

GCOM-C radiance global binning algorithm

Hiroshi Murakami,
JAXA/EORC,

Aug. 2021 (v3000: Main revisions of Ver. 3 is underlined)

1. Background

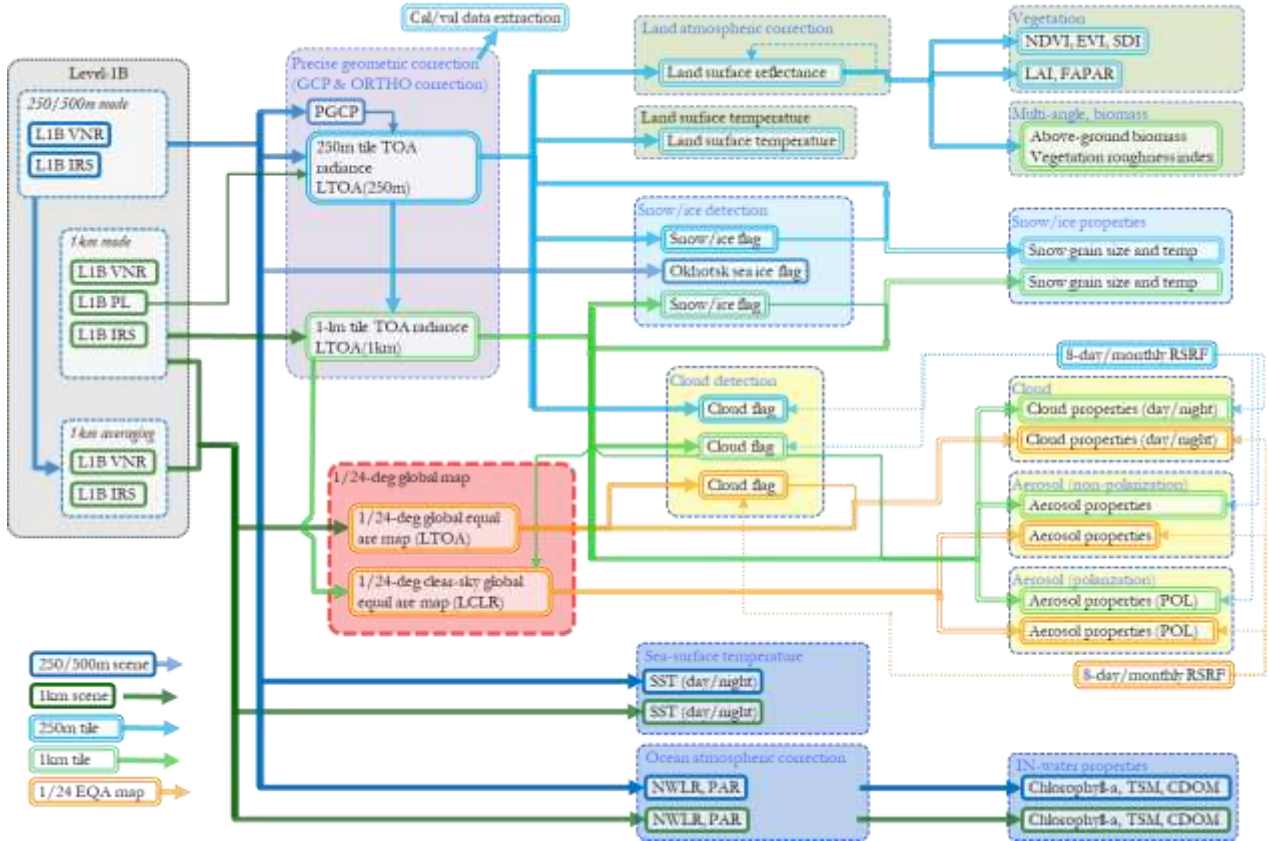


Figure 1 GCOM-C processing flow from Level-1B to Level-2

GCOM-C atmosphere algorithms read global mapped radiance datasets for overviewing global distribution of the cloud and aerosols. Two GCOM-C global binning datasets are produced (red colored parts in Fig. 1):

- (1) one is an simple resampling data for the cloud algorithms,
- (2) the other is non-cloud-pixel sampling data for aerosol algorithms.

2. Method

2.1. Simple resampling (LTOAF)

L1B data is resampled to the global equal-area (sinusoidal) grids (EQA). The EQA grid is defined as follows as same as IOCCG Report Number 4, 2004.

Line size (NL) and pixel size (NP₀) when resolution d=0.04 degrees are calculated as follows.

$$NL = NINT(180/d), \text{ from } S\text{-pole to } N\text{-pole}$$

$$NP_0 = 2 \times NINT[180/d], \text{ from } 180W \text{ to } 180E$$

Latitude (lat) and Longitude (lon) can be calculated from line number (lin) and column number (col).

$$lat = 90 - (lin - 0.5) \times d,$$

$$lon = 360 / NP_i \times (col - NP_0 / 2 - 0.5),$$

$$\text{where, } NP_i = NINT[NP_0 \times \cos(lat)].$$

The lin and col can be converted from lat and lon as follows.

$$lin = NINT[(90 - lat)/d + 0.5]$$

$$col = NINT[NP_0 / 2 + NP_i \times lon / 360 + 0.5]$$

$$\text{where, } NP_i = NINT[NP_0 \times \sin((lin - 0.5) \times d)].$$

A nearest L1B (VNR-NP, PL, and IRS) pixel from the center location of the each EQA grid is selected by using L1B geolocation (/Geometry_data/Latitude and /Geometry_data/Longitude) datasets. Ascending and descending data is binned to separate files (indicated by “yyyymmdd”D01D and “yyyymmdd”A01D in the output filename). The binning time range is basically one day (from 00:00UT to 23:59UT).

After identify the correspondence between [longitude and latitude] and [L1B column and line], [column and line] are shifted by [dx, dy] which are approximately calculated by altitude (alt in meter), satellite zenith (saz), pixel, and tilt angle as follows.

$$\underline{\text{column} \rightarrow \text{column} + dx}$$

$$\underline{\text{line} \rightarrow \text{line} + dy}$$

$$\underline{dx = dxy \times ax / \sqrt{ax^2 + ay^2} \times \cos(ax \times \pi / 180)}$$

$$\underline{dy = dxy \times ay / \sqrt{ax^2 + ay^2}}$$

$$\underline{dxy = elv \times \tan(saz \times \pi / 180) / (1000. / \cos(saz \times \pi / 180))}$$

POLK:

$$\underline{ay = \text{tilt}(\text{line})}$$

$$\underline{ax = -31.5 + 63. \times \text{column} / 1000.}$$

VNRK or IRSK:

$$\underline{ay = 0.}$$

$$\underline{ax = -43. + 86. \times \text{column} / 1250.}$$

2.2. Non-cloud pixel resampling (LCLRF)

GCOM-C 1-km tile mosaic data (LTOAK and LTOAL) is resampled to the global EQA. A LTOA pixel which is discriminated as clear (probability flag “110”) or aerosol (Heavy Aerosol: bit-9=0) by the 1-km cloud flag data (/Image_data/Cloud_flag in CLFGK) and nearest from the center of the EQA grid within the EQA grid area is selected.

3. Output file name

(1) LTOAF

GC1SG1”yyyymmdd”D01D_A0000_L2SG_LTOAF_”vvvv”.h5 (Descending: daytime)

GC1SG1"yyyymmdd"A01D_A0000_L2SG_LTOAF_"vvvv".h5 (Ascending: nighttime)

yyyy: year

mm: month

dd: day

vvvv: product version

(2) LCLRF

GC1SG1"yyyymmdd"D01D_A0000_L2SG_LCLRF_"vvvv".h5 (Descending: daytime)

GC1SG1"yyyymmdd"A01D_A0000_L2SG_LCLRF_"vvvv".h5 (Ascending: nighttime)

References

IOCCG Report 4, "Guide to the creation and use of ocean-colour, Level-3, binned data products," Edited by David Antoine, pp. 88 (2004).