ATSK3_p / ATSK3_r Retrieval Algorithms for cloud parameters

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Contents

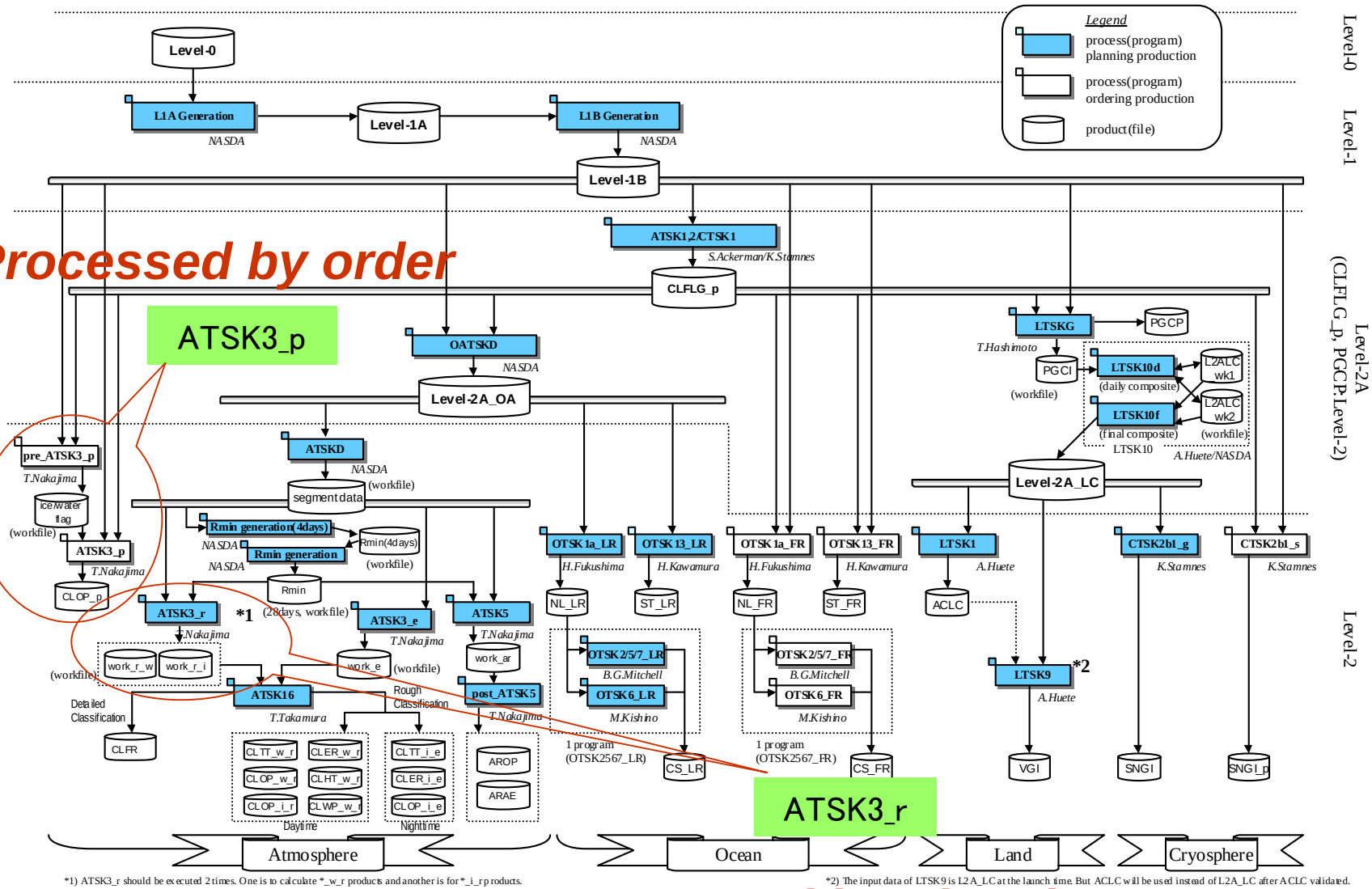
1. Overview

1.1 Algorithm name and person in charge

Algorithm Name (PI's definition)	Algorithm Code	PI Name (Code)	In charge of implementation
Retrieval algorithms of cloud parameters(pixel by pixel)	**ATSK3_p**	**Dr. Nakajima (G60)**	**Fujitsu**

Algorithm Name (PI's definition)	Algorithm Code	PI Name (Code)	In charge of implementation
Retrieval algorithms of cloud parameters(segment) (by reflection method)	**ATSK3_r**	**Dr. Nakajima (G60)**	**Fujitsu**

1.2 Location of ATSK3_r / ATSK3_p in GLI Standard Products Flow

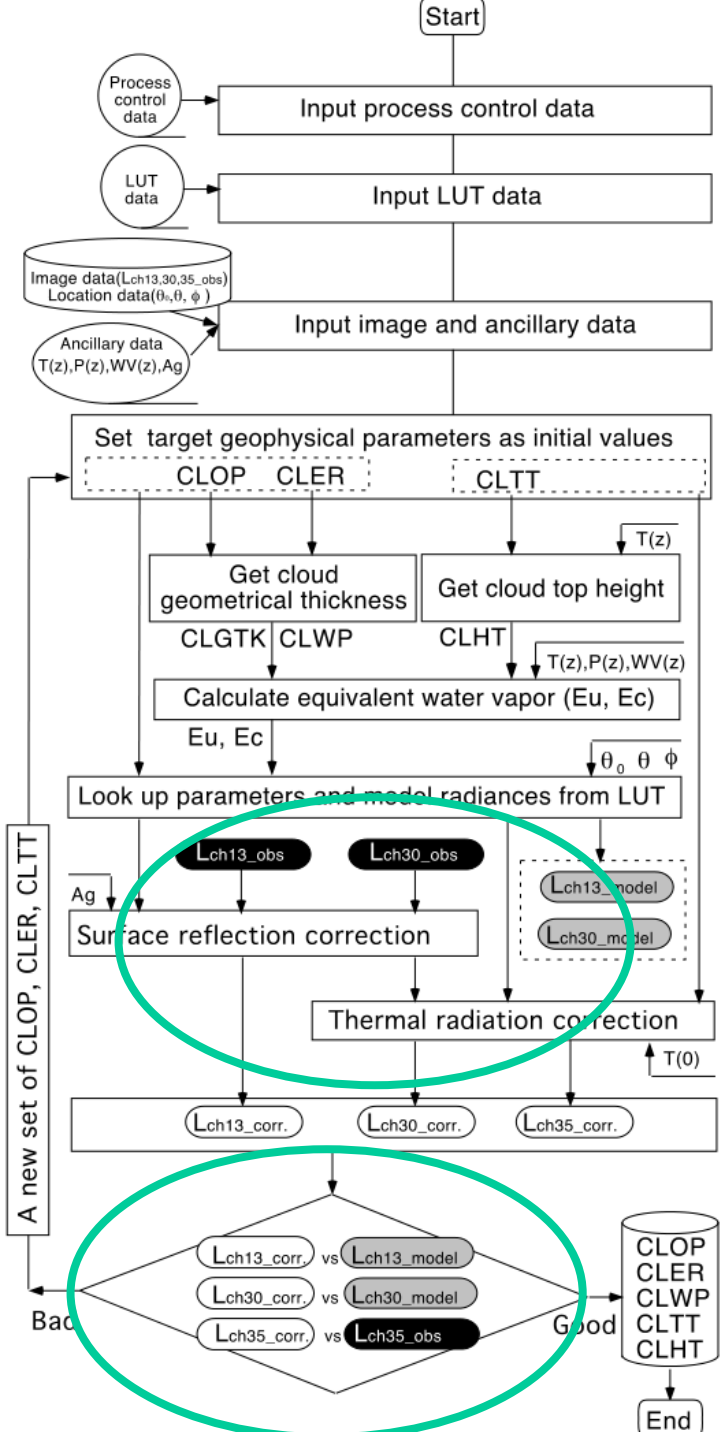


2. Algorithm Flow Chart

- Surface reflection correction
- Thermal radiation correction

- L_obs vs L_model, less than 0.1%

- ATSK3p, with fixed Re and Tc.



3. Input / Output Files

3.1 Input Files (ATSK3_p)

File type	Product code or Data name	The number of necessary files	Reading data	
GLI product files	Level-1B	1 (VNIR)	radiance (GLI channel : 13, 30, 35)	
		1 (MTIR)	latitude/longitude	
			solar zenith angle	
			solar azimuth angle	
			sensor zenith angle	
			sensor azimuth angle	
			observation time	
			etc.	
	ice/water flag	1	ice cloud / water cloud discrimination flag	
Other data files	LUT	7	Look up tables	
	RD	2	Response data	
	Grid system	1	Grid system definition	
	Rmin	1	Minimum reflectance	(constant value)
Ancillary files	ANCD_AP	2(=2 files * 1day)	pressure	JMA objective analysis or climatology
	ANCD_AH		humidity	
	ANCD_AT		air temperature	

3. Input / Output Files

3.2 Output Files (ATSK3_p)

Product Name	Data Name	Code	Processing	Area coverage	Spatial resolution	unit
CLOP_p	Cloud optical thickness(pixel by pixel)	CLOP_p	Order	Scene	1 km	(none)

3. Input / Output Files

3.3 Input files (ATSK3_r)

File type	Product code or Data name	The number of necessary files	Reading data	
GLI product files	Segment data	6 (=6 files * 1day)	radiance (GLI channel : 13, 30, 35)	
			latitude/longitude	
			solar zenith angle	
			sensor zenith angle	
			relative azimuth angle	
			observation time	
			cloud flag	
			etc.	
	Rmin	1	Minimum Reflectance	
Other data files	LUT	7	Look up tables (for water cloud and ice cloud)	
	RD	2	Response data	
	Grid system	1	Grid system definition	
Ancillary files	ANCD_AP	4 (=4 files * 1day)	pressure	JMA objective analysis or climatology
	ANCD_AH		humidity	
	ANCD_AT		air temperature	

3. Input / Output Files

3.4 Output Files (ATSK3_r)

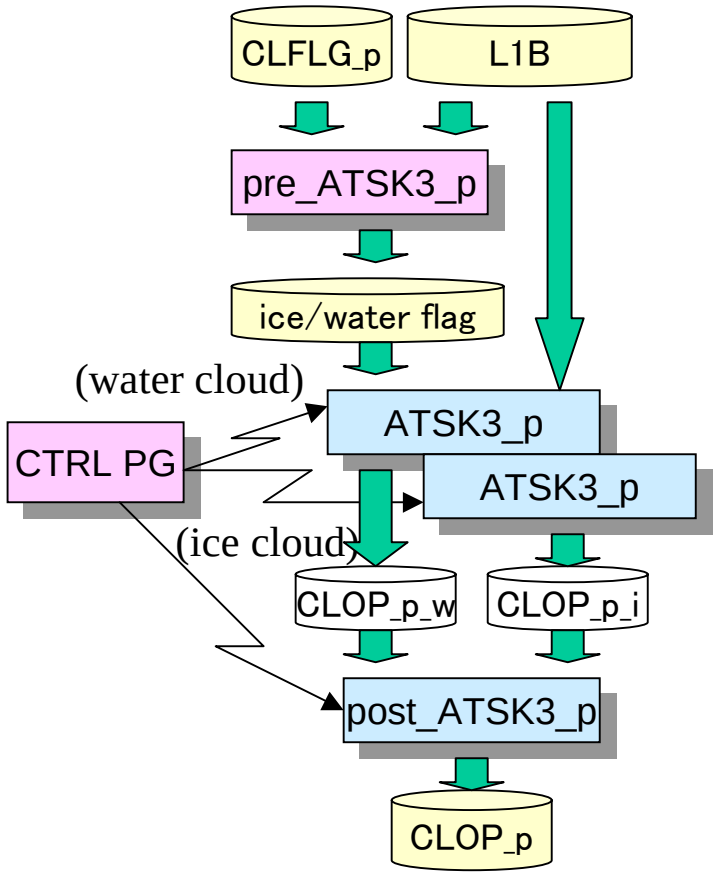
Product Name	Data Name	Code	Processing	Area coverage	Spatial resolution	Unit	Comments
work_r_w	Ch35 Brightness temperature	Tbb_ch35	Planning	Global	0.25°	K (Kelvin)	
	Cirrus flag	---	Planning	Global	0.25°	(none)	for ATSK16
	Cloud top pressure (water cloud)	CLTP_w_r	Planning	Global	0.25°	(none)	
	Cloud optical thickness (water cloud)	CLOP_w_r	Planning	Global	0.25°	(none)	
	Cloud top temperature (water cloud)	CLTT_w_r	Planning	Global	0.25°	K (Kelvin)	
	Cloud effective particle radius (water cloud)	CLER_w_r	Planning	Global	0.25°	μm	
	Cloud top height (water cloud)	CLHT_w_r	Planning	Global	0.25°	km	
	Cloud liquid/ice water path (water cloud)	CLWP_w_r	Planning	Global	0.25°	g/m^2	
work_r_i	Cirrus flag	---	Planning	Global	0.25°	(none)	for ATSK16
	Cloud optical thickness (ice cloud)	CLOP_i_r	Planning	Global	0.25°	(none)	

4. Program Block Diagram

4.1 ATSK3_p (pixel by pixel analysis)

There are 4 programs to generate Cloud Optical Thickness product.

- **pre_ATSK3_p** is pre-process to generate ice/water flag (0: water cloud, 1:ice cloud).
- The **control program** executes **ATSK3_p** 2 times. 1st time, run for the water cloud. 2nd time, run for ice cloud. Two temporary files CLOP_p_w and CLOP_p_i are produced.
- **post_ATSK3_p** is post-process to merge CLOP_p_w and CLOP_p_i as a product file.

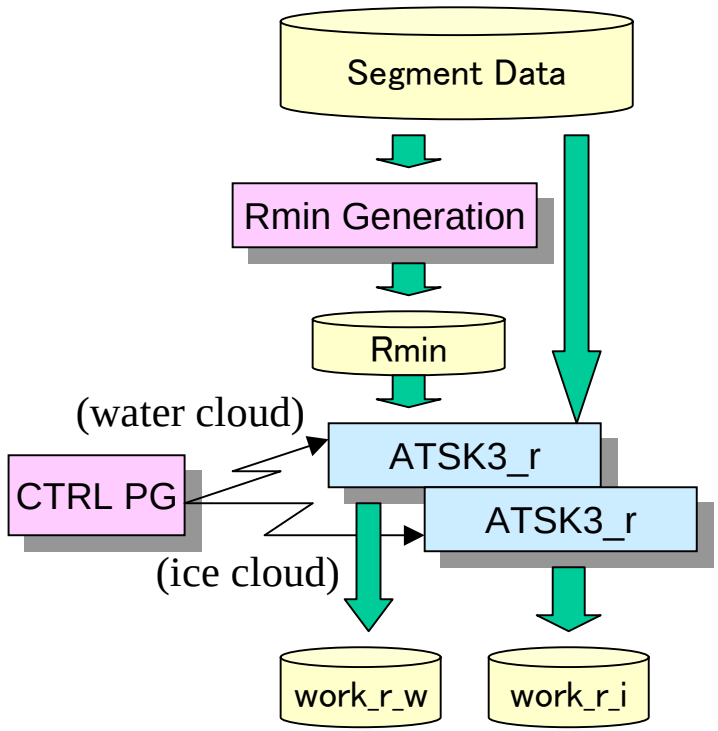


4. Program Block Diagram

4.2 ATSK3_r (segment analysis)

There are 3 programs to generate cloud properties.

- **Rmin Generation** generates minimum reflectance from 28 days segment data.
- The **control program** executes **ATSK3_r** 2 times. 1st time,run for the water cloud. 2nd time, run for the ice cloud LUT. Two files work_r_w and work_r_i are outputted respectively.



5. Development Status (Oct.,31)

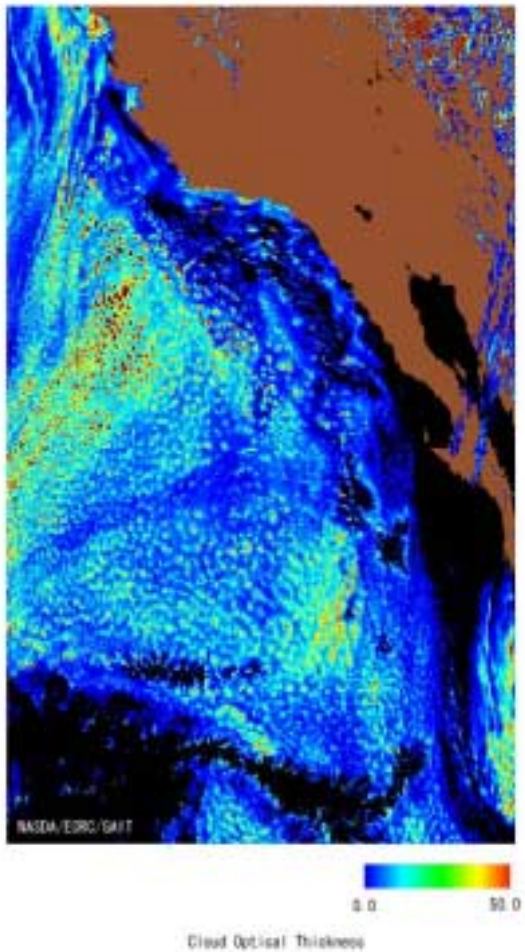
5.1 Implementation

- Toolkit conversion is almost finished except ancillary data reading.
- The program module is under **Integration Test** with system software.

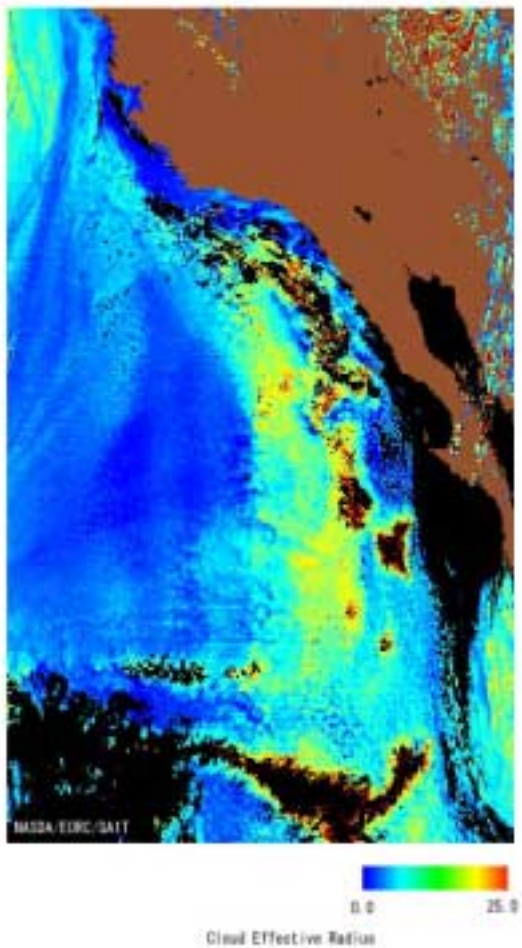
5.2 Performance

- Execution time (current and future)

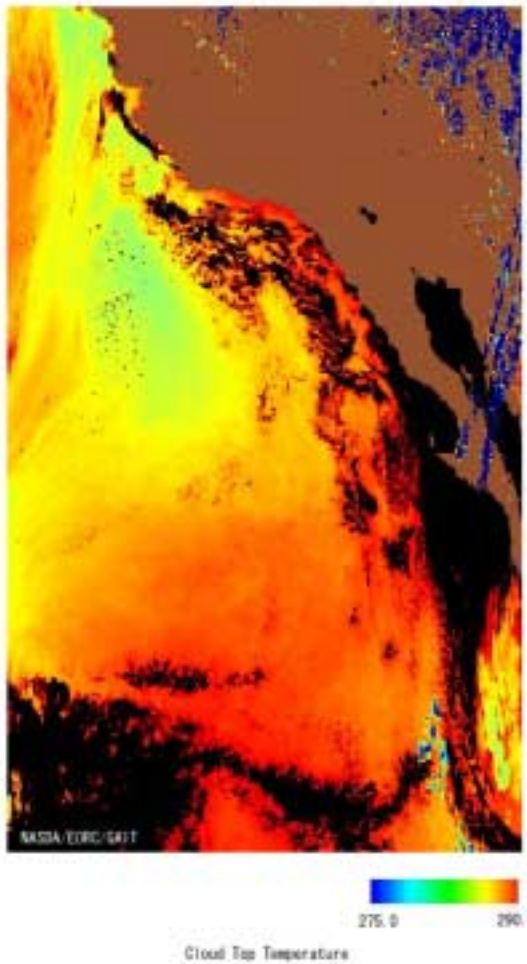
	without optimizing option	with optimizing option	comments
I/O separation version	36 pixel/sec	100 pixel/sec	
TK version	4 pixel/sec	---	(This is preliminary result because TK converion is not completed.)
necessary performance	34 pixel/sec	---	



Optical Thickness



Effective Radius (μm)



Cloud Top Temperature (K)

6. Conclusion

- Both ATSK3_r and ATSK3_p are successfully implemented by Fujitsu Ltd.
- The program module is under Integration Test with system software.
- The necessary performance (34pixels/second) will be recorded after TK conversion.
- The retrieval result from MODIS with ATSK3_p seems reasonable.

7. Future Works

- Implementation for reading ancillary data (ATSK3_r / ATSK3_p), by **Fujitsu Ltd**.
- Performance tuning, by **Fujitsu Ltd**.

Appendix: Action Items @Kyoto, '99

	Action Item	Solution
1	Investigate the necessity of 1.05 μm instead of 0.68 μm.	PI(CI) had checked it and got reasonable results with 1.05μm. More tests with GSS and AMSS data are planned, and will replace LUTs soon.
2	Investigate the necessity 2.2 μm for cloud droplet size retrieval.	PI(CI) had checked it with AMSS data, and got reasonable results. ADD or REPLACE with 3.7μm?
3	Investigate the necessity of cloud pressure as a product.	Depend on the data analysis system. ADD or REPLACE with CLTT?
4	Investigate a flow of surface albedo setting by use of GLI.	Rmin process had added in the flow chart.

Appendix: AMSS analysis