

# MAPPING OF REGIONAL TRANSPORTATION NETWORK WITH MEDIUM RESOLUTION SATELLITE IMAGERY

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## 1. INTRODUCTION

- ❖ Social and economic development of a nation depend on availability of good transportation network
- ❖ In most developing countries of Africa, ground transportation network consists mostly of roads, scattered railways and a few developed waterways.
- ❖ Road transportation however remains the most prominent system of transportation in Nigeria. Very few rail lines exist in the country. Many of the road networks are annually threatened by ecological forces such as soil erosion, landslides and flooding, especially in the southern part of the country.
- ❖ Constant monitoring of the state of these road are extremely important to planners
- ❖ Road transportation network in Nigeria consist of
  - \* Inter State Express Ways
  - \* Inter City Federal High Ways

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## INTRODUCTION CONTD.

- \* Major and Minor Tarrred Roads
- \* Untarred Roads and Footpaths
- ❖ This paper aims at identification and mapping of Road transportation network in the South Eastern Nigeria, using NigeriaSat-1 satellite imagery
- ❖ Satellite Remote sensing offer the advantages of global and regional view of the earth surface, which allows the analyst to perform whole studies of the phenomena of interest .
- ❖ The paper concentrates on the first three categories of road transportation network which can be mapped with the resolution of the satellite imagery available.

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## 2. THE STUDY AREA

- ❖ **LOCATION**
  - Latitude 5° 56'N - 6° 25'N
  - Longitude 6° 45'E - 7° 08'E
- ❖ **AREA**
  - About 1625 \* 1625 pixels of NigeriaSat-1
  - Corresponds to 2704 Square Kilometers
- ❖ **VEGETATION**
  - Consists of pockets of rainforest, wooded shrub lands and farmlands
- ❖ **MAJOR ECOLOGICAL PROBLEMS**
  - The area is ravaged by soil erosion, the most prominent of which is gully erosion. Seasonal landslides and flooding also occur.

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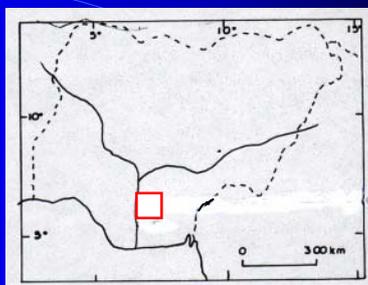


Fig. 1. Map of Nigeria Showing the Study Area

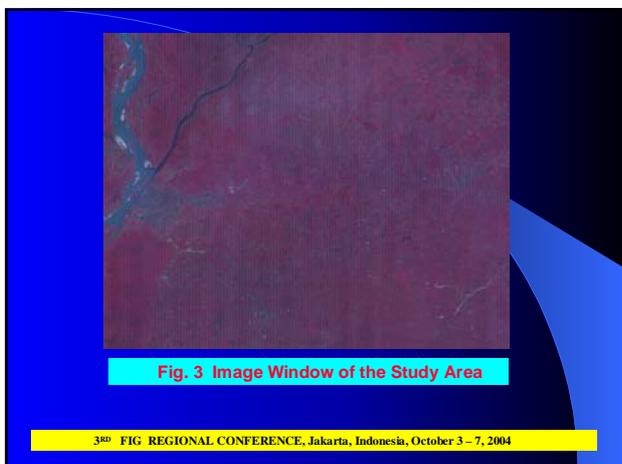
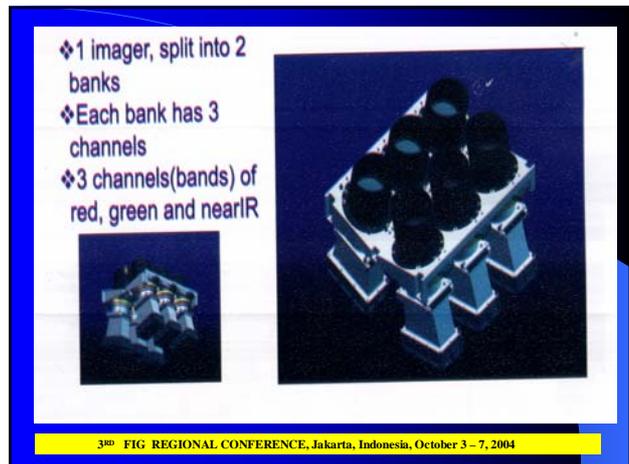
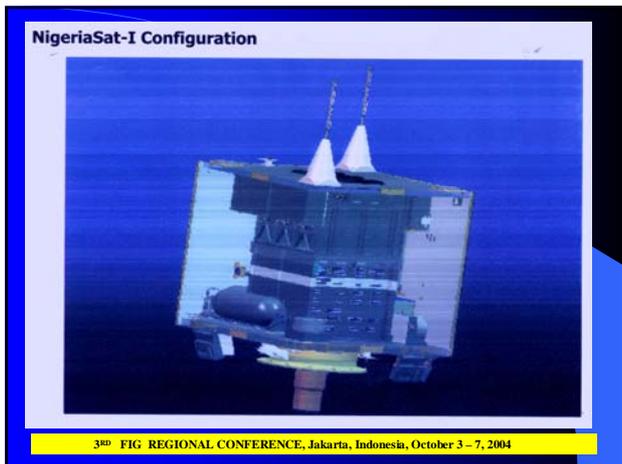
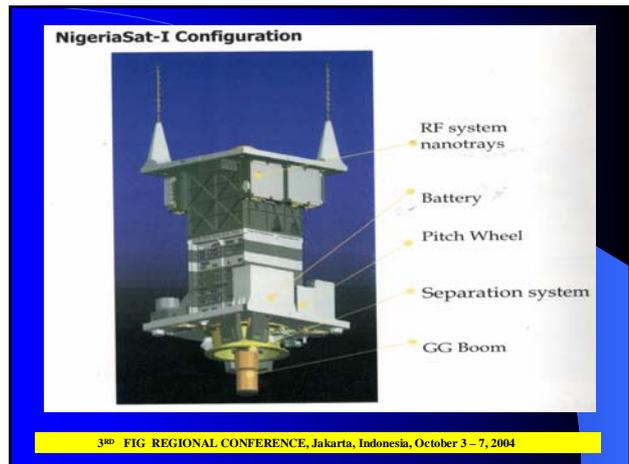
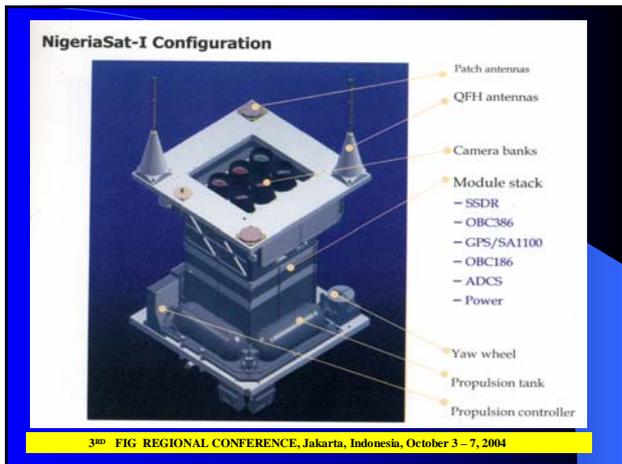
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## 3. NigeriaSat-1 IMAGE DATA

- ❖ Launch Date : 27<sup>th</sup> September, 2003
- ❖ Swath Width : 600 Km
- ❖ Ground Coverage: 600 \* 570 Km
- ❖ Image Recording: Multispectral in Bands
  - Green: 0.52 – 0.62  $\mu$ m
  - Red: 0.63 - 0.69  $\mu$ m
  - NIR: 0.76 – 0.90  $\mu$ m
- ❖ Ground Sampling Resolution: 32 m
- ❖ Typical Revisit: 3 – 5 Days

NigeriaSat-1 is a member of DMC constellations which include satellite systems from Algeria, Turkey, UK and China

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#### 4. DATA PROCESSING AND EXTRACTION OF ROAD NETWORKS

The Image Data was processed using the standard Digital Image Processing (DIP) techniques involving

- ◆ Radiometric Correction (mostly contrast manipulations t)
- ◆ Image Enhancement (Filtering – directional high and low pass filtering where necessary to enhance the visual quality of the image.

All the visible roads in the image were extracted. These include

- ◆ Inter State Expressway
- ◆ Major intercity Roads
- ◆ Major and minor tarred roads

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Table 2: Percentage of Completeness of the Extracted Roads

S/N o	Transportation Network	Identification from NigeriaSat-1	% of Completeness
1.	Inter State Express Ways	Clearly visible	100 %
2.	Major Intercity Highways	Visible	85
3.	Major tarred Toads	Visible on close zooming Covered by vegetation in some places	75
4.	Minor Tarred Roads	Partly Visible with zooming.	65

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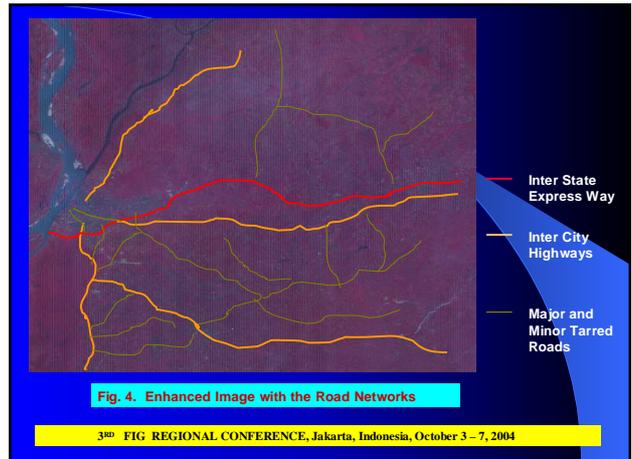


Fig. 4. Enhanced Image with the Road Networks

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## 5. COMPARISM WITH THE EXISTING MAPS

- ❖ Less than 10 % of the extracted roads are found in the existing topographic maps. This is not surprising because topographic maps in Nigeria are quite old have not been revised.
- ❖ The newer existing road maps contained most of the extracted roads. When the maps were digitized and overlaid with the extracted roads, they showed a close match

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## 6. CONCLUSION

- ❖ At the 32m sampling resolution, NigeriaSat-1 image can support the identification and mapping of regional transportation network at scales of 1: 150,000 – 1 : 250 000.
- ❖ The images can support small and medium scale map revision.
- ❖ NATIONAL SPACE RESEARCH AND DEVELOPMENT AGENCY(NASRDA), ABUJA, NIGERIA has already started preparations for NigeriaSat-2, which is expected to have ground resolution of 2.5m

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**THANK YOU FOR LISTENING**

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