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ABSTRACT

The National Oceanic and Atmospheric Administration (NOAA) has developed the Comprehensive Large Array-data Stewardship System (CLASS) to archive and provide access to the data from current satellite-based observing systems (e.g., Polar-orbiting Operational Environmental Satellites – POES and Geostationary Operational Environmental Satellites – GOES) and ground-based observing systems (e.g., Next Generation Weather Radar - NEXRAD). CLASS is also being designed to handle the significant increases in data volume that will come from planned satellite launches (e.g., National Polar-orbiting Operational Environmental Satellite System – NPOESS, NPOESS Preparatory Project – NPP, and Earth Observing System – EOS satellites). Finally, CLASS will ultimately be capable of supporting current in situ data sources (e.g., Automated Surface Observing System – ASOS).

GOES operational capabilities:

- GOES data archive and access capability
- Multiple data formats
- Multiple spatial resolutions
- Multiple bands
- Dual site operations
- New GOES ingestors

Search capabilities include the following:

- Coverage
- Satellite schedule
- Data type
- Satellite
- Date and time range
- Spatial coverage

Current development activities:

- Planning for ingest of historical GOES data
- Statistical analysis of Imager data
- Evaluation of GOES products

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1. INTRODUCTION

The vision for GOES is that the CLASS system will be extended to include archive and distribution of GOES data and data products dating back to 1978. The system will make GOES data easily accessible to any interested party via the CLASS web portal. The customer base will range from professional users such as research scientists needing raw instrument data to casual users interested in viewing satellite imagery of recent weather events.

The primary goal of the CLASS system is to become NOAA's Internet portal providing access to meteorological data from a variety of sources, including geostationary and polar-orbiting satellites, as well as NEXRAD data. From the CLASS perspective, as well as the users' perspective, the GOES Campaign is simply one of the CLASS components. As a result, the GOES Campaign capabilities and functionality are based on CLASS, with the addition of functionality specific to meeting the needs of GOES customers.

Like other components of CLASS, the GOES design is based on a series of interconnected and interoperable data and information management components, each of which satisfies a major functional data stewardship requirement area.

2. GOES DATA IN CLASS

GOES data archive and access capability became operational on December 1, 2003. By January 2005, there will be more than a full year's worth of data in the archives. The CLASS team is formulating plans to backfill some or all of the more than 200 terabytes of historical GOES data.

GOES operational capabilities:

- Available data formats: McIDAS area format, NetCDF, GIF, JPEG, and raw GVAR
- Spatial resolutions: 1, 2, 4, 8, and 16 times the native resolution
- Bands: Imager bands 1-5/6, Sounder bands 1-19
- Dual site operations in Suitland, MD (Office of Satellite Data Processing and Distribution [OSDPD]) and Asheville, NC (National Climatic Data Center [NCDC])

- New GOES ingestors in Suitland replacing data feed from University of Wisconsin Space Science Engineering Center

Search capabilities:

- Coverage (CONUS, Full disk, Northern or Southern Hemisphere, etc.)
- Satellite schedule (Routine, Rapid scan, Super rapid scan, Other)
- Data type (Block 11, Imager, Sounder)
- Satellite (GOES-8, GOES-9, GOES-10, GOES-12)
- Date and time range
- Spatial coverage using a bounded box or entering lat/long coordinates

3. GOES SATELLITE BACKGROUND

The GOES series of satellites is owned and operated by NOAA. The National Aeronautics Space Agency (NASA) manages the design, development and launch of the spacecraft. Once the satellite is launched and checked out, NOAA assumes responsibility for the command and control of the satellite, the transmission of data, and the archive and dissemination of the data and its derived products to the user community.

The NCDC is responsible for the long-term archive of GOES data, while the NOAA National Environmental Satellite, Data, and Information Service (NESDIS) operates the satellites and is responsible for providing real-time data and products.

Where the POES satellites provide daily global coverage for analyzing long-term climatic and environmental trends, the GOES satellites' primary goal is to monitor the atmosphere for severe weather development such as tornadoes, flash floods, hail storms, and hurricanes. When these conditions develop, the GOES satellites can track storms on a minute-to-minute basis.

The GOES spacecraft is positioned 35,790 km (22,240 statute miles) above the equator, allowing it to view a major portion of the Western Hemisphere including southern Canada, the contiguous 48 states, major portions of the eastern Pacific Ocean and western Atlantic Ocean, and Central and South America. Because the Atlantic and Pacific basins strongly impact the weather over the United States, coverage is typically provided by two GOES spacecraft, one at 75 E west longitude (GOES East) and the other at 135 E west longitude (GOES West).

The combined footprint (radiometric coverage and communications range) of the two spacecraft encompasses Earth's full disk about the meridian approximately in the center of the continental United States.

The objective of the GOES satellites is to provide continuous, timely, and high-quality environmental and atmospheric observations over much of the Western Hemisphere to enable forecasters to more accurately predict weather conditions and monitor and track severe storms. GOES data are used in a number of forecast situations such as estimating heavy rainfall, measuring

movement and strengths of tropical storms, tracking volcanic plumes for aviation safety, measuring sea surface temperatures, and much more. Since the GOES data archive extends well over two decades, its applications in long-term climate studies are being used by scientists around the world.

3.1 Imager

The Imager instrument is designed to sense radiant and solar-reflected energy from sampled areas of the Earth's surface and atmosphere. The Imager's five spectral channels simultaneously sweep an 8 km north-south (N/S) longitudinal swath along an east-west (E/W) latitudinal path by means of a two-axis gimballed mirror scan system. Beam splitters separate the spectral channels into the various infrared (IR) detector sets.

3.2 Sounder

The Sounder operates independently of the Imager and is designed to measure atmospheric temperature and moisture across large regions of the western hemisphere. The instrument contains 18 IR channels and one visible channel. There are four detectors for each band. Each detector's Field of View (FOV) is 8 km at nadir. The scan swath width is 40 km wide (N-S). The IR spectral definition is provided by a rotating filter wheel that brings selected filters into the optical path of the detector assembly. Filters in three spectral ranges – longwave (12 μ m to 14.7 μ m), midwave (6.5 μ m to 11 μ m), and shortwave (3.7 μ m to 4.6 μ m), are arranged on the wheel for efficient use of sample time and optimal channel co-registration. The rotation of the filter wheel is synchronized with the stepping motion scan mirror. The visible channel (0.67 μ m) is not part of the filter wheel but is a separate set of uncooled silicon detectors having the same field of size and spacing. These detectors are sampled at the same time as IR channels 3, 11, and 18, providing registration of all sounding data.

4. REFERENCES

NOAA, CLASS Concept of Operations (1004_V_1.0_CLASS Concept of Operations), 5 April 2002.

NOAA, CLASS Dual Site Architecture & Operational Concept (1038_V_1.0_Dual Site Operations), 30 May 2003.

Note 1, Detailed technical information on the GOES spacecraft and instruments is found in a publication called GOES I-M DataBook. A copy is available in PDF format and can be downloaded in its entirety or in sections at :

http://rsd.gsfc.nasa.gov/goes/text/goes_databook.html.

Note 2, A full description of the GVAR transmission format is located at :

<http://www.osd.noaa.gov/gvar/gvardownload.htm>.