How to use QA flag

- How to mask <u>stray light correction flag. </u>(p.2)
  ⇒ This is necessary when you use applicable products.

- Usage example of QA flag for statistical calculation.(p.3)
  ⇒This is our recommendation of applying QA flag.

- How to use QA flag（p.4-9）
  ⇒This is the information for advanced users who
    apply QA flag individually.

How to mask of stray light correction flag

2020.05.15

QA flag information used to mask is stored in higher bit of the pixel or in other bit of the pixel. L1B, LTOAQ, LTOAK, LOTAF and LCLRF store the stray light correction flag in higher bit of the pixel.
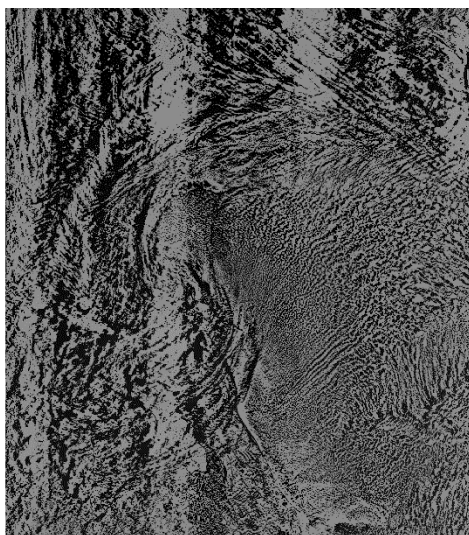
<Example of mask processing>
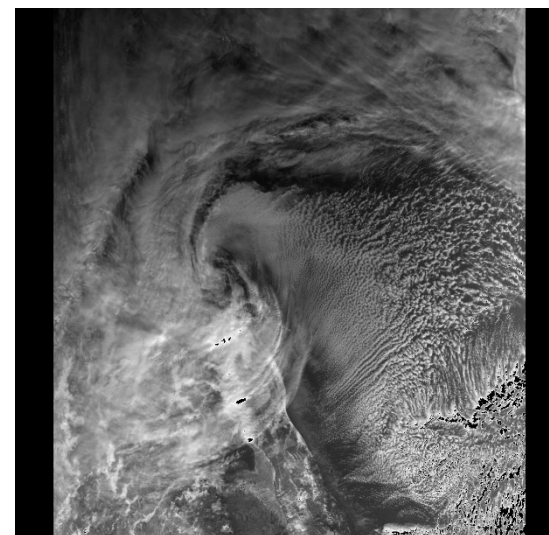DN Value (example)   : 0100101001110111 (19063)
Mask   : 0011111111111111 (16383)
AND Operation   : 0000101001110111 (2679)

↑stray light correction flag

Before mask

After mask

GC1SG1_201903152247S46918_1BSG_VNRDK_1003.h5

- Ancillary_data
- Converted_PCD
- Data_quality_flag
- Earth_rotation_parameter
- Geometry_data
- Geometry_parameter
- Global_attributes
- Image_data
  - Land_water_flag
  - Line_msec
  - Line_tai93
  - Lt_VN01
  - Lt_VN02
  - Lt_VN03
  - Lt_VN04
  - Lt_VN05

Lt_VN01 (91280, 4)
  16-bit unsigned integer, 1955 x 1250
  Number of attributes = 25
    Band_weighted_TOA_solar_irradiance = 1104.2622
    Band_weighted_TOA_solar_irradiance_unit = W/m^2/um
    Band_width = 10.0
    Band_width_unit = nm
    Bit00(LSB)-13 = Digital Number
16383 : Missing value
16382 : Saturation value
    Bit14 = Stray light correction sign flag (delta_L = Ltrue - Lobs)
0:Sign of the amount of stray light correction is positive (or zero)
1:Sign of the amount of stray light correction is negative
    Bit15(MSB) = Stray light correction flag
0 : Stray light is uncorrected
1 : Stray light is corrected
    Center_wavelength = 380.0
    Center_wavelength_unit = nm
    Data_description = TOA radiance of VN01: Lt[W/m^2/sr/um]=(DN&Mask)*Slope
Band_weighted_TOA_solar_irradiance, F0/D^2; F0: Band weighted TOA solar irradi
    Dim0 = L1B-lines
    Dim1 = L1B-pixels
    Error_DN = 65535
    Mask = 16383
    Maximum_valid_DN = 65533
    Minimum_valid_DN = 0
    Offset = -24.0
    Offset_reflectance = -0.068279274
    Saturation_radiance = 264.0
    Saturation_radiance_unit = W/m^2/um/sr
    Slope = 0.01758027
    Slope_reflectance = 5.001534E-5
    Spatial_resolution = 1000.0
    Spatial_resolution_unit = meter
    Unit = W/m^2/um/sr

Usage example of QA flag for statistical calculation

GC1SG1_20190415D01D_T0529_L2SG_LST_Q_1000.h5
- Geometry_data
- Global_attributes
- Image_data
  - E01
  - E02
  - LST
  - QA_flag
- Level_1_attributes
- Processing_attributes

LST (6856, 4)
  16-bit unsigned integer,   4800 x 4800
  Number of attributes = 8
    Data_description = Land Surface Temperature (LST)
    Error_DN = 65535
    Mask_for_statistics = 63507   (※)Different for each physical quantity
    Maximum_valid_DN = 65534
    Minimum_valid_DN = 0
    Offset = 0.0
    Slope = 0.02
    Unit = Kelvin

Log Info | Metadata

To keep accuracy of a statistical value, temporal statistics product of GCOM-C is performed AND operation on「Mask_for_statistics」and 「QA_flag」, and also discriminated pixels used for statistical calculation.
Please refer the above when using products.

<Example of discrimination of LST product. >
QA_flag(Example) :0000011110001000 (1928)
Mask_for_statistics:1111100000010011 (63507)
AND calculation   :0000000000000000 (0)
                          == 0 → Target of statistical processing

QA_flag(Example) :0000110000000000 (3072)
Mask_for_statistics:1111100000010011 (63507)
AND calculation   :0000100000000000 (2048)
                          > 0 → Non-target of statistical processing
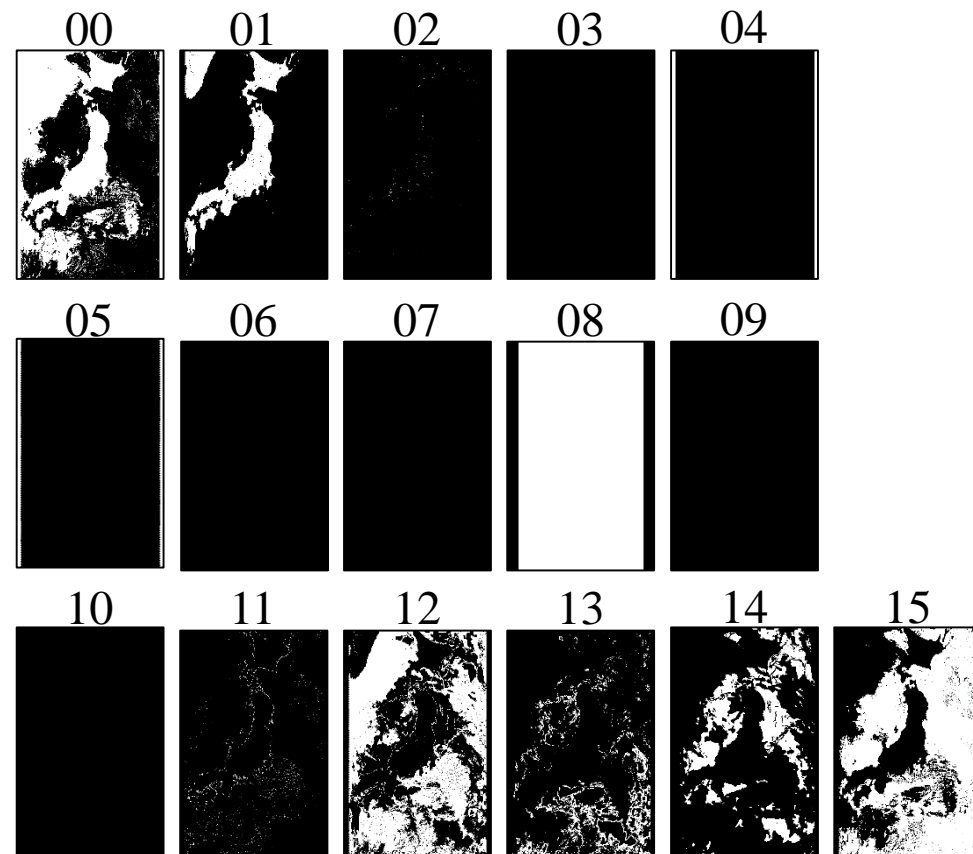
How to use QA flag

2020.04.23

QA flag indicates the quality of physical quantity per each pixel. You can control the quality by applying QA flag as mask to each pixel.
 QA flag is different depending on a product.
For more details, please refer to Attribute or ATBD.
*Please note that there are flags which indicated good quality and low quality.

bit	SST
00	no data
01	land
02	Rejected by QC
03	Retrieval error
04	No data(TIR1)
05	No data(TIR2)
06	no
07	no
08	0:nighttime or no visible data,1:daytime
09	no
10	no
11	unknown (clear/cloudy)
12	cloudy
13	acceptable (possibly cloudy)
14	good
15	0:unreliable (inland/too close to land),1:reliable

Black：0　White：1

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How to use QA flag

A part of QA flag may be upgraded at Ver2

QA flag indicates the quality of physical quantity per each pixel. You can control the quality by applying QA flag as mask to each pixel.
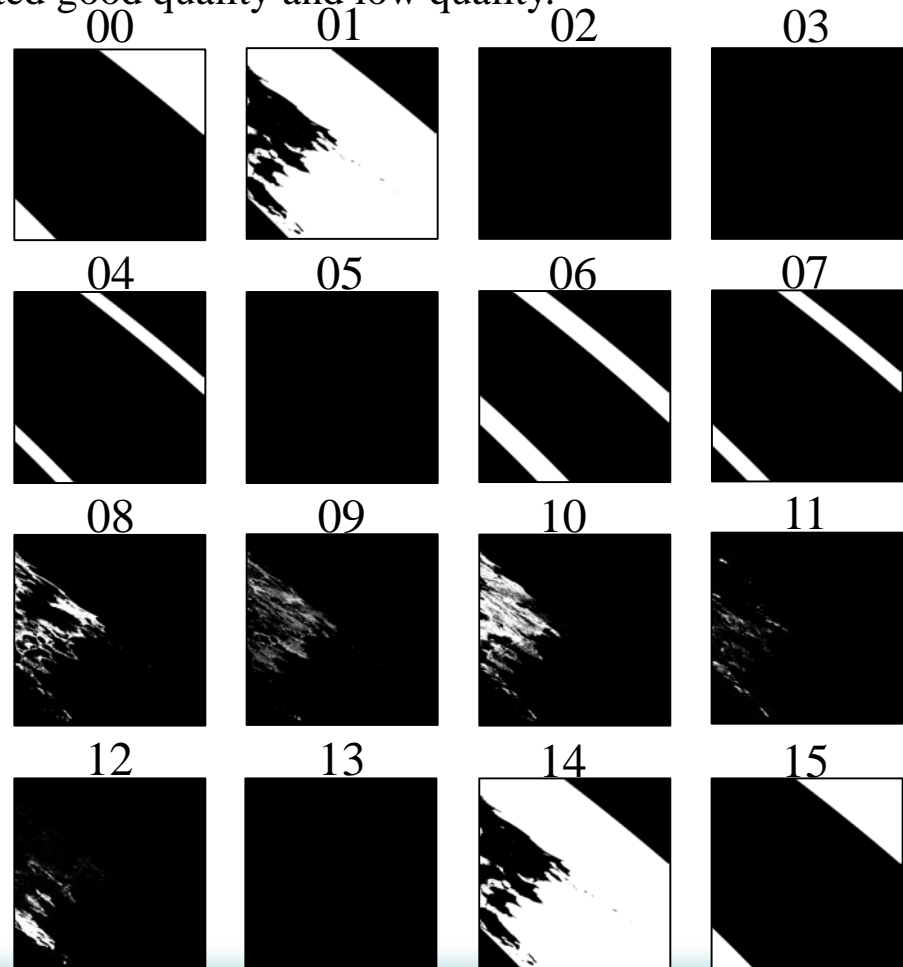 QA flag is different depending on a product.
For more details, please refer to Attribute or ATBD.
*Please note that there are flags which indicated good quality and low quality.

bit	LST
00	no input data(※1)
01	land/water flag(0=land/1=water) (※1)
02	Spare
03	Spare
04	no VNR/SWR
05	Snow
06	Sensor zenith angle > 33
07	Sensor zenith angle > 43
08	TR1 < 0.6
09	RES > 1[K]
10	RES > 2[K]
11	Probably Cloudy
12	Cloudy
13	TS out of range
14	land/water flag(0=land/1=water) (※1)
15	no input data(※1)

(※1) bit00,01 and bit14,15 include same information.

Black：0　White：1

A part of QA flag may be upgraded at Ver2

GCOM-C

2020.04.23

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bit	L1B
00	channel integrity (0 : Not integrity, 1 : Integrity)
01	vnr-pol tilt-driving (0 : Not driving, 1 : driving)
02	Spare
03	Spare
04	Spare
05	Spare
06	Spare
07	Spare
08	Spare
09	Spare
10	Spare
11	Spare
12	Spare
13	Spare
14	Spare
15	Spare

bit	IWPR(CHLA,CDOM)
00	No observation data in one or more band[s]
01	Land pixel
02	Atmospheric correction failure
03	Apparent cloud/ice (high reflectance)
04	Cloud-affected (near-cloud or thin/sub-pixel cloud),
05	Stray light anticipated (ref. L1B stray light flags & image),
06	High sun glint predicted (atmospheric corr. abandoned)
07	Moderate glint predicted (correction applied)
08	Solar zenith larger than threshold
09	Aerosol optical thickness larger than threshold
10	Negative nLw in one or more bands
11	Turbid Case 2 water
12	Shallow water than threshold
13	Iteration failure for CDOM algorithm
14	Chlorophyll a estimate out of range
15	Spare

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*Please note that there are flags which indicated good quality and low quality.

bit	VGI (NDVI,EVI)
00	no data
01	land/water
02	mixed with land/water
03	cloud
04	probably cloud
05	now or ice
06	no data for EVI
07	no data for SDI
08	bad input for SW
09	bad input for VN
10	solar zenith angle >70solar zenith angle >70
11	sensor zenith angle >45
12	EVI <-0.2 or EVI >1.0
13	large incident angle
14	small NDVI
15	anti solar side

Example of SST

A part of QA flag may be upgraded at Ver2

The more severely you mask, the severer extraction condition becomes.
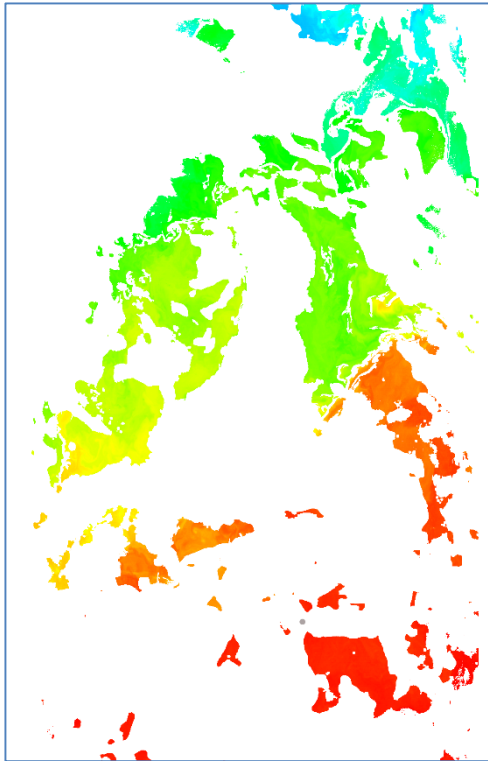Please refer to the following advantages and disadvantages..
There are some products store QA flag which you can extract good quality.

Mask severely
（Advantage）You can use good quality data.
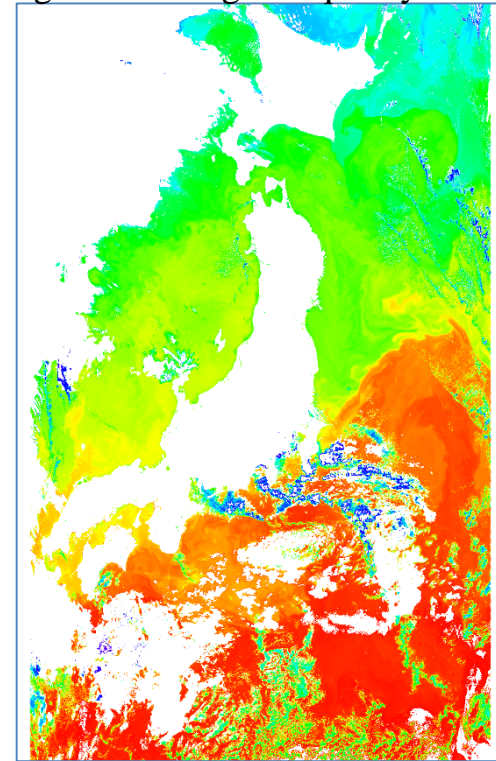（Disadvantage）The number of the pixels you can use will decrease.

Mask loosely
（Advantage）The number of pixels you can use will increase.
（Disadvantage）Including low quality data.

Excluded pixels of cloud detection flag (bit11, 12 ,13) and used only pixels of good quality flag (bit 14).

Unused QA flag

Example of LST

A part of QA flag may be upgraded at Ver2

The more severely you mask, the severer extraction condition becomes.
Please refer to the following advantages and disadvantages..
There are Some products store QA flag which you can extract good quality.
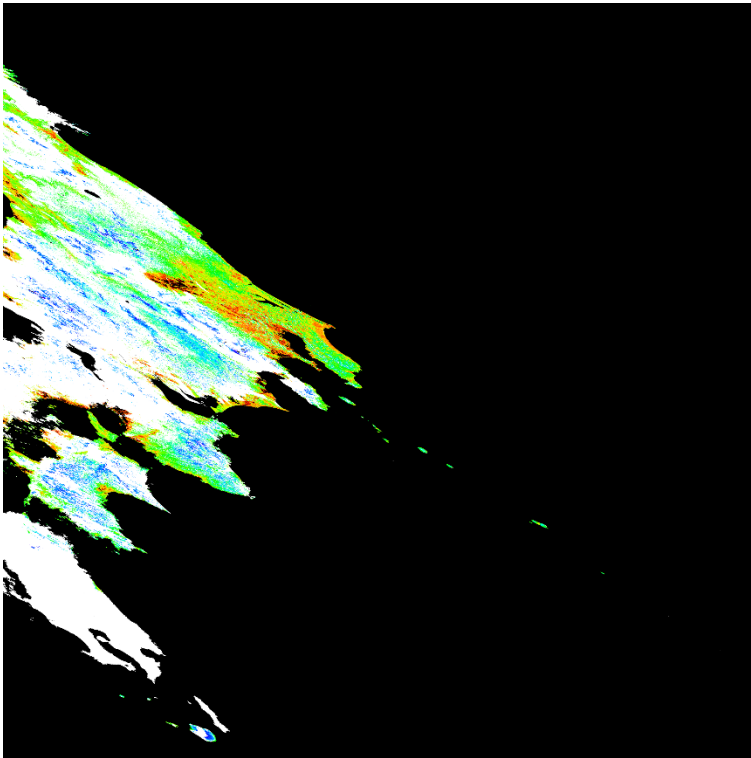
Mask severely (appluing a lot of QA flag)
（Advantage）You can use good quality data.
（Disadvantage）The number of the pixels you can use
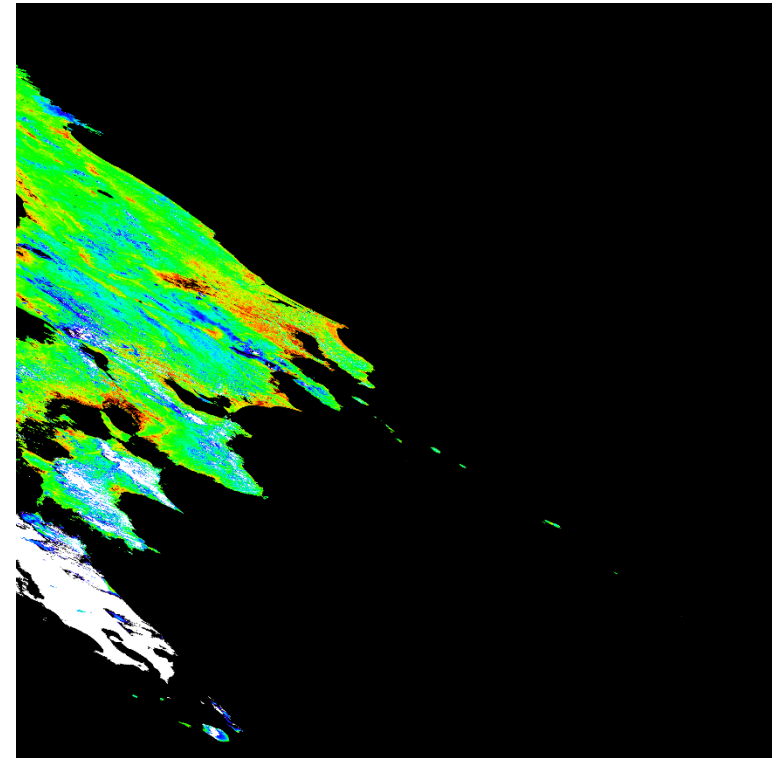will decrease.

Mask loosely (applying minimum QA flag)
（Advantage）The number of pixels you can use will
increase.
（Disadvantage）Including low quality data.

Excluded pixels of bit10-12

Unused QA flag