National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and Information Service
Environmental Satellite Processing Center (ESPC)
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Operational Analysis
2006

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Executive Summary

ESPC is managed within the National Environmental Satellite, Data and Information Service/Office of Satellite Data Processing and Distribution (OSDPD) located in Suitland, Maryland. Environmental Satellite Processing Center (ESPC) will combine two National Environmental Satellite Data and Information Service (NESDIS) operations: Central Environmental Satellite Computer System (CEMSCS) and Satellite Environmental Processing Systems (SATEPS). The combined system(s) ingest environmental data from NOAA's polar and geostationary spacecraft and produce environmental products and imagery, thus directly supporting the NESDIS Mission: "To Deliver accurate, timely and reliable satellite observations and integrated products and to provide long term stewardship for global environmental data in support of the NOAA mission."

Currently, CEMSCS and SATEPS are operated separately. CEMSCS ingests, processes, and distributes environmental satellite data and products generated from NOAA's satellites, several foreign country's satellites and Department of Defense's satellites. The primary product applications residing in CEMSCS and SATEPS are real-time remapped imagery, interactive products, and automated products. Remapping is the process of mapping imagery data into conventional map projections required by National Weather Service (NWS) field office meteorologists to generate timely and accurate weather forecasts and warnings. The real-time remapping system generates

infrared, water vapor, and visible sectors, converting the perspective from the satellite to a standard map, (e.g. Mercator) in the process. Interactive satellite products are generated via the manual interpretation of various satellite data sets by trained analysts in the Satellite Analysis Branch of the Satellite Services Division in OSDPD. Examples of these interactive products include ice/snow cover maps, detection and height of volcanic ash, location and extent of fires/smoke plumes, rainfall estimates and position and intensity of tropical cyclones. Automated products are routinely generated from CEMSCS and SATEPS with minimal human intervention except for maintenance and quality monitoring activities. Automated products, such as atmospheric temperature/moisture profiles, sea surface temperature maps, aerosol optical thickness composites and total ozone analyses, provide critical input to environmental modeling programs thus improving the predictive capability of weather and water forecasts.

ESPC will maximize the benefits of the common IT environment by combining processes, eliminating redundancies, and lowering refresh costs. Consolidation of systems and staff at NOAA Satellite Operations Facility (NSOF) will allow ESPC to reduce operator/admin and telecommunication expenses. ESPC will utilize current CEMSCS management schema, which has undergone NOAA Information Technology Review Board (NITRB) and the Department of Commerce (DOC) CITRB review. The CEMSCS management schema requires the ESPC project to be reviewed by a project management team which meets weekly for a staff meeting and monthly for a complete progress review of all tasks. Senior management will review major decisions monthly. Review by both the NITRB and the CITRB will be conducted as required.

NOAA has identified a performance gap in the computational resources available to support climate change and other environmental research, ESPC partially fills this gap by supporting NOAA's ability to transition space weather models, products, and data into operations.

1.0 Customer Results

The ESPC program is fully meeting the customer's needs and the program is delivering the services that it is intended to deliver. The program provides all required outputs and continues to reach the required customer focused outcomes. In 2006, fifteen products and/or product systems were successfully transitioned into the ESPC operations. A complete list of these products and their utility can be found in ANNEX A**.** These products provide all required outputs and continue to satisfy the required customer focused outcomes**.** For example, ocean color and sea surface temperature products support the identified outcome of the NOAA Ecosystem Goal to ensure "healthy and productive coastal and marine ecosystems that benefit society." Similarly, new cloud cover products, aerosol/smoke products and the tropical cyclone formation parameter support the NOAA Weather and Water Goal outcome of "reduced loss of life, injury and damage to the economy." ESPC hardware was required to meet the security requirements mandated by DOC. In 2007, the implementation of SATEPS equipment currently located at the World Weather Building in Camp Spring, MD to NSOF is planned. Integrating SATEPS into the ESPC migrates all processing (except the communications servers in the Trusted Access Security Zone) to the IBM pSeries servers and eliminates the majority of the Dell/Linux servers. In addition to the software migration this effort includes:

- Separating distribution and processing functions in each of the individual applications so the they can deployed in the appropriate ESPC security zone.
- Implementing a Storage Area Network (SAN) based file system.
- Implementing a common logging technique in all applications.

- Implementing a common automated operations monitoring system.
- Incorporating the SATEPS documentation into the ESPC documentation set

The ESPC program is fully meeting the customer's needs and the program is delivering the services that it is intended to deliver.

1.1 Customer Requirements

The ESPC program operates 24 hours per day/7 days per week. The primary customers are the National Weather Service (NWS), the Department of Defense, other agencies and the private sector companies that protect life and property as well as providing for the economic well being of the Nation.

The current ESPC program supports the customer's requirements. Four performance measures track the timeliness and accuracy of ESPC program's performance:
(1) Accuracy of Service delivered – Customer requirements reviewed and revalidated;
(2) Products Transitioned per operational year;
(3) % of data processed and delivered within targeted time;
(4) % of non-NOAA satellite data processed and distributed within targeted time.

1.2 Performance Measures

The performance measures evaluate the accuracy and timeliness of the data transmitted from the polar satellites to our primary and end-user customers. In FY07, ESPC is adding milestones that link to established Performance Measures. These milestones are for the transition of new METOP products and Microwave Integrated Retrieval System into operations. Metrics will be reported on a quarterly basis. Table 1 summarizes the performance measures

Table 1: Customer Results Performance Measure

Measurement Area	Indicator	2005 Baseline	2006 Actual Result	2007 1st Quarter	Comments
Customer Results	Customer Requirements Reviewed	1 per year	2	To be reported in 4th Quarter FY07	Actual result is through 1st Quarter FY07
Mission and Business Results	Products Transitioned	6 per year	15	1 as of 1st Quarter FY07	Actual result is through 1st Quarter FY07
Processes and Activities	Timeliness	98%	99%	98%	Actual result is through 1st Quarter FY07
Technology	Percent of non-NOAA Satellite data processed and distributed within targeted time	85%	87%	86%	Actual result is through 1st Quarter FY07

2.0 Strategic and Business Results

The ESPC program is meeting its own goals and objectives as well as those of the agency. Program management and controls are in place to ensure the program continues to meet its goals and objectives and monitor how well the ESPC program performs.

2.1 ESPC Helps to Achieve Strategic Goals

The ESPC program directly facilitates NOAA's Strategic Goal to "Advance understanding and predict changes in the Earth's environment to meet America's economic, social and environmental needs."

Within the Agency Enterprise Architecture, ESPC supports NOAA's "Produce Products / Services" component: "Processing of NOAA's 1A and 1B data sets into approx. 400 products that specifically address atmospheric, oceanographic, land, and solar application requirements".

2.2 Business Results

In 2006, ESPC purchased a significant amount of hardware in order to prepare for the physical move between the Suitland Federal Building 4 and NSOF.

2.2.1 Program Management and Controls

ESPC will maximize the benefits of the common IT environment by combining processes, eliminating redundancies, and lowering refresh costs. Consolidation of systems and staff at NSOF will allow ESPC to reduce operator/admin and telecommunication expenses. ESPC will utilize current CEMSCS management schema, which has undergone NOAA Information Technology Review Board (NITRB) and the Department of Commerce (DOC) CITRB review. The CEMSCS management schema requires the ESPC project to be reviewed by a project management team which meets weekly for a staff meeting and monthly for a complete progress review of all tasks. Senior management will review major decisions monthly. Review by both the NITRB and the CITRB will be conducted as required.

The ESPC performs extensive, continuous Operational Analysis on the performance of its components. This ensures system resources and ancillary supporting infrastructure (security, training, facilities, etc.) as well as labor resources remain optimally functional and configured to suit the NESDIS/NOAA's goals.

ESPC management conducts an objective measurement of resource and performance metrics of the ESPC elements. The ESPC Contract Administration Plan established a formal process for the evaluation of contractor performance. The ESPC Performance Evaluation Board meets twice a year to evaluate all task areas of the contract. This process includes an award fee pool that is distributed to the contractor based on performance. For all IT components, performance thresholds have been established. For IT systems, performance is measured continuously through an automated process and augmented by a manual process when required. Performance data is gathered at the functional level and reported to management on a weekly basis. Management reports to the NESDIS Program Office on a weekly basis. Performance deficiencies in the system resulting from hardware downtime are referred to the maintenance contractor for remediation. Performance deficiencies for IT systems resulting from software problems, such as bugs are referred to in-house software maintenance group for resolution. Key performance issues and risks are identified through these reviews and tracked by management.

Given that the ESPC operational environment includes a large IT component, keeping abreast of changes in technology that would impact operations is crucial. Often, this is done in conjunction with the Office of Systems Development (OSD), which performs system development and identification of new technologies on behalf of ESPC. These changes identify risks, such as, incompatible software or hardware to current operations in addition to identifying viable alternatives for improving systems and processes. The results of this analysis are the basis for ESPC input to the Ground System Five Year Plan.

2.2.2 Monitoring Cost, Schedule and Performance

Cost – The ESPC conducts a variety of budget analyses throughout the fiscal year. Obligations and expenditures are tracked on a weekly basis. Labor costs and full time equivalent usage are tracked on a bi-weekly basis. Variances to budget plans are analyzed monthly and reported to ESPC and OSDPD Management as well as NESDIS management. A Needs Analysis is conducted annually in conjunction with the Planning, Programming, Budgeting and Execution System (PPBES) and Ground System processes. Key budget issues and risks are identified through these reviews and tracked by ESPC management.

Schedule – The annual operating plan is used to track key milestones. The final matrix annual operating plan, based on FY06 appropriations established the FY06 schedule. Weekly Staff meeting and quarterly reviews of all contractor tasks allow the program manager to track progress towards key milestones and other operational aspects of the program (e.g., IT security compliance, data availability, etc.).

Performance – Contract performance is monitored to support both budget and performance measurements. ESPC operations are conducted utilizing contractors. For these contracts, ESPC management receives monthly status reports and meets as least quarterly with contract management to review performance, priorities, lessons learned, and work plan. A more formal review is held at the end of each contract year to assess the performance, come to agreement on ways to maximize the efficiency and productivity, and decide on potential corrective actions and milestones. Hardware maintenance contracts are reviewed on a semi-annual basis for technology advances impacting system maintainability, reliability, and interoperability.

All of these elements are provided to Ground Systems management via a monthly project report summarizing cost, schedule, and performance

2.3 Reviews

As part of the NOAA program structure, the ESPC program is reviewed on a bi-annual basis. The last review took place as part of the FY08 budget cycle and was completed in June 2006**.** The ESPC Program is scheduled for a NITRB systems review in June 2007 and CITRB review in July 2007**.**

The ESPC project is continues to meet the customer's needs and the program is delivering the services that it is intended to deliver. All program metrics are at or above expectations. The program continues to effectively and efficiently support NOAA's Strategic Goal to "Advance understanding and predict changes in the Earth's environment to meet America's economic, social, and environmental needs."

2.4 Security

ESPC is a government system, operated by government staff and contractors, using government-owned equipment, and residing in a government facility. Contractors provide operational and development services. The required security clauses are inserted in the ESPC IT services contracts by the Contracting Officer and independently verified by the Information Technology Security Officer. Upon contract award, contractor employees required to access this system must be approved for a NOAA badge and undergo the appropriate background check to ensure employee trustworthiness. The Contractor Officer's Technical Representative verifies the identity of each contractor employee and submits appropriate forms to the NOAA Security Office for a background check and employee badge. A personnel security professional within the NOAA Security Office ensures that all information provided by the Contractor Officer's Technical Representative is correct and initiates a security background check for the contractor employee through the Office of Personnel Management.

After OPM performs the contractor employee's background check, the NOAA Security Office is notified and a personnel security specialist reviews the results of the background check and subsequently approves issuance of a NOAA badge. The expiration date of a NOAA badge worn by a contractor employee must coincide with the contract's end date. This process is repeated for each new contractor employee. Contractors do not store, process or transmit data/information with any of the government system(s) identified in this investment. As a result, contractors are not required to undergo certification and accreditation activities for their information systems and submit a C&A package to the Contracting Officer and Information Technology Security Officer for review.

ESPC has an approved System Security Plan, Risk Assessment, and Contingency Plan in place. Management, operational and technical security controls are in place to ensure the confidentiality, integrity, and availability of information.

2.5 Performance Measures

The performance measures in Table 2 show the ESPC program's performance with respect to Strategic and Business Results.

Table 1: Customer Results Performance Measure

Measurement Area	Indicator	2005 Baseline	2006 Actual Result	2007 1st Quarter	Comments
Contractor Performance	Requirements and Metrics are Reviewed by Evaluation Board	N/A	1	0	Planned for 2nd and 4th Quarters FY07

N/A – ESPC contract award September 30, 2005.

3.0 Financial Performance

3.1 Current Performance vs. Baseline

Cost – The program planned costs vs. actual costs are shown in Figure 1. Program costs consist of labor and benefits for full time permanent staff dedicated to ESPC, travel, communications, supplies and equipment, and corporate overhead. To date, actual costs are equal to budgeted costs.

The dollars on the Y-axis are in thousands. Total planned expenditures for the calendar year 2006 were approximately $8,720,000; actual expenditures were approximately $8,746,000.

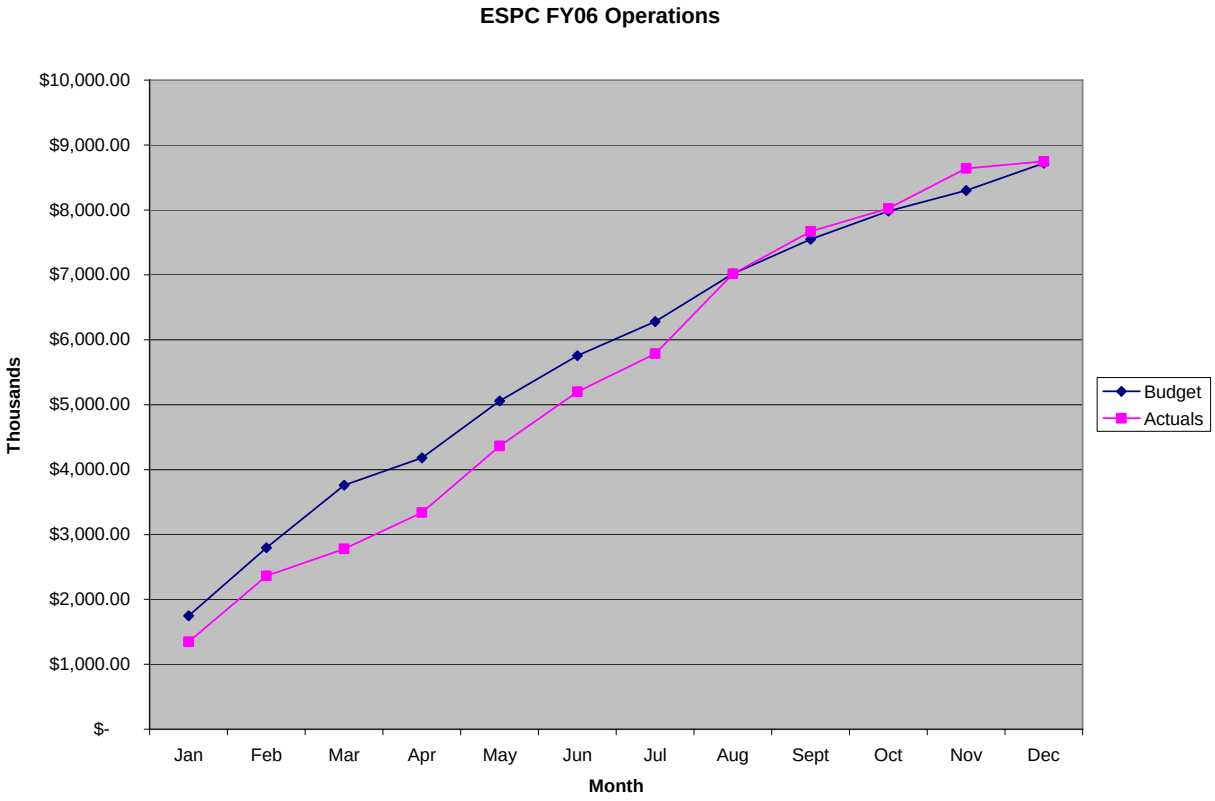

Figure 1: Budget vs Actual Costs

The ESPC operational expenses remain within the approximate operational budget planning threshold of +/-10%.

Schedule – All ESPC Operations and Maintenance activities to date are on schedule.

3.2 Performance Measures

The ESPC contract was awarded on September 30, 2005, the first year of the contract there was only one performance evaluation after nine months. Beginning in FY07, the ESPC contract will be evaluated by the ESPC Performance Evaluation Board twice annually.

3.3 Cost Benefit Analysis

An analysis of the socio-economic benefits, or the cost-benefit analysis, of the ESPC program was done in 2003. The analysis provides an economic perspective and helps determine present and future impacts of ESPC activities. The estimate concluded that for every Federal dollar spent on the program the Nation derived more than 7 dollars in benefit.

3.4 Financial Performance Review

Financial performance is typically subjected to a periodic review for reasonableness and cost efficiency. Monthly budget reviews are held with the program manager, contracting officers' representative and contract managers to ensure contracts are within cost and on schedule. Monthly reports from contractors are required to ensure the Government has the information it needs to evaluate cost performance. A detailed review of work and priorities is undertaken if cost is significantly above base lined values. Also, any necessary corrective actions are also identified and implemented.

4.0 Innovation to Meet Future Customer Needs

Please see Annex A for a detailed description of the products transition into operations during 2006. Section 4.1 details those operational improvements that have been identified in 2006, and for which future implementation is planned.

4.1 Improve 24/7/365 Customer Services

The ESPC will maximize the benefits of the common IT environment by combining processes, eliminating redundancies, and lowering refresh costs. The two systems and staff will be physically consolidated at the NOAA Satellite Operations Facility (NSOF). As a result of this consolidation, NESDIS will begin to provide our operational customers of environmental data and products a single point interface for any operational issues and customer problem resolution. These improvements are manifest in the following areas:

4.1.1 Improvements to Pre and Post Launch Operations

Improvements to the ESPC Pre- and post launch activities will include the following areas: (1) Streamlined simulation and analysis of spacecraft mission data; (2) Improvements to validation processes of instrument calibration; (3) Generation of improved statistical data and reports of instrument thermal vacuum data that serves as key information between instrument scientists and manufacturers for purposes of specification validation.

4.1.2 Improvements to Ingest Operations

ESPC ingest requirements for the following elements will be improved: (1) Downstream product processing timeliness requirements, (2) Dual interfaces and interactions with our Satellite Operations Control Center (SOCC) and indirect interfaces and interactions with our Command Data Acquisitions Stations (CDAs) for all satellite data sources streams including those that are not

NOAA assets; (3) ESPC hardware, software and equipment similarities and differences which involve the operational ingest and pre-processing of NOAA GOES and POES spacecraft mission sensors, DMSP, non-NOAA GOES and POES and Earth Observing System (EOS) data and by-products;

4.1.3 Improvements to Processing Operations

ESPC improvements to operational product requirements will include the following areas:
(1) Timeliness of data and products from ingest to delivery to its user. (2) Performance metrics and quality control parameters and systems utilized in each product processing subsystem;
(3) Technology solutions to streamline and integrate ingest and processing requirements for all sensor data and product types. Resulting in economies in processing and distribution times passed on to our customers for faster assimilation into their respective applications. This streamlining may range from the fusion of a few or several product and/or data types into a new product; or the integration of several products form several different data sources into comprehensive retrieval package that a user can select-on-demand geographic areas of interest and resolution on a global-wide scale.

4.1.4 Improvements to Data and Product Distribution Operations

The ESPC services a large, unique set of customers for its respective data and derived products. Improvements to communication network and distribution methodologies will be required to provide robust solutions that will accommodate the heavier volumes of data anticipated from NPP/NPOESS and GOER R through 2012 and beyond.

Annex A

ESPC Products Transitioned into Operations

GOES Clear Sky Brightness Temperature (CSBT)

This is a new product that was being distributed hourly by Cooperative Institute for Meteorological Satellite Studies (CIMSS) in Wisconsin to National Center for Environmental Prediction (NCEP)/ Environmental Modeling Center (EMC) and European Center for Medium-range Weather Forecasts (ECMWF) for use in there models. Both users wanted the product to be placed in operation so that the product would be maintained 24/7 in an operational environment. The CSBT product was made operational on December 6, 2005. The software selects cloud-free Fields-Of-View (FOVs), average these data to 50 km by 50 km areas, and stage the information to Binary Universal Format Representation (BUFR) files for subsequent use by the modeling community. The CSBT product provides clear sky information for the five spectral bands from both the GOES/East and West Imagers. NCEP/EMC has successfully accessed and decoded the CSBT data and routinely incorporated them into their databases. Assimilation of geostationary satellite data allows a more complete description of the atmosphere for initialization of numerical weather analyses and forecasts by providing hourly radiance information. The current GOES Imagers provide information on upper-level tropospheric humidity structures (water vapor channel), the surface temperature, and near surface humidity (window channels). Compared to polar orbiting satellites, the benefit of geostationary imagers comes from the high temporal frequency (hourly) of radiance observations and increased areal coverage. Coverage for the GOES/East and West CSBT product extends from

roughly 67S to 67N and 30W to 165E. For each 50 km processing box the average brightness temperature for each infrared (IR) band is calculated along with the average clear and cloudy brightness temperatures. Processing is performed using the Man computer Interactive Access System (McIDAS) and the output information is then transferred from a McIDAS Meteorological Data (MD) file into a BUFR file.

GOES Merged Soundings Product System (MSPS) Single Field of View (SFOV)

This new system has merged three separate soundings systems into one system and went from a 50km resolution system to a 10km resolution. The merger of the three systems represents a significant improvement in efficiency and cost savings on the product side. The product was made operational on November 1, 2005. These products are generated every hour 24/7, and made available to the appropriate users. The first products to be replaced were the four Derived Product Images (DPI) (Lifted Index (LI), Precipatable Water (PW), Surface Skin Temperature (SKT), and Cloud Top Pressure (CTP)), that are sent to the NWS AWIPS. The benefits of the improvements are;

1) An improved cloud mask;
2) Finding CO2 solutions at pressures that lie between the fixed pressure levels used in the quadrature
3) Improvements/corrections made to the forward calculation of the radiances, particularly as it pertains to the treatment of the lowest layer of the atmosphere just above the surface.

These improvements were noticed right away by the users. The other products to be replaced shortly are the Automated Surface Observing System (ASOS) Satellite Cloud Product (SCP) text file. Which is NESDIS' assistance product to the NWS ground system ASOS, which can not detect above the low level clouds. Satellite Services Division (SSD) currently services 1600+ observing stations throughout the US. The Soundings SFOV product is sent to the National Weather Service Telecommunications Gateway (NWSTG) for NWS distribution in standard BUFR format. It is also used by NWS/NCEP/EMC for use in the models in NCEP BUFR format. These soundings are being made in both 5X5 and 1X1 off of the MSPS SFOV system. The 5X5 product is a sub-sample of the 1X1 product. NCEP also receives a 1X1 Cloud Top Pressure BUFR product which is a part of the previous product and will not be generated separately once NCEP has transitioned over to the new product. The deadline for having all products transitioned over is March 1, 2006.

GOES Aerosol Smoke Product (GASP)

The GOES and Aerosol Smoke Product (GASP), developed at National Environmental Satellite Data and Information Service (NESDIS)/Office Research Applications (ORA) by Drs. Ken Knapp, Ana Prados and Shobha Kondragunta, is a retrieval of the Aerosol Optical Depth (AOD) using visible radiances from the Geostationary Operational Environmental Satellite (GOES) imager.

GASP uses the GOES visible channel to calculate surface reflectivity and then AOD. First, visible imagery from the last 14-28 days is used to create a composite clear background image, using the second darkest pixel. The surface reflectivity is then calculated from this image by means of a Look Up Table and assuming a background aerosol load of 0.04. The AOD is calculated from the estimated surface reflectivity and the Look-Up Table. A cloud mask algorithm is used to identify clouds, emissions (i.e., automobiles, industry, fires) and dust.

The GASP system, declared operational in Dec, 2005, provides a satellite-derived aerosol product that is used to improve air quality and visibility forecasts. Specific applications which use GASP

include: Air Quality (AQ) forecast verifications, EPA AQ assessments, assists EPA in understanding the linkage between conditions observed in satellite data and human health and air quality and is used as guidance by local AQ monitoring agencies to develop short-term pollution control strategies and issue AQ alerts.

Tropical Cyclone Formation (TCF) Parameter

The TCF parameter calculates the potential for tropical cyclone formation (or genesis) in the North Atlantic between Africa and the Caribbean islands. Climatologically, this region is the source of about 40% of the Atlantic basin tropical cyclones and roughly 60% of the major hurricanes. The genesis parameter is based on an appropriately scaled 5-day running mean of vertical shear, vertical instability, and midlevel moisture variables. The instability and shear variables are calculated from operational NCEP analyses, and the midlevel moisture variable is determined from cloud-cleared GOES water vapor imagery. On average, there is only a short period from mid-July to mid-October when all three variables are favorable for development. This observation helps explains why tropical cyclone formation in the tropical Atlantic has such a peaked distribution in time. The parameter also helps explain intra- and inter-seasonal variability in tropical cyclone formation. The TCF product is a valuable forecasting tool because it assists in the early prediction of the formation (and possible track) of new tropical cyclones.

Ocean Color Products

OKEANOS is a satellite data processing system that generates CoastWatch ocean color, water clarity, and sea surface temperature products. Twenty-one individual CoastWatch ocean color products were declared operational on June 12, 2006. These products are used to facilitate coastal resource management including the detection of harmful algal blooms (HABs). These 21 products fall into seven ocean color product categories including: normalized water-leaving radiances (Nlw), daily mean chlorophyll-a concentration, 61 day mean chlorophyll-a concentration, chlorophyll-a concentration anomaly, daily mean remote sensing reflectance (Rrs), 61 day mean remote sensing reflectance and remote sensing reflectance anomalies. One set of these products are generated using data from the Moderate Resolution Imaging Spectroradiometer (MODIS) on the Aqua satellite. Two sets of these products are generated using Sea-viewing Wide Field-of-view Sensor (SeaWiFS) data, one using a NOAA-unique atmospheric correction and the other using a standard atmospheric correction provided by the NASA SeaWiFS Data Analysis (SeaDAS) software modules.

Specific ocean color products include:

Normalized water-leaving radiances (1)
SeaWiFS nLw (NOAA atmospheric corrections)
SeaWiFS nLw (NASA atmospheric corrections)
MODIS/Aqua nLw
Chlorophyll_a mean concentrations (daily and multi-day composites) and anomalies (3)
SeaWiFS Daily mean Chlorophyll_a concentration (NOAA atmospheric corrections, OC2.RS)
SeaWiFS Daily mean Chlorophyll_a concentration (NASA atmospheric corrections, OC4v4)
MODIS/Aqua Daily mean Chlorophyll_a concentration (OC3M)
SeaWiFS 61-day mean Chlorophyll_a concentration (NOAA atmospheric corrections, OC2.RS)
SeaWiFS 61-day mean Chlorophyll_a concentration (NASA atmospheric corrections, OC4v4)
MODIS/Aqua 61-day mean Chlorophyll_a concentration (OC3M)

SeaWiFS Chlorophyll_a concentration anomaly (NOAA atmospheric corrections, OC2.RS)
SeaWiFS Chlorophyll_a concentration anomaly (NASA atmospheric corrections, OC4v4)
MODIS/Aqua Chlorophyll_a concentration anomaly (OC3M)
Remote Sensing Reflectances (3)
SeaWiFS Daily mean Rrs670 (NOAA atmospheric corrections)
SeaWiFS Daily mean Rrs670 (NASA atmospheric corrections)
MODIS/Aqua Daily mean Rrs667
SeaWiFS 61-day mean Rrs670 (NOAA atmospheric corrections)
SeaWiFS 61-day mean Rrs670 (NASA atmospheric corrections)
MODIS/Aqua 61-day mean Rrs667
SeaWiFS Rrs670 anomaly (NOAA atmospheric corrections)
SeaWiFS Rrs670 anomaly (NASA atmospheric corrections)
MODIS/Aqua Rrs667 anomaly

Effective Cloud Amount (ECA)

The ECA is an image product, a part of the Merged Soundings Product System (MSPS) of Single Field of View (SFOV). MSPS was made operational in October 2005 and a number of the deliverables were dependent upon the user readiness to receive the products. The ECA is sounding derived product image, one of the five products being delivered to AWIPS. AWIPS is receiving the product even though it is not slated to be made operational by NWS until OB7.2 is activated into operations. We are now sending the ECA product to AWIPS via GINI2, which began on June 19, 2006.

GOES-12 Imager Clouds

The GOES-12 Imager Cloud Product (GICP) is an image product that can only be made with the use of the 13.3 um channel of the imager instrument. GOES-12 was modified to be able to make this product available 24/7. It will enhance the meteorologist's ability to see the cloud structures on a full disk removing the limits of the soundings instrument. This product is being made available to National Center for Environmental prediction (NCEP)/Aviation Weather Center (AWC) every hour, AWC are required to include convective cloud tops (in units of feet) to the SIGMET (significant meteorological information) database. This product helps them fulfill this requirement. GICP has been made operational on July 31, 2006.

GOES SST Bayesian Cloud Mask Enhancement

GOES SST products provide diurnal cycle for the POES/GOES high-resolution spatial and temporal analysis. GOES SST Bayesian Cloud Mask Enhancement is a new cloud masking methodology based on a probabilistic (Bayesian) approach to detection using model outputted thermal infrared radiances with a spatial variance predictor to estimate the probability of a particular pixel being clear of cloud. It remove sources of retrieval bias in all Geostationary SST products increasing coverage of SST observations, maximizing return from GOES Imager data.

The Joint Center requires improved SST products which have had biases removed and include error estimates for each observation that can be assimilated into their operational forecast models. GOES-SST is CoastWatch's most requested product Coral Reef Watch requires accurate information on the diurnal SST cycle of the ocean to determine the heat stress on the coral reefs. These expanded products will allow global assessment of the heat stress on coral reefs worldwide.

GOES SST Frontal product

A new GOES SST frontal product was approved for operational status by the Satellite Products and Services Review Board (SPSRB) on Wednesday, November 15. The product became operational with an 8 by 5 support level on December 14th, 2006. A graphical depiction of the product is available on the West Coast CoastWatch browser site at
http://coastwatch.pfeg.noaa.gov/coastwatch/CWBrowser.jsp
and also on their OceanWatch North Pacific Demonstration Project live access server at
http://las.pfeg.noaa.gov/oceanWatch/oceanwatch_safari.php
The CoastWatch Oceanic Front Probability Index measures the probability of sea surface temperature front formation based on data from NOAA's GOES satellites. Fronts play an important role in upper ocean processes. Fronts can impact ocean fisheries, for example, by influencing the spatial distribution of biological productivity and by controlling the accumulation of marine debris, which serves as a beacon to higher trophic levels.

Technical Summary:

CoastWatch generates the frontal probability index from the GOES SST dataset. Daily average SST is generated from the GOES data. Fronts are identified by applying an edge detection algorithm to this daily averages SST field (Breaker et al., 2005). Pixels with gradients greater than 0.375 degrees C per pixel are classified as a front. The probability index is then calculated as the number of times a pixel is classified as a front divided by the number of cloud free days for the given time period. Days when the pixel is cloud-masked do not count towards this calculation. Initial data validation was performed by comparing the data to in situ observations by a research ship on a California Cooperative Oceanic Fisheries Investigations (CalCOFI) cruise. Additional evaluation and validation is in progress by a number of organizations (e.g. Castelao et al., 2006). The data are mapped to an equal angle grid (0.05 degrees latitude by 0.05 degrees longitude) to produce composite images of various durations (e.g., 5-day, 10-day, 14-day).