

### 3. Level 0 Input

#### 3.1 Decision of time input started

(1) LAC Image pickup mode

LAC scene is selected according to start, finish time and how far scene moves for GAC scene, which generated by each tilt segment. Number of LAC scene are basically fixed and in cases where tilt segment which includes LAC is larger than the fixed size, scene can be relocated within the extent of tilt segment. In cases where tilt segment is smaller, entire segment becomes LAC scene. Therefore, in cases where tilt segment is larger than LAC size, time input started is calculated by the following equation:

$$T_{0LAC} = T_{0GAC} + (T_{0GAC} - T_{1GAC} - L_{LAC}) / S \times (S / 2 + M) \quad (3.1-1)$$

Where,

$T_{0LAC}$ : Time LAC input started

$T_{1GAC}$ : GAC Start time

$T_{0GAC}$ : GAC Finish time

$L_{LAC}$ : Time equivalent to LAC scene size  
 = LAC number of scanning line \* scanning period

$S$ : Number of steps (8) in distance scene moved

$M$ : Distance of scene moved (-4 to 4)

Time input finished is expressed as follows:

$$T_{1LAC} = T_{0LAC} + L_{LAC} \quad (3.1-2)$$

In cases where tilt segment is smaller than LAC size, input start time and finish time should be the same as the one of GAC.

The way LAC scene is determined as shown in Figure 3.3-1.

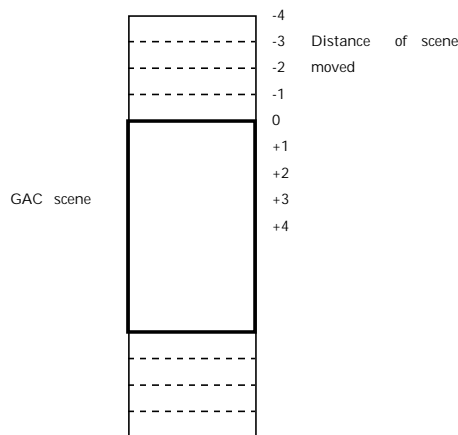


Fig. 3.1-1 Determination of LAC scene

(2) LAC Calibration mode

In case of calibration data, scene is designated by latitude argument. Latitude argument is transformed into time by the following procedures:

First, input orbit data and calculate latitude argument of that position  $\gamma_0$  with the orbit data closest to observation start time on 0 input level:

$$\begin{aligned} \gamma_0 &= \arcsin(\sin \phi / \sin i) \quad \dots \quad (Z' > 0) \\ \gamma_0 &= \pi - \arcsin(\sin \phi / \sin i) \quad \dots \quad (Z' < 0) \end{aligned} \quad (3.1-3)$$

However, 
$$\sin \phi = \frac{Z}{\sqrt{X^2 + Y^2 + Z^2}}$$

Where  $(X, Y, Z)$  : Satellite position (ECI coordinates)  
 $(X', Y', Z')$  : Satellite velocity (ECI coordinates)  
 $i$  : Orbit tilt angle

In the formula, cases where a value of  $\sin \phi / \sin i$  is greater than a fixed value, that is; in case of  $\sin \phi / \sin i > \sin \phi_{\max}$ , calculation should be performed not using this format but the following orbit data. Suppose time of orbit data used for calculation is  $T_0$ , start latitude argument is  $\gamma_1$ , finish latitude argument is  $\gamma_2$ , input start time  $T_1$  and finish time  $T_2$  are calculated by the following equation:

$$\begin{aligned} T_1 &= T_0 + (\gamma_1 - \gamma_0) / 2\pi \cdot T_s \\ T_2 &= T_0 + (\gamma_2 - \gamma_0) / 2\pi \cdot T_s \end{aligned} \quad (3.1-4)$$

In this formula,  $T_s$  is nodal period.

For input of level 0 data, it is necessary to determine scan time for each frame in order to determine input start frame. Refer to 4.1 "Calculation of scan time" for methods to decide scan time. With frame time  $T_F$ , extent for input is as follows:

$$T_1 < T_F < T_2$$

(Note the sign of equality)

(3) Others

In case of GAC, RTC and near-real processing, entire level 0 data which has been designated should be input.

### 3.2 Subsampling input of GAC

For GAC (Global Area Coverage) data, the resolution is degraded with subsampling of image data to process wide area of data. When it is required to process large volumes of data for this subsampling procedure, it is performed at the same time as input Level 0 data from DI cassette. Therefore, if simple subsampling is performed during input, accuracy only stays pixel size after subsampling even if registration correction is performed afterwards. Subsampling with registration correction should be performed during input. Since it is difficult to perform precise interpolation calculations line by line by referring to telemetry data, pre-generated subsampling table should be referred to perform this process. Since generating one line data to perform registration correction required data with multiple scanning (three scanning before and after), in order to connect level 0 data generated in increments of receiving segment, connecting points of segments are processed later with several image data frames stored.

#### (1) Creating subsampling table

The same calculation for LAC processing is applied to registration correction; however, nominal circular orbit (has the same orbital track as RSP definition) is used for orbit data, nominal value for tilt angle and 0 is used for attitude angle. Table should be created by an extent of certain latitude arguments as to nominal altitude and satellite altitude top and bottom 10 km. When referring to this, use the table of the closest altitude searched by performing correlation between latitude argument and time and then calculating satellite orbit radius by each latitude argument. Refer to section 6.4 for registration correction methods. Procedures for subsampling input are as follows:

a. Input orbit data from level 0 tape and select orbit data of the lowest altitude between scene start and finish time (that is, whichever has smaller absolute value of Z coordinates).

b. Calculate latitude argument by 3.1.3 equation. In this calculation, if latitude argument is  $\gamma_0$ , and time is  $t_0$ , the relationship between latitude argument and time  $t$  is expressed as follows.

$$t = t_0 + T_3(\gamma - \gamma_0) / (2\pi). \quad (T_3 \text{ is nodal period})$$

c. Input latitude argument value that indicates the range of using the same subsampling table from database and transform the latitude argument into time by equation b. and transform applicable range into time range.

d. Express orbit radius of satellite as  $\gamma = X^2 + Y^2 + Z^2$  using orbit data of satellite and search subsampling table file from satellite altitude and central latitude argument of each range and input subsampling table of each tilt angle (  $-20^\circ$ ,  $0^\circ$ ,  $20^\circ$  )

## (2) Subsampling processing

Table to be used is determined by referring tilt angle of telemetry DSP status during data input. However, when determining tilt angle by telemetry data, if continued for certain lines (input from database) after tilt angle is changed, it is regarded that tilt angles has actually been changed in order to avoid anomalous data caused by bit error. In cases where time range for using table is changed, table should also be switched and the line number used for switching should be recorded.

During subsampling process, in cases where pixel position at input side corresponding to objective pixel exceeds the extent of valid scanning in the direction of column or exceeds before the start of image picking or excess before/after tilt angle changes, dummy data is set and a flag to indicate "out of scan" should be stood.