

STATUS OF GOCI DATA PROCESSING SYSTEM(GDPS) DEVELOPMENT

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ABSTRACT: Geostationary Ocean Color Imager (GOCI), the world-first ocean remote sensing instrument on geostationary Communication, Ocean, Meteorological Satellite (COMS), will be able to take a picture of a large region several times a day (almost with every one hour interval). We, KORDI, are in charge for developing the GOCI data processing system (GDPS) which is the basic software for processing the data from GOCI. The GDPS will be based on windows operating system to produce the GOCI level 2 data products (useful for oceanographic environmental analysis) automatically in real-time mode. Also, the GDPS will be a user-interactive program by well-organized graphical user interfaces for data processing and visualization. Its products will be the chlorophyll concentration, amount of total suspended sediments (TSS), colored dissolved organic matters (CDOM) and red tide from water leaving radiance or remote sensing reflectance. In addition, the GDPS will be able to produce daily products such as water current vector, primary productivity, water quality categorization, vegetation index, using individual observation data composed from several subscenes provided by GOCI for each slit within the target area. The resulting GOCI level 2 data will be disseminated through LRIT using satellite dissemination system and through online request and download systems. This software is carefully designed and implemented, and will be tested by sub-contractual company until the end of this year. It will need to be updated in effect with respect to new/improved algorithms and the calibration/ validation activities.

KEY WORDS: GDPS, GOCI, Software, GOCI Level 2 Products, COMS

1. INTRODUCTION

The COMS (Communications, Ocean and Meteorological Satellite), to be launched in 2009, will be the first geostationary observation satellite in Korea. The COMS mission primary objectives are to provide meteorological service, ocean monitoring, and Ka-band satellite communications.

GOCI(Geostationary Ocean Color Imager) is the oceanographic sensor on COMS. GOCI will image a target area 8 times (with one hour interval) at day time and 2 times at night time. The ocean monitoring mission aims at the monitoring of marine environments around Korean peninsula, the production of fishery information (chlorophyll, etc.) and the monitoring of long-term/short-term change of marine ecosystem.

The remote sensing data by the GOCI, is transmitted from satellite to ground data receiving stations. The received data must be processed by IMPS(Image Pre-processing system) & GDPS(GOCI Data Processing System) to be used the oceanographic environmental analysis. IMPS will produce the GOCI Level 0/1A/1B data in real-time at KORDI KOSC(Korea Ocean Satellite Center) and KARI SOC(Satellite Operation Center) and GDPS in KORDI KOSC can make various ocean related products from the total radiance(GOCI Level 1B). KORDI is in charge of the development of GDPS from 2003 and we have accomplished qualified algorithm for GOCI level 2 data products within various research during four years.

We have designed the software diagram for real-time and interactive mode and decided the sub-contractual company to establish the each adapted algorithms and programs for production of GOCI level 2 data.

2. DEVELOPING STATUS

2.1 General Developing Environments

The GDPS is developed using visual C++ language under MS Windows 2003 server operating system 32bit, but this software will be migrated to 64bit windows system. And it is able to support multi processing operation and parallel processing among 4 servers. It could be worked as batch machine to prepare some auxiliary data and parameter data files before real-time processing. This software can use the database for data processing schedule and data storing.

2.2 Schedules

The contract for GDPS implementation was made at Feb. 2007. And the Preliminary Design Review (PDR) was at Apr. 2007 and the Critical Design Review (CDR) at Jun. 2007. Hereafter, we will have the Test Readiness Review (TRR) at Oct. 2007 and the technical and operational tests will be taken during three months. the additional data processing algorithm study and algorithm update are going to progress in next several years.

2.3 Data Processing

The GDPS have the two specific data processing modes. Because of GOCI mission schedule, this software must finished previous data processing before next input data arriving. So, it works real-time and automatically in the input data arriving check, data processing step check and data storing check. And the other hands, this software can be used for the users to process the GOCI Level 2 data. In this case, these people want to see and order the data processing with user-friendly interface like any other program on windows.

2.3.1 Automatic Real-time Processing

This mode is only applied to KOSC operational data processing case. Before starting data processing from Level 1B input total radiance to Level 2 ocean analysis data, an monitoring agent in GDPS must check the existence of input file and the preparation status of parameter files. When all files are exist, GDPS can works through the processing schedule designed by GDPS operators. After all data processing are finished, the result files as GOCI Level 2 data file and GOCI LRIT image file are stored in database and send its information to the data management system in KOSC. The GDPS can works in night-time for the periodic composite data generation and the radiometric calibration information update.

2.3.2 User-Interactive Processing

This mode is applied to KOSC data monitoring case and general user data processing case. Automatic real-time processing mode do not need any data displaying function, but user-interactive processing mode must have data displaying function for recognition and validation of satellite image data and ocean analytic data.

The GDPS can display GOCI all products and its parameters and calculate statistical analysis of image. An user can subset the interested region from GOCI Level 1B/ Level 2 data and merge several images to a scene file. And GDPS can animate the series of data and composite the periodic data like the daily, monthly, annually data.

2.4 GDPS Products

After IMPS processing and GOCI Level 1B data file is arrived, GDPS can make the Level 2 products and daily products.(Figure 1)

2.4.1 Level 2

GDPS have sequential process to make Level 2 products. The first step is the masking for cloud and land. And then extract the water-leaving radiance (Lw) and the normalized water leaving radiance (nLw) using atmospheric correction algorithm. This values can be transformed to remote-sensing reflectance (Rrs). The colored dissolved organic matter (CDOM), the total suspended sediment (TSS), the chlorophyll concentration (CHL) in the ocean water mass can be derived from upper values. And then, the inherit optical property (IOP) as absorption coefficient (a), scattering/back-scattering

coefficient(b, bb), attenuation coefficient(c), diffuse-attenuation coefficient (Kd) is able to derived. This hourly data processing flow chart is shown the Figure 2 and the chlorophyll concentration estimation algorithm is shown the Figure 3.

The products can be converted to the GOCI LRIT image file for the data distribution with satellite and to the GOCI browsing image for the on-line data search & download system

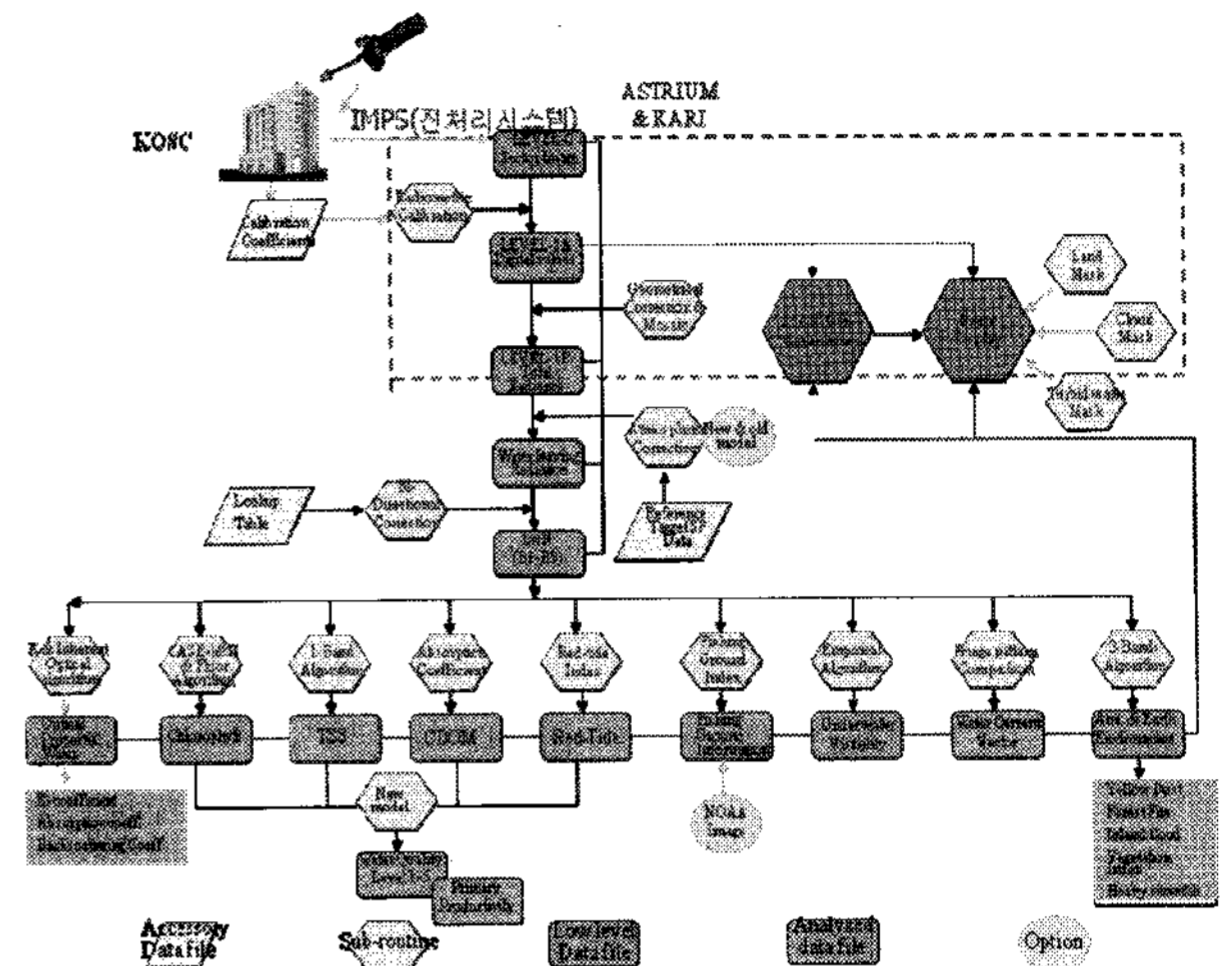


Figure 1. GOCI data processing flow chart with applied algorithms

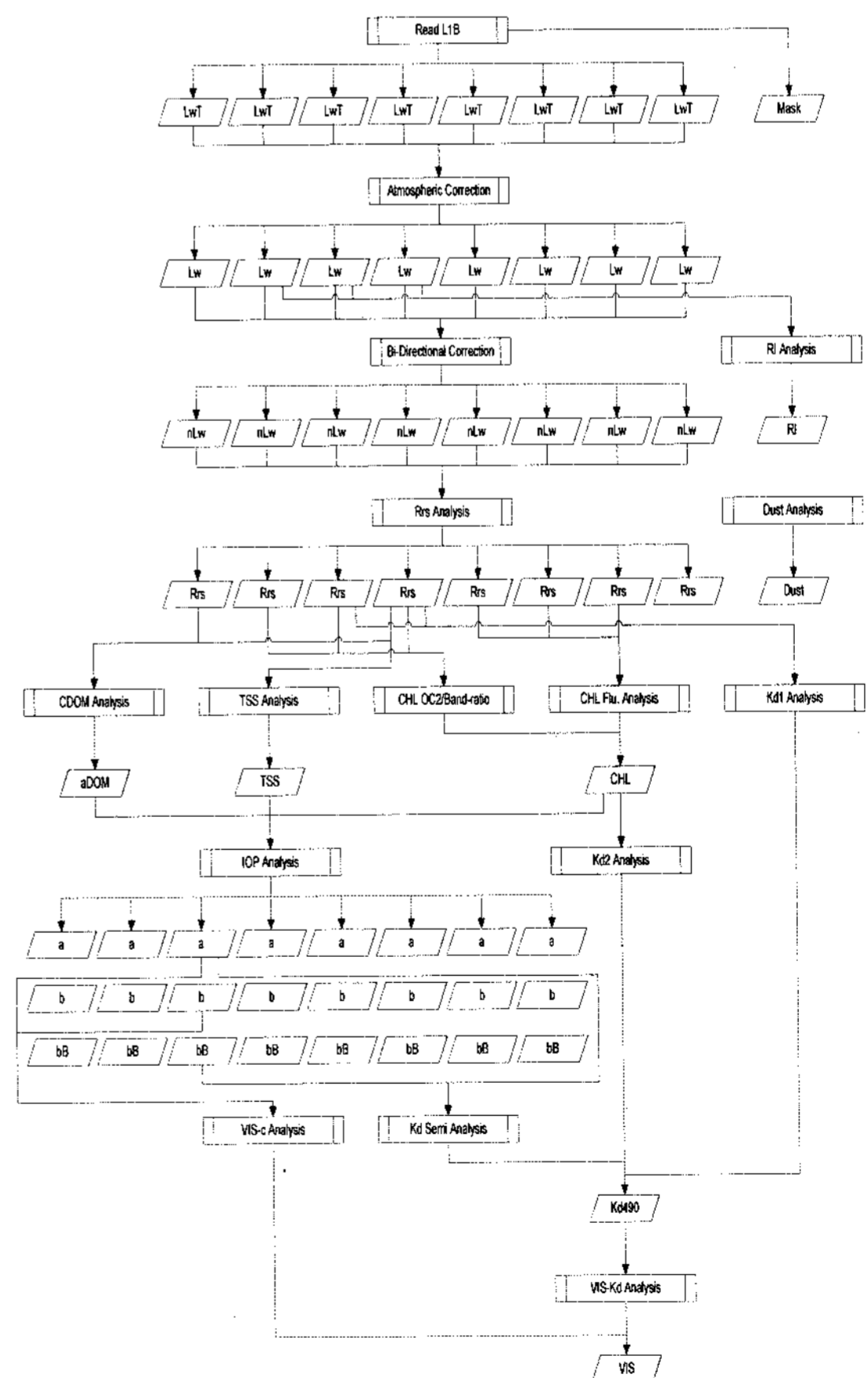


Figure 2. GDPS Level 2 data processing flow chart

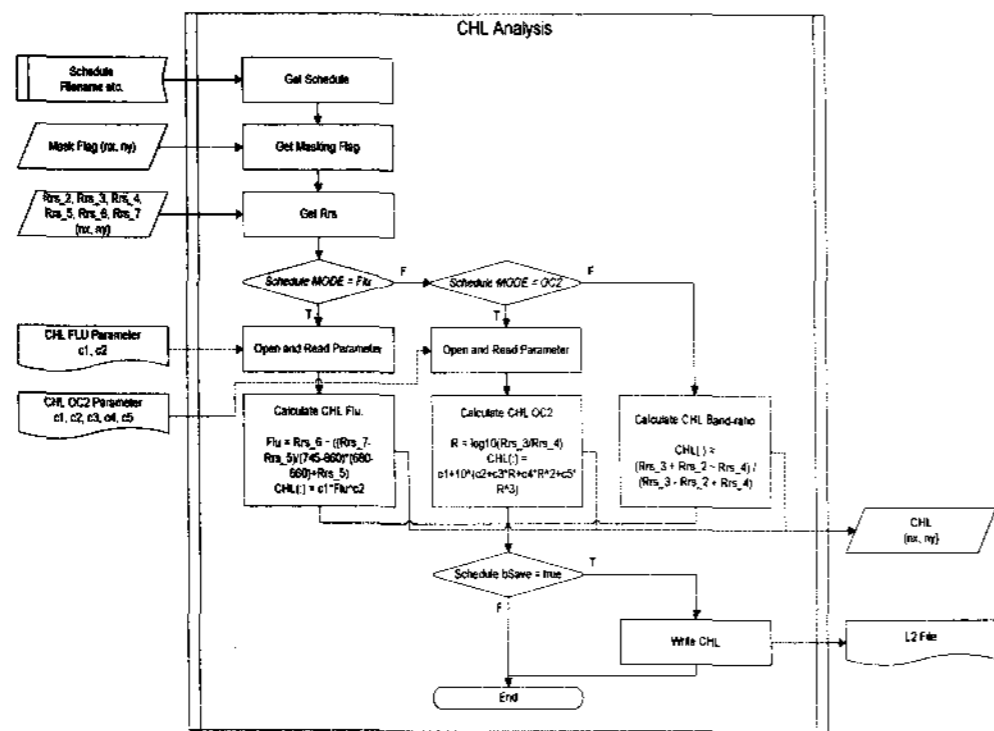


Figure 3. the chlorophyll concentration estimation algorithm flow chart

2.4.2 Level 2 Daily Product

GDPS can also make daily products useful to monitor ocean environmental change and marine ecosystem like the fishing ground information index, the primary productivity in ocean, water quality index and water current vectors. For the GOCI data various usage, vegetarian index are also derived from GOCI Level2. We need to cumulate the day's all products for this product derivation. (Figure 4)

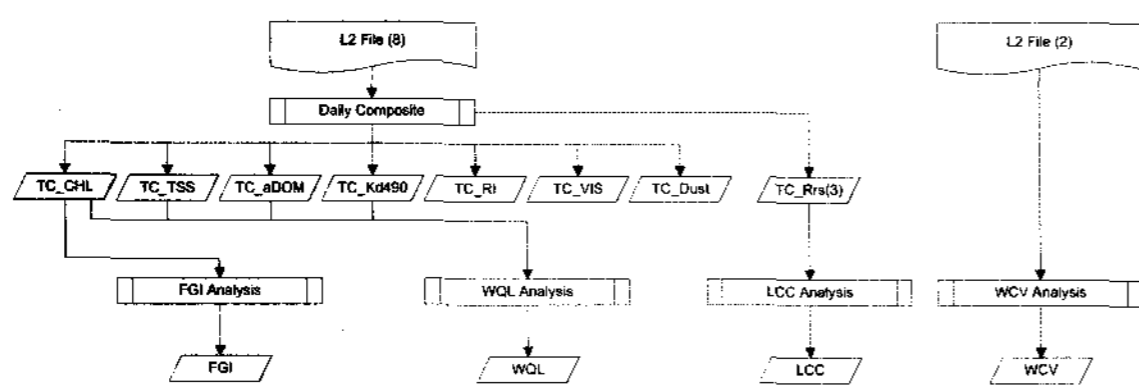


Figure 4. GDPS Level 2 Daily Product flow chart

GDPS can composite the series of one whole day data automatically and composite any periodic data like the daily, monthly, annually data. (Figure 5)

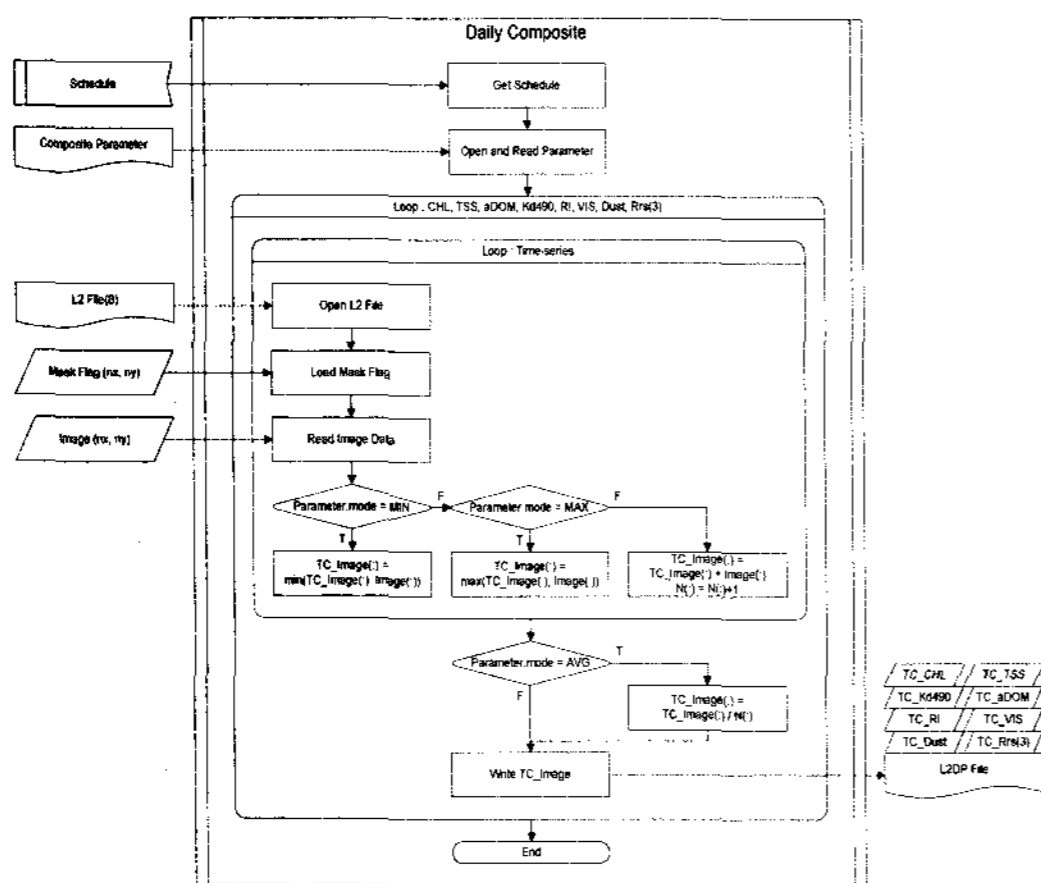


Figure 5. GDPS Level 2 daily composite product flow chart

2.4.3 Data File Format

The GOCI Level2 data file is formatted by HDF-EOS format. This format is consisted of the attributes part and the grids part. The attributes part contains whole information about the sensor and the scene. And the grids

part contains whole derived result images by band-by-band in data fields. Each image in the grids part can contain its own attributes for the image information. The Figure 6 is shown the hdf-eos formatted GOCI Level 2 data.

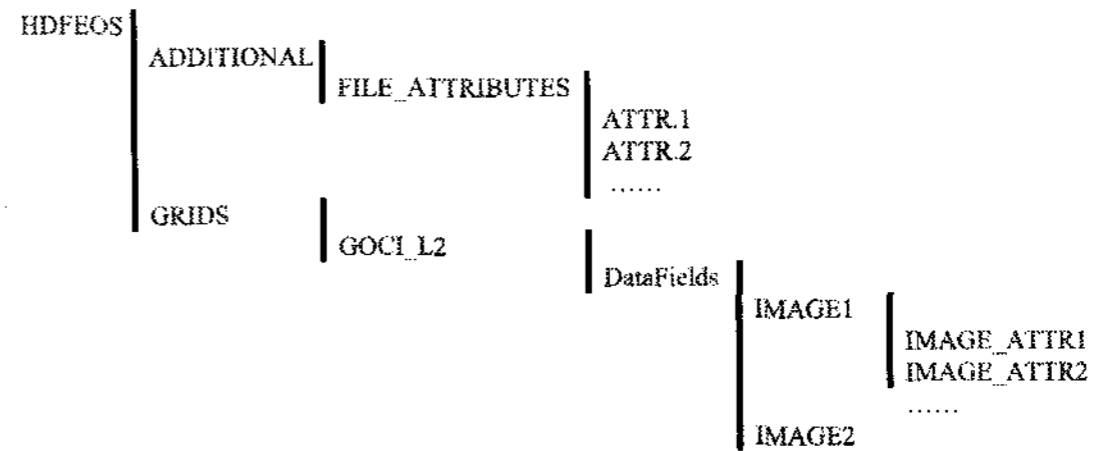


Figure 6. GOCI Level 2 HDF-EOS Format

2.5 GDPS Data Dissemination

The resulting GOCI level 2 data will be disseminated through LRIT using satellite dissemination system and through online request and download systems. This dissemination will be followed to the KOSC data distribution policy which is now developing. For the satellite dissemination system, GDPS can make the three images in a scene and make 24 images in a day. Each image will be disseminated hourly to user by the order of LRIT dissemination.

In the KOSC on-line homepage, the Ocean Satellite Data Distribution System will be established. This system should be required the browsing images and the information of observation. The on-line users can search, request and download the interested scene or images after join in this site or system. But the GOCI Level 1B and Level 2 whole data which can download from website are too big to download. So the data can be separate several sub area datasets.

3. CONCLUSIONS

The GDPS is carefully designed and implemented, and will be tested by sub-contractual company until the end of this year. It will need to be updated in effect with respect to new/improved algorithms and the calibration/validation activities.

4. REFERENCES

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