estimating precipitation, detecting convection nucleation [initiation?], atmospheric profiles, fires detection, volcanic ash and types of clouds.
- It supports predictions and alerts for evacuations regarding hurricanes or severe rains. It also supports climatological studies regarding the environment and the water quality.

5. What are your sounder data needs?
   - To initiate our models.
   - To cover our country and to make same free software to extract the information from GVAR file in 10 bit.
   - To have full coverage for Mexico and Central America. Keep working on retrieval algorithms. Have these inputs to run high resolution numerical weather models.
   - We need sounder data via satellite from GOES.
   - Critical if we want to do Volcanology and other applications, which are key issues for Civil Protection Authorities.
   - For water vapor analysis, ozone analysis. We need some TOVS channels.
   - Because of our synoptic configuration (?) we need the data from our 104 automated stations in a period of no less than 20 minutes.
   - Because of the high cost of [balloon based] sounder use, we only use the data once daily at each of our 15 existing stations, which is not sufficient to cover the whole country.

6. What are your timeliness needs—real time or delayed?
   - Real-time
   - Real time, and we make an archive to use data in special research projects.
   - Real time for short-term weather forecasting. Delayed when doing research. We need both.
   - Biggest needs are meteorological bulletins.
   - Real time is our primary need.
   - Obviously real-time based data offer a unique opportunity for R&D.
   - We need images from GOES with more constant reception and without too many interruptions. We need to create software specializing in products related to the data of GOES Sounder and TOVS of NOAA.
   - We have problems with access to the Wallops host and often do not have immediate access to information.

USA (5 responses – 3 U.S. government, 2 private)

U.S. Private (2 responses)

1. How is GOES important to your nation's forecasts?
   - Retrieval of DCP data.
   - Very important

2. What is your forecast modeling capability? Human based? Computers?
   - Computers, Automated Neural Network for storm surge.
   - N/A

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - State agencies and other federal agencies, Texas General Land Office, Texas Water Development Board, U.S. A.C.O.E., NOAA, NOS, NWS, local municipalities.
   - N/A

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Hurricane, storm surge.
   - All

5. What are your sounder data needs?

6. What are your timeliness needs—real time or delayed?
   - Real time.
   - Real time.
   - Timely, real-time.

Recommendations for the next meeting:
- All visual aids should be in both English and Spanish (text).
- More time devoted to GOES-DCS.

US Antarctic Program (USAP) (2 responses - US Navy & Space Science and Engineering Center (SSEC) of Univ. of Wisconsin)

1. How is GOES important to your nation's forecasts?
   - We use it to build composite imagery over the Antarctic for forecasting and research. GOES-West can be critical for ship forecasting. GMS is (was) of direct help; GOES-9 will be of help too!
   - It is used to help build a composite satellite that we use. It is also utilized in providing Ship Forecasting Support in Western Antarctica near Palmer Peninsula. It could be helpful if it covered areas between New Zealand and Antarctica for Aviation Support.

2. What is your forecast modeling capability? Human based? Computers?
   - USAP is just getting into Polar MMJ modeling via MMM group @ NCAR.

- We work closely with Bryel Research Center at Ohio State U. and National Center for Atmospheric Support (NCAR) in getting a tailored MMM5 model output. Also we work closely with AMRC at Univ. of Wisconsin in data acquisition.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - Data is needed at Domestic US sites like U.Wisconsin (where I'm based), and perhaps GSU, NCAC, SPAWAR-Charleston, others. Data will likely get to Antarctica for use on station.
   - We base out of Charleston, S.C., Christchurch NZ and McMurdo Station, Antarctica. Also various sites that support our efforts such as U. of Wisconsin, O.S.U., etc.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - The USAP uses it for research (widely varied), and for forecasting – both aviation support and midterm forecasting (via the composite). Direct GOES data has been used for South Pacific ship forecasting too.
   - We use as an assist to POES to provide Aviation Support from NZ and Ship Support. It is also used by others that support us.

5. What are your sounder data needs?
   - We would like Sounder data for the full southern part of the Southern Hemisphere.
   - Sounding data for the entire Southern Hemi. would be ideal.

6. What are your timeliness needs—real time or delayed?
   - Real time is preferred. Delayed (within our current setup for our composites) cannot be more than 2 to 2.5 hours!!!
   - Real time is always preferred when dealing with operations, which is what we do.

<u>U.S Army Corps of Engineers (1 response)</u>

1. How is GOES important to your nation's forecasts?
   - Use for regulating reservoirs and emergency operation. Floods, navigation are primary.

2. What is your forecast modeling capability? Human based? Computers?
   - Computers

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - 40 cities around the country ? the locations of our field offices.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - To forecast river stages

5. What are your sounder data needs?
   - Imagery is needed especially for hurricane activities. QPF is very important.

6. What are your timeliness needs—real time or delayed?
   - Real time

Caribbean

Antigua (1 response)

1. How is GOES important to your nation's forecasts?
   - GOES is most important as it provides much needed information as to what is happening in the tropical Atlantic, a very large area with very sparse data.

2. What is your forecast modeling capability? Human based? Computers?
   - We do have the capability as far as trained personnel is concerned. We, however, do not have proper computing facilities to perform the required modeling. We use the Star 4. We also have a GVAR receiving system.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - Agriculture, tourism, aviation, marine, public utilities. Most need satellite data. All need other numerical data.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - GOES data is used on a daily basis for forecasts and aviation purposes. It is an absolute must-have during the hurricane season for viewing the Eastern Atlantic.

5. What are your sounder data needs?
   - High resolution data, giving us the capability to view the state of atmosphere more accurately. This would be more useful than just a simple temperature profile.

6. What are your timeliness needs—real time or delayed?
   - All data is required real-time as we do not have a weather radar to get the latest information off.

Please note: I will have my director and other senior members of staff give more definite answers.

Bahamas (1 response)

1. How is GOES important to your nation's forecasts?
   - It is important because of the images that aid us in forecasting local weather. It gives us coverage of the wider Caribbean to view tropical waves from the East and frontal systems from US that a general WX forecast would not address.

2. What is your forecast modeling capability? Human based? Computers?
   - Both human and computers.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - International airports throughout country, 7 in total.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - We use all aspects listed and soon to look at tidal data as well as sea surface temp. for marine forecasting.

5. What are your sounder data needs?
   - --

6. What are your timeliness needs—real time or delayed?
   - Real time is preferable.

Barbados (1 response)

1. How is GOES important to your nation's forecasts?
   - Because of the location of Barbados, 13.04N, 59.30W, the nearest land mass to the east is Africa, so with a decreasing number of ship reports, the GOES data is the only information available.

2. What is your forecast modeling capability? Human based? Computers?
   - Computers/human. P.C Grids

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - One site located at the International Airport Training Center at CAMI.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Aviation, hurricane, precipitation, preparation of local forecasts and at least two other smaller islands—St. Vincent, Dominica.

5. What are your sounder data needs?
   - ?

6. What are your timeliness needs—real time or delayed?
   - Real-time.

Cayman (1 response)

1. How is GOES important to your nation's forecasts?
   - Very important, especially visible and water vapor.

2. What is your forecast modeling capability? Human based? Computers?
   - Computers using PCgridds. Will shortly get Region IV workstation.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - --

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Aviation

5. What are your sounder data needs?
   - Would like to start using.

6. What are your timeliness needs—real time or delayed?
   - Real time

Dominican Republic (1 response)

1. How is GOES important to your nation's forecasts?
   - My nation is every year under threatening of hurricanes, so GOES images are a very powerful tool to follow those phenomenons and to analyze through it the development of them to produce our forecast.

2. What is your forecast modeling capability? Human based? Computers?
   - Human based yet.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - Our international airports. They are in process to acquire DCP's and one satellite GOES receiver.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Aviation, precipitation, humidity, hurricane, cloud cover and . . . so.

5. What are your sounder data needs?
   - How can we get sounder data. We have a Direct Met through it we get just temperatures and clouds height but I am interested in getting other options.

6. What are your timeliness needs—real time or delayed?
   - Real-time

Grenada (1 response)

1. How is GOES important to your nation's forecasts?
   - Due to limited real time meteorological data, over the eastern Caribbean, GOES satellite data provide a very useful and valuable means of having information for the tropical Atlantic and Caribbean areas.

2. What is your forecast modeling capability? Human based? Computers?
   - --

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - Location at the Point Salines International Airport.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - (1) To track tropical cyclone (hurricanes, etc.); (2) for flight documentation; (3) public forecasting.

5. What are your sounder data needs?
   - In the tropics, high resolution satellite imagery provides meaningful information.

6. What are your timeliness needs—real time or delayed?
   - Preferably real-time data, however the necessary receivers have to be installed.

Jamaica (1 response)

1. How is GOES important to your nation's forecasts?
   - Info re hurricanes, severe WX.
   - It provides info on the location and movement of hurricanes, tropical waves, severe thunderstorms, complementing our Doppler radar.

2. What is your forecast modeling capability? Human based? Computers?
   - Both human and computer.
   - Human based & computers

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - Norman Manley Intl. Airport, Kingston, Jamaica.
   - Norman Manley Int'l Airport, Kingston, Jamaica.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Hurricanes, aviation forecast (severe WX), thunderstorms etc.
   - Hurricane, aviation, severe thunderstorms

5. What are your sounder data needs?
   - --
   - --

6. What are your timeliness needs—real time or delayed?
   - Real time
   - Real time

St. Lucia (1 response)

1. How is GOES important to your nation's forecasts?
   - Timely dissemination of short/mid-range weather forecasts and in the preparation of flight documentation. Enable us to pick up the meso-scale features that produce weather.

2. What is your forecast modeling capability? Human based? Computers?
   - Computers and human based

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - Hewanorra International Airport – Satellite-GVAR Meteorological Office

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Precipitation, storms, hurricanes, aviation, daily WX forecasts

5. What are your sounder data needs?
   - Vertical profile temperature/humidity

6. What are your timeliness needs—real time or delayed?
   - Real time

Other

France (1 response)

1. How is GOES important to your nation's forecasts?
   - Very important for weather forecasts in France and its overseas territories.

2. What is your forecast modeling capability? Human based? Computers?
   - Both (human expertise applied on numerical weather prediction outputs).

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - Météo-France Centre de Météorologie Spatiale (CMS), Lannion, France & Météo-France centers in French West Indies and French Polynesia

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   - Direct use of GOES imagery and products (cloud products, SST) for general, aviation, hurricanes and marine forecast.
   - Assimilation of GOES wind products in NWP models.

5. What are your sounder data needs?
   - Important, if they are not limited to US territory.

6. What are your timeliness needs—real time or delayed?
   - GOES imagery: less than 5 minutes
   - For assimilation purposes (winds, sounding data): less than 3 hours

Turkey (1 response)

NESDIS note: Even though Turkey lies outside of the area allowing its direct reception of GOES data broadcasts, a need and use for GOES data is identified.

1. How is GOES important to your nation's forecasts?
   - Monitoring agricultural land and making plans for sustainable development. Integrating GOES data including weather related data with real time and near real time ground information allow us to manage growing population needs.

2. What is your forecast modeling capability? Human based? Computers?
   - It is mostly dependent on computers, but on the other hand some academic organizations study on different modeling techniques, but we are still in need of modeling education.

3. What are the locations of your government sites needing data? Satellites vs. other options?
   - In terms of Ministry of Agr. we need all kinds of meteorological data. In fact, our national meteorological institute provides some basic climate data, but these data is not as well detailed as NOAA data.

4. How does your nation use GOES data (i.e., precipitation, hurricane, aviation, etc.)?
   GOES data is mostly used for monitoring clouds movements, precipitation, sea surface and land surface temperature measurements, aviation, and monitoring vegetation changes over the time.

5. What are your sounder data needs?
   - --

6. What are your timeliness needs—real time or delayed?
   - Real time