

# JPSS EDR Products Performance Monitoring

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## Introduction

Long term monitoring is a key function of quality assurance for the Center for Satellite Applications and Research (STAR) Joint Polar Satellite System (JPSS) Program.

To track the quality of the products and performance of the algorithms, a real-time product monitoring tool is being designed and developed for the Suomi National Polar Partnership (SNPP) and JPSS Environmental Data

### **Database Design**

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ER diagram

# **NRT Performance Monitoring**

	Product Monitor					
	imgs					
ool Interface: oduct Status	Manual Plotting Tool       < 2014-03-19 > Today					
	●Good ●Warning ●Bad ●Unknown					
	ACSPO_SST • • • • • • • • • • • • • • • • • •					
	NPR_MIRS   • • • • • • • • • • • • •					
ool Interface: eshold						
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#### **Product Monitor**

imgs NUCAPS\_Ret 2014-03-19 14:00:00

Manual Plotting Tool

**Right**:

Below:

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Detail t

pre-def

### Record (EDR) products.

The real-time monitoring tool will be able to detect the products availability, as well as abnormal events, and send out notification for the anomalies.

The approach of the EDR long term monitoring is an extension of the product monitoring tool developed to monitor the output of NOAA' s operational NPP Data Exploitation (NDE) products.

This presentation will describe in detail: determination of the monitoring methods, software architecture, and database and interface designs.

# **Objectives / Requirements**

### **Build a web-based graphic user interface software** system to monitor SNPP/JPSS EDR products

- Near real time product performance monitoring
- Visually simple interface:

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High Level Tables						
Table	Primary Key	Foreign Keys				
Satellites	Satellite ID					
Instruments	Instrument ID					
Channels	Satellite ID, Instrument ID, Channel/Band Number	Satellite ID (Satellites table) Instrument ID (Instruments table)				
Products	Product ID	Satellite ID (Satellites table) Instrument ID (Instruments table)				
Prod_Tables	Product ID, Table Name	Product ID (Products table)				
Prod_Versions	Product ID, Version Number	Product ID (Products table)				
Prod_Units	Product ID, Variable Name	Product ID (Products table)				
Prod_QA	Product ID, QA Value	Product ID (Products table)				
Prod_Layers	Product ID, Layer Number	Product ID (Products table)				
Prod_Regions	Product ID, Region Number	Product ID (Products table)				
AncillaryData	Ancillary Data ID					
Prod_Ancillary	Product ID, Ancillary Data ID	Product ID (Products table) Ancillary Data ID (AncillaryData table)				
Data_Type	Data Type Flag					
StatusDesc	Status Number					
Contacts	Contact ID					

Product Tables							
Product	Table	Primary Key	Foreign Keys				
	NUCAPS_Rad	Product ID, Data Type Flag, Record Start Datetime	Product ID (Products table) Data Type Flag (Data_Type table)				
	NUCAPS_RadPCS	Product ID, Data Type Flag, Record Start Datetime, FOV Number, Band Number	Product ID, Data Type Flag, Record Start Datetime (NUCAPS_Ret table)				
NUCAPS	NUCAPS_Ret	Product ID, Data Type Flag, Record Start Datetime	Product ID (Products table) Data Type Flag (Data_Type table)				
	NUCAPS_RetTP	Product ID, Data Type Flag, Record Start Datetime, Layer Number	Product ID, Data Type Flag, Record Start Datetime (NUCAPS_Rad table) Layer Number (Prod_Layer table)				
	MIRS	Product ID, Region Number, Data Type Flag, Record Start Datetime	Product ID, Region Number (Prod_Regions table) Data Type Flag (Data_Type table)				
	MIRS_btDiff	Product ID, Region Number, Data Type Flag, Record Start Datetime, FOV Number, Channel Number	Product ID, Region Number, Data Type Flag, Record Start Datetime (MIRS table)				
MIRS	MIRS_SEM	Product ID, Region Number, Data Type Flag, Record Start Datetime, Channel Number	Product ID, Region Number, Data Type Flag, Record Start Datetime (MIRS table)				
	MIRS_QA	Product ID, Region Number, Data Type Flag, Record Start Datetime, QA Value	Product ID, Region Number, Data Type Flag, Record Start Datetime (MIRS table) Product ID, QA Value (Prod_QA table)				
	MIRS_TQ	Product ID, Region Number, Data Type Flag, Record Start Datetime, Layer Number	Product ID, Region Number, Data Type Flag, Record Start Datetime (MIRS table) Product ID, Layer Number (Prod_Layers table)				
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	Winds_Lay	Product ID, Data Type Flag, Record Start Datetime, Band Number, Clear/Cloud Flag, Layer Number	Product ID, Data Type Flag, Record Start Datetime, Band Number, Clear/Cloud Flag (Winds table) Product ID, Layer Number (Prod_Layers table)				

#### Message Counts -- Good: 113 Warning: 12 Bad: 1 Hide Messages Include GOOD Messages

2014	-03-	-19T1/	1.33.217	nucane	rettn	refresh-rate	tobias	-4 1730000 BAD
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#### 2 Hour Plots

-hour time series: Q(p) Bias of full troposphere (200~1100) -hour time series: Q(p) RMS of full troposphere (200~1100) -hour time series: Q(p) Percent Error of full troposphere (200~1100) -hour time series: T(p) Bias of mid troposphere (520~790) -hour time series: T(p) RMS of mid troposphere (520~790)

#### 24 Hour Plots

24-hour time series: Q(p) Bias of full troposphere (200~1100) 24-hour time series: Q(p) RMS of full troposphere (200~1100) 24-hour time series: Q(p) Percent Error of full troposphere (200~1100) 24-hour time series: T(p) Bias of mid troposphere (520~790) 24-hour time series: T(p) RMS of mid troposphere (520~790)



#### Trending Plots: 2-hour refresh-rate (Upper) and 60-day daily-mean (Bottom) time series of Q(p)/T(p) Bias and RMS



Manual Plotting Tool enable users to create time series plots of any parameter in the database.

- Yellow: Warning
- Red: Bad
- Email notification of anomalies
- Ability for long term product quality monitoring

### **General requirements:**

- The system shall provide capabilities for automatic monitoring of SNPP and JPSS EDR product quality in near real time and send out notification of the anomalies.
- The system shall be designed and built as a common tool, which implements a common database, common interfaces (e.g. common data parsers), and a common web-based Graphical User Interface (GUI).

Example Plot: Daily percent clear sky ocean pixels (SST)

### Number of seconds used to processing 1 data file

Process Time						
Product	Interval	Process Time				
NUCAPS Rad	32 seconds	0.5 ~ 1 seconds				
NUCAPS Ret	32 seconds	0.3 ~ 0.5 seconds				
MIRS Ret	~ 10 minutes	5 ~ 7 seconds				
ACSPO SST	~ 30 minutes	16 ~ 20 seconds				

# **Monitoring Method / Process Flow**

### **Product Monitoring is determined via three steps:**

- Defining metadata variables that can be used to catch anomalies for product quality monitoring
- Defining how the product metadata are trended
- Determining thresholds for the trended metadata

# **Configuration File**

**<u>Configuration file controls the monitoring tool program</u>** <u>execution, it contains:</u>

- Product ID
- Directory to check for raw data files

# **Summary**

- The monitoring tool has been developed and is running on OSPO development machine with operational NDE SNPP EDR products.
- The performance of the tool meets the near real time

variables to identify when the products fall outside a valid range

### **Monitoring Tool Processing flow:**

- > Pull the raw data files to the processing system
- Read in product configuration files
- Process raw data file, calculate needed metadata variables, save into common format metadata file
- > Parse metadata file, insert records into database
- Calculate long-term (hourly/daily/weekly/monthly) statistics of metadata variables, insert statistics records into database
- Compare with thresholds to determine product quality
- Generate pre-defined time series plots
- Web interface to show the product quality status and detail thresholds comparison messages

- Raw data file name extension
- File name searching string to find all available raw data files
- Executable program name for processing raw data file to generate common format metadata file
- Detail information about database tables, primary keys, data columns for inserting metadata records into database
- Information about kinds of metadata variable statistics needed. Detail database information for inserting/updating metadata statistic records into database
- Metadata variable thresholds: Good/Warning/Bad ranges
- Information of pre-defined trending time series to plot. Detail database information for fetching records to do trending plots

### requirement.

- The tool enables users to view near real-time data feeding and quality.
- The system allows users to monitor the SNPP and JPSS EDR products' quality in the long term and to analyze the anomaly in detail.
- Enterprise approach: Easy to add new products into the system.

### **Future Plan:**

- Work with product teams to refine the thresholds
- Add phase 2 products into the tool
- Build monitoring tool for JPSS EDR products