



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 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:
 - Green: Good
 - 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).

Monitoring Method / Process Flow

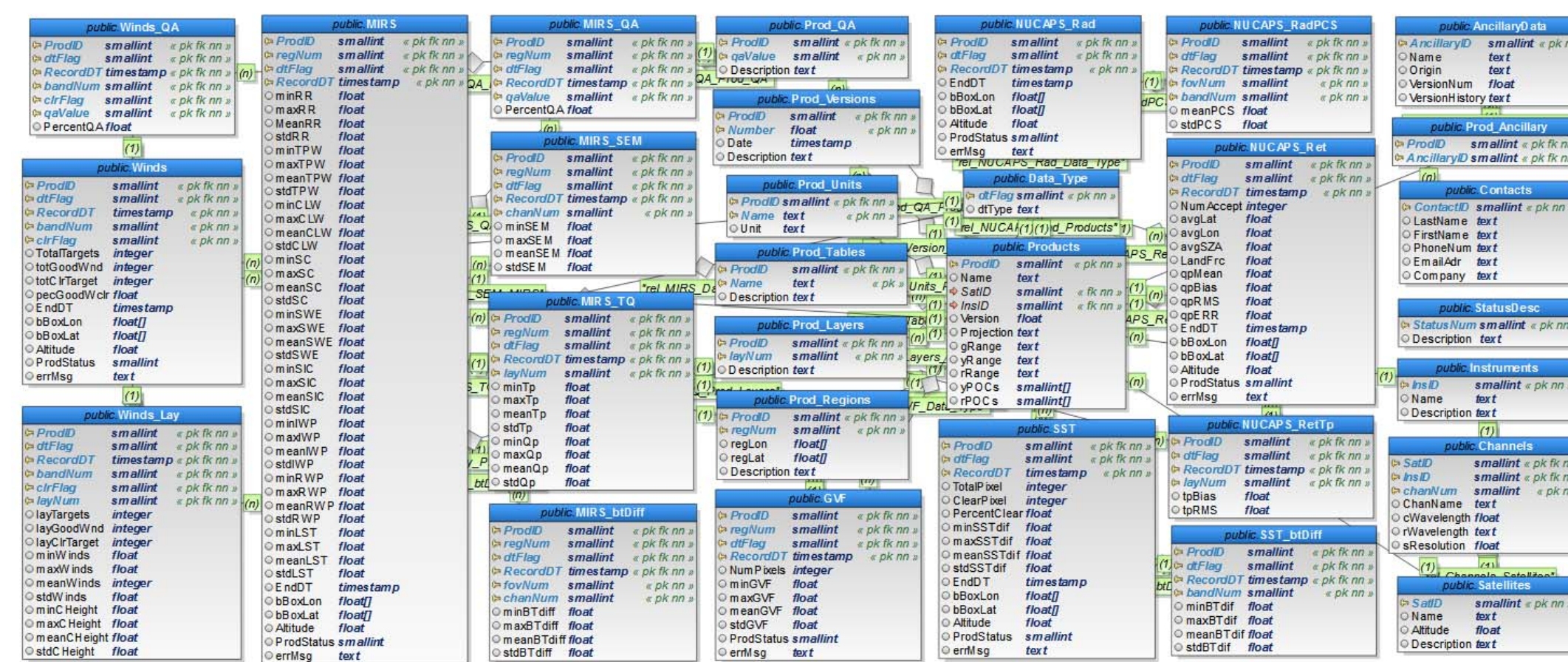
Product Monitoring is determined via three steps:

- 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 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

Database Design



ER diagram

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	

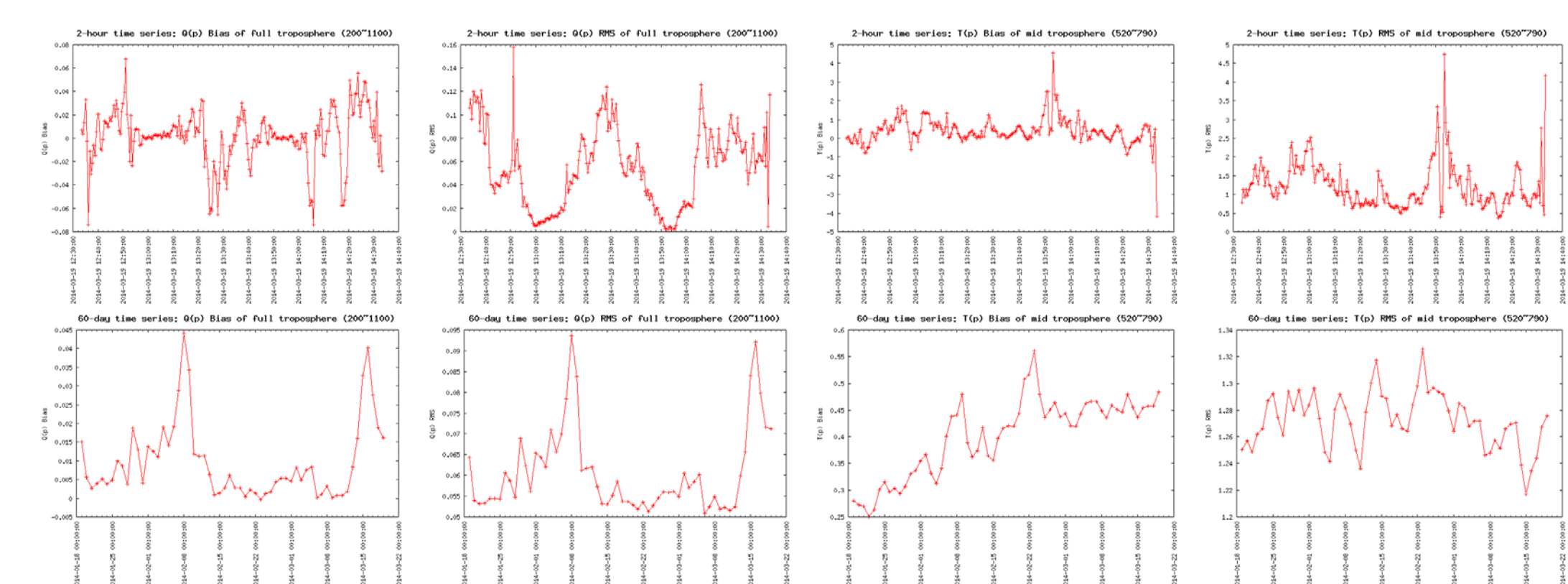
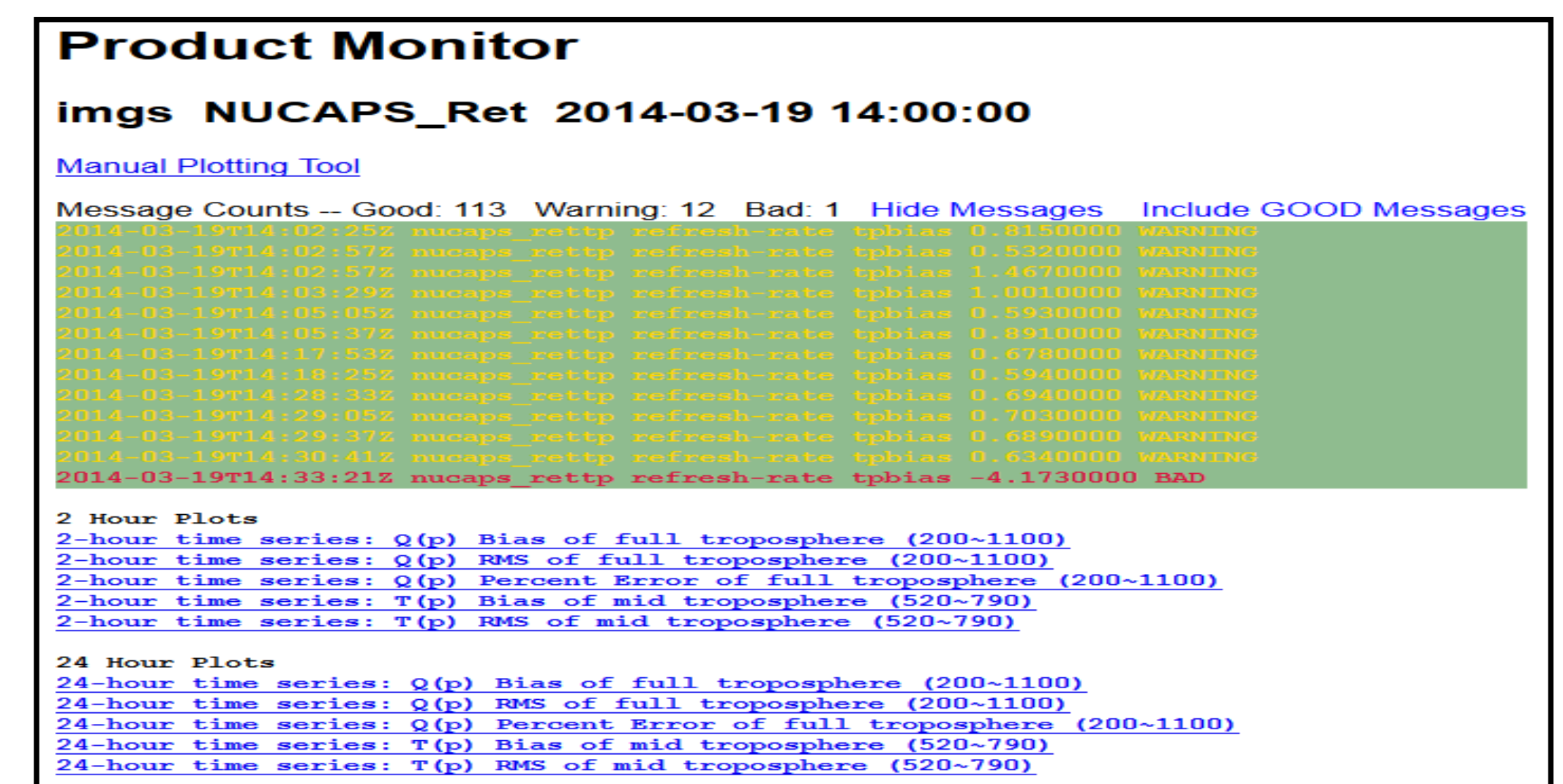
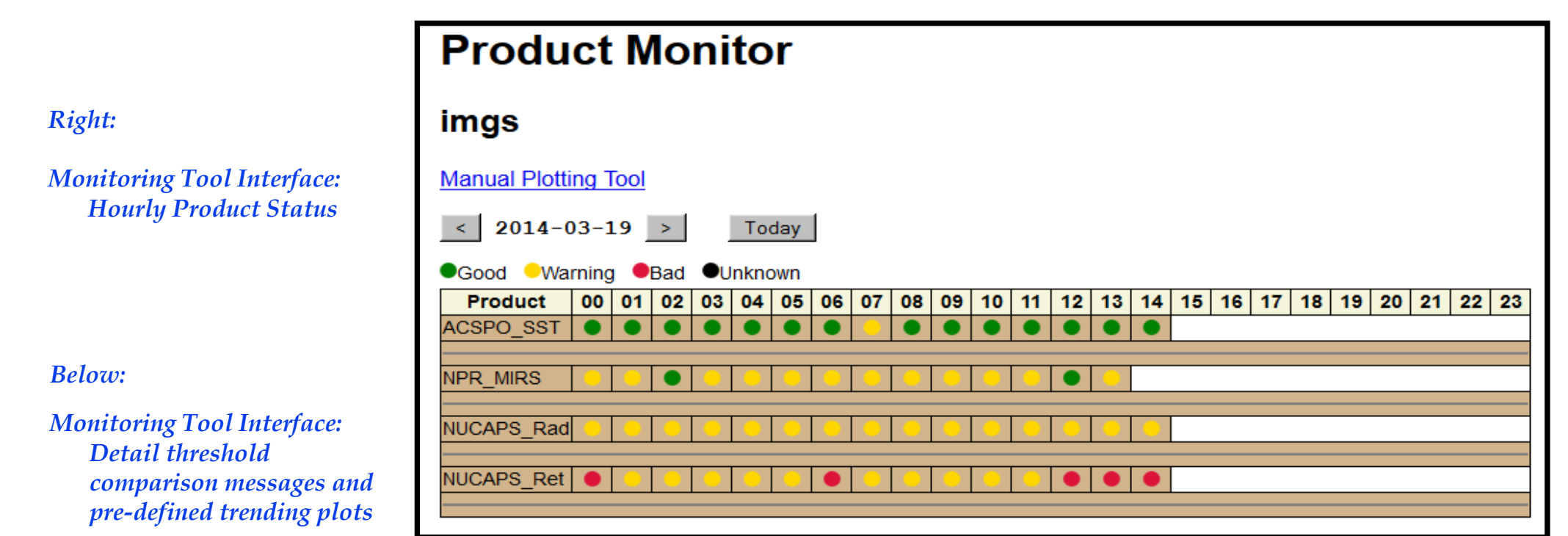
Product Tables			
Product	Table	Primary Key	Foreign Keys
NUCAPS	NUCAPS_Rad	Product ID, Data Type Flag, Record Start Datetime	Product ID (Products table) Data Type Flag (Data_Type table)
	NUCAPS_RadPCS	Product ID, Data Type Flag, Record Start Datetime, FOV Number, Band Number	Product ID, Data Type Flag, Record Start Datetime (NUCAPS_Ret table)
	NUCAPS_Ret	Product ID, Data Type Flag, Record Start Datetime	Product ID, 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)
MIRS	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_bidiff	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_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)
GVF	GVF	Product ID, Region Number, Data Type Flag, Record Start Datetime	Product ID, Region Number (Prod_Regions table) Data Type Flag (Data_Type table)
	GVF	Product ID, Region Number, Data Type Flag, Record Start Datetime	Product ID, Region Number (Prod_Regions table) Data Type Flag (Data_Type table)
SST	SST	Product ID, Data Type Flag, Record Start Datetime	Product ID (Products table) Data Type Flag (Data_Type table)
	SST_bidiff	Product ID, Data Type Flag, Record Start Datetime, Band Number	Product ID, Data Type Flag, Record Start Datetime (SST table)
Winds	Winds	Product ID, Data Type Flag, Record Start Datetime, Band Number, Clear/Cloud Flag	Product ID (Products table) Data Type Flag (Data_Type table)
	Winds_QA	Product ID, Data Type Flag, Record Start Datetime, Band Number, Clear/Cloud Flag, QA Value	Product ID, Data Type Flag, Record Start Datetime, Band Number, Clear/Cloud Flag (Winds table) Product ID, QA Value (Prod_QA table)
	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)

Configuration File

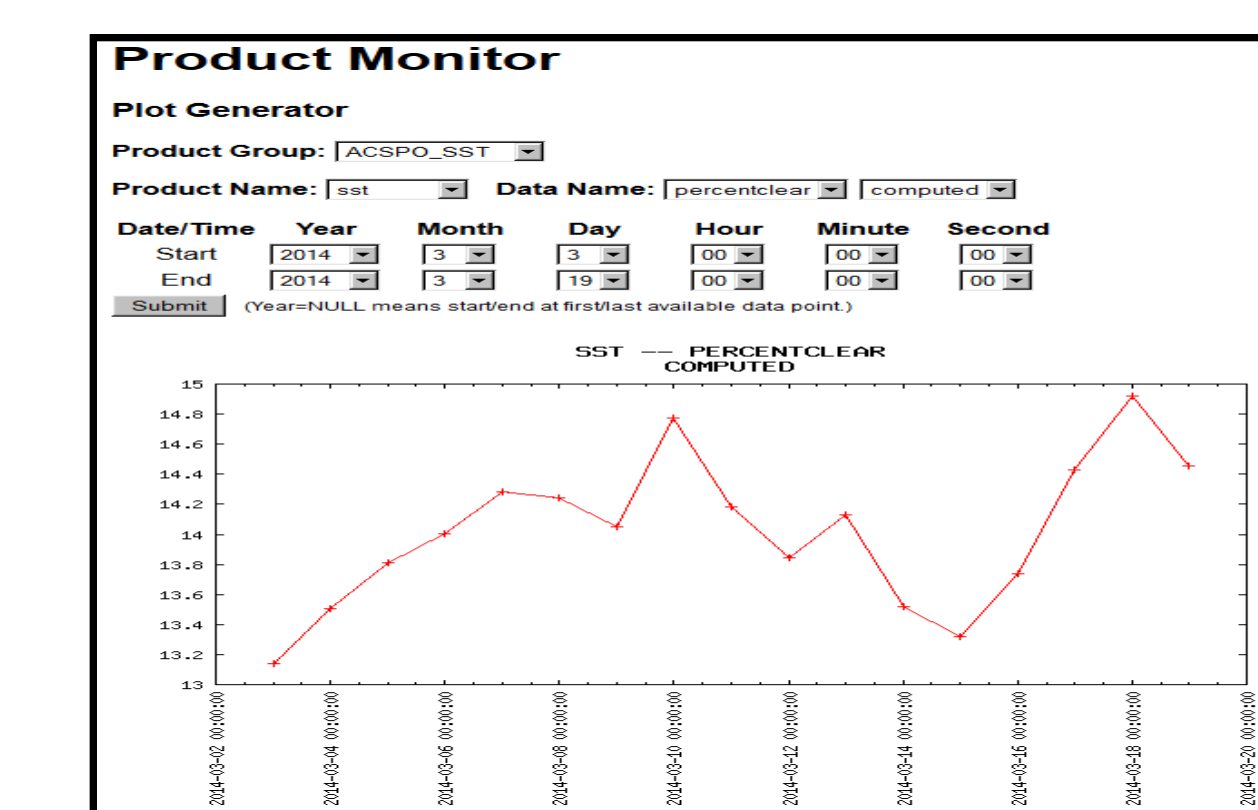
Configuration file controls the monitoring tool program execution, it contains:

- Product ID
- Directory to check for raw data files
- 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

NRT Performance Monitoring



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



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

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 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