



AMTEC RESOURCES MANAGEMENT S.A.

*CREATION OF A NATIONWIDE
GEOSPATIAL DATABASE*

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AMTEC - BACKGROUND

- ❑ Ground-breaking nationwide exploration, resource evaluation and development projects around the globe since the mid 1960s.
- ❑ Extensive experience in natural resource data acquisition, evaluation, management and monetisation, particularly in the exploration, mining, agriculture and environmental fields.
- ❑ Group resource investigations to date: 15 million km², more than 40 major projects, many on a nation-wide scale, in over 20 countries
- ❑ Projects bring significant boost to the mineral sectors of countries concerned (eg Tanzania gold and uranium development)
- ❑ Current projects allow countries' resource wealth to be developed and managed within a modern GIS-based geospatial databank
- ❑ Amtec assists clients to maximise their resource potential through better understanding & management of geospatial data

KEY PROJET STAGES

- Preliminary topographic, mapping and remote sensing database
- Nationwide Geospatial Database development
- Natural Resource Evaluation
- Target area follow up
- Development of Global Observatory
- Reporting, database update, marketing and promotion

WHY IS A NATIONWIDE GEOSPATIAL DATABANK NECESSARY?

- A nationwide geospatial databank concerns all information of a territorial nature
- Territorial information is the primary factor in the sustainable development of a country
- Territorial information must be maintained in a secure manner
- Territorial information must be widely accessible (subject to security safeguards)
- Territorial information must be kept up to date

GEOSPATIAL DATABANK DELIVERABLES

- ❑ **Main topics requiring adequate geospatial data:**
 - Optimisation of agriculture and rearing of animals
 - Infrastructure of the country (routes, railways, dams & waterways)
 - Optimisation of state administrative services
 - Prevention and management of natural risks
 - Optimisation of environmental management and forestry
 - Preservation of soil and erosion management
 - Optimisation of border defences
 - Security needs (National defence)
 - Optimal management of transport routes – for people & goods
- ❑ Localisation of mineral resources through geophysical survey
- ❑ Optimisation and management of mineral concessions

KEY ELEMENTS OF A MODERN NATIONWIDE DIGITAL GEOSPATIAL DATABANK

- ❑ New digital topographical mapping at 1/100,000 and 1/50,000 scales
- ❑ Digitization (vector) of existing thematic mapping:
 - Geology, Mineralogy, hydrogeology, land use, forestry etc
- ❑ Production of new thematic maps based on recent high resolution satellites + ground follow up:
 - Detailed ground use maps
 - Population density maps
 - Potential erosion maps
 - Flood risk maps
 - Landslide risk maps
- ❑ Establishment of a NATIONWIDE GLOBAL OBSERVATORY based on real-time low resolution satellite imagery

STAGES TO DEVELOPING A NATIONWIDE DIGITAL GEOSPATIAL DATABANK

- Application of the most recent technologies and methodologies regarding geospatial activities
- Development of a new mapping standard, based on modern parameters, fully digitized and based on recent high resolution satellite images
- Establishment of a new GPS-based geodetic network
- Development of a new nationwide Geographical Information System
- High level training plan for all nationals involved in the project

APPLICATION OF THE MOST RECENT TECHNOLOGIES AND METHODOLOGIES REGARDING GEOSPATIAL ACTIVITIES

- Complex utilisation of high and very high resolution satellite images
- Updating of the geodetic network, applying GPS-based millimetric measurement + levelling network
- Adoption of mapping norms (datum WGS 84 & UTM projection), regionally compatible
- Exploitation of GIS technologies

MODERN FULLY DIGITIZED MAPPING STANDARD, BASED ON RECENT HIGH RESOLUTION SATELLITE IMAGES

- ❑ New digital topographical mapping at 1/100,000 and 1/50,000 scales which will provide:
 - All linear components: routes, railways, high tension cables, hydrology
 - The primary infrastructures of the country
 - The urbanized zones
 - Rural settlements
 - Natural and agricultural land use

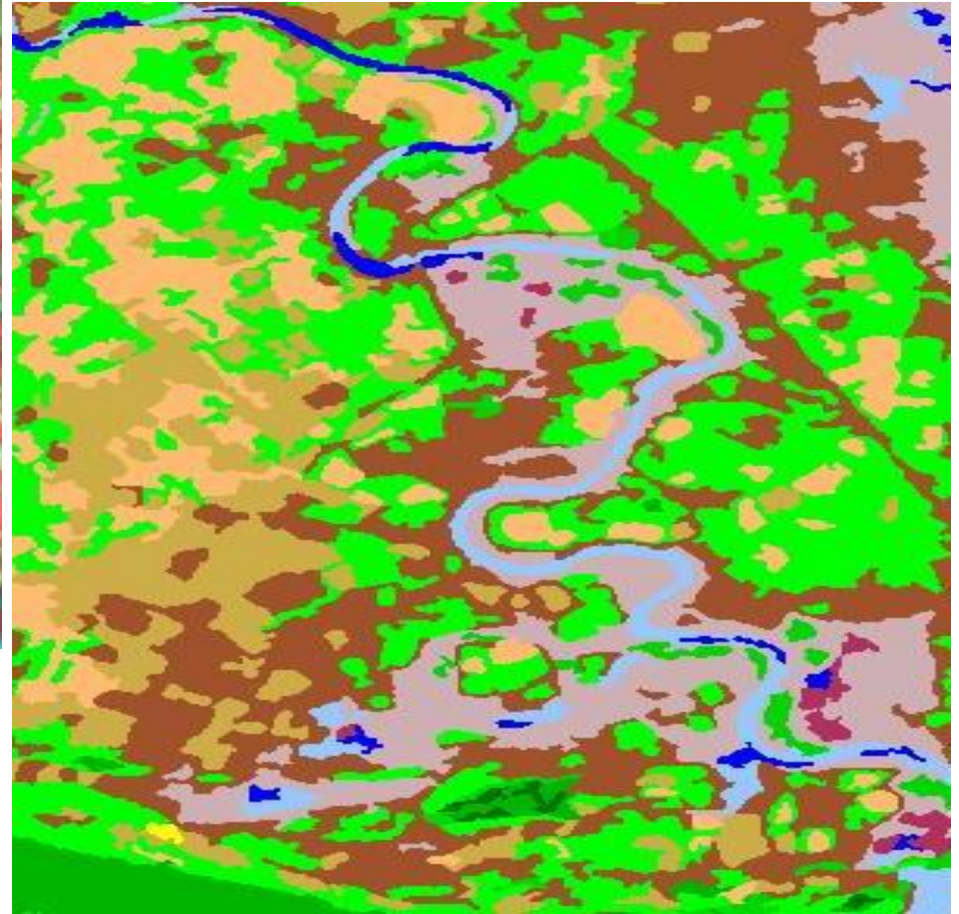
ACQUISITION OF HIGH RESOLUTION SATELLITE IMAGES

- Data from Earth Observation by satellite in very high and high definition :
 - IKONOS et GEOEYES satellites
 - Indian satellite LIS
 - SPOT 5 satellite:
 - 2,5 & 5m resolution in Panchromatic mode (B&W)
 - 10 & 20m resolution in Multispectral mode (colour)
 - Landsat 7 satellite:
 - 15 m resolution in Panchromatic mode (B&W)
 - 30 m resolution in Multispectral mode (colour)
 - 60 m resolution in infra-red mode

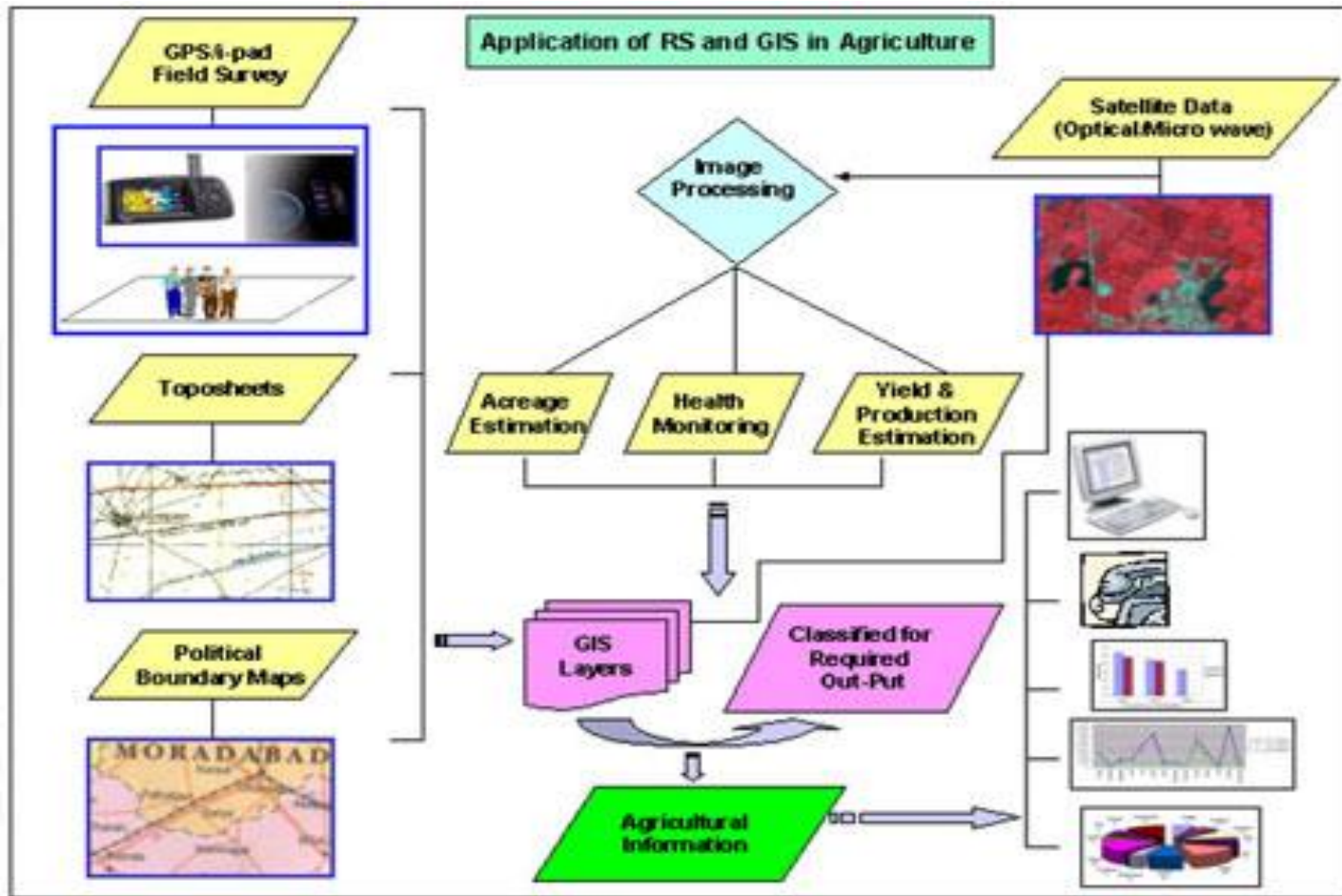
Digital classification of land use map



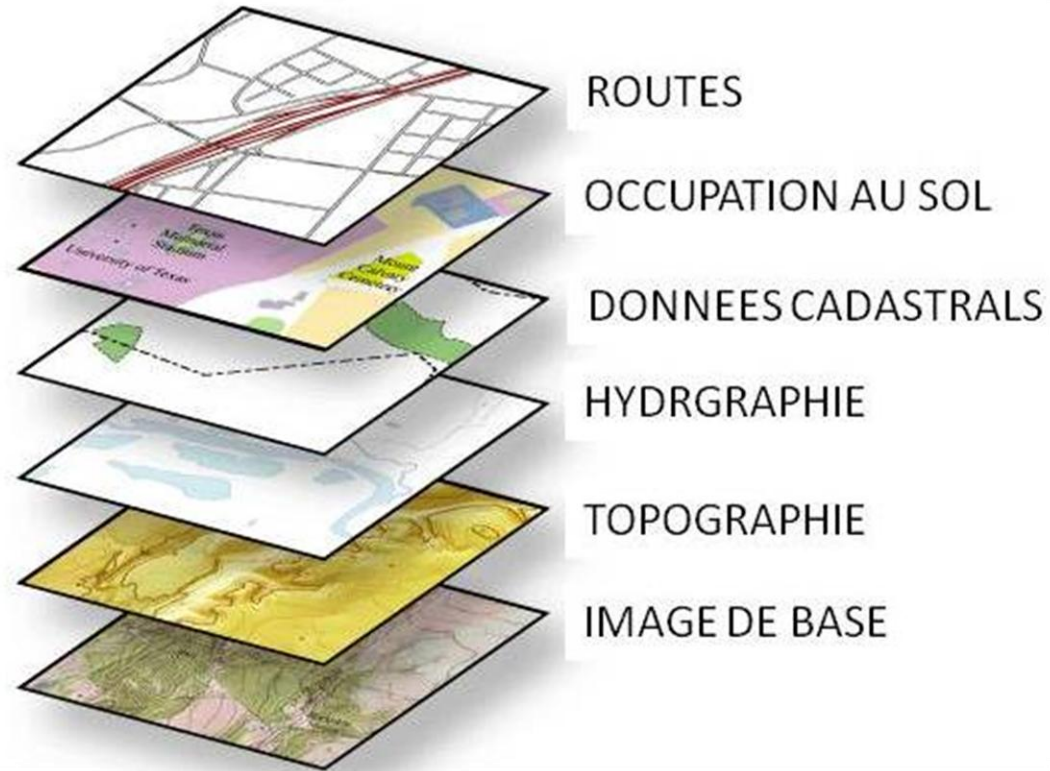
Extract from high resolution
satellite image satellite in false
colour



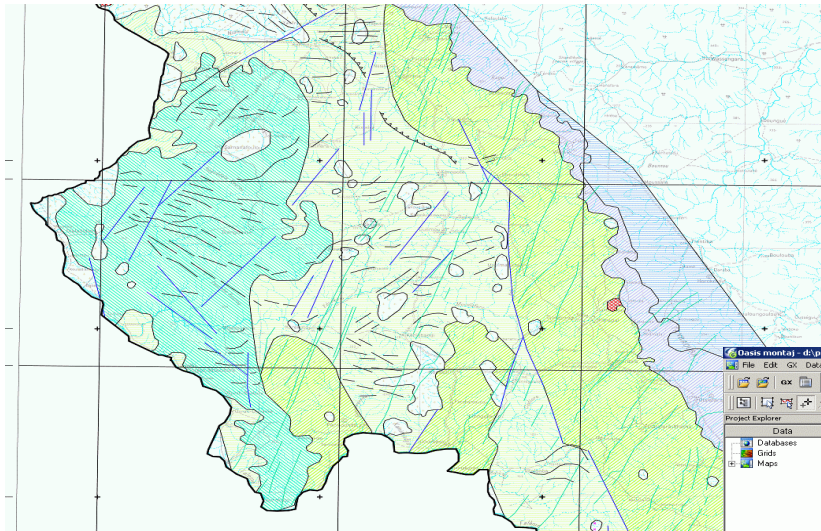
APPLICATION OF A GEOSPATIAL DATABANK FOR AGRICULTURE



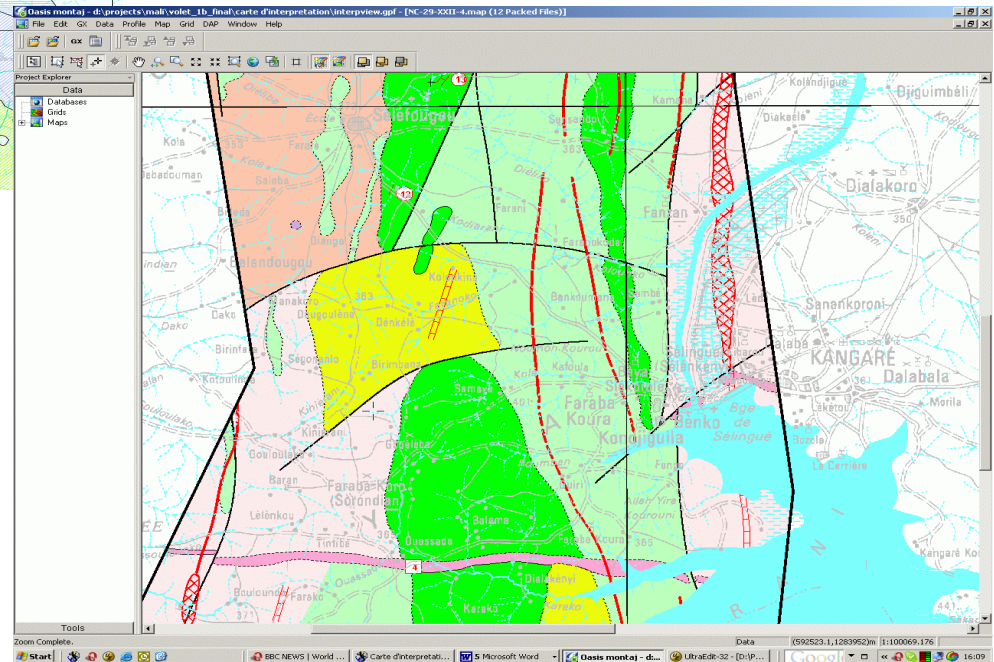
EXAMPLES OF “LAYERS” OF DATA IN A GEOSPATIAL DATABANK



PAPER VS. GEOSPATIAL DATABANK



Example of paper geological map



Example of digital geological map with topographical map underlay

PAPER VS. GEOSPATIAL DATABANK

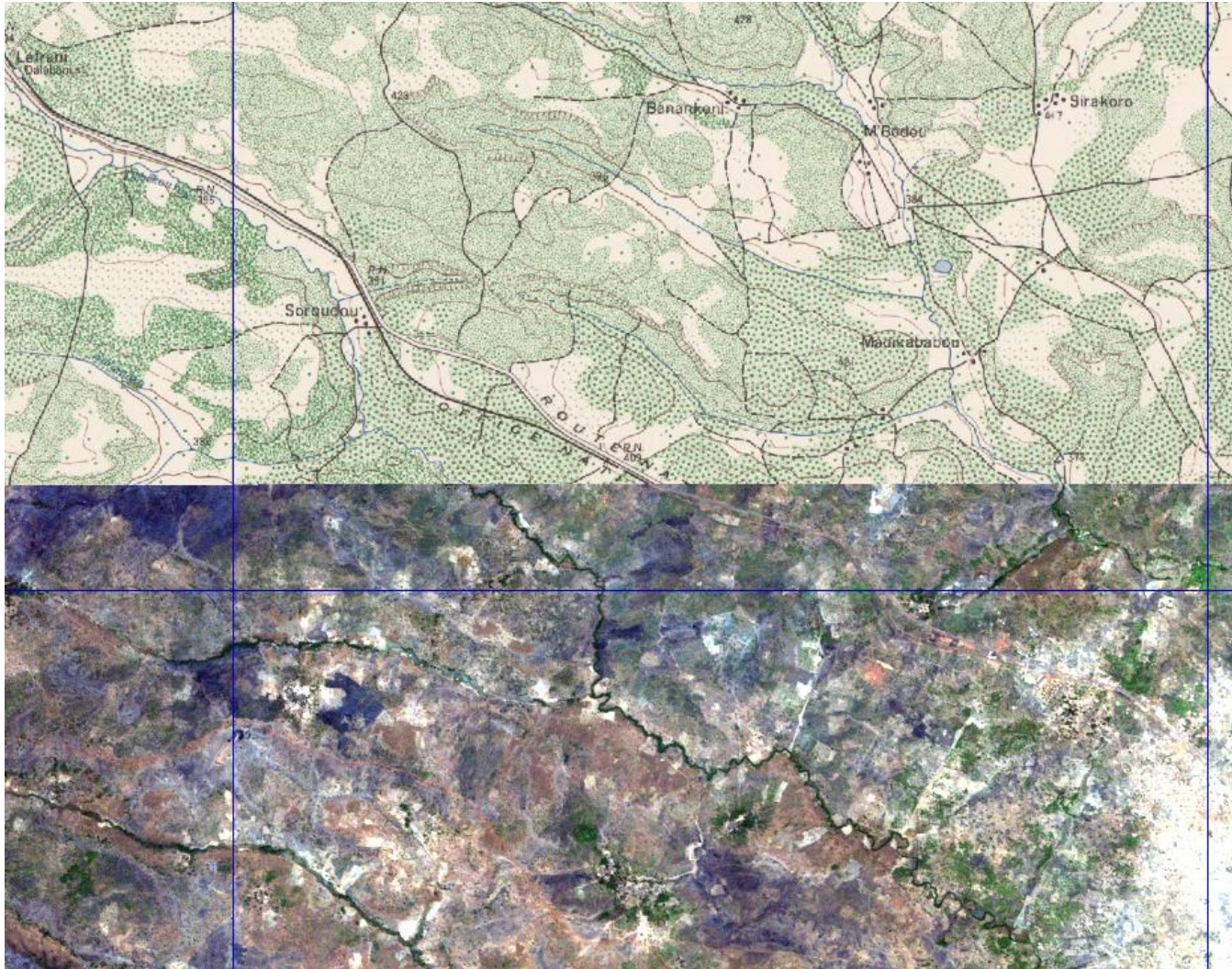


Old paper map

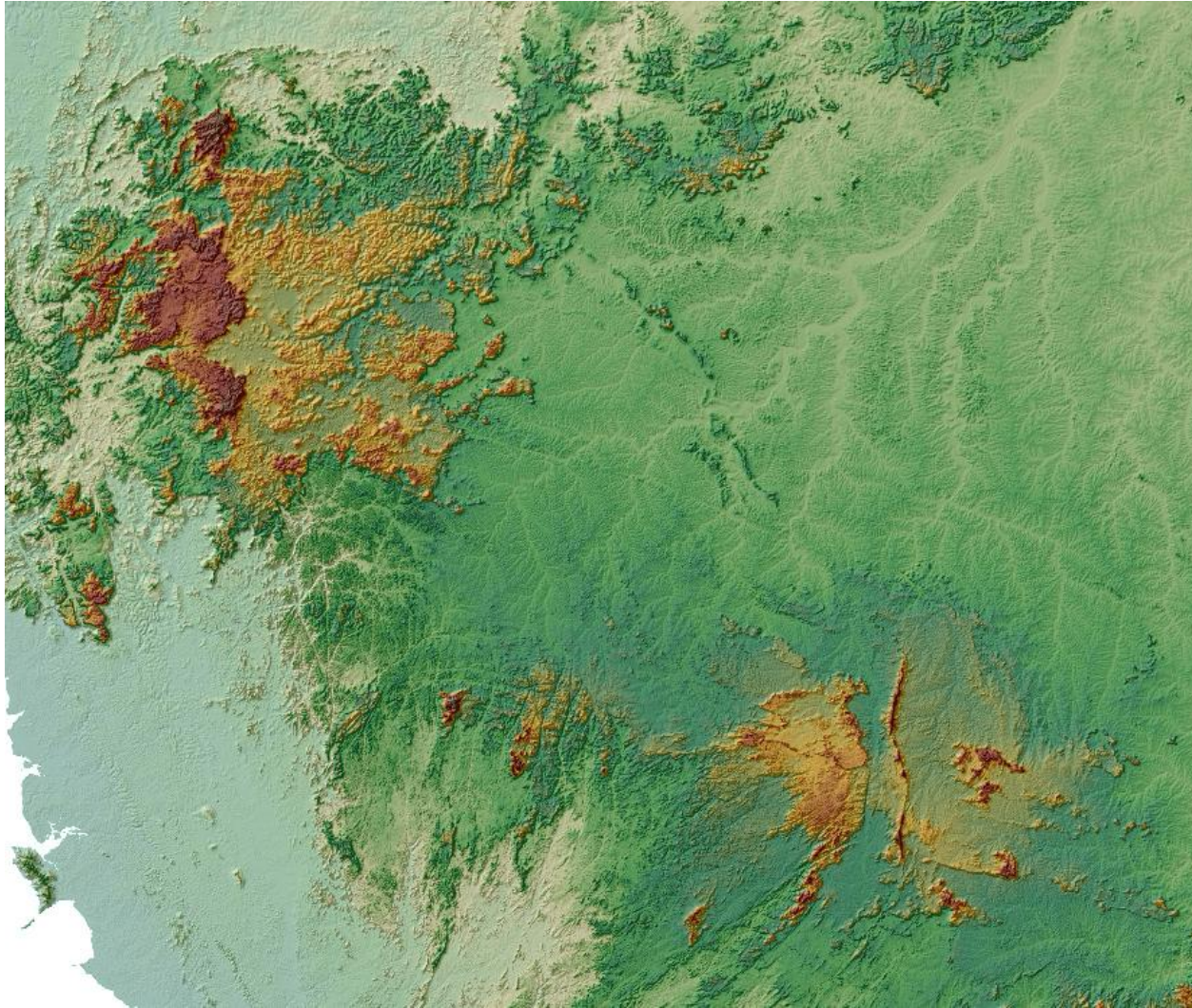


Modern digital map

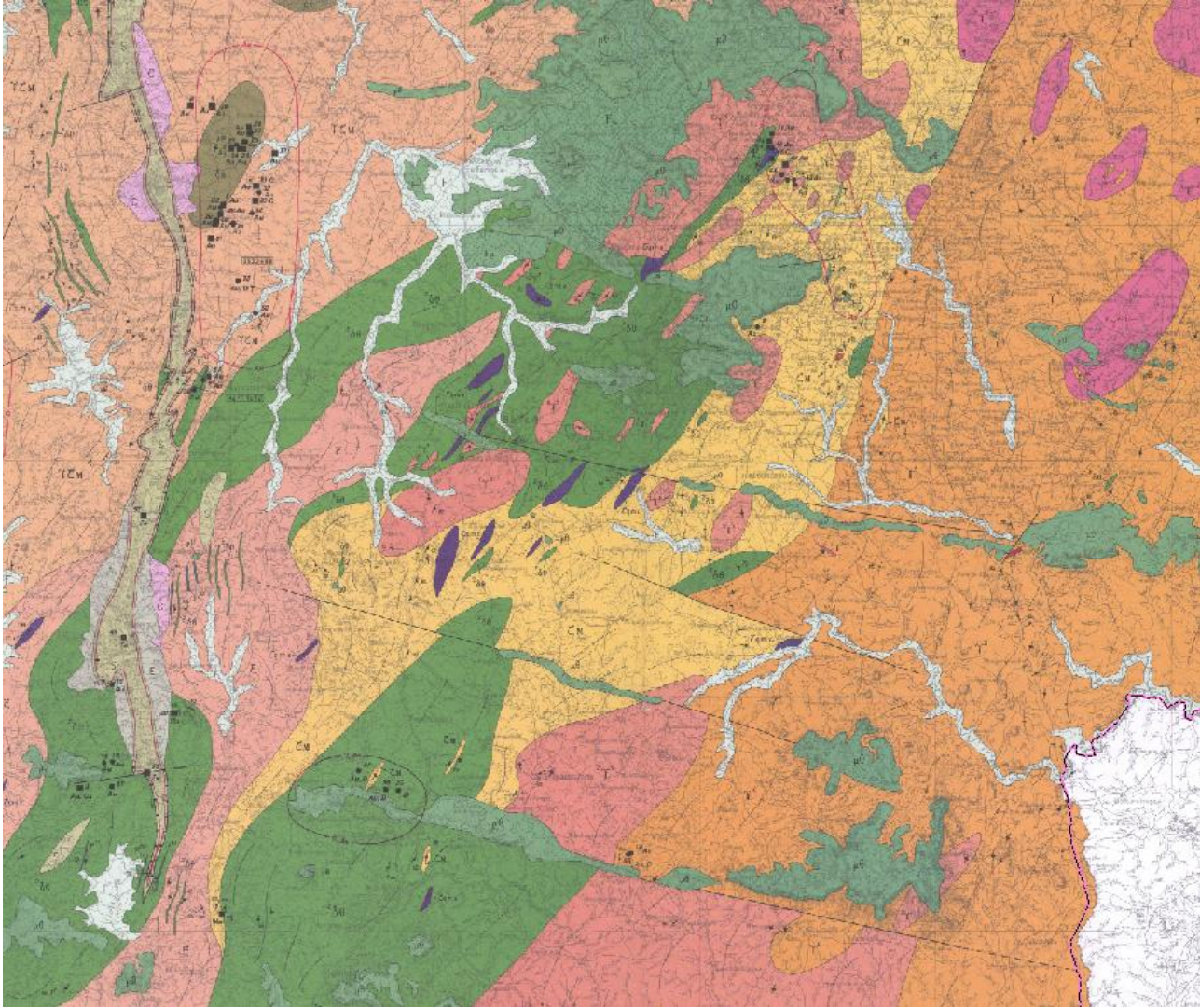
PAPER VS. GEOSPATIAL DATABANK (MAPPING/SATELLITE IMAGERY)



AN ALTERNATIVE PRESENTATION OF THE TOPOGRAPHY IN A GEOSPATIAL DATABANK (DTM)



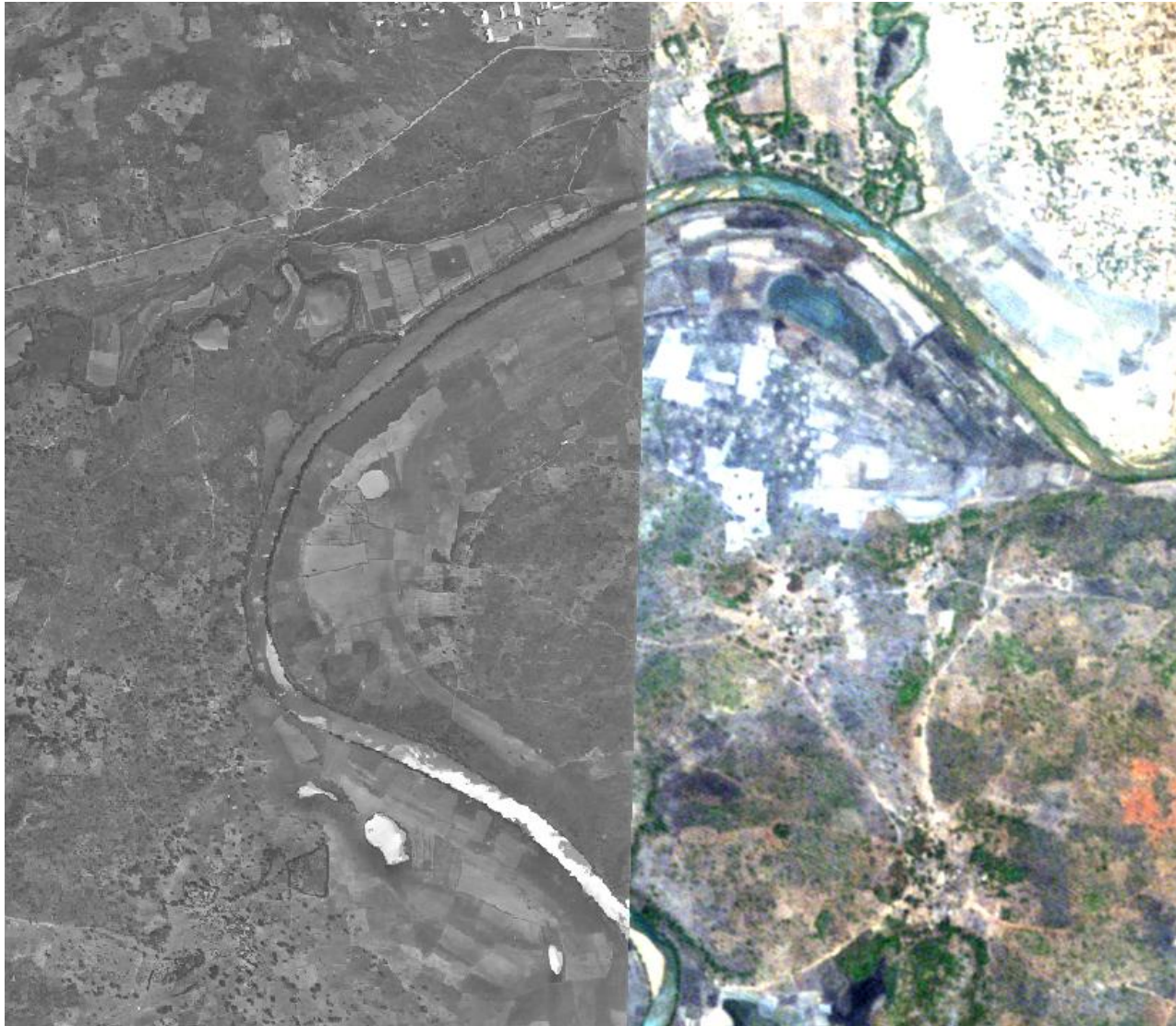
EXAMPLE OF A TRADITIONAL GEOLOGICAL MAP



EXAMPLE OF A GEOLOGICAL MAP WITHIN GEOSPATIAL DATABANK WITH DTM UNDERLAY



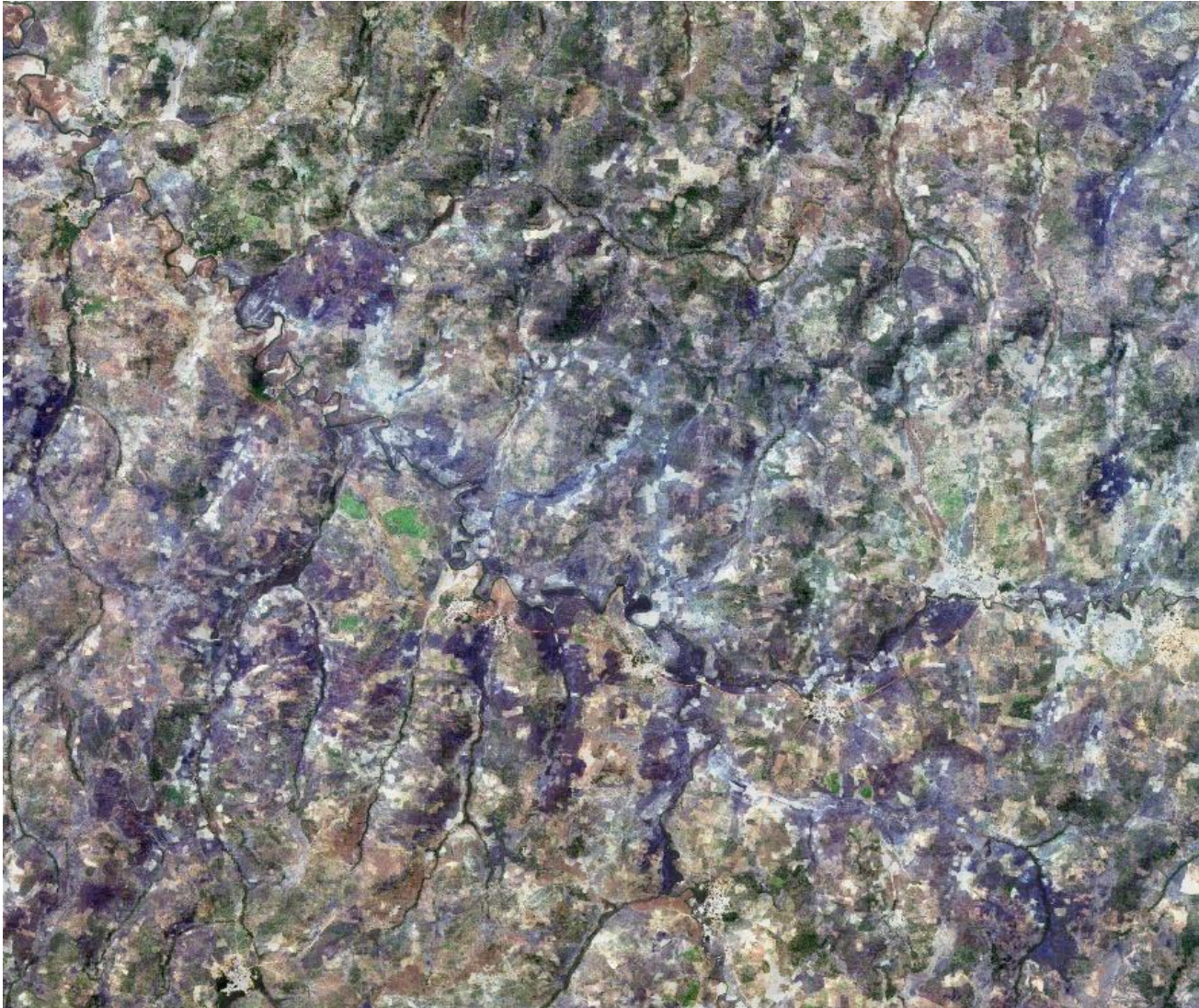
EXAMPLE OF AERIAL PHOTO/SATELLITE IMAGE USED FOR UPDATING GEOSPATIAL DATABANK



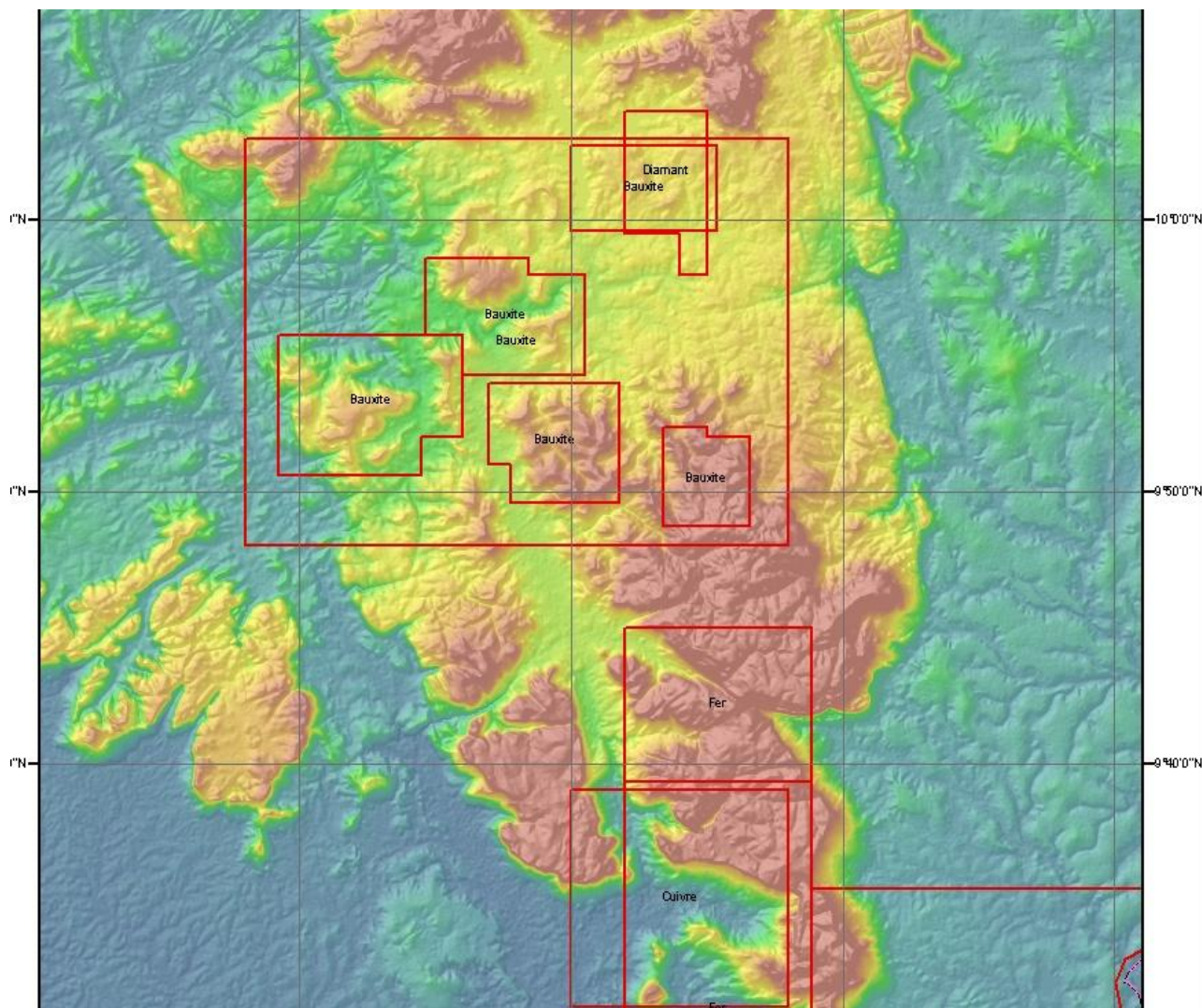
EXAMPLE BASIC SATELLITE IMAGE



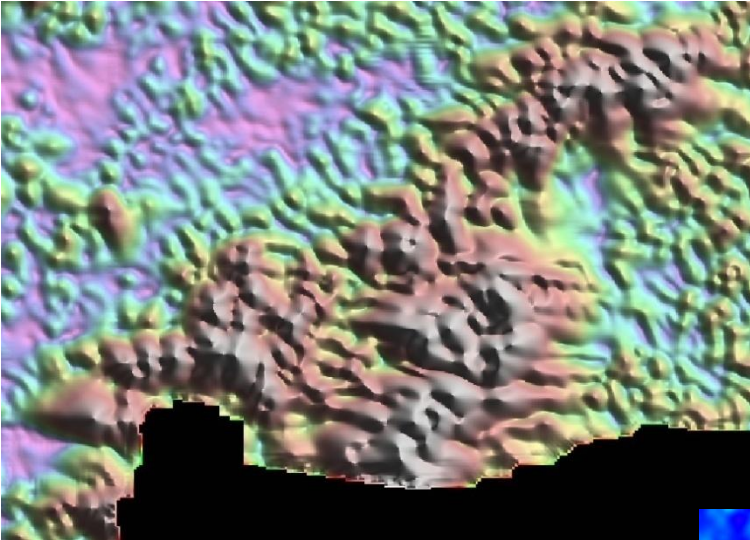
EXAMPLE SATELLITE IMAGE WITHIN GEOSPATIAL DATABANK WITH DTM ENHANCEMENT



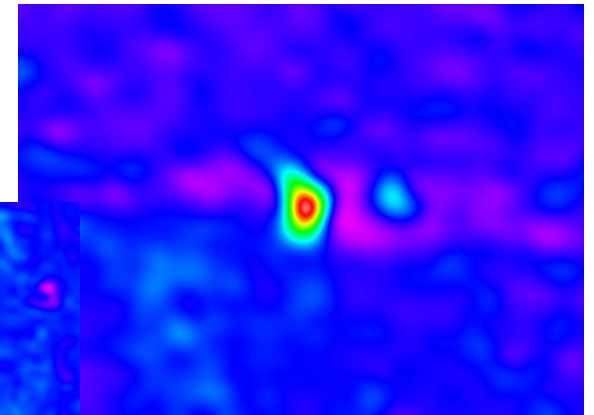
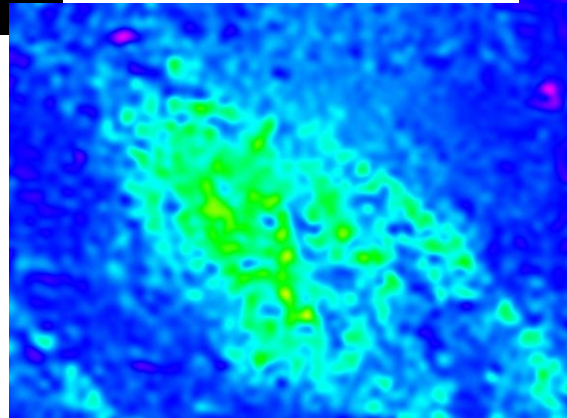
EXAMPLE OF A CONCESSION MAP EXTRACT FROM THE GEOSPATIAL DATABANK



EXAMPLES OF GEOPHYSICAL DATA WITHIN THE GEOSPATIAL DATABANK

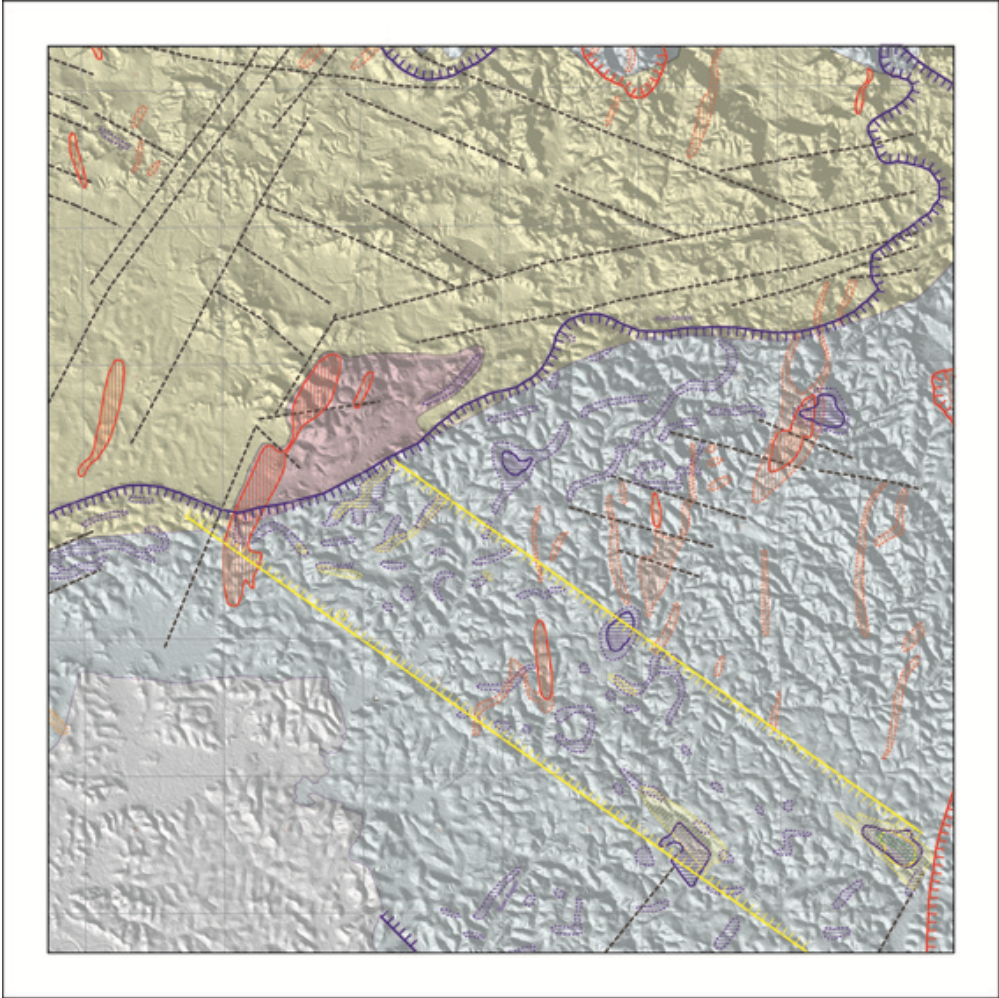


Analytical signal of magnetic data

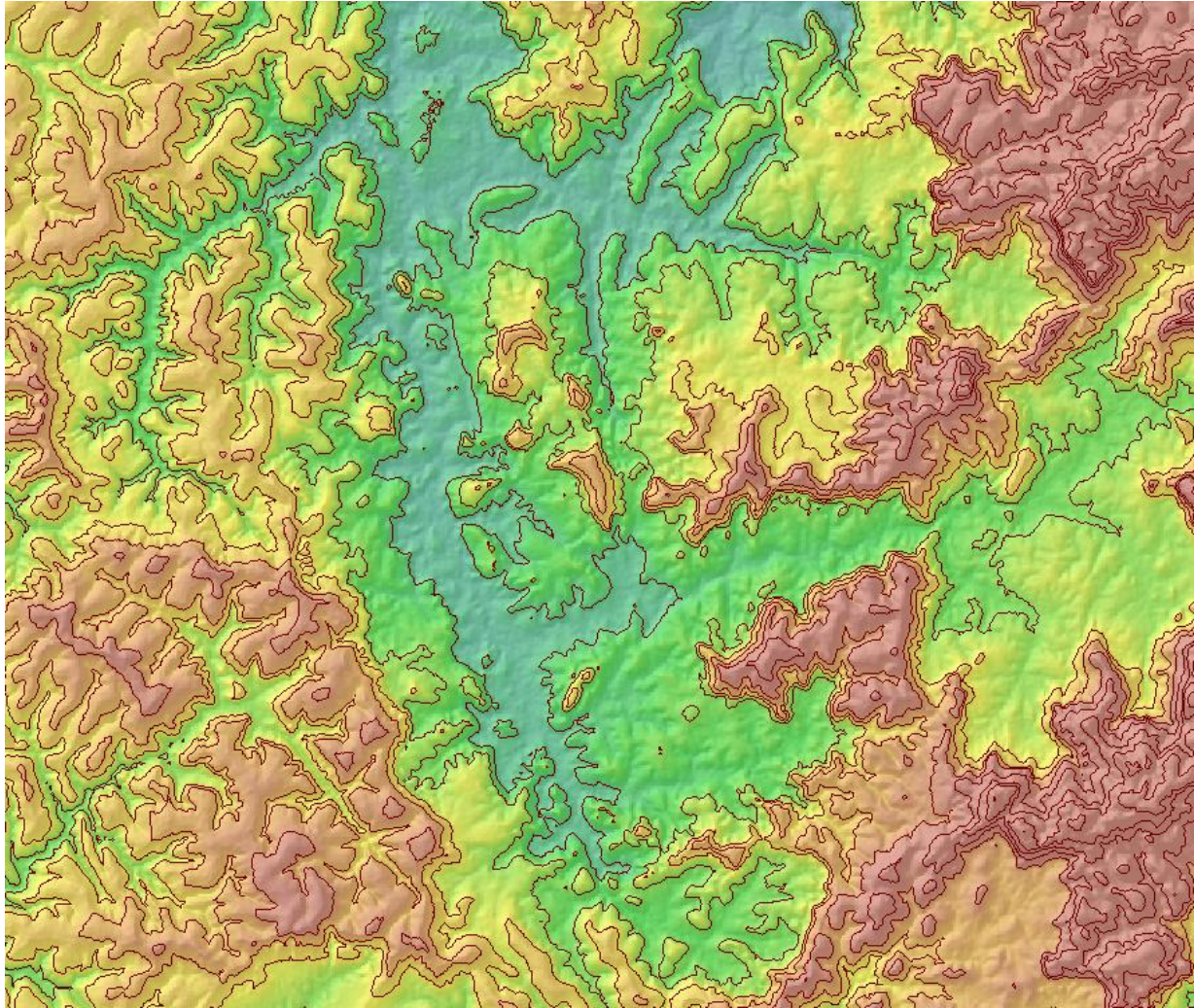


Uranium target zones

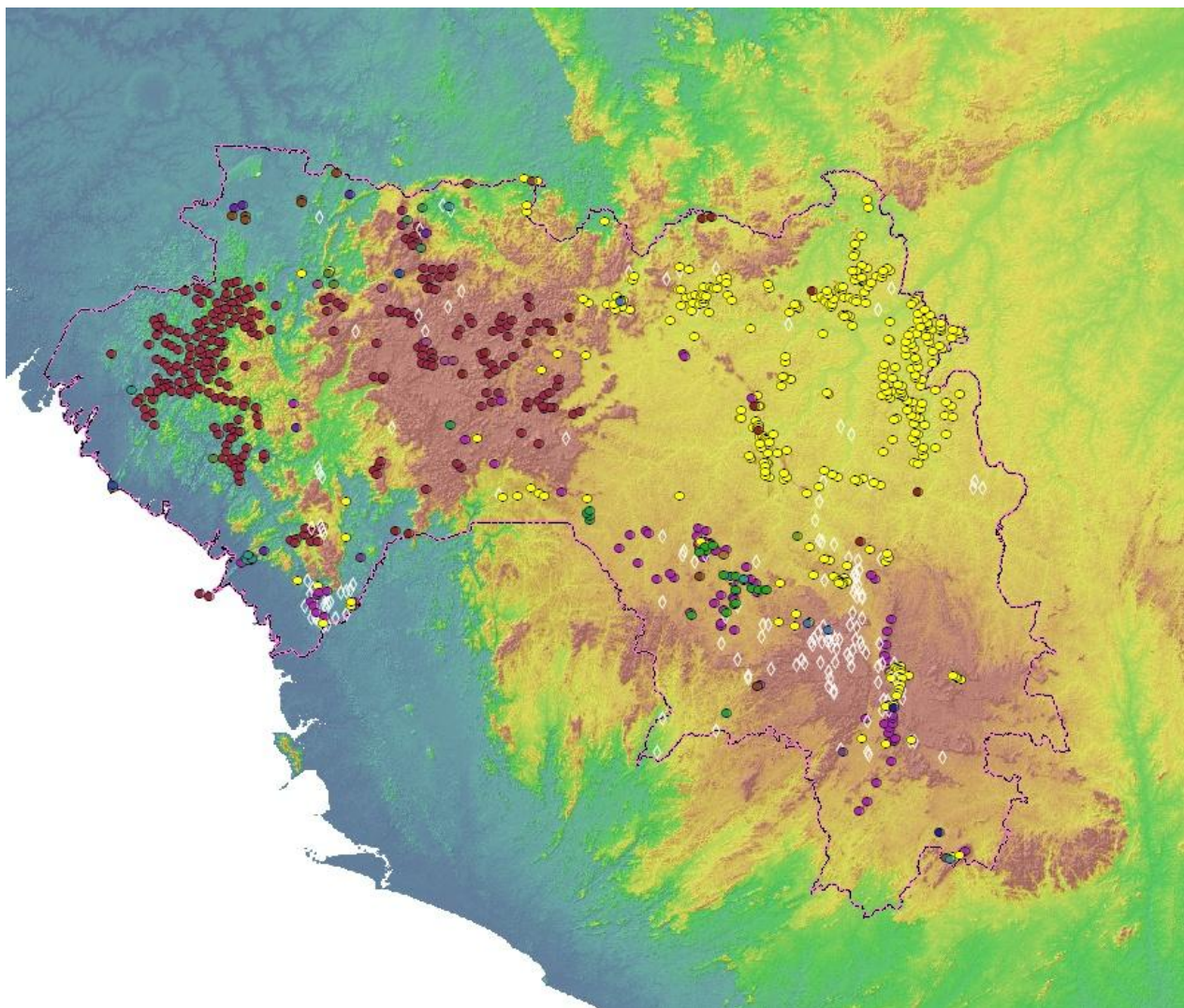
EXAMPLE OF INTERPRETATION OF GEOPHYSICAL DATA IN THE GEOSPATIAL DATABANK



UTILISATION OF GEOPHYSICAL DATA CONTOURS (+DTM) WITHIN THE GEOSPATIAL DATABANK



MINERAL OCCURENCES OVERLAYED ON DTM IN THE GEOSPATIAL DATABANK



ESTABLISHMENT OF A NEW GPS-BASED GEODETIC NETWORK

□ Data from GPS positioning satellites:

- Update of nationwide geodetic network by GPS with modern datum norms (WGS84) & projection (UTM)
- Current US GPS satellite system :
 - Millimetric/centimetric resolution for geodetic positioning
 - Resolution decametric to metric for navigation positioning applications
- European GALILEO satellite system from 2016

DEVELOPMENT OF A NEW NATIONWIDE GEOGRAPHICAL INFORMATION SYSTEM

- **Geographic Information Systems** for exploitation of geospatial cartographic data (geo-referenced) :
 - Relational geospatial databank
 - Multidimensional modelling
 - Cartographic renderings, complex graphics

HIGH LEVEL TRAINING PLAN FOR ALL NATIONALS INVOLVED IN THE PROJECT

- Training of local experts in the different technologies and methodologies :
 - *Complex treatment of satellite imagery:*
 - Geometric corrections, radiometrics
 - Thematic classifications
 - Extraction of altimetry information
 - *Thematic interpretations of satellite imagery:*
 - Land use, erosion, linear digitization
 - *Exploitation of GIS :*
 - Conception and development of databank
 - Basic and more complex exploitation of GIS-based geospatial databank
 - Cartographic enhancements
 - Thematic modelling



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