# A TEST ON THE GENERATION OF ADDIDTIONAL PRODUCT FROM THE KOMPSAT-2 TERMINAL FOR POLAR SYSTEM

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**ABSTRACT** The final product generated from the KOMPSAT-2 Terminal for Polar System, K2PS, is an ellipsoid projected image. This leaves a relief displacement on the image by process of which the height value of subject area is constant. In this paper, orthorectification using the SRTM was used to remove such artifacts, and thereafter, the additional product that could be generated from the K2PS was discussed.

**KEY WORDS :** K2PS, ellipsoid projection, orthorectification, SRTM, product

## 1. INTRODUCTION

The K2PS supplies an image with map coordinates for users through automatic processing with the KOMPSAT-2 image reception and processing system established in the North Pole. The final product is a map projected image with ellipsoid, so it has a distortion following the change in the subject's topography. The use of SRTM, which is distributed for free, is expected to generate and configure the image product applied such distortion calibration, and it was tested in this study.

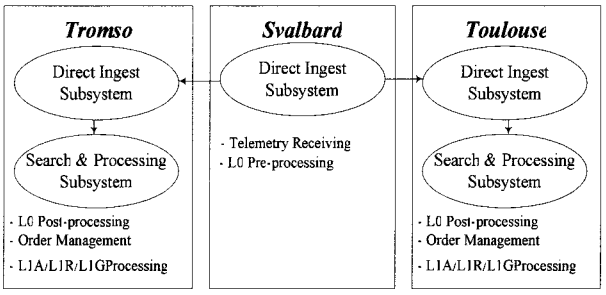
Before the test was conducted, the system and image generated from the present system were introduced, and the possibility of additional product generation was discussed through the result of test.

## 2. SYSTEM OVERVIEW

*KOMPSAT-2 Terminal for the Polar System*

The K2PS was established in *Svalbard*, and it uses an X-band antenna to receive image and auxiliary data as well as generates an image product to meet the KOMPSAT-2 standard product specifications. This product forms three other products consisted of L1A, L1R, and L1G. The L1A and L1R products mainly calibrate the radiometric and geometric corrections caused by the physical characteristics of the MSC sensor, while the L1G product is the image that calibrates the geometric distortion between raw image and corresponding space. In addition, upon the demand of a user, the MTFC and RPC information are provided along with the L1R and L1G images.

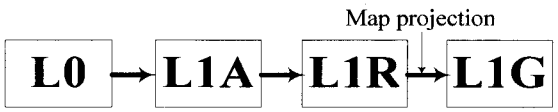
**<Figure 1>** displays the K2PS structure.




**<Figure 1> K2 Terminal System Hierarchy**

The K2PS level processor installed in *Troms* and *Toulouse* respectively generates the L1A, L1R, and L1G products after receiving the pre-processed L0 data obtained from *Svalbard*. The final product is the 1G product and has the WGS84 UTM coordinate.

**<Figure 2>** displays the level process procedure.




**<Figure 2> K2PS Level Process Procedure**

In this paper, the 1R image and RPC information generated from the system and the SRTM provided by NASA were used to generate the orthorectified image, and the possibility of additional product generation was discussed based on the results.

## 3. ORTHORECTIFIED IMAGE GENERATION

### 3.1 MSC MULTI-SPECTRAL IMAGE

The image that was used in the test was the multi-spectral image acquired on July 11th in 2008, which has a 4-m GSD, and the subject area was *Aix-en-Provence* in France.

<Figure 3> K2PS Multi-Spectral Imagery

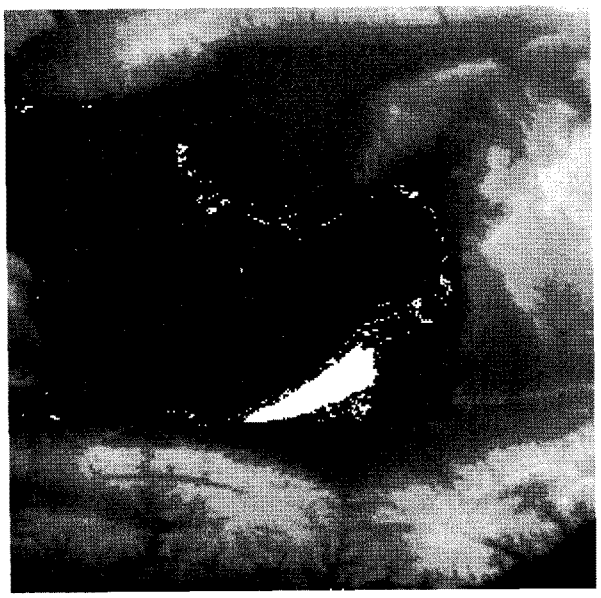
### 3.2 SENSOR MODEL: RPC MODEL

K2PS uses the MSC physical sensor model and DEM data to extract the RPC coefficient. The extracted coefficients have a location error owing to the used DEM and physical model. There is thus a need for a model adjustment process. However, the purpose of this test is to produce a product that has a global coverage without the use of GCPs, whose adjustment process has been omitted.

### 3.3 COARSE DEM: SRTM

The DEM data is the SRTM ARC-3 (3 arc seconds) provided by NASA. The used SRTM was cropped with a 1 degree interval for each longitude and latitude, therefore the overlapped area with an image can be selected using each longitude and latitude as parameters. The selected data is the area with a north latitude of 43~44 degrees and an east longitude of 5~6 degrees.

<Figure 4> SRTM tile with Data Holes



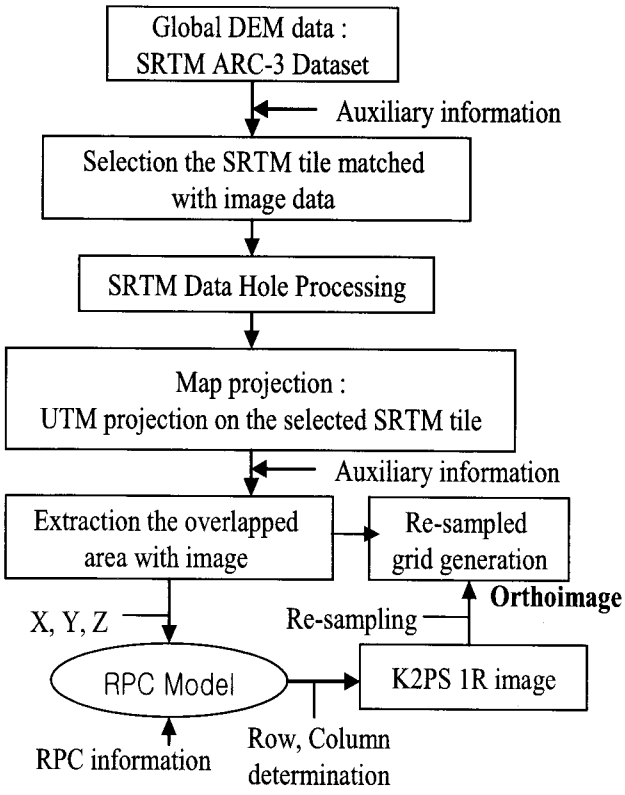
<Figure 5> Data Holes in the SRTM tile

As shown in **<Figure 4>** and **<Figure 5>**, there are many data holes in the water area. This is the issue of the SRTM data: There is a need for filling work through the pre-processing. **<Diagram 6>** shows the result of the pre-process on the original SRTM data with data holes.

**<Figure 6> Pre-processed SRTM tile**

### 3.4 WORKFLOW

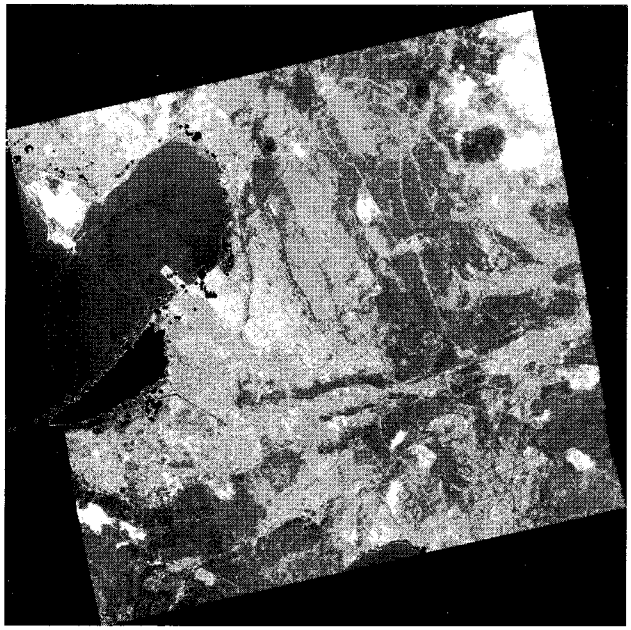
The workflow is shown in **<Figure 7>**.



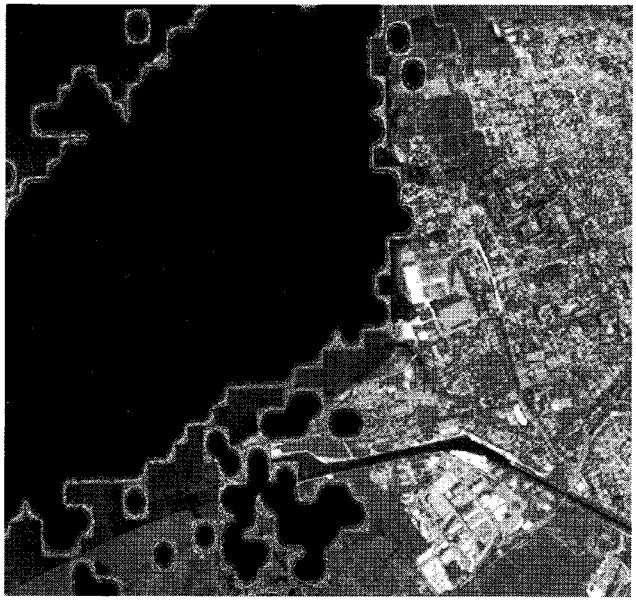

**<Figure 7> Work Flow**

## 4. RESULTS

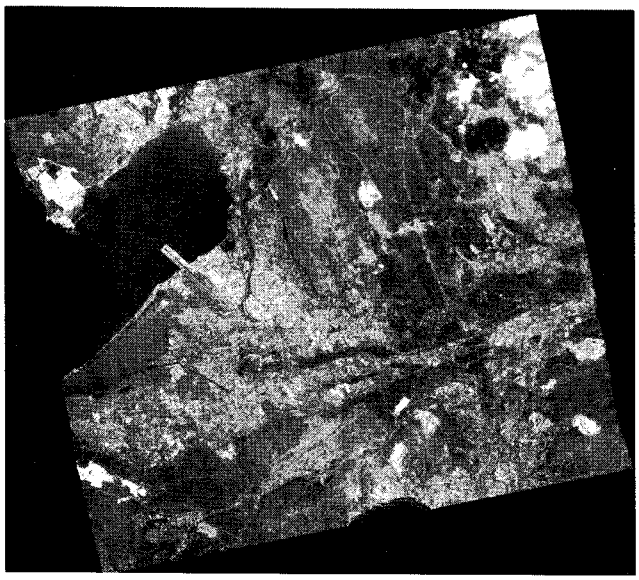
**<Figure 8>** and **<Figure 10>** show the result of orthorectification using the SRTM with data holes, and using the SRTM without data holes.



**<Figure 8> Generated Orthorectified image using SRTM with Data Holes**



**<Figure 9> Artifacts caused by Data Holes**



**<Figure 10> Generated Orthorectified image using SRTM without Data Holes**

It is clear that there is a difference in the image quality due to the presence of data holes. As such a reason, SRTM pre-processing must be performed before orthorectification.

The applied area is *Aix-en-Provence* in France. As such, the location accuracy evaluation was omitted due to the difficulty of obtaining GCPs.

## 5. DISCUSSION

Currently, the final product of K2PS, 1G image, is applied that the height value of subject area is the constant value when the map projection is made. It thus leaves the resident distortion following the topography changes. Therefore, if the SRTM is used as the global coarse DEM data, it is deemed to generate a product that is removed extra distortion to a certain degree. For this purpose, the following conditions have to be satisfied:

(1) The SRTM cannot display the elevation on object that has a drastic inclination, such as a bridge or building. As such a reason, the image to be used must be acquired in the maximum Nadir angle.

(2) The data hole disposition that the chronic problem in the SRTM has to be resolved, and the algorithm optimization is required to improve the process speed.

## REFERENCES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