

# DATA BROWSING AND ANALYSIS TOOL FOR MTSAT/LRIT

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## ABSTRACT

The Multi-functional Transport Satellite (MTSAT), which is the successor to the Geostationary Meteorological Satellite (GMS) series, will come into operation in 2003. MTSAT carry out a new dissemination method called the Low Rate Information Transmission (LRIT), which was coordinated and agreed by CGMS members. By LRIT, JMA will disseminate meteorological data such as conventional observation data, typhoon advisories and numerical weather/sea state prediction data as well as high resolution satellite imagery. In order to support utilization of those data disseminated by LRIT, JMA will provide national meteorological services with LRIT data display and utilization software. The software runs on Windows operating system and has enough capability even on a small PC. The functions are;

to animate satellite images,

to overlay NWP data on satellite images,

to plot in-situ surface and upper observation data over satellite images,

to show time sequences and cross sections of three dimensional field.

### 1. OUTLINE

The Multi-functional Transport Satellite (MTSAT), which is the successor to the Geostationary Meteorological Satellite (GMS) series, is to come into operation in 2003. MTSAT is to carry out a new data dissemination method agreed with CGMS Members, the Low Rate Information Transmission (LRIT).

By LRIT, JMA is to disseminate meteorological data such as conventional observation data, typhoon analysis and numerical prediction data as well as high-resolution satellite imagery. To utilize those data disseminated by LRIT, JMA is to provide a data display and utilize software to national weather services free of charge.

The software is an extension of MSC's Computer Aided Learning (CAL) system for satellite imagery applications, runs on Windows operating system and has enough capability to display and analyze data even on small PCs. The software is called SATAID (Satellite animation and interactive diagnoses)

### 2. MTSAT

MTSAT is a multi functional geostationary satellite for meteorological and aeronautical missions. For meteorological mission it has some improved features compared to present GMS series. Major characteristics of the meteorological mission are summarized in the table.

Table 1. Major characteristics of meteorological mission of MTSAT

Channel	VIS	IR1	IR2	IR3	IR4
Wavelength	0.55-0.80	10.3-11.3	11.5-12.5	6.5-7.0	3.5-4.0 $\mu$ m
Resolution	1 km (VIS) and 4 km (IR channels) at the sub-satellite point				
Signal quantizing	10 bits for both VIS and IR channels (1024 gradations)				
Communications	High Resolution Image Data (HiRID) and Low Rate Information Transmission (LRIT)				

A new IR4 (3.7  $\mu$  m) channel imager will enable detection of low-level clouds and fogs at night and increased quantization levels of 10 bits (1024 levels) from GMS's 8bits (256 levels) will upgrade the precision of the temperature observation.

With these image sensors, JMA plans to start a new satellite driven product, Satellite Cloud Grid Information Data. It is the information of cloud types and amount in each 0.25 by 0.2 degree grid mesh produced hourly automatically. It is supposed to be used for the verification of weather forecast at high spatial and temporal resolution. New features of the imager are also expected to improve the product precisions of present GMS.

The communication system is also improved. The highlight in this field is Low Rate Information Transmission (LRIT). It is a digital data dissemination method of 64 kbps agreed with CGMS members. JMA plans to disseminate a number of meteorological data as well as satellite imagery:

- Gridded analysis and prognostic fields by JMA global atmospheric/wave models.
- Observational data exchanged over GTS+ $\alpha$ .
- Advisories on tropical cyclones.

### 3.SOFTWARE

To make use of these data including satellite imagery, software to display LRIT data will be provided to National Meteorological Services free of charge. The software is an extension of a Computer Aided Learning (CAL) system of Meteorological Satellite Center (MSC) for satellite imagery applications.

MSC has been developing the CAL system since 1996 to provide forecasters of a tool for neph-analysis and upgrade their analysis skill. The tool (SATAID: SATellite Animation and Interactive Diagnoses) is quite a small but a very powerful MS-Windows application.

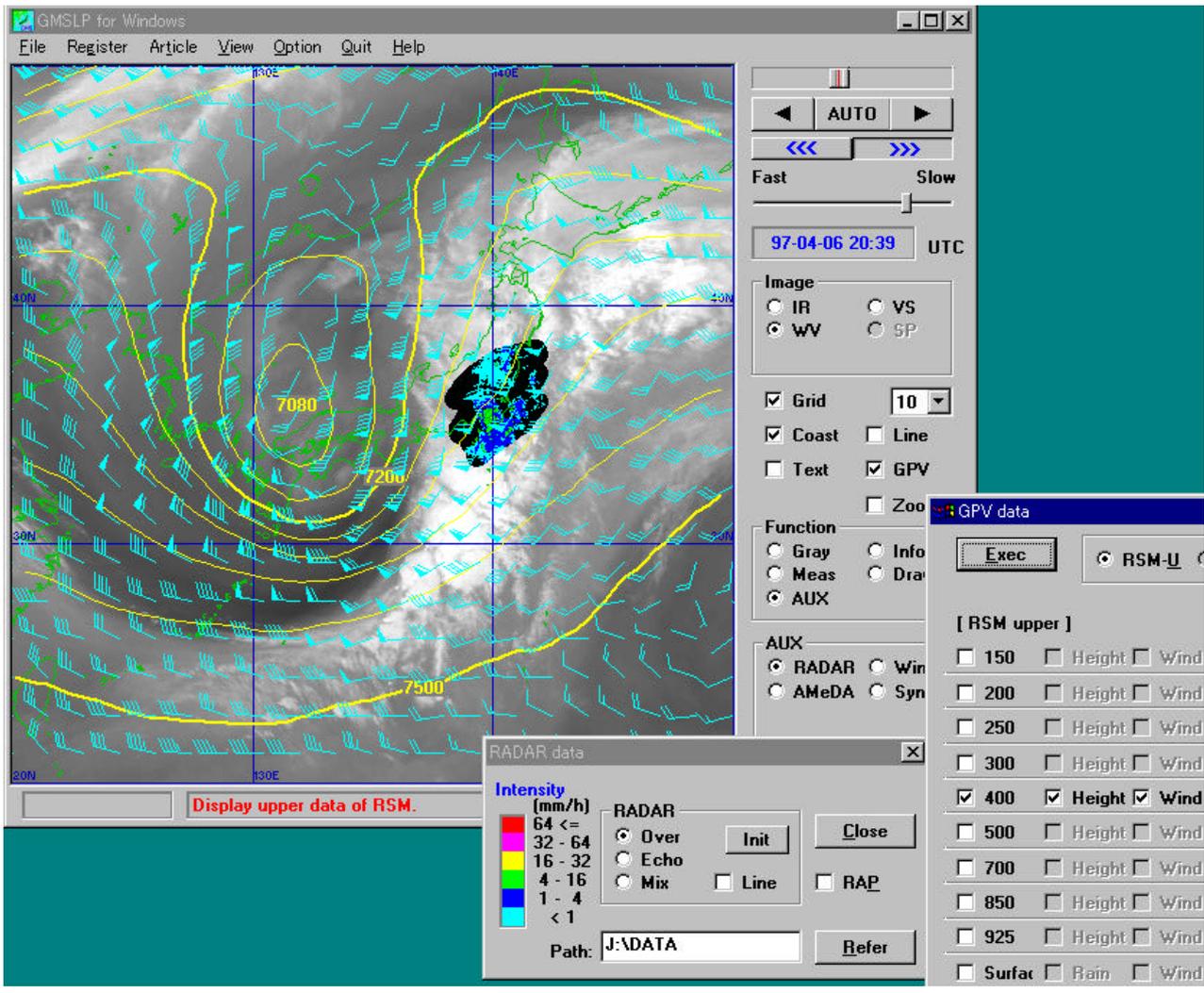


Fig. 1 An example of SATAID display

The main functions of Gmslpw are as follows:

- (1) Functions for displaying satellite images
  - Display images in loop (animation) and still forms
  - Gradation control
  - Colored display (color can be changed arbitrarily)
  - Enlarged views of images
- (2) Functions for analysis
  - Measuring cloud top temperature (includes plain, cross section, and time series)
  - Measuring cloud speed and other items
  - Overlaying other meteorological elements such as NWP, radar, AMeDAS, conventional observation, cloud motion winds.
  - Displaying various combination of meteorological data in various ways (cross section, time series, table, etc.)
- (3) Functions for self-learning and communication
  - Displaying explanations and supplemental figures
  - Writing memos on an image
  - Making your own explanation files.

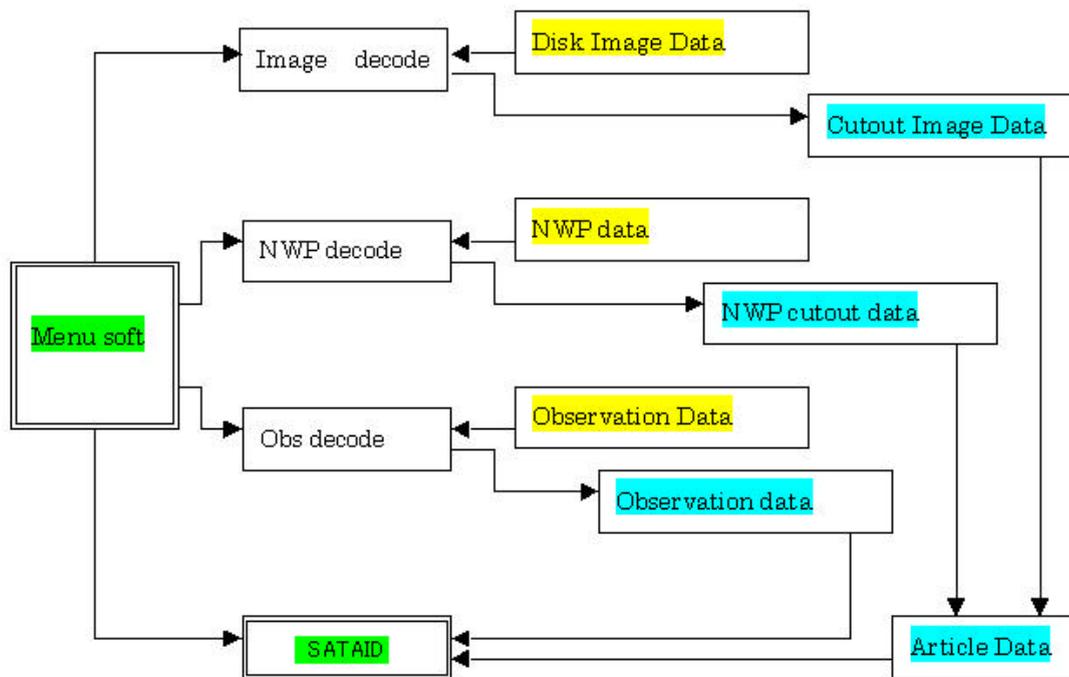
With these functions, SATAID can be used as a learning tool and also an analysis tool for satellite imagery and other meteorological data. An example of the program display is shown in the figure 1 with a satellite image overlaid by NWP data and radar echo.

SATAID has been used in many training occasion for domestic and overseas GMS users in a few years. People in JMA also are using SATAID as a tool for their researchs.

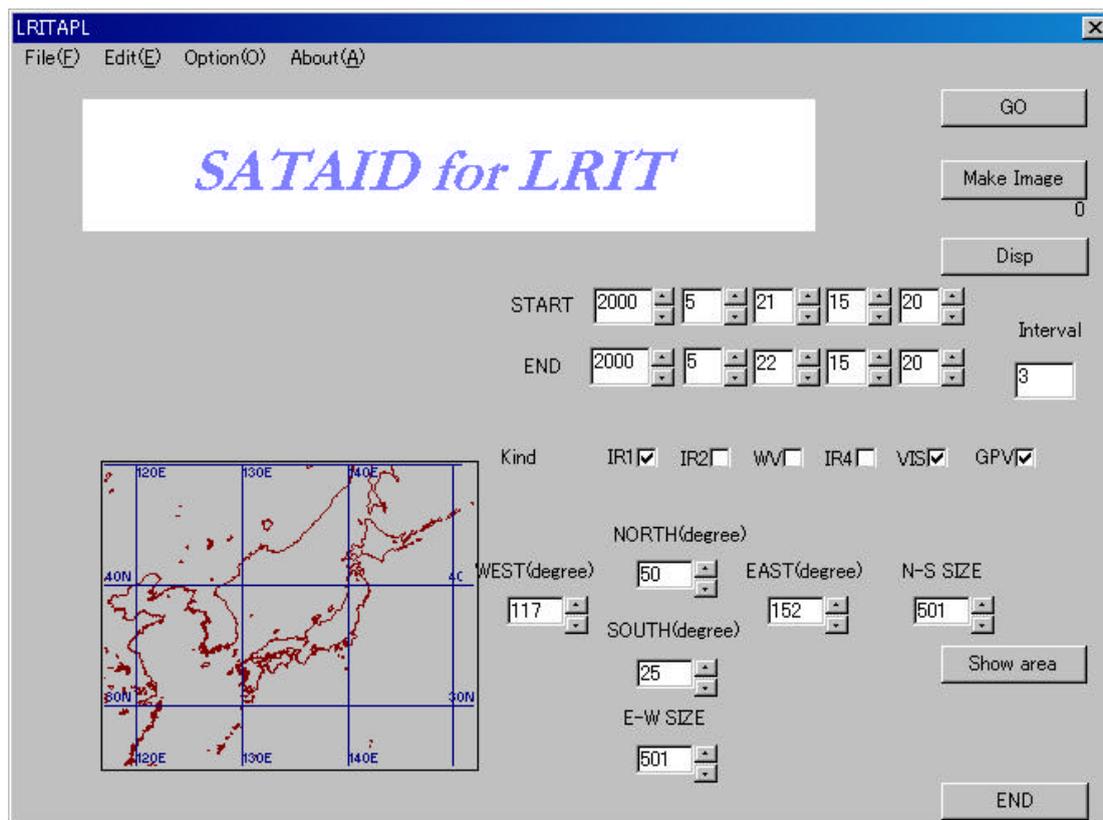
JMA is working on making SATAID ccompatible with LRIT transmitted data. To make it as portable as posible SATAID adopts its own data formats for satellite imagery and other data while data transmitted with LRIT are global satellite imagery and other meteorological data in international formats like GRIB and SHIP. A format convert program is needed. A menu program to assign region, period, and data and to drive the format convert program and SATAID would let users use SATAID for any interested region with minimum operation.

The concept and a sample menu display are shown in figs. 2 and 3.

The whole system will be distributed to any national weather services for free of charge. Is is also possible to nay LRIT reciever manufacture install this system in their receiving system. If they adopt a few rules, they will optimize the capability of the system. JMA provides information to them.



**Fig. 2 Diagram of LRIT data utilizing system.**



**Fig. 3 A sample of the menu display**