

APPLICATION OF SATELLITE IMAGES FOR CARTOGRAPHIC PRESENTATION OF THEMATIC MAPS

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ABSTRACT

Satellite images, similarly to small scale maps show a synoptic view of a large area. However there is an important difference between images and maps. Small scale maps show an average condition of the surface for a long period of time (sometimes 10-15 years !) by traditional graphic representation methods. Images represent Earth's surface in a uniformly detailed way in one snapshot by a certain "photographic" appearance.

The result of interpretation is usually a thematic map showing a special subject extracted from the complex satellite image. Earlier it was necessary to apply such "poor content" maps because of limited representation possibilities.

The aim of "new concept" mapping is to compile complex thematic maps where further interpretation is possible. Using satellite images as "background maps" combining them with suitable graphic representation methods new type of thematic maps can be constructed.

The paper gives a review of satellite-cartographic products, and shows the application possibilities of thematic representation methods for satellite cartography.

Introduction

Satellite images similarly to small scale maps show a synoptic view of a large area. However there is an important difference between images and maps. Small scale maps show an average condition of the surface for a long period of time (sometimes 10-15 years !) by traditional graphic representation methods. Images represent Earth's surface in a uniformly detailed way in one snapshot by a certain "photographic" appearance.

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Satellite images as cartographic products

As satellite images represent Earth's surface they can be considered as "map like" pictures. Production of an image (ie. an original photography or scanner image) is

RÉSUMÉ - Application des images satellitaires à la présentation de cartes thématiques

Les images de satellites, comme les cartes à petite échelle, donnent une vue synoptique des territoires étendus. Néanmoins on peut constater une différence importante entre les images de satellites et les cartes. Les cartes à petite échelle représentent une condition moyenne de la surface sur une longue période (10-15 ans) avec des méthodes cartographiques traditionnelles. Les images de satellites représentent la surface de la Terre à un moment donné avec des détails uniformes par une certaine appréhension « photographique ».

Le résultat de l'interprétation est normalement une carte thématique montrant un sujet particulier tiré de l'image satellitaire complexe. Auparavant il était nécessaire d'utiliser de telles cartes à « contenu restreint » à cause des possibilités limitées de la représentation cartographique.

Le but de la cartographie de « principe nouveau » est de produire des cartes thématiques qui servent de matériau de base pour une interprétation ultérieure. La combinaison des images satellitaires et de représentations graphiques complémentaires nous donne des cartes thématiques d'un nouveau type.

La communication résume les possibilités de l'application des méthodes de représentation thématique de la cartographie satellitaire.

more than thousand times quicker than that of a same scale map. The number of images and remotely sensed data stored at data centers increases from day to day and during the last 25 years it has exceeded the number of traditional maps. There are remote areas of the Earth of which satellite images give more detailed information than the available maps do. Table I. gives a review of the system of satellite cartographic products.

The "original" image forms of satellite pictures are usually spectrally corrected scenes being used as "maps" for illustrations of different earth surface phenomena. In this case geometrical fidelity is not important as stress is only on the feature illustrated. Radiometric corrections like contrast stretch, edge and colour balance enhancement can be applied to get an optimal image for further interpretation. Generally they give a complex view of the surface so a general legend cannot be applied to them : they have to be interpreted.

Interpreted images form the next group of satellite cartographic products. These are so-called sketch maps compiled by analogue interpretation or computer maps of digital classification. Their appearance depends on the method applied for the interpretation.

Photomaps are special products where original satellite image is conserved in the form of a background map and cartographic content is introduced to get a real map. Depending on the type and rate of cartographic representation "general" and "thematic" photomaps can be distinguished.

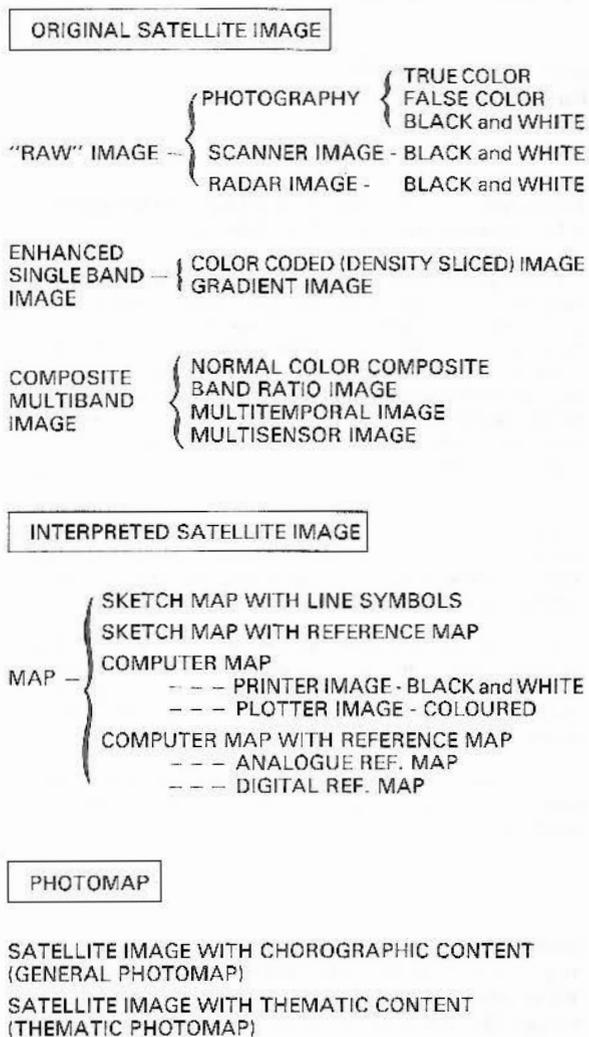


Table 1. Satellite cartographic products

Cartographic methods for image maps

Cartography applies graphic symbols to represent different features and phenomena of earth surface. Depending on the area the symbols relate to, there are three types of symbols distinguished: point, line and area symbols. Combining satellite images with cartographic symbols an important problem arises: how much of the image area is covered by graphic lines - how much of the original data has disappeared behind the symbols.

Fig. 1. illustrates how cartographic symbols can be combined with the "photographic" display of images.

In Fig. 1. A. the graphic symbol totally covers the image content. In this case the image generally appears in single colour form and symbols are multicoloured.

Fig. 1. B. shows a similar situation. Here areal symbols (dense net of lines or symbols) cover the image area making the image invisible. Single coloured symbols give a good combination with singlecoloured or multicoloured images as well.

In Fig. 1. C. line symbols are applied to represent generally boundary lines or other linear features interpreted. It is a frequently used representation method. The single coloured lines give a good combination with multicoloured images as well, though the linear features of the original image disappear behind the line symbols.

Fig. 1. D. shows a combination of a single coloured image with an areal colour symbol. Though the symbol covers the image making a homogenous "foggy" effect but the image is visible under the colours. The more light and pale the colours are, the better the image is interpretable. Applying more (5-7) colours there can be a confusing contrast between the different parts of the image.

An optimal combination is illustrated in Fig. 1. E., where interpreted image parts appear in different colours. Though the contrast between the colours is rather high, no image content is lost. The high contrast can be balanced by combining the interpreted colour image with a single coloured original getting a "subject enhanced" composite image.

Subject enhanced color composite ("SECC") maps

The procedure making a SECC is illustrated in Fig. 2. An analogue or digital classification precedes the process. According to the interpreted areal categories and colours chosen for final appearance a mask series is constructed. Through a normal "pre press" masking process screened colour separations are produced where the original screened single band image is used as raster screen. To obtain an interpretable and more homogeneous image the single band classified image is combined with a "neutral" color image of the same band or another one, depending on the subject of classification. A good example is a classified Landsat MSS 5 image combined with MSS 7 in blue. Sometimes - depending on the area and season - normal color composites can also be combined with classified image.

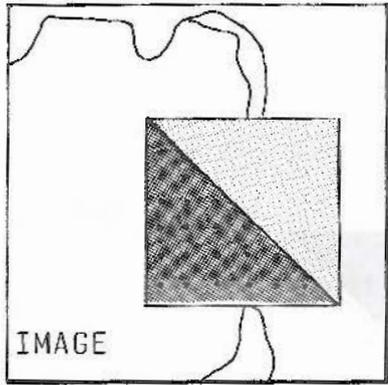
The result is a subject enhanced color composite, where map categories are represented by certain colour groups ie. well separable colours in a broad scale of density. Separation of 6-8 colour categories is optimal.

SECC maps are especially useful in thematic earth science mapping where further interpretation can be important eg. in landscape, relief, geologic and geomorphological maps.

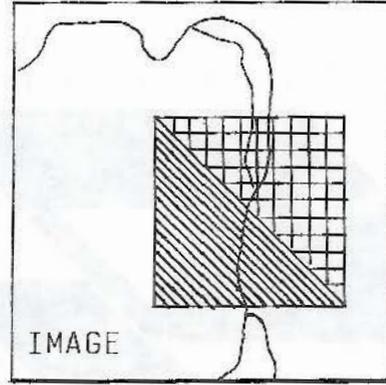
Conclusion

Satellite images give a broad scale basis for thematic mapping also for cartographic presentation of maps. Satellite photomaps ie. images combined with a variety of traditional cartographic symbols represent a special new type of maps.

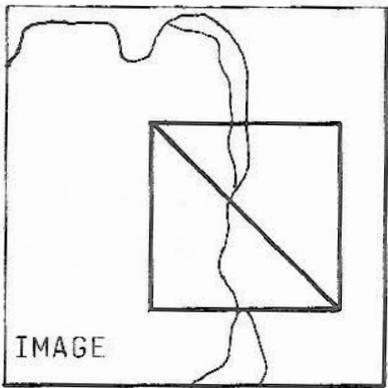
Applying these maps the task of cartography is changed. Instead of representing known data satellite photomaps - especially SECC maps - offer a possibility for further interpretation to obtain new informations making the content of mapping more complex and forming a close connection among earth sciences.



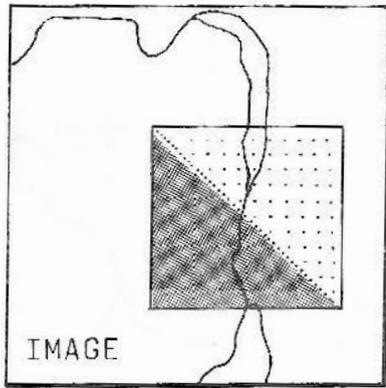
A.



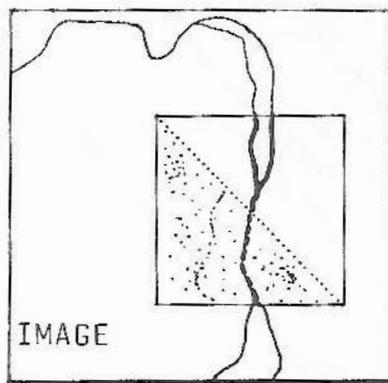
B.



C.



D.



E.

Figure 1. Image - symbol combinations in photomaps

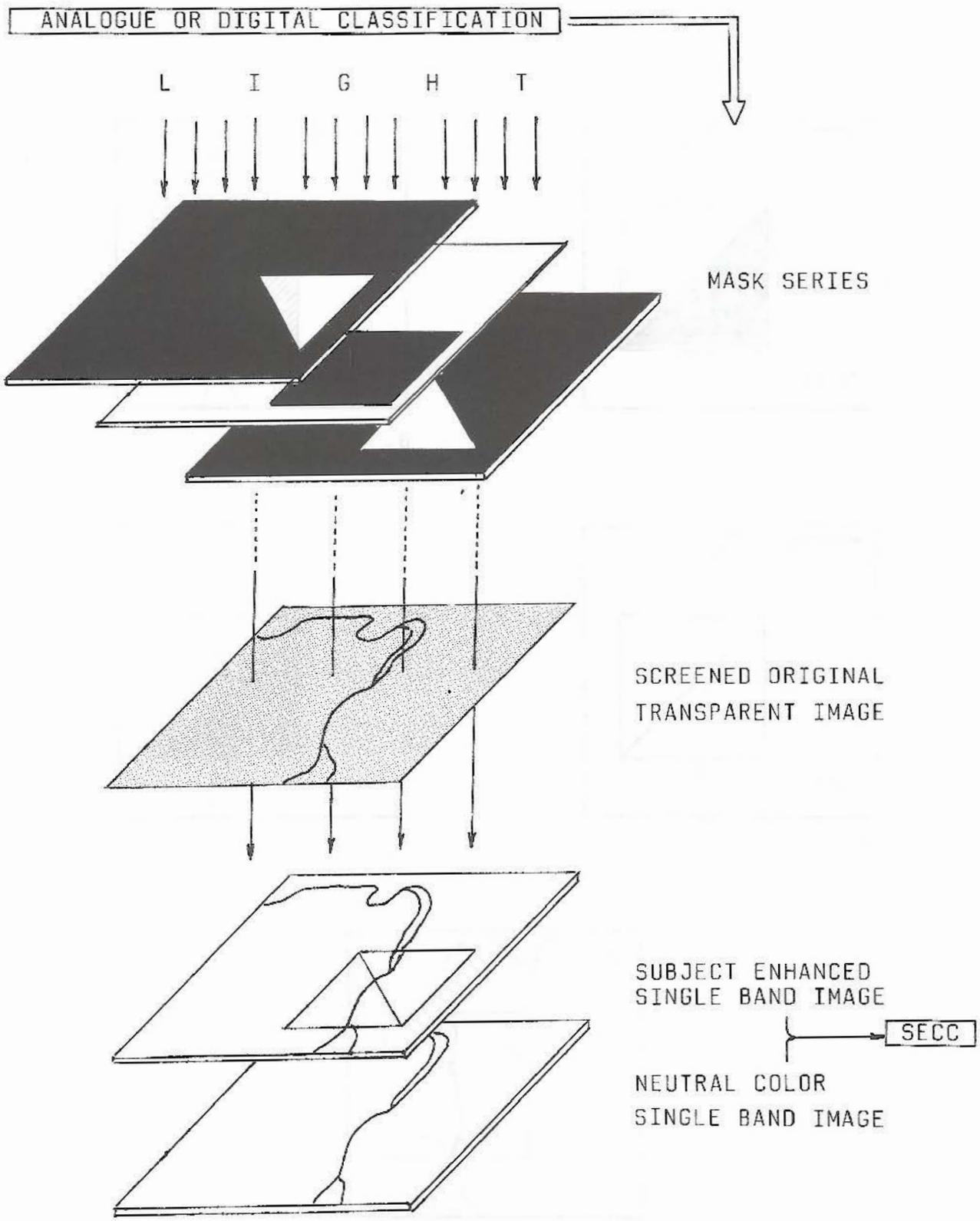


Figure 2. Construction of SECC maps

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