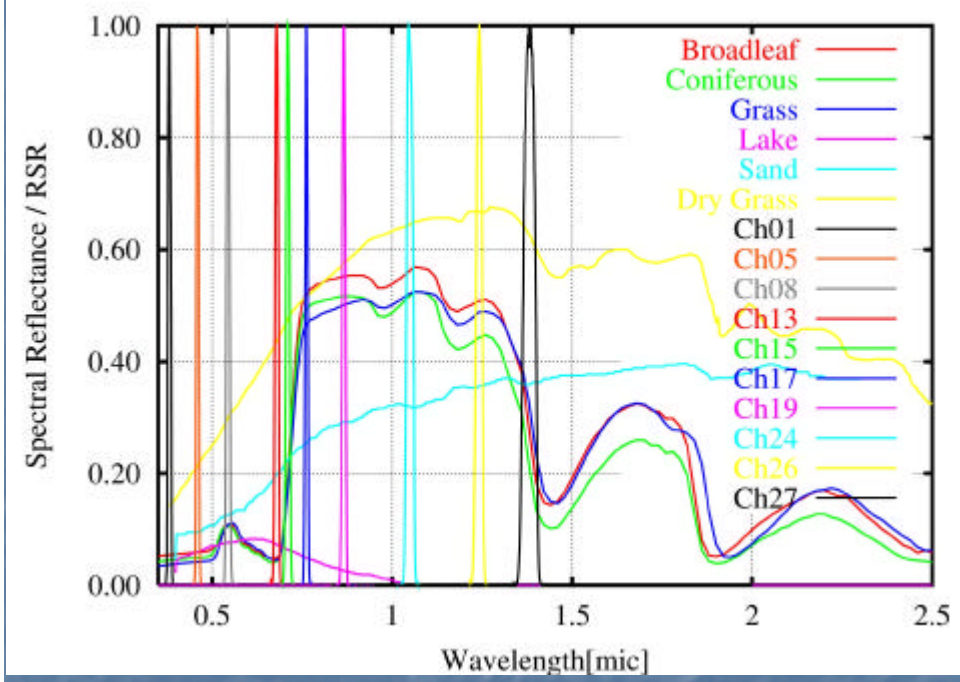
Land channels Specification (VNIR, SWIR, MTIR)

ch	Wave length [nm]	Dynamic range [W/m2/str/mm]	SNR (input L)	ch	Wave length [nm]	Dynamic range [W/m2/str/mm]	SNR (input L)	ch	Wave length [nm]	Dynamic range [W/m2/str/mm]	SNR (input L)
VNIR (1km) (#p: *piecewise linear band*)				15	710.1	233 (369)	300 (10)	**250 m bands**			
1	380.7	683	467 (59)	16	749	11 (17)	991 (7)	20	462.4	691	241 (36)
2	399.6	162	1286 (70)	17	762	246 (473)	293 (6)	21	542.1	585	141 (25)
3	412.3	130	1402 (65)	18	866.1	8 (13)	1309 (5)	22	661.3	115 (156)	255 (14)
4p	442.5	110 /680	893 (54)	19	865.7	211 (339)	386 (5)	23	824.1	210 (287)	218 (21)
5p	459.3	124 /769	880 (54)	**SWIR (1 km)**				28	1644.9	76	298 (5)
6	489.5	64	1212 (43)	24	1048.6	227	381 (8)	29	2193.8	32	160 (1.3)
7p	519.2	92 /569	627 (31)	25	1136.6	184	412 (8)	**MTIR (Kelvin, NEΔT at 300K)**			
8p	544	96 /596	611 (28)	26	1241	208	303 (5.4)	30	3721.1	345 K	0.07 K
9	564.8	39	1301 (23)	27	1380.6	153	192 (1.5)	31	6737.5	307 K	0.03 @285K
10	624.7	28*1 (39*2)	1370 (17)	•Dynamic range and SNR are cited from "Tanaka, K., GLI Mission Data Evaluation Test results, NASDA ADEOS-II Project, ADEOS-II/GLI Workshop, November 14-16, 2001, Tokyo, Japan".				32	7332.6	322 K	0.03 K
11	666.7	22 (31)	1342 (13)	•Center wavelength is derived from GLI spectral response.				33	7511.4	324 K	0.02 K
12	679.9	23 (33)	1293 (12)	•S/N tests are in ambient (VN+SW) and high temp (MT) condition.				34	8626.3	350 K	0.05 K
13	678.6	342 (522)	235 (12)	•*1 Maximum radiance for **linear response (VN2)**				35	10768	354 K	0.05 K
14	710.5	16 (24)	1404 (10)	•*2 Predicted maximum radiance for **DN=4095 (12bit) or saturation.**				36	12001.3	358 K	0.06 K
									NASDA GLI CAL Group, May 1, 2002		
											:1km Land Channel
											:250m Land Channel

Relative Spectral Response of GLI 1km and 250m land channels

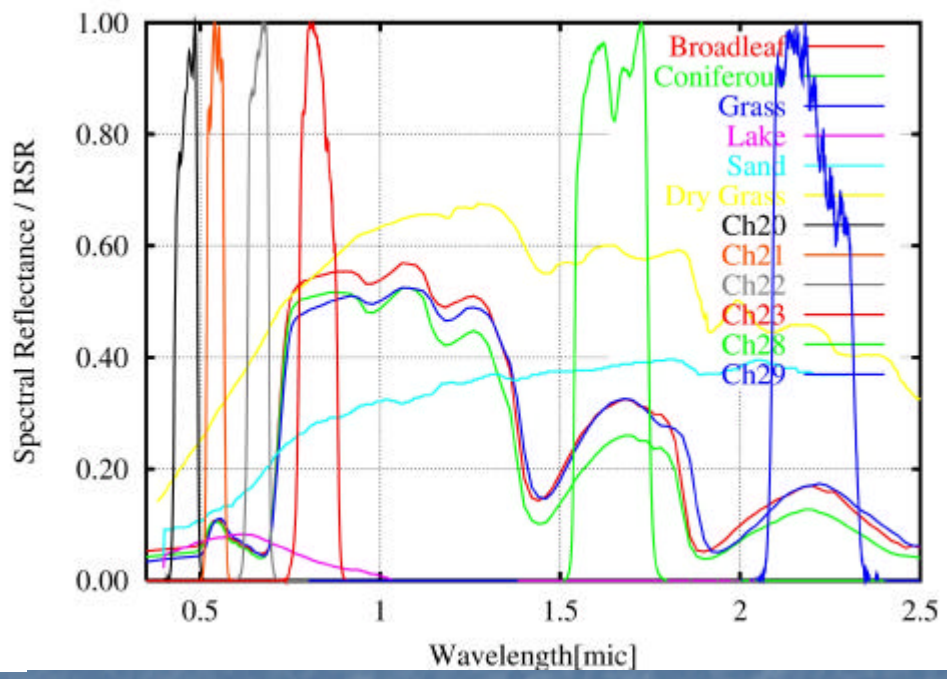
VNIR SWIR



RSR of 1km land channels
With typical spectral reflectance

- 7 VNIR land channels
- 3 SWIR land channels
- 5 MTIR land channels

VNIR SWIR

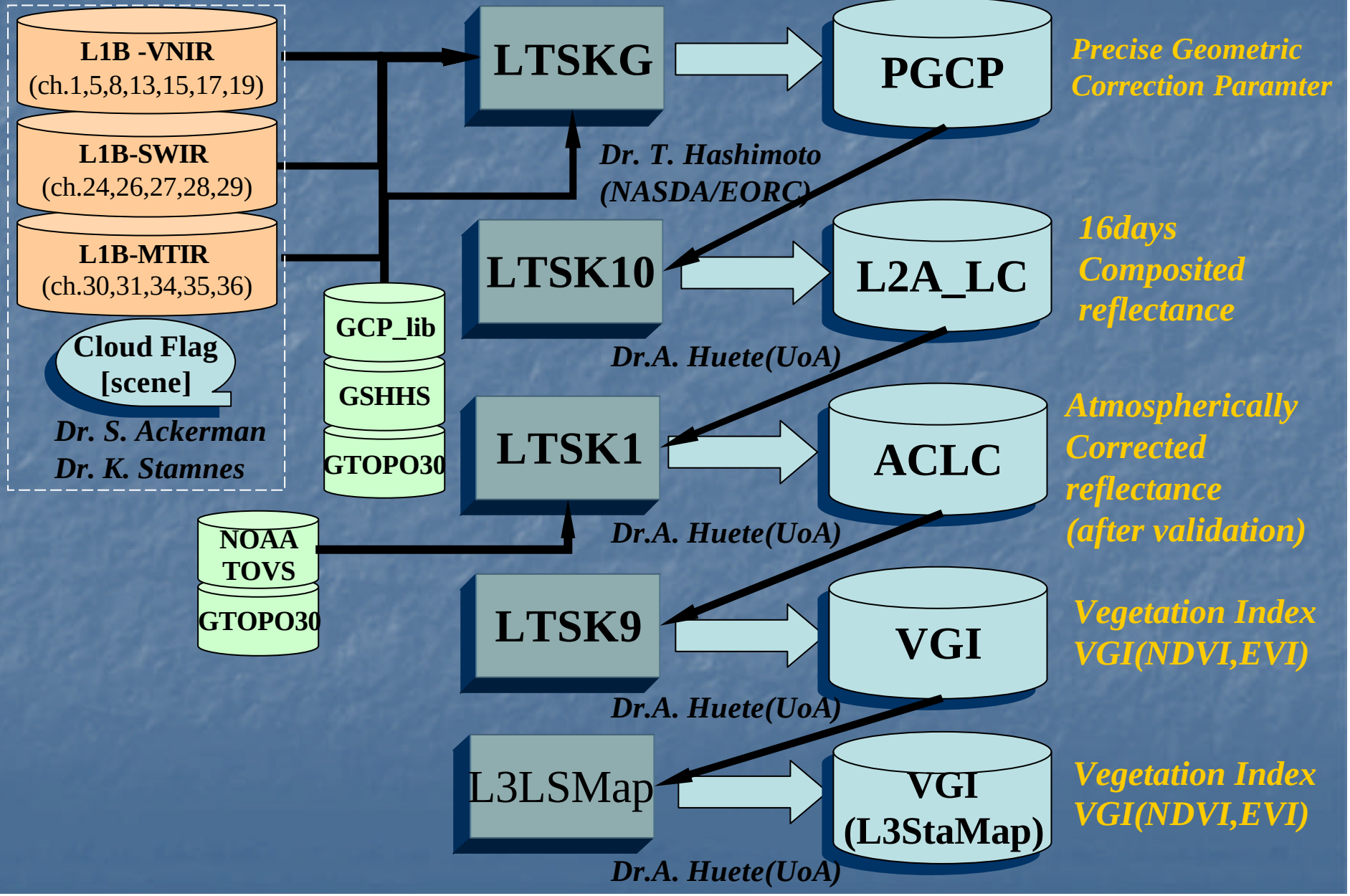


RSR of 250m land channels
With typical spectral reflectance

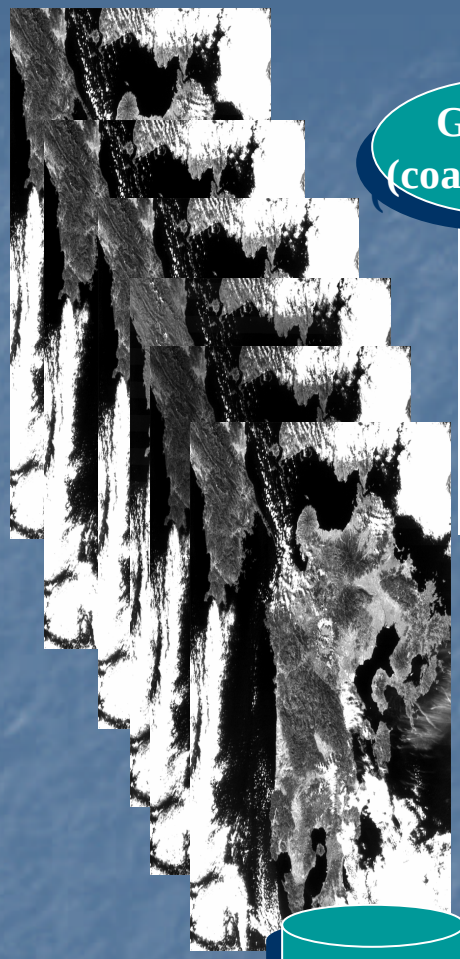
- 4 VNIR land channels
- 2 SWIR land channels

These channels are quite similar to Landsat/TM

GLI **1km** land algorithm on higher processing and products

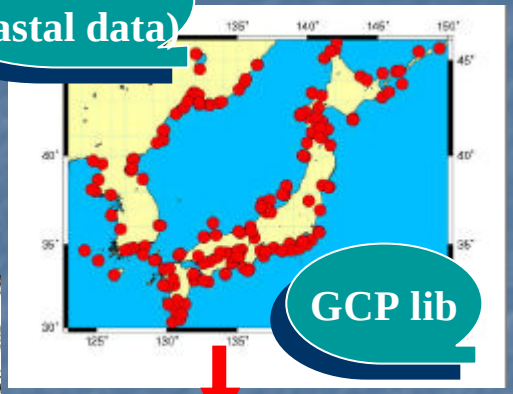


1 . GLI 1km Precise Geometric Correction

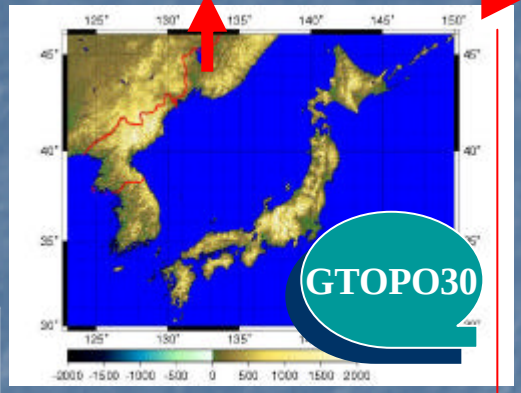


L1B

GSHHS
(coastal data)

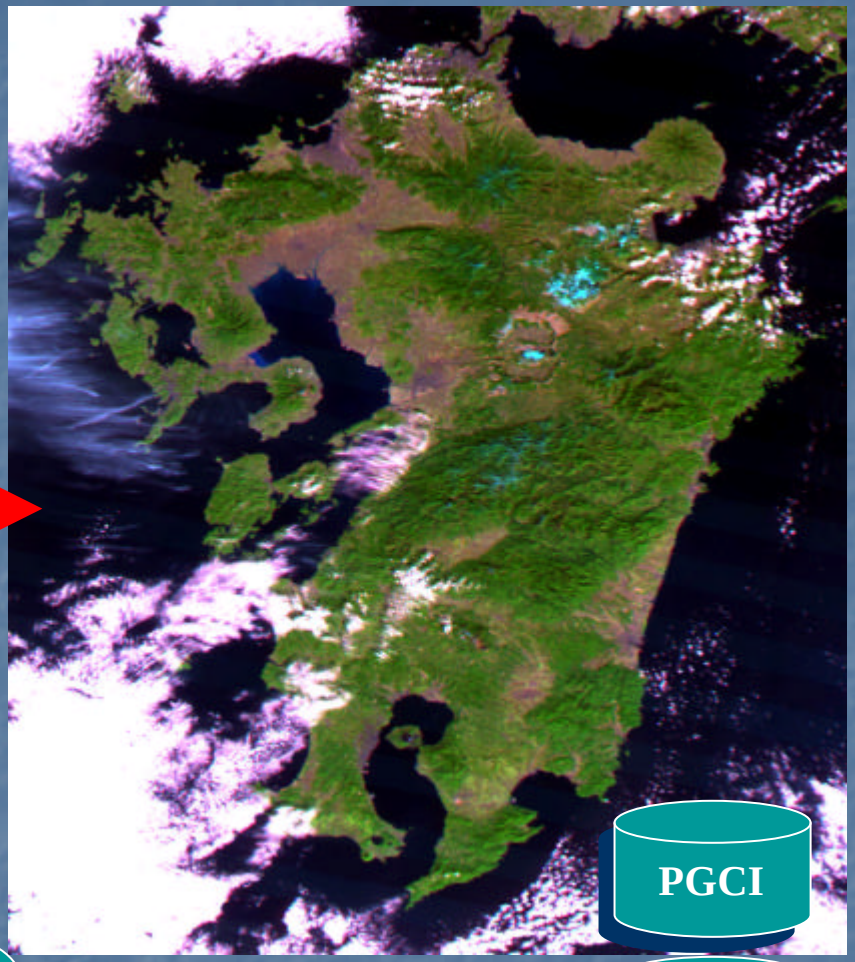


GCP lib



GTOPO30

CLFLG

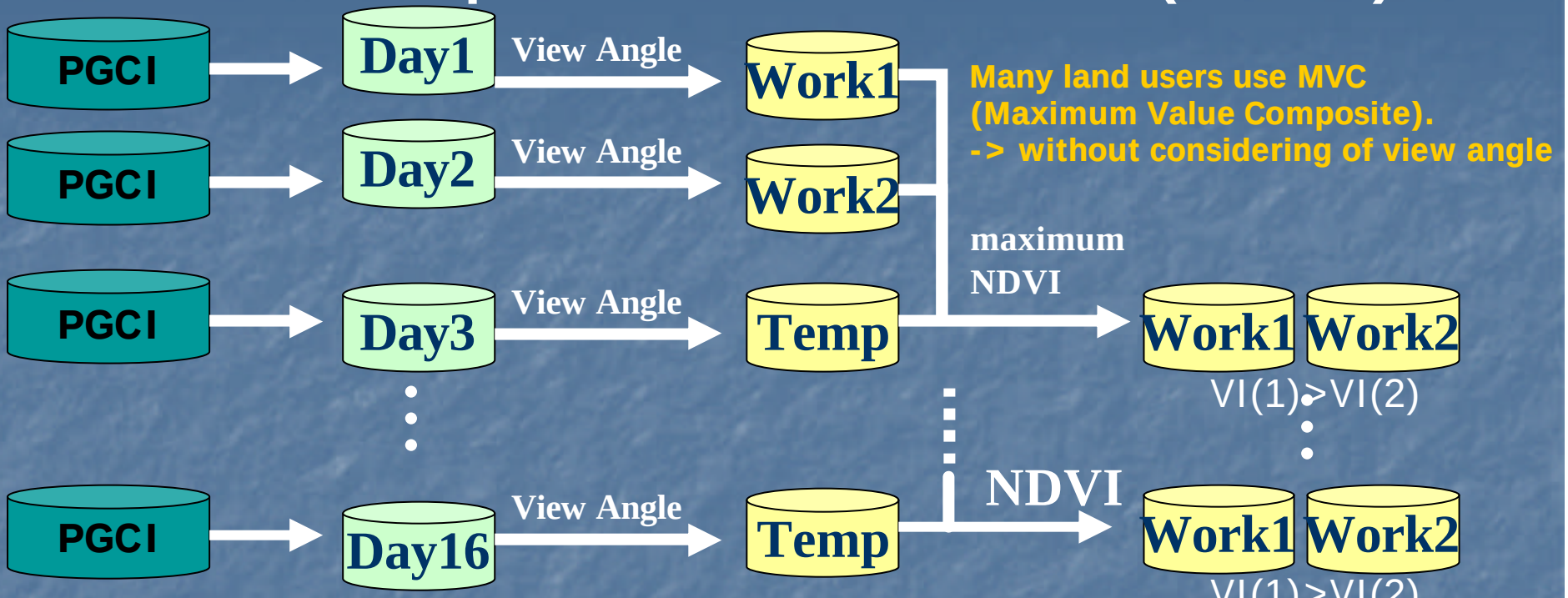


PGCI

PGCP

※GLI sensor scans from east to west.

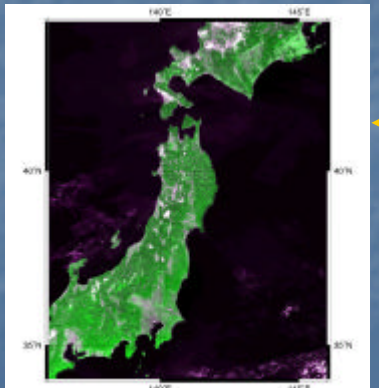
2. GLI 1km Composite for cloud free data (CVMVC)



Reason of using CVMVC is …

1. Maximum NDVI can detect cloud free pixels
2. Maximum NDVI can also detect higher satellite zenith angle pixels, which is effected by surface BRDF.
3. Selected pixel should be satisfied with both of lower satellite zenith angle and maximum NDVI.

CVMVC (constraint view angle maximum value Composite)

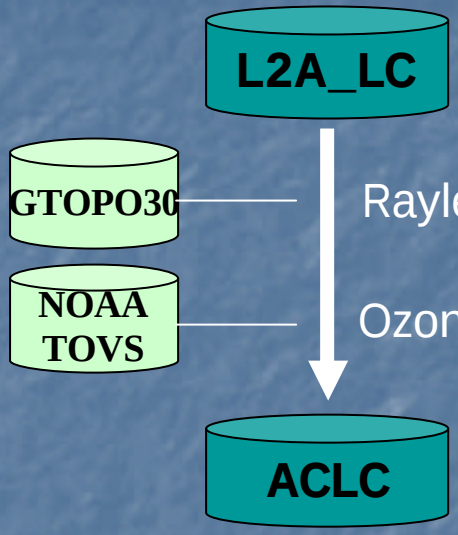


L2A_LC

16day composite
Days: 1 to 16

$$\rho_{obs} = \frac{\pi L_{sat}}{F_0 \cos(\theta_s)}$$

3. GLI 1km Atmospheric Correction (remove Ozone Absorption, Rayleigh Scattering)



This algorithm will be applied after CAL/VAL phase (Dec., 2003) .

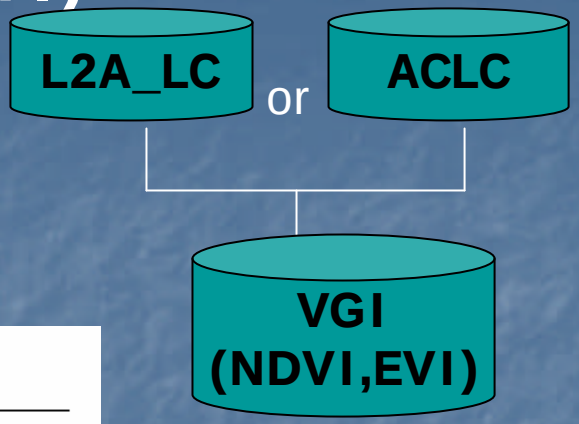
Much of the computation during atmospheric correction requires intensive CPU time due to floating point processing.

Solution 1. L2A_LC leaves the STSG (Sun-Target-Sensor Geometry) data.

Atmospheric corrected reflectance can be **applied after composite**.

Solution 2. Optical depth of molecular scattering and STSG conditions can be expressed **by LUT (Look-Up table)** using standard atmospheric model and elevation (depends on temperature and pressure).

4. GLI 1km Vegetation Index (NDVI, EVI)



$$NDVI = \frac{\rho_{NIR} - \rho_{RED}}{\rho_{NIR} + \rho_{RED}}$$

$$EVI = G \times \frac{\rho_{NIR} - \rho_{RED}}{L + \rho_{NIR} + C1 \times \rho_{RED} - C2 \times \rho_{BLUE}}$$

Normalized Difference Vegetation Index (NDVI):

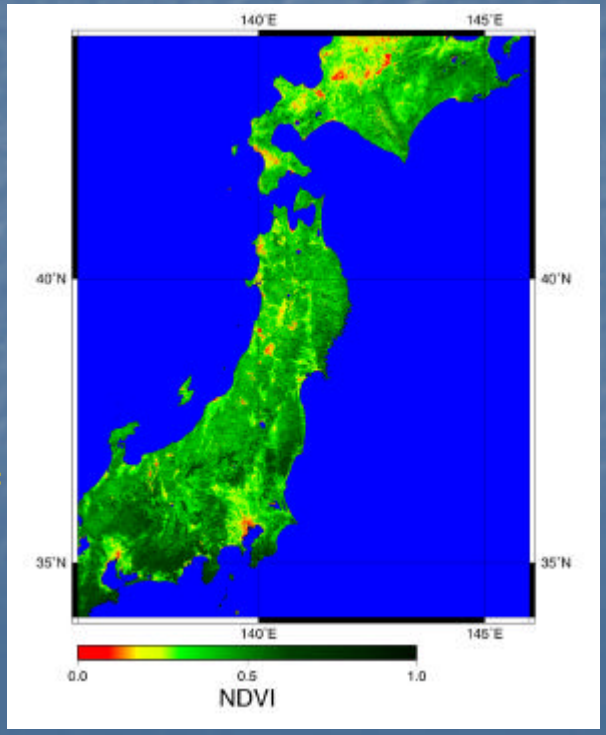
-> "continuity index"

This index could be extended to provide a longer term data for use in operational monitoring studies.

Enhanced Vegetation Index (EVI):

-> “optimized index”

This index can enhance the vegetation signal with improved sensitivity in high biomass regions and improved vegetation monitoring through a decoupling of the canopy background signal and a reduction in atmospheric effects



GLI 250m land higher algorithm (Ongoing)

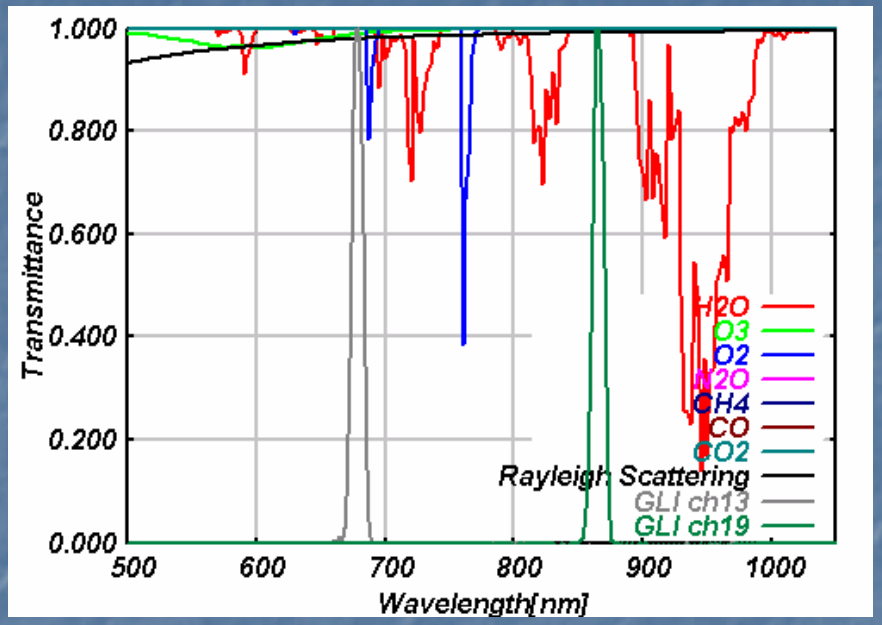
The example of applying 1km ozone & rayleigh correction algorithm to 250m data

Before RGB= **(Ch.22,21,20)**

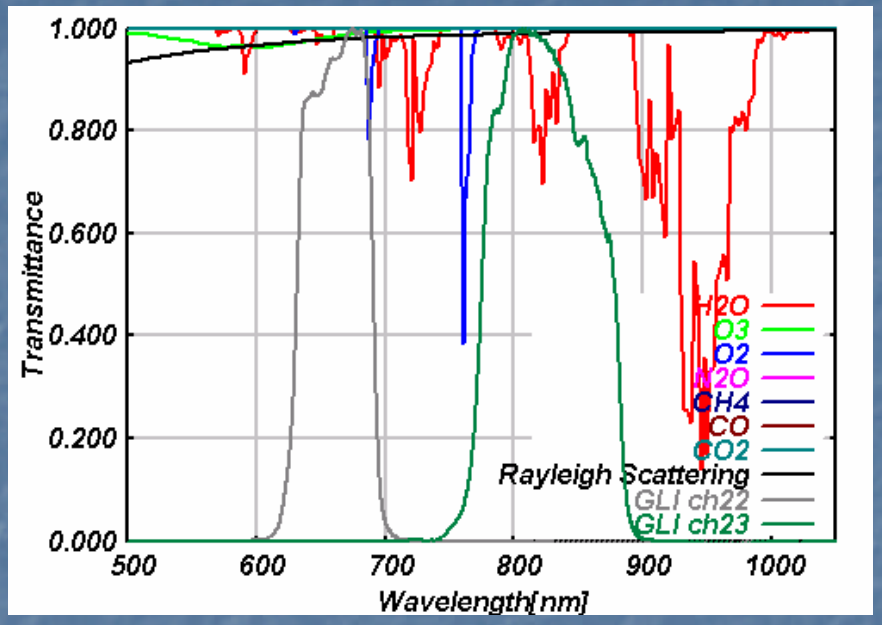
After RGB= **(Ch.22,21,20)**

These images are captured on May 3, 2003.
And these are RGB radiance images with linear stretch equally to each channels.

1km and 250m RSR with gaseous transmittance



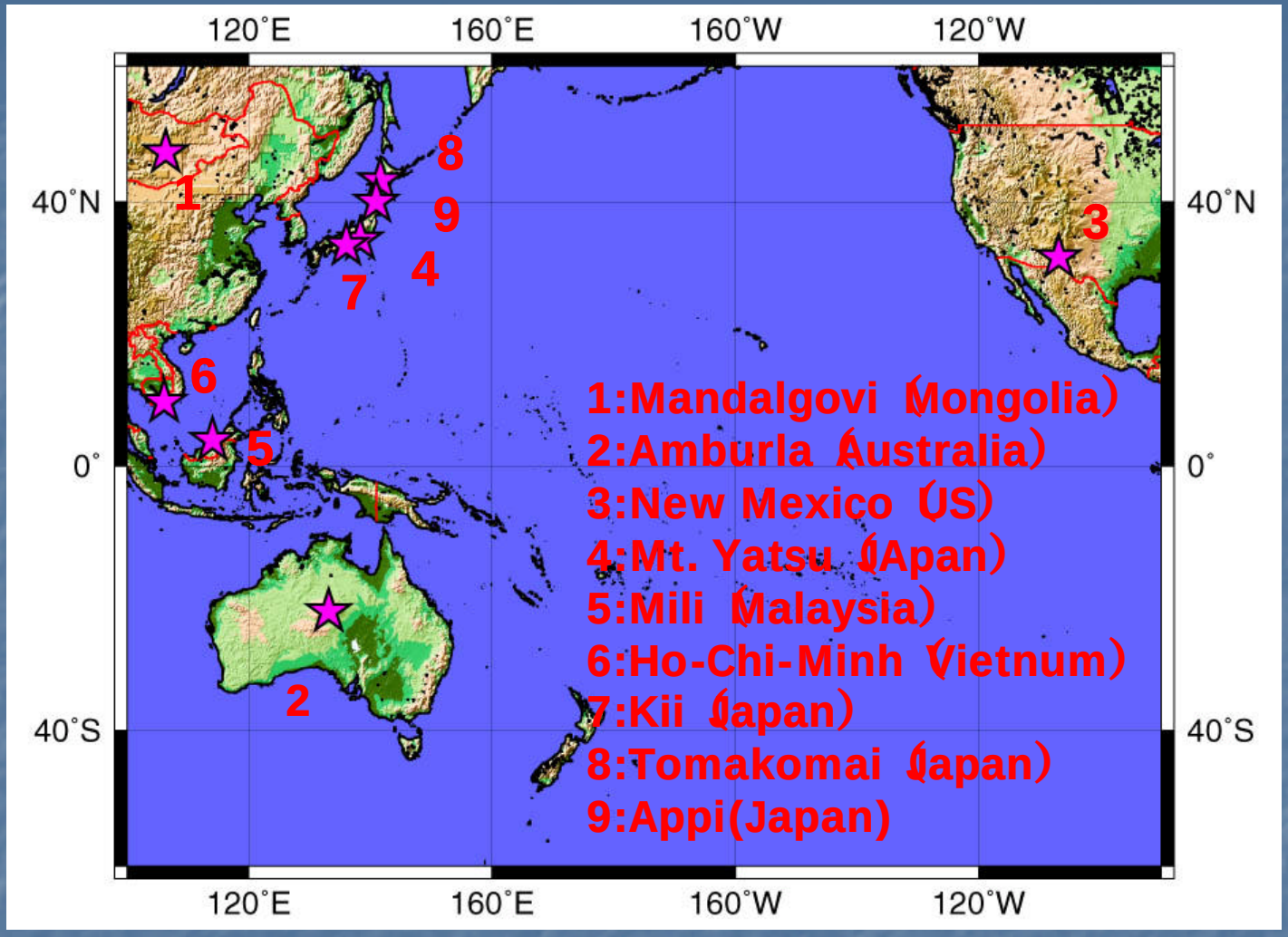
1km red and NIR RSR with gaseous transmittance

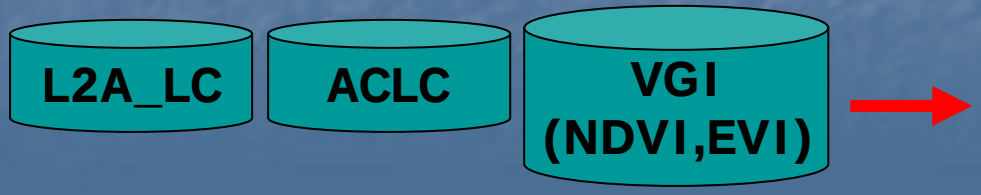


250m red and NIR RSR with gaseous transmittance

- Red and NIR 250m channels have SENSITIVITY OF ATMOSPHERIC COMPENSATION (Water Vapour etc.)
- **The characteristics of GLI 1km NDVI and GLI 250m NDVI may be different.**
- **Radiance and reflectance will be evaluated using other sensors and validation data.**

GLI Land Validation Site



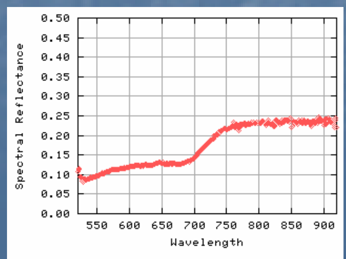


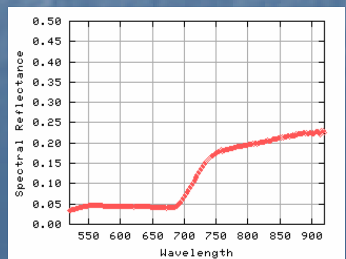
Validate and investigate the sensibility of vegetation physical parameters for GLI higher products

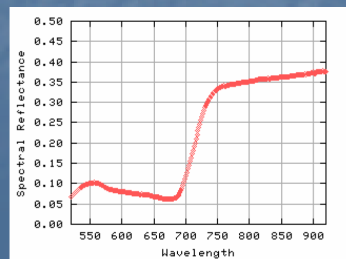
Spectral Reflectance Data

Spectral reflectance data of Various Objects on the ground

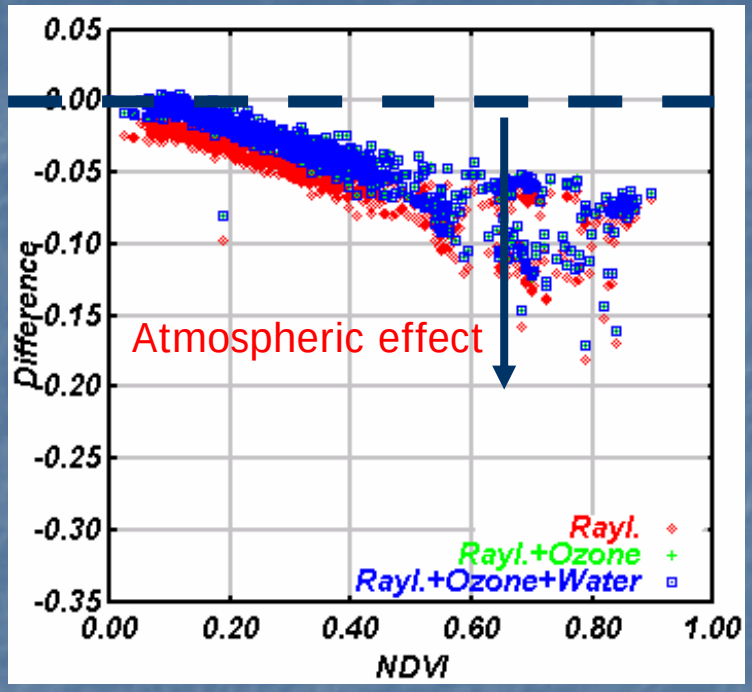
Site	Mandalgovi (Mongolia)	Brazilia National Park (Brazil)	Konza (U.S.)
Date	1998/08/09 ～1998/08/11	2000/05/05	2000/06/15
organization	Chiba Univ.	Uinv. Of Arizona	Uinv. Of Arizona
Spectrometer	S2320 (Soma Optics Inc.)	FieldSpec HH	FieldSpec HH
Range	350nm-1050nm	269.2nm-1068nm	269.2nm-1068nm
Number of Channels	512ch	512ch	512ch
Method	Mobile Measurement System	MQUAL (MODLAND Quick Airborne Looks)	"Yoke"
Sensor Height	about 2m	about 200m	about 2m



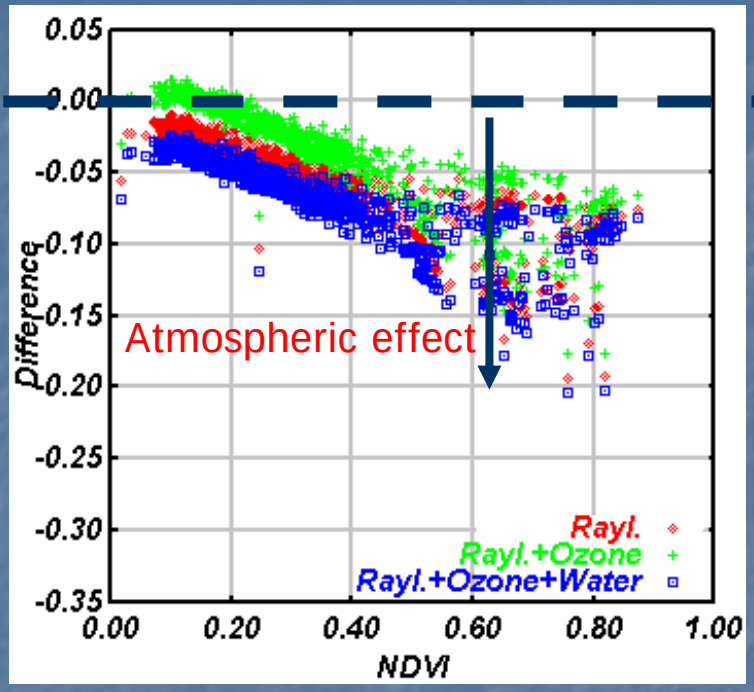




Example of simulation results



GLI 1km NDVI



GLI 250m NDVI

- No atmospheric corrected

These results derived from 6S RTM and spectral reflectance data obtained by Chiba Univ. and UoA field experiment data.

Item	Condition
Date	23, June
Solar Zenith Angle	45[deg]
Satellite Zenith Angle	45[deg]
Relative Azimuth Angle	20[deg]
Target Height	0[m]
Aerosol	None
Water Vapor	2.93[g/cm2]
Ozon	0.333[cm-atm]
Ground Condition	Lambertian