Pi-SAR-L2 Geometric Conversion and the contents of the facter_md (Version 5), Feb. 11, Shimada Masanobu

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The following equation (1) can convert the pixel(in x direction)/line(in y direction) to latitude/longitude of the SLC and geo-coded products.

(1-1):SLC data or ground range data

$$lat = \sum_{i=0}^{mmr-1}\sum_{j=0}^{mma-1} a_{i,j}\left(pixel - pixel_c\right)^{mma-1-j}\left(line - line_c\right)^{mmr-1-i} + lat_c$$

$$lon = \sum_{i=0}^{mmr-1}\sum_{j=0}^{mma-1} b_{i,j}\left(pixel - pixel_c\right)^{mma-1-j}\left(line - line_c\right)^{mmr-1-i} + lon_c$$

(1-1)

(1-2) Geo-reference and geo-code data (including Ortho-rectified data)

$$lat = \sum_{i=0}^{mmr-1}\sum_{j=0}^{mma-1} a_{i,j}\left(line - line_c\right)^{mma-1-j}\left(pixel - pixel_c\right)^{mmr-1-i} + lat_c$$

$$lon = \sum_{i=0}^{mmr-1}\sum_{j=0}^{mma-1} b_{i,j}\left(line - line_c\right)^{mma-1-j}\left(pixel - pixel_c\right)^{mmr-1-i} + lon_c$$

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(1-2)

$$a_{i,j} = fac[j + i \cdot mma]$$
$$b_{i,j} = fac[j + i \cdot mma] \qquad (1\text{-}3)$$

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Incidence angle of the target at pixel is expressed by

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$$inci(\deg ree) = \sum_{i=0}^{mmr-1} c_i \cdot r^i \qquad (2)$$

$$c_i = fac[i]$$

$$r = r0 + dr * pixel \qquad (3)$$

here, r is the slant range distance to the pixel, and r0 is the shortest distance, dr is the increment.

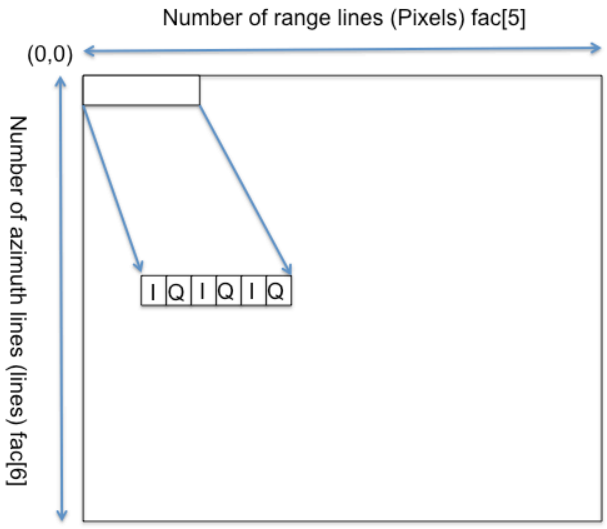

Figure 1 Coordinate system

Data format of the related factor is facter_md

No	Contents	Remarks
0	Acquisition year (YYYY)	
1	Acquisition date (DDD) (Total dates in a year 年内通算日)	

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2	Acquisition second (SSSS.SS)（日内通算秒）	
3	Latitude of scene center (radian): latc	
4	Longitude of scene center (radian): lonc	
5	Image size: nx- > pixelc=nx/2	$pixel_c$
6	Image size: ny>linec=ny/2	$line_c$
7	mmr	
8	mma	
9	process level : 0:SLC, 1:gcode,2:ortho	
10	Prf(Hz)	At the origin and ECR
11	X (km)	Ditto
12	Y (km)	Ditto
13	Z (km)	Ditto
14	Vx (km/s)	Ditto
15	Vy (km/s)	Ditto
16	Vz (km/s)	Ditto
17	Imaxa: This line number is used for the	Number of lines of SLC data generation
18	Doppler gradient a	Fd=a*r+b
19	Doppler offset b	Fd=a*r+b
20	r0	r=r0+dr*j
21	dr	r=r0+dr*j
22~22+ $mm_r x mm_a$-1	a	
22+$mm_r x mm_a$~ 22+2x$mm_r x mm_a$-1	b	
22+2x$mm_r x mm_a$~	c	

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mm_r-1		
22+2xmm_rxmm_a~ mm_r	number of pixels (in X)	Level 1.5, 2.1 の場合
22+2xmm_rxmm_a~ mm_r+1	Number of lines (in Y)	Level 1.5, 2.1 の場合
22+2xmm_rxmm_a~ mm_r+2	X coordinate of the upper/left corner of the map	Level 1.5, 2.1 の場合
22+2xmm_rxmm_a~ mm_r+3	Y coordinate of the upper/left corner of the map	Level 1.5, 2.1 の場合
22+2xmm_rxmm_a~ mm_r+4	Pixel spacing (km)	Level 1.5, 2.1 の場合
22+2xmm_rxmm_a~ mm_r+5	NA (system parameter)	Level 1.5, 2.1 の場合
22+2xmm_rxmm_a~ mm_r+6	Left/upper latitude 左上隅の緯度 (degree)	Level 1.5, 2.1 の場合
22+2xmm_rxmm_a~ mm_r+7	Left/upper longitude 左上隅の経度 (degree)	Level 1.5, 2.1 の場合
22+2xmm_rxmm_a~ mm_r+8	Right/upper latitude 右上隅の緯度 (degree)	Level 1.5, 2.1 の場合
22+2xmm_rxmm_a~ mm_r+9	Right/upper longitude 右上隅の経度 (degree)	Level 1.5, 2.1 の場合
22+2xmm_rxmm_a~ mm_r+10	Right/bottom latitude 右下隅の緯度 (degree)	Level 1.5, 2.1 の場合
22+2xmm_rxmm_a~ mm_r+11	Right/bottom longitude 右下隅の経度 (degree)	Level 1.5, 2.1 の場合
22+2xmm_rxmm_a~ mm_r+12	Left/bottom latitude 左下隅の緯度 (degree)	Level 1.5, 2.1 の場合
22+2xmm_rxmm_a~ mm_r+13	Left/bottom longitude 左下隅の経度 (degree)	Level 1.5, 2.1 の場合

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Potion at the nth line can be estimated by the following equations

$$x_i = x_0 + v_x \cdot \frac{i}{prf}$$
$$y_i = y_0 + v_y \cdot \frac{i}{prf}$$
$$z_i = z_0 + v_z \cdot \frac{i}{prf}$$