# CARTOSAT IMAGERY APPLICATION CAPABILITIES TO UPDATING TOPOGRAPHIC MAPS, ESPECIALLY VMAP LEVEL 2

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ABSTRACT:

VMAP Level  is the basic scale concerning digital military maps. Its dynamic change requires frequent updating to maintain high degree of topicality. The paper analyzes the geo-interpretation potential of Cartosat images in comparison with other satellites. VMAP level 2 updating results for Cartosat and other satellite systems are presented. Additionally, application of Cartosat images to the map updating in some information ranges is presented on the example of the 1:10000 scale topographic map.

## 1. INTRODUCTION

The Indian CARTOSAT-1 satellite was designed mainly for cartographic applications and therefore its images should be perfect for updating maps. CARTOSAT-1 has two high resolution panchromatic sensors imaging the Earth's surface in the visible range. The space resolution of the images is 2.5 m while the imaging strips are about 30 km wide. Since the space resolution is almost two times higher than of the previous Indian IRS satellite and the radiometric resolution has improved, it is likely that Cartosat products will be frequently used in various types of GEO works.

To determine the possibilities to use the images in cartography, an attempt of qualitative and quantitative comparison with the Vmap Level 2 was made. The initial idea was to make the details comparison with Vmap Level 3 but it is not available for the area yet.

### Set of data

Two panchromatic (stereo) scenes from the vicinity of Rawa Mazowiecka (51° 42',5 N; 20° 23',0 E) were delivered. The scene dimensions were 26.5 km times 29.5 km.
Data acquisition date: 25 February 2006
Cloudiness: none
Image quality: very good/good
Remarks: Snow cover (winter time scene)

## 2. DATA INTERPRETATION AND ACQUISITION BASED ON THE CARTOSAT ORTHOPHOTOMAP.

An orthoimage was generated and a vector based on it in the first phase.

Objects detectable and recognizable on the Cartosat satellite data were vectored. These are: road network, forests and vegetation areas, crops areas, trees among fields, urban terrains and individual farm houses and individual houses beyond urban terrains, major rivers and streams and ponds, and flooding terraces. Some of the elements can be recognized only by a skilled interpreter who knows the local conditions (landscape types and characteristic vegetation types for the specific geographical region). The acquired thematic contents was compared with the contents of the V-map level2. It was done in a simple way consisting in visual comparison of layers including orthophotomap, Vmap contents and vectored data overlaid over one another.

When comparing accuracy of the V-map and orthophoto we notice that the location of V-map contents elements is less accurate than in the orthophoto from the Cartosat which is the result of the process of vectoring the V-map contents from the existing topographic maps of the 1:50 000 scale.
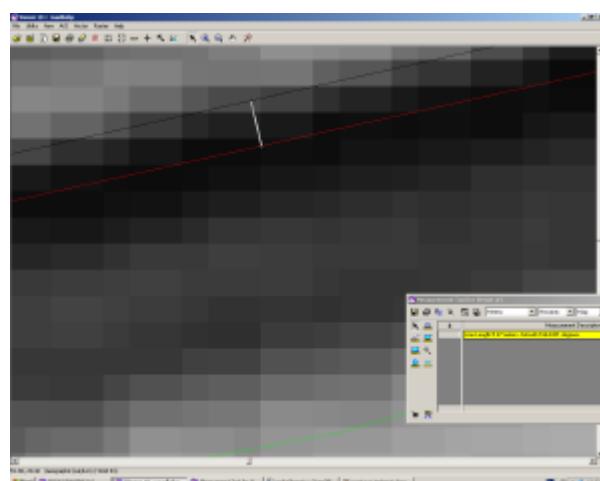


Figure 1. The accuracy of V-map contents compared to vectored a vectored fragment with indicated  roads

The examples below show the differences between the V-map level 2 contents and Cartosat data interpretation capabilities.

The date of the images acquisition is a problem in the experiment. Snow cover on the majority of the image made it impossible to accurately interpret topographic objects. For example, drainage ditches and small streams appear only as small groups of vegetation along them and the interpretation may yield wrong results.
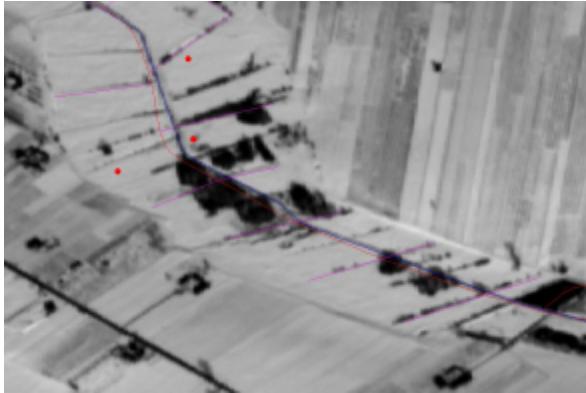
Figure 2. A vectored fragment with ditches and streams (blue - Cartosat, red - Vmap level 2)

Ice and snow covering the water tanks may cause interpretation difficulties – they are like other snow covered areas, Figure 3.
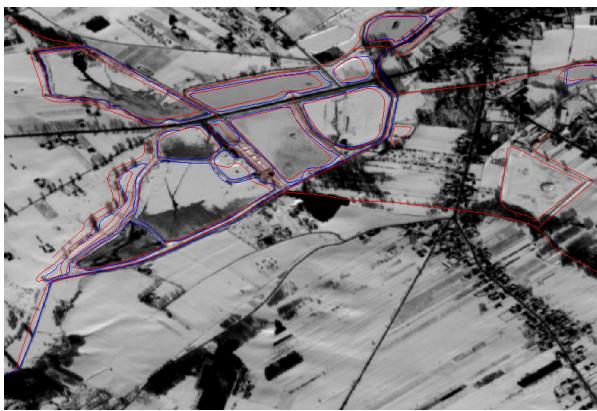


Figure 3. A vectored fragment with lakes and ponds (blue - Cartosat, red - Vmap level2)

Pixels resolution does not allow to distinguish buildings in an urban area. However, it allows to distinguish individual buildings in a non-urban terrain (farm houses and individual houses) as well as recognizing terrains with dense built-up areas, Figure 4.
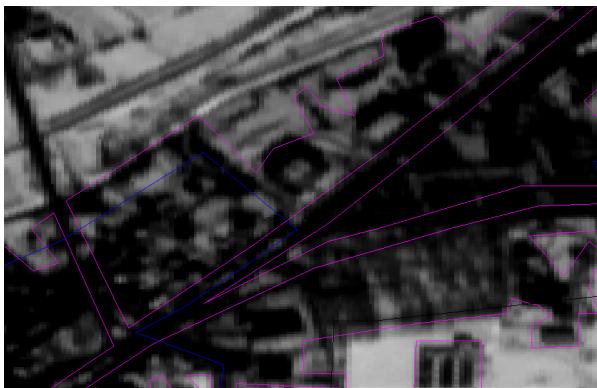


Figure 4. A vectored fragment with build up areas (blue - Cartosat, red - Vmap level2)

In cases when the snow cover or vegetation allows, some linear elements like fences and boundary walls may be recognized, Figure 5.



Figure 5. Fences and boundary walls

### 3. CONCLUSION

Maps with larger scale do show more details, so also more detailed object information is required. There is relation between the GSD or ground pixel size and the scale of the map based on the experience the following relation can be used:

GSD = 0.05 up to 0.1 mm in the map

The smaller value is valid for detailed maps in areas with a high number of details, while usually the higher value is sufficient [Jacobsen,2004].
The scene snow coverage diminishes its usefulness for acquiring information concerning land use and cover. Nevertheless, the results suggest that the satellite images may occur useful for updating topographic maps contents and as a layer in miscellaneous GIS systems because they provide high plannimetric accuracy and slightly worse interpretation capabilities due to recording only in the visible range of the electromagnetic spectrum by means of panchromatic sensors.

### 4. REFERENCES

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