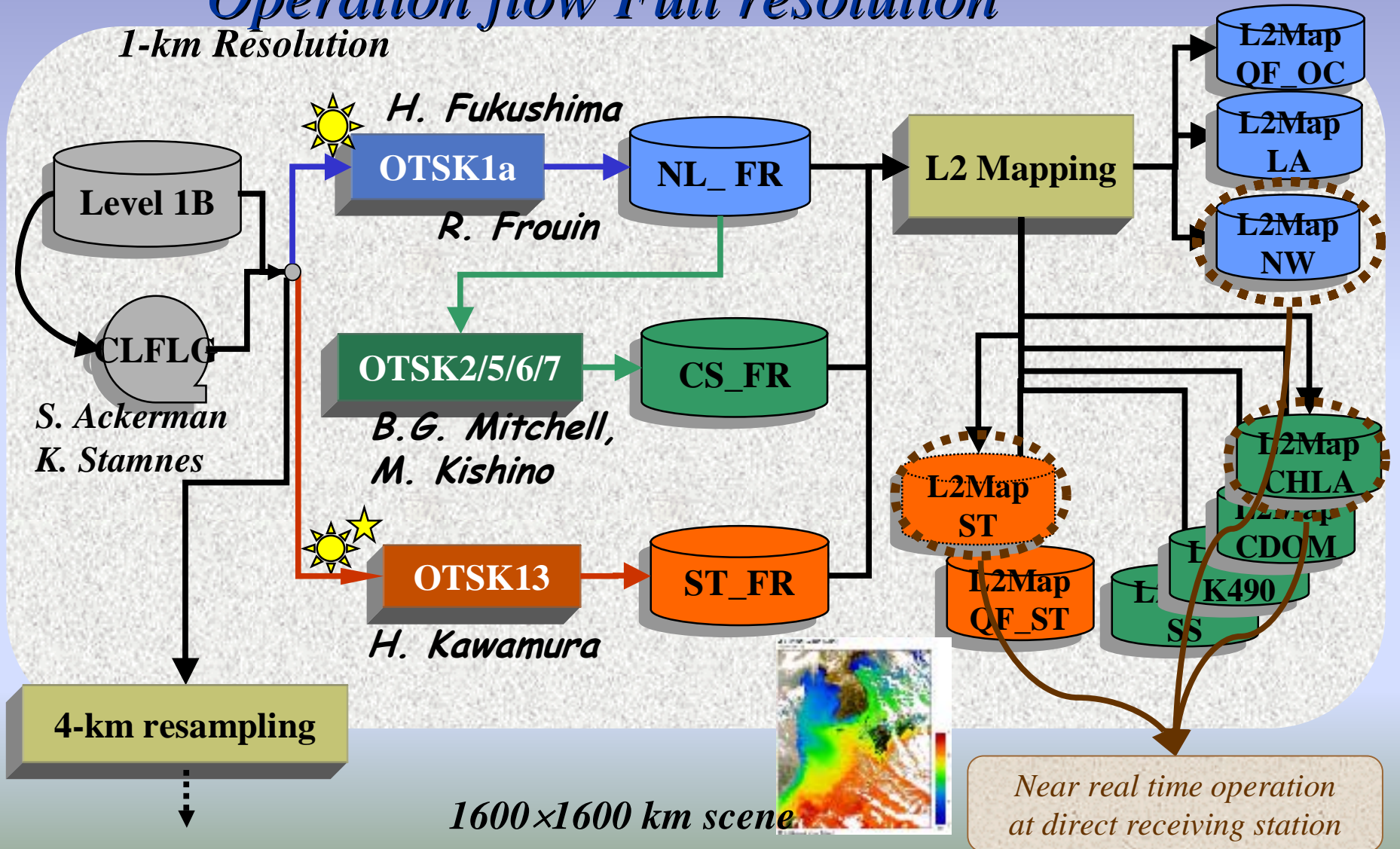
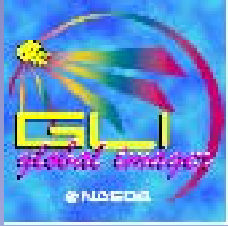




# 3. GLI Ocean algorithms

## Operation flow Full resolution

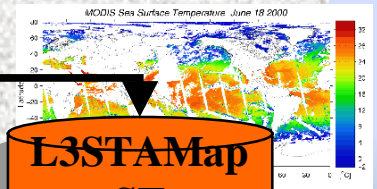
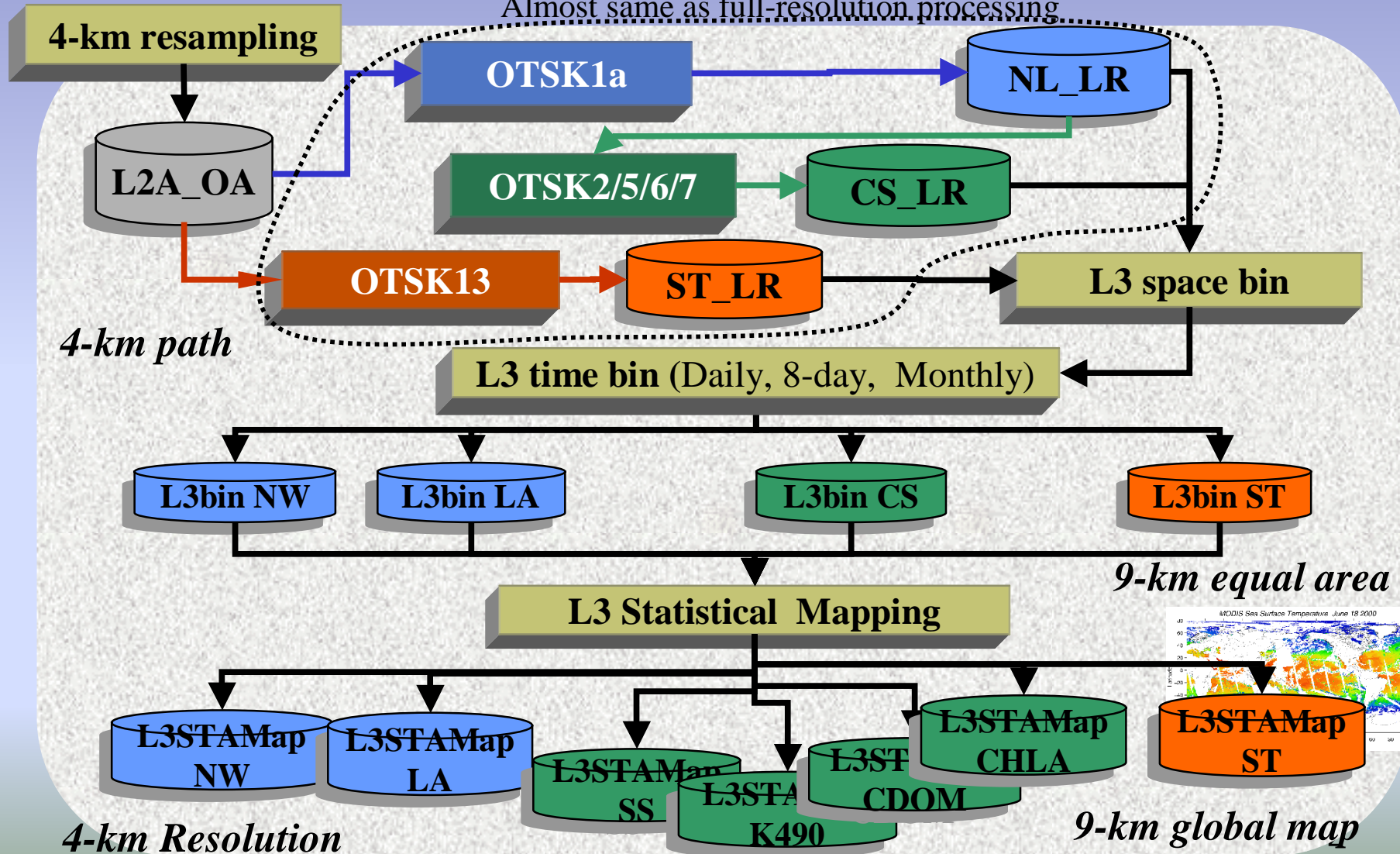




# 3. GLI Ocean algorithms (conti.)

## Operation flow Low resolution

Almost same as full-resolution processing



### 3. Algorithm (basic flow of **OTSK1a** with band switch)

GLI observed Lt at 749<sub>CH16</sub>, 865<sub>CH18</sub>, 678<sub>CH13</sub>, 865'<sub>CH19</sub> nm

Lt at 380-710nm

*.. Ratio1 and Ratio2 calculated by Lt749 and Lt865*

*Lt → ρt .. convert to reflectance*

*ρa + ρma = ρt - ρm .. subtract molecular reflectance*

*Lt → ρt : convert to reflectance*

*ρa + ρma + ρw = ρt - ρm*

*: subtract molecular reflectance*

*.. look up table of ρa + ρma → τa at 749, 865, 678, 865' of M*

τa(749<sub>CH16</sub>), τa(678<sub>CH13</sub>)

τa(865<sub>CH18</sub>), τa(865'<sub>CH19</sub>)

τa(749<sub>CH13</sub>)

τa(865<sub>CH19</sub>)

*Ratio1*

*Ratio2*

τa(749)

τa(865)

*.. composed by Ratio1 and Ratio2*

*.. aerosol model selection by ε749/865 at M1~9*

τa(865) at M<sub>select</sub>

*.. convert by K-extension of the selected model M<sub>select</sub>*

τa at in-water channels 380-710nm

*.. look up table of τa → ρa + ρma of M<sub>select</sub>*

ρa + ρma at in-water channels

for models M = 1 to 9

$-(\rho_a + \rho_{ma})$

ρw at 380-710nm

$L_w$

nLw at 380-710nm

### 3. Algorithm (characteristics of OTSK1a )

- Principal investigator is Prof. H. Fukushima same as OCTS.
- Atmospheric correction by 749nm and 865nm bands (except for band-saturated area)
- Look Up Table ( $\tau_a \leftarrow (\text{aerosol model}) \rightarrow \rho_a + \rho_{ma}$ ) is calculated by RSTAR-5b (PSTAR) developed by Prof. Nakajima of CCSR Tokyo Univ.

*The next version will include functions of*

- *Sunlint correction developed by Prof. H. Fukushima*
- *Whitecap correction developed by Dr. R. Frouin of SIO*
- *Iteration for non-zero  $L_w$  using in-water algorithm developed by Tanaka-Toratani*
- *Band switching to avoid NIR band saturation*

### 3. Algorithm

#### Formulations of the GLI in-water empirical algorithms

OTSK2/5/6/7

Variable	Algorithm source	Type	Equation, Coefficients (a*), Band Ratio (R)
<b>CHLA</b>	OC4-GLI by Mitchell and Kahru Modified from O'Reilly et al., 1998	Max Band Ratio, Modified Cubic Polynomial	$CHLA = 10^{(a_0 + a_1 \times R + a_2 \times R^2 + a_3 \times R^3) + a_4}$
			$R = \log_{10}(NWLR443 > NWLR460 > NWLR520) / NLWR545)$
<b>K490</b>	GLI-K490 Modified from Mitchell and Kahru, 1998	Cubic polynomial in log-log	$K490 = 10^{(a_0 + a_1 \times R + a_2 \times R^2 + a_3 \times R^3)}$
			$R = \log_{10}(NWLR460/NLWR545)$
<b>CDOM</b>	In preparation by Mitchell and Kahru	Linear band ratio in log-log	$CDOM440 = 10^{(a_0 + a_1 \times R)}$
			$R = \log_{10}(NWLR443/NLWR520)$
<b>SS</b>	Provided by Kishino, May, 2002	Square polynomial in log-log	$SS = 10^{(a_0 + a_1 \times R + a_2 \times R^2)}$
			$R = \log_{10}(NWLR443/NWLR545)$
<b>RED TIDE flag</b>	<i>Renewed</i> Kahru and Mitchell, 1998	Threshold of band ratio	REDTIDE index on, if $R < a_0$ and $CHLA > a_1$
			$R = NWLR380/NLWR412$

### 3. Algorithm

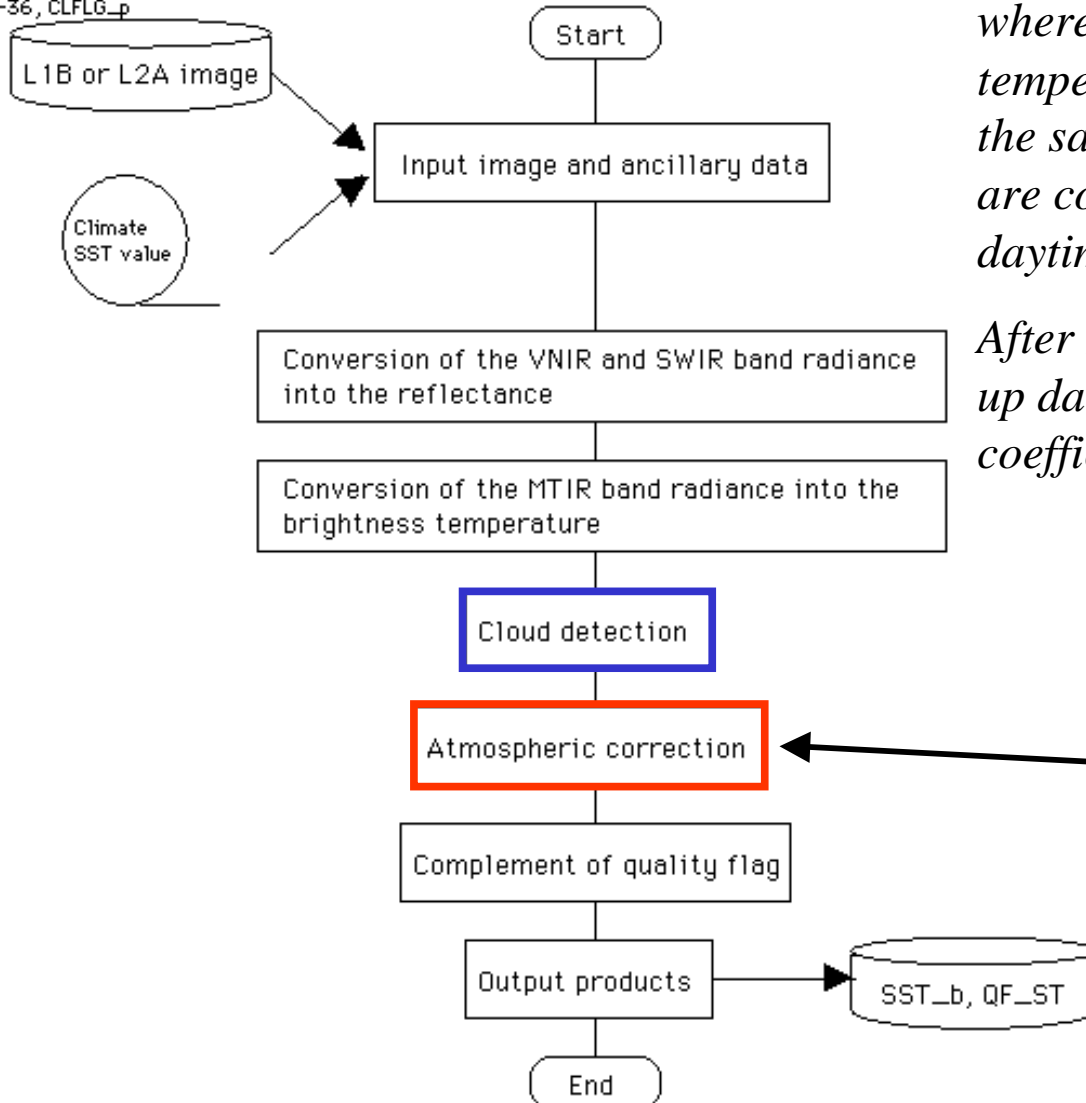
GLI SST algorithms

OTSK13

Atmospheric correction for SST

$$SST = a T35 + b (T35-T36) + c (T35-T34) + d (T35-T36)(1-1/\cos\theta_s) + e (T35-T34)(1-1/\cos\theta_s) + f$$

Band 8,13,19, 26, 27, 30, 31, 34-36, CLFLG\_p



where  $T34$ ,  $T35$  and  $T36$  are brightness temperatures of bands-34, -35 and -36,  $\theta_s$  is the satellite zenith angle,  $a$ ,  $b$ ,  $c$ ,  $d$ ,  $e$ , and  $f$  are constant coefficients; the coefficients in daytime may differ from those in nighttime.

After starting of GLI operation, the match-up data set will be used to adjust the coefficients ( $a$ ,  $b$ ,  $c$ ,  $d$ ,  $e$ ,  $f$ ) of the equation.

GLI SST algorithm (OTSK13) is based on the split-window MCSST technique.

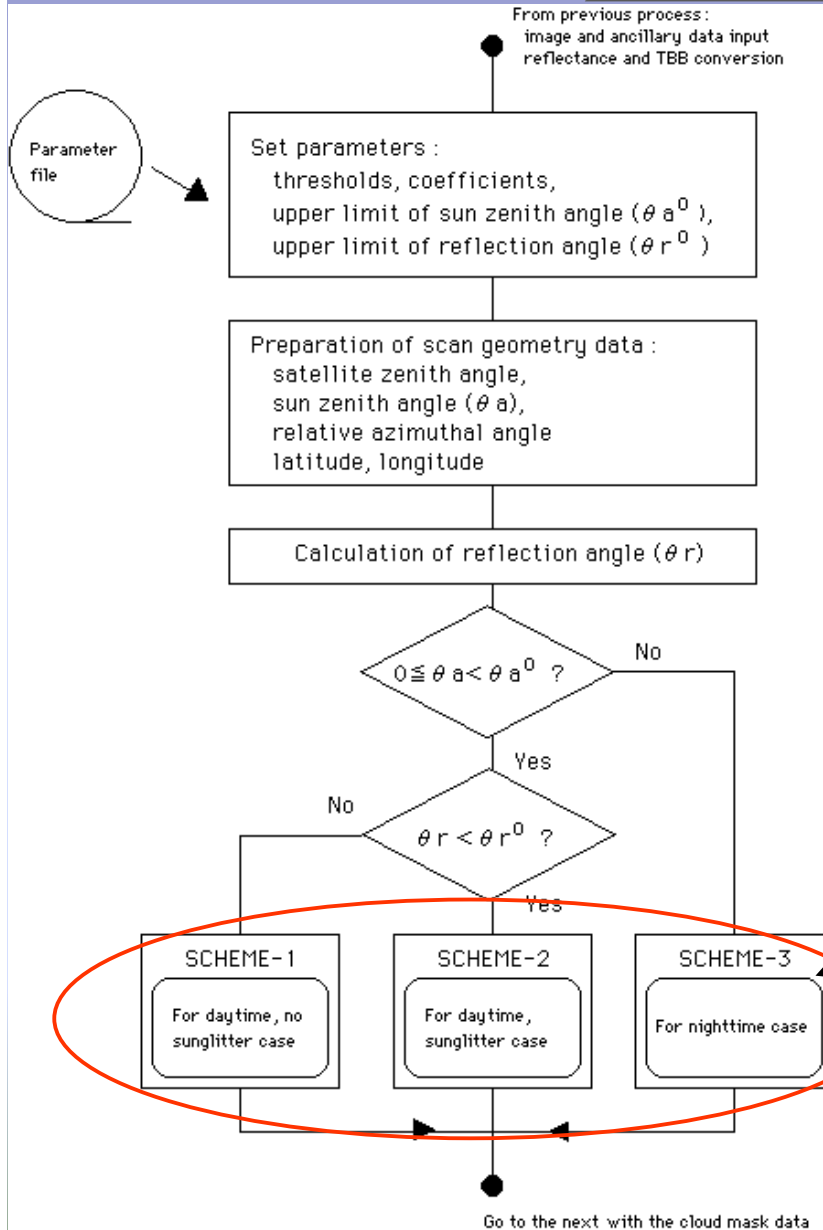
From algorithm description by H. Kawamura

# 3. Algorithm

## GLI SST algorithms

OTSK13

Cloud detection for SST



The framework of the cloud detection algorithm is to apply up to some threshold tests to detect cloud, and then to identify a pixel as cloud-free only when all the tests prove negative.

*Coefficients of the threshold tests and the number of the tests will be determined using the real GLI data after the ADEOS-II launch.*

### 3. Algorithm

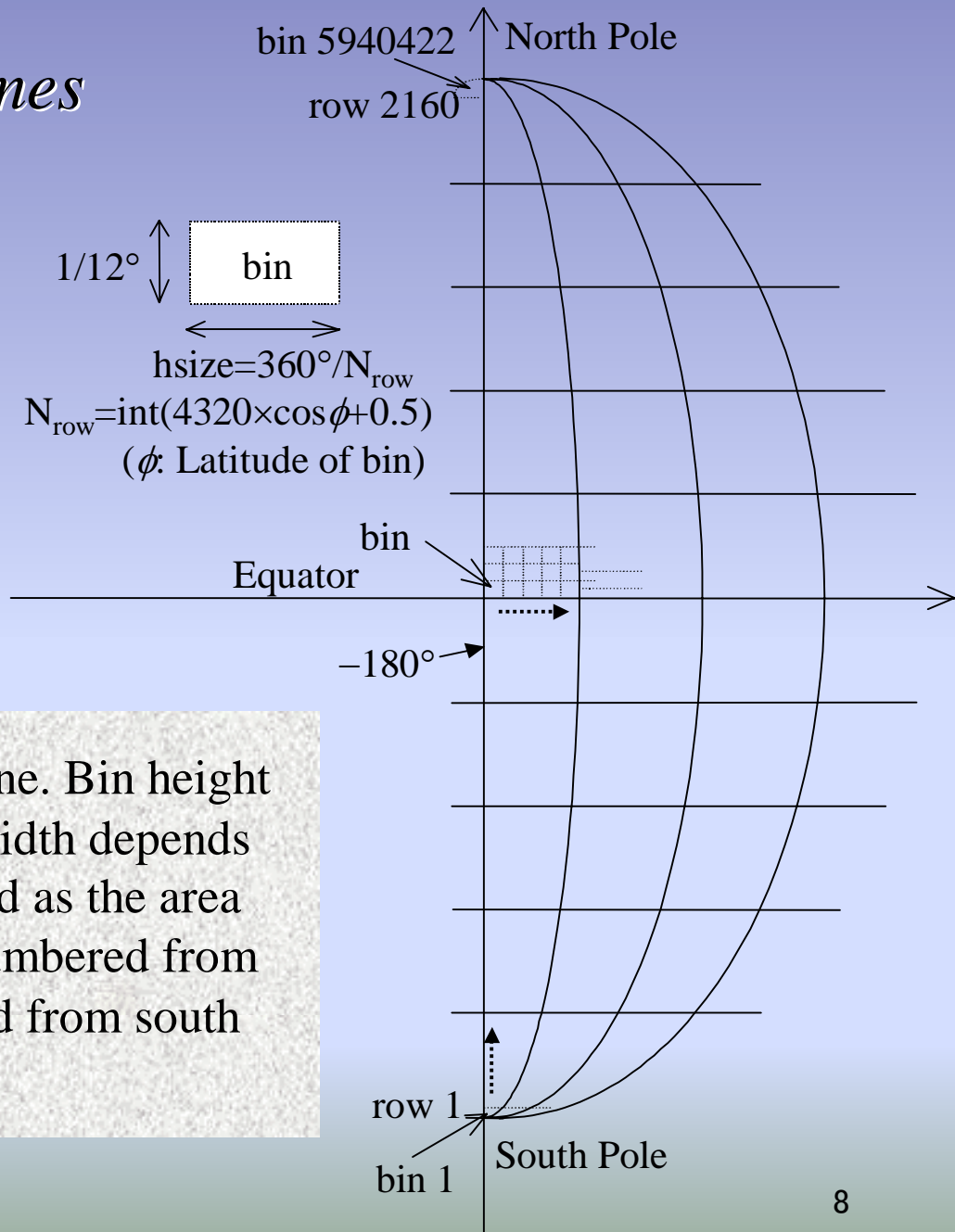
## GLI Level 3 binning schemes

#### L3 space/time bin

Grid definition

Equal area grid same as  
OCTS and SeaWiFS

Each bin is placed along latitude line. Bin height is  $1/12^\circ$  in everywhere. But bin width depends on its latitude, which is considered as the area of each bin is equal. The bin is numbered from  $-180^\circ$  longitude to eastbound, and from south to north.





### 3. Algorithm

#### GLI Level 3 binning schemes

**L3 space/time bin**

<i>valuable</i>	<i>equation</i>
<p><i>chl<sub>a</sub>, cdom, ss, k490 nLw**, La**, Tau_865, alpha_78</i></p>	<p><i>log-scheme</i></p> $\log(\text{Ave}) = \frac{\sum_{BIN} \left\{ \left( \frac{\sum_{i=1, N_{BIN}} \log(\text{Data}_i)}{BIN} \right) / N_{BIN} \cdot \sqrt{N_{BIN}} \right\}}{\sum_{BIN} \left( \sqrt{N_{BIN}} \right)_{BIN}}$ <p><i>Same as OCTS</i></p>
<p><i>sst</i></p>	<p><i>linear-scheme</i></p> $\text{Ave} = \frac{\sum_{BIN} \left\{ \left( \frac{\sum_{i=1, N_{BIN}} \text{Data}_i}{BIN} \right) / N_{BIN} \cdot \sqrt{N_{BIN}} \right\}}{\sum_{BIN} \left( \sqrt{N_{BIN}} \right)_{BIN}}$ <p><i>Same as SeaWiFS</i></p>