



# GENERATING AND ACCESSING GEOLOGICAL INFORMATION: INNOVATIVE AND TRANSPARENT APPROACHES

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BRGM  
—  
THE FRENCH  
GEOLOGICAL  
SURVEY

**BUILDING ON  
GEOLOGY AS ITS  
CORE COMPETENCE,  
BRGM DEVELOPS  
EXPERT KNOWLEDGE  
IN RESOURCE  
MANAGEMENT,  
RISK MANAGEMENT  
AND INNOVATIVE  
ECOTECHNOLOGIES.**



## GEOLOGY



## MINERAL RESOURCES



## GEOTHERMAL ENERGY



## GEOLOGICAL STORAGE OF CO<sub>2</sub>



## POST-MINING



## RISKS



## WATER



## ENVIRONMENT AND ECOTECHNOLOGIES



## LABORATORIES AND EXPERIMENTATION



## INFORMATION SYSTEMS



## KEY ROLES

- SCIENTIFIC RESEARCH
- SUPPORT TO PUBLIC POLICY DEVELOPMENT
- INTERNATIONAL COOPERATION
- MINE SAFETY
- TRAINING

# KEY ROLES

## INTERNATIONAL COOPERATION

### INTERNATIONAL COOPERATION IN 2016 (in BRGM work-days)

#### AMERICAS

- ARGENTINA
- HAITI
- DOMINICAN REPUBLIC

6%

#### MAGHREB

- ALGERIA
- MOROCCO
- TUNISIA

7%

#### EUROPE

- KOSOVO • POLAND • ROMANIA
- UNITED KINGDOM • SWITZERLAND
- UKRAINE

6%

12%

#### MIDDLE EAST

- SAUDI ARABIA
- JORDAN
- TURKEY

67%

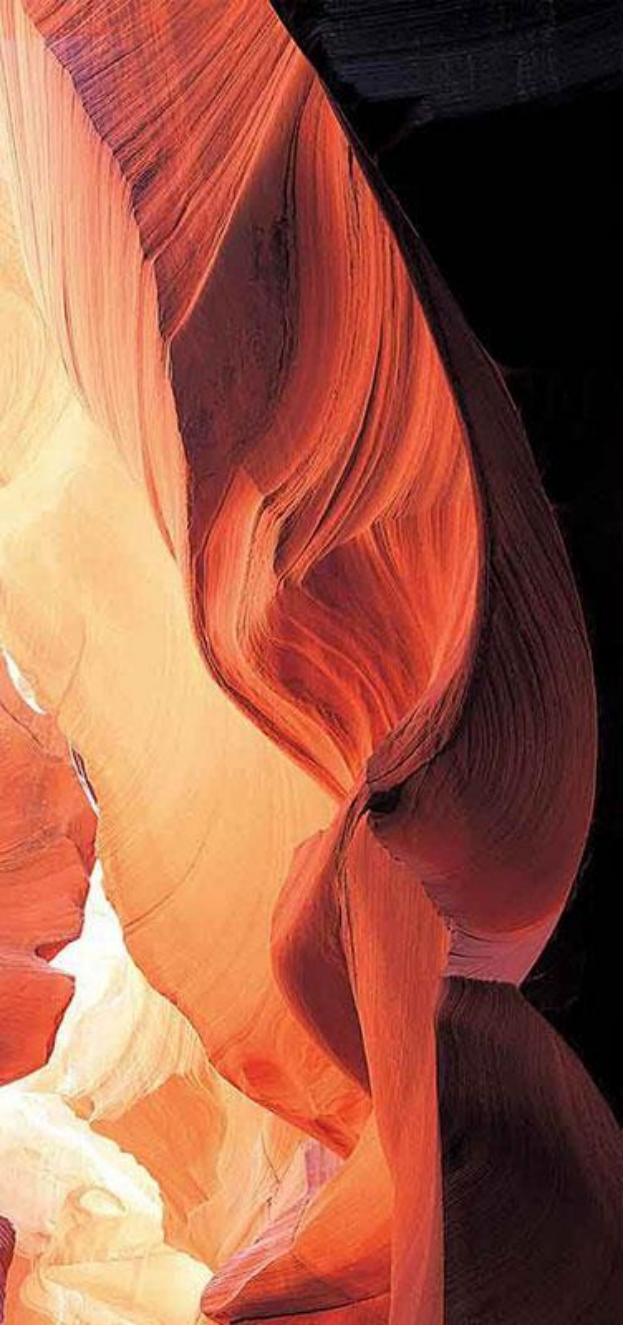
#### AFRICA

- BENIN • BURKINA FASO • CAMEROON • CONGO • CÔTE D'IVOIRE
- GABON • GUINEA CONAKRY • MALAWI • MALI
- DEMOCRATIC REPUBLIC OF CONGO • SENEGAL • CHAD

2%

#### ASIA

- MONGOLIA
- MYANMAR



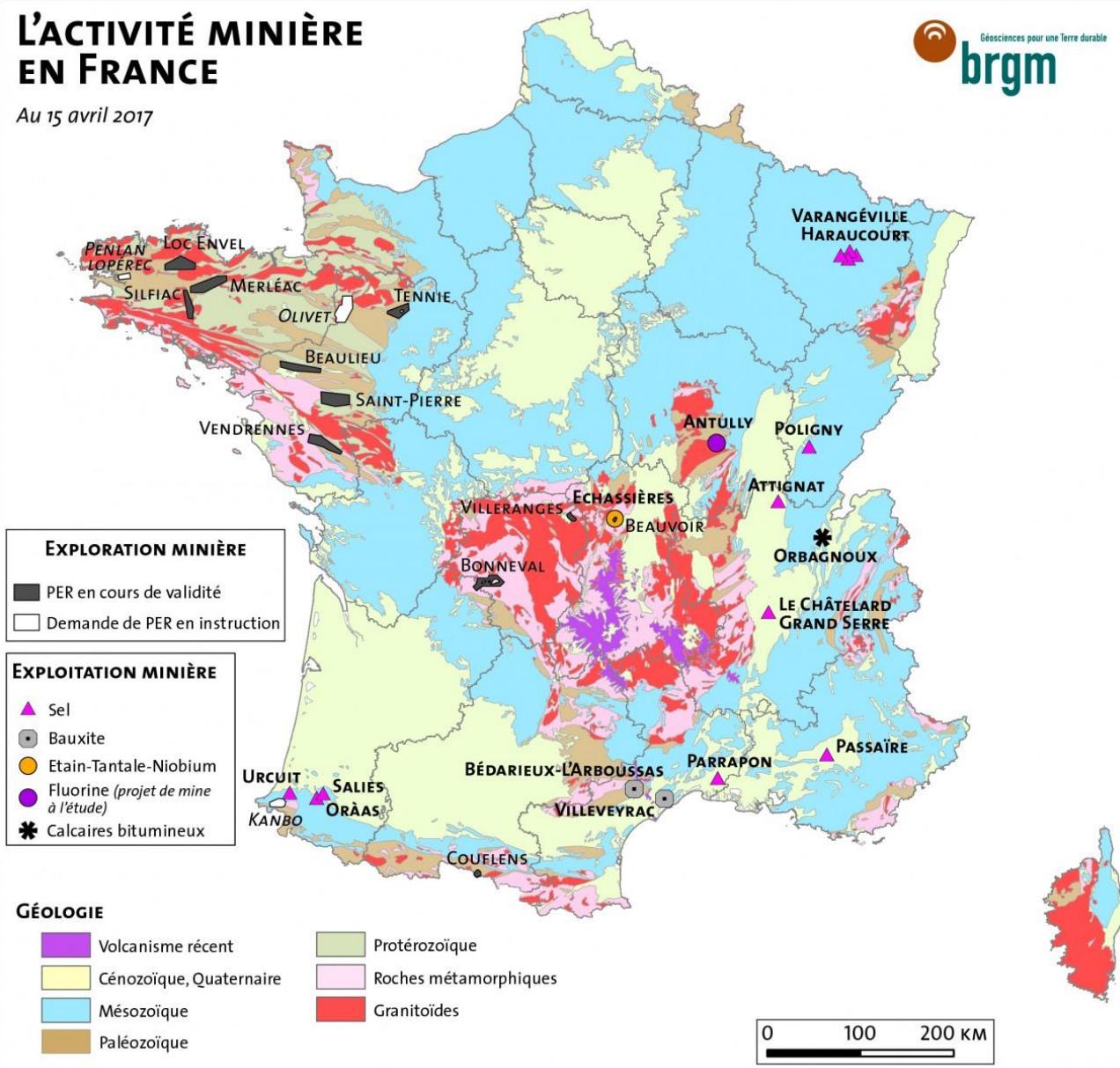
# Mining data in France

## Data acquisition

# Mining in France

## L'ACTIVITÉ MINIÈRE EN FRANCE

Au 15 avril 2017



- Continental France **used to** be a mining country;
- BRGM acted as a national geological survey, collecting and disseminating base data;
- BRGM owned exploration permits to develop several projects;
- But mining activity in continental France went decreasing during the 1980s and 90s (the last significant mine closed in 2004);
- Practically no more metal production sites from primary ores

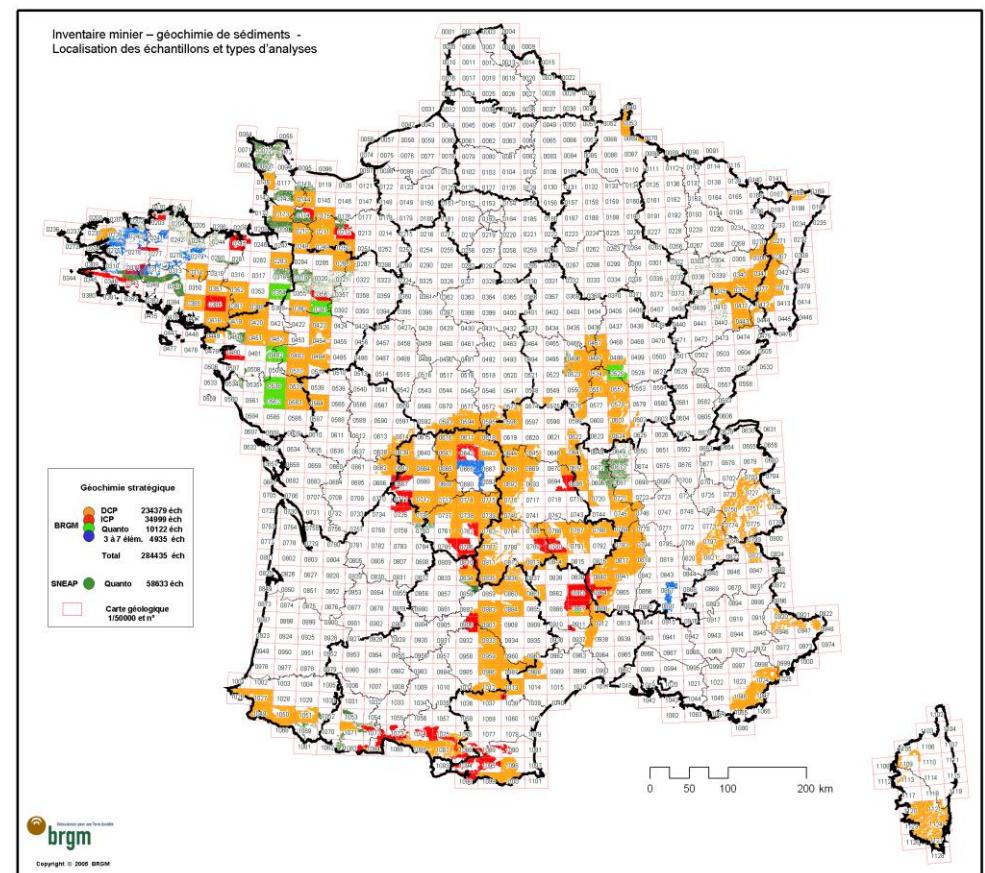
# France mineral potential assessment by BRGM (1975-1991)

- **Geochemical prospecting « stream sediment »**

- 284 435 samples ;
- 102 000 km<sup>2</sup> prospected (20 % of continental France) ;

- **Additionnal « alluvial »  
prospection**

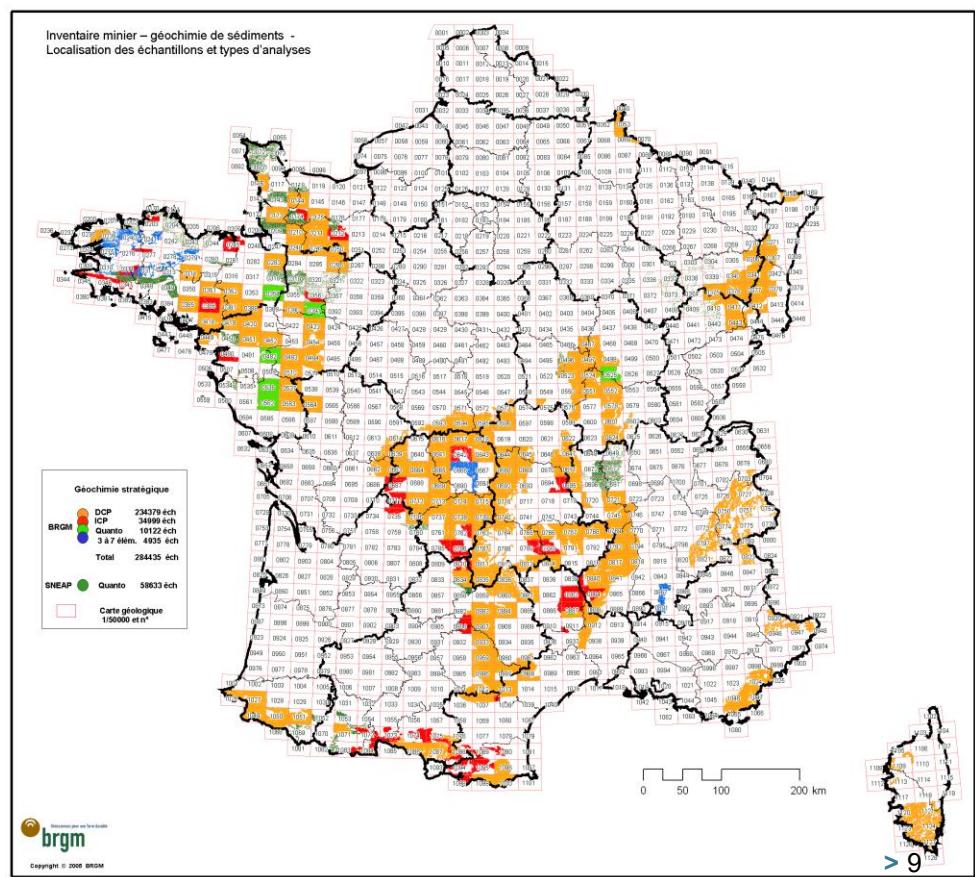
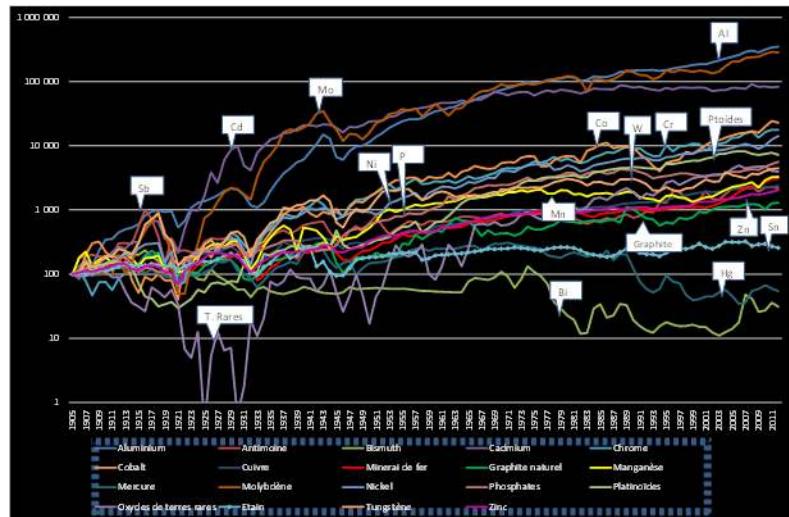
- 96 924 alluvial samples



# France mineral potential assessment (1975-1991)

- **Main results (1975-1991) :**

- About 2000 new mineral occurrences discovered ;
- 103 new prospect have been proposed to the profession (including 19 gold)
- 61 resulted in the allocation of PER for a dozen operators..



# Archiving mining documentation.

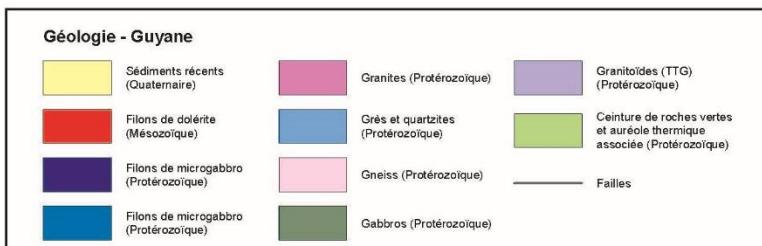
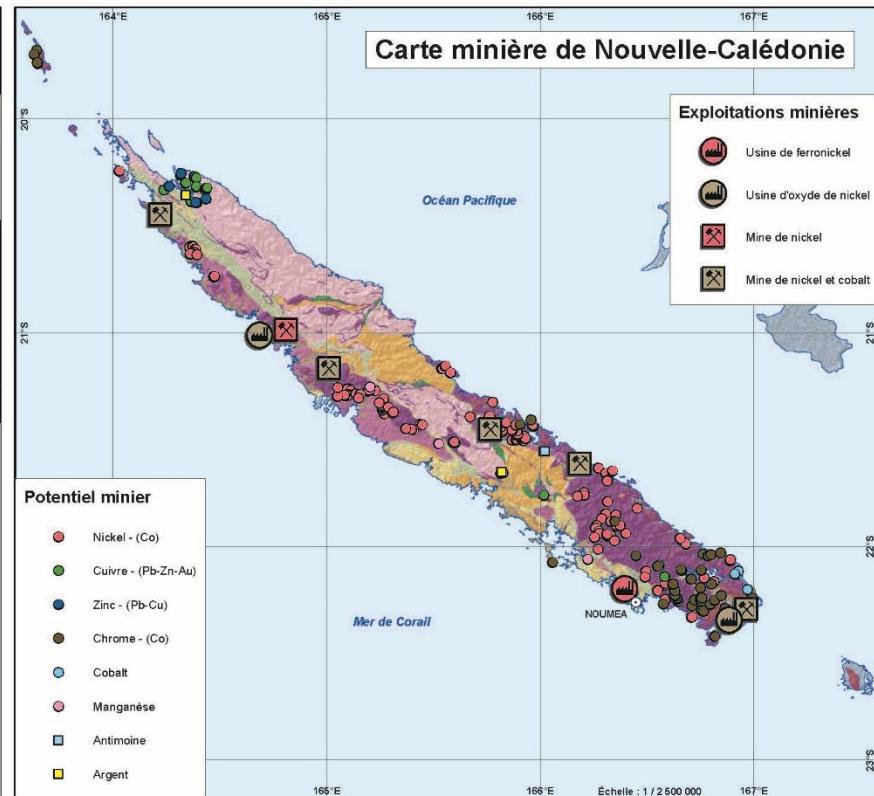
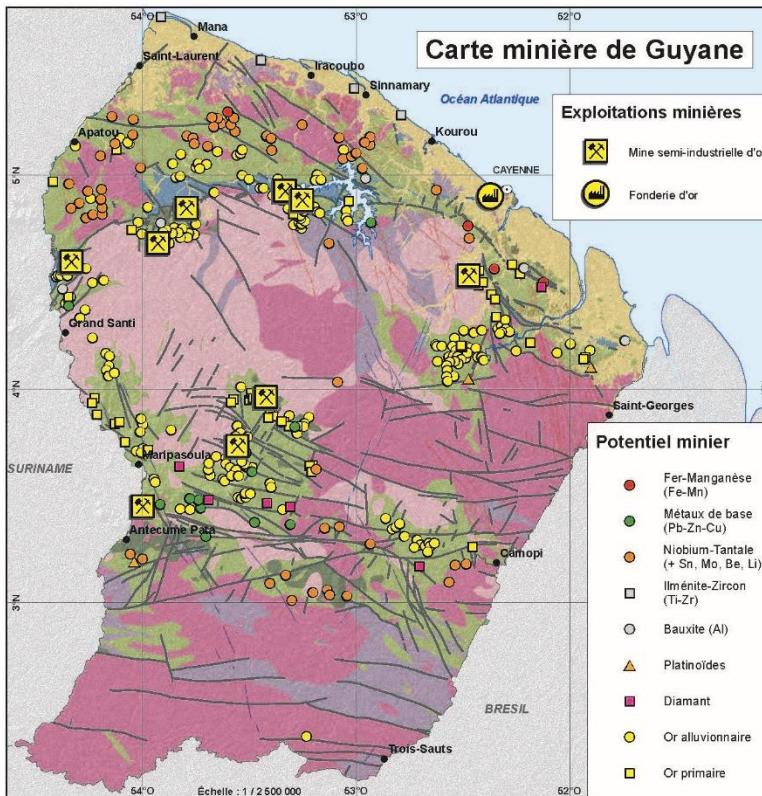
- Drill hole, cuttings, samples, thins & polished sections ...



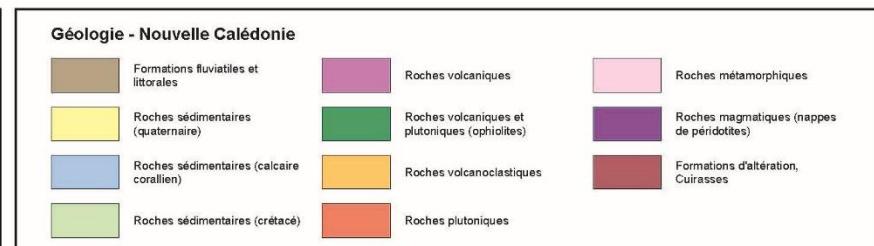
# Mining activities restricted to oversea territories

- French Guyane (Au)

and New Caledonia (Ni-Co)

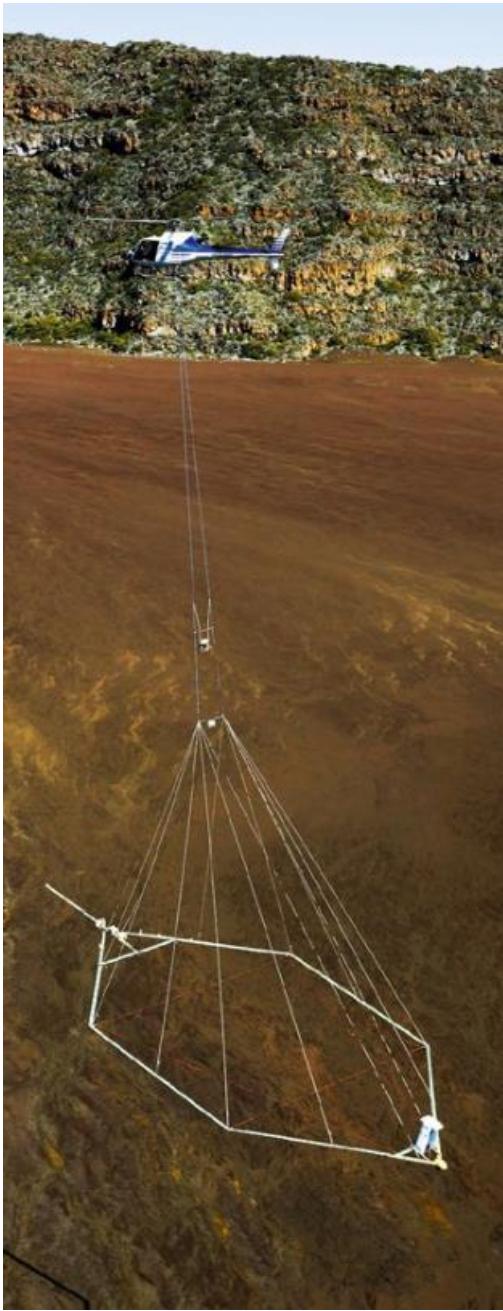


1,5 t/Au since 2011 (MTES/DGALN 2018)

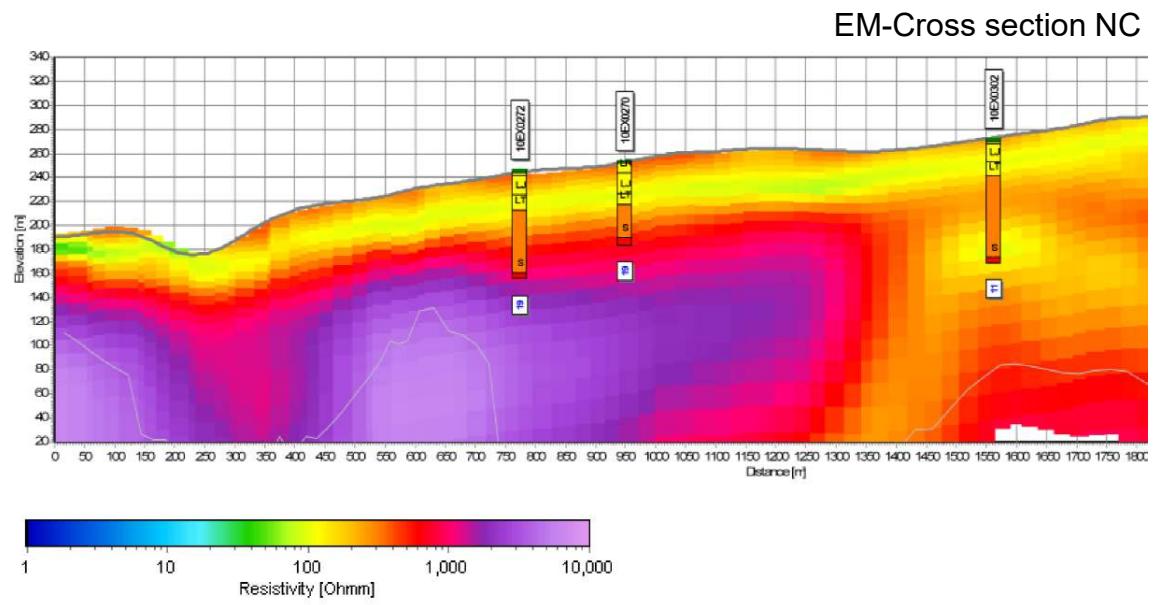


205 kt Ni in 2016 / 6,7Mt reserve  
+ 3,3 kt Co / 200 kt reserve (USGS 2017)

# Modern Data Acquisition



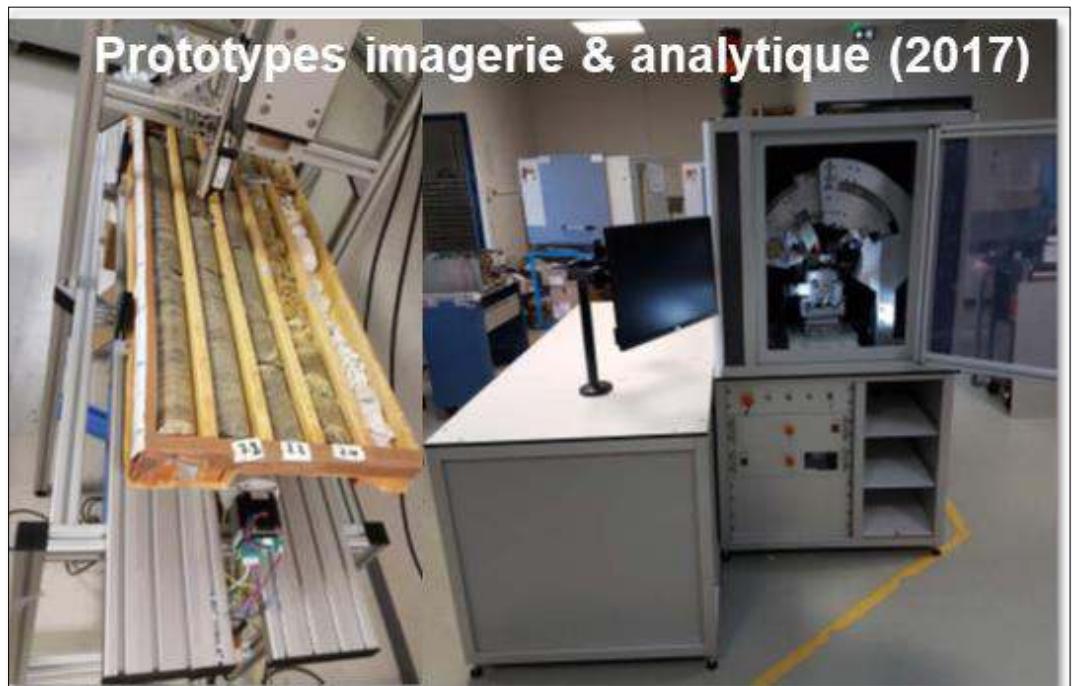
Heli Born EM data acquisition  
-La Réunion Island

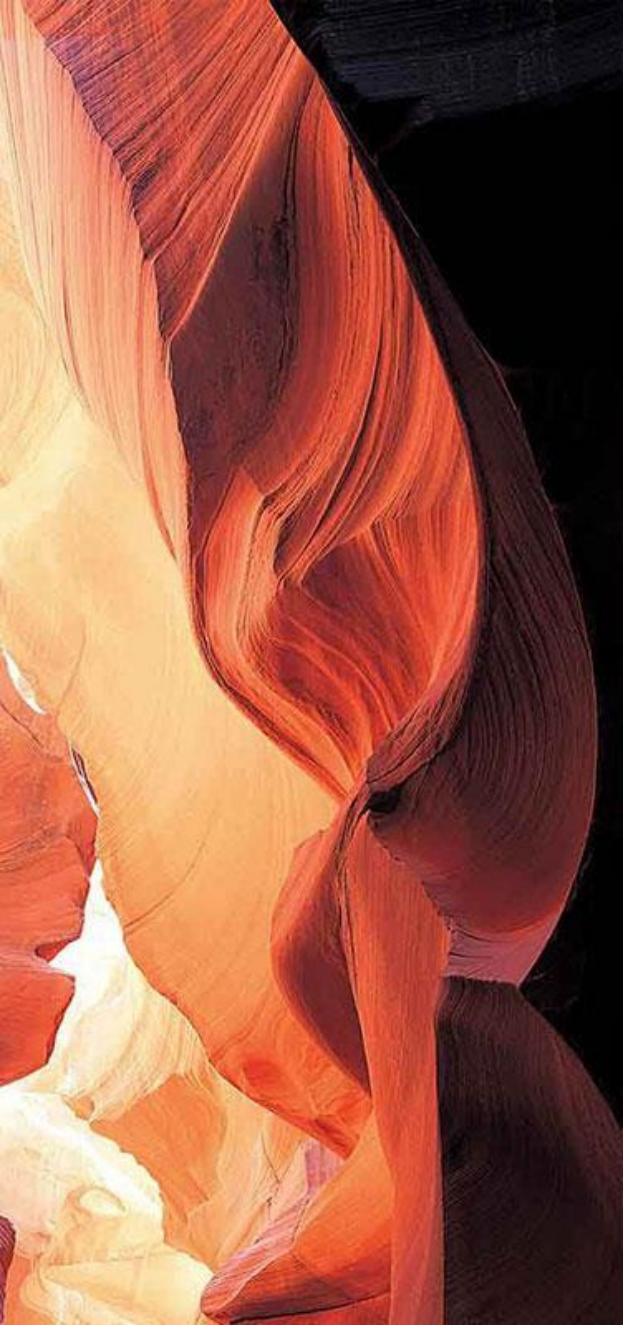




# Modern Data Acquisition

Prototypes imagerie & analytique (2017)





# Mining data in France Data diffusion

# BRGM develops, maintains and provide numerous databases

- Large experience in GIS web portal definition and database management, cloud, computing...
- Numerous examples : BSS, EU Promine critical raw material inventory, Mineral4Eu (large-scale predictive maps), GIS of Africa



See more on : <http://www.brgm.fr/>  
<http://infoterre.brgm.fr/>



InfoTerre

Exploitez les données scientifiques du sol et du sous-sol français



Un portail Web rassemblant des données, des outils et des services pour comprendre, aménager et prévoir

cartes géologiques  
eaux souterraines  
forages  
pollutions  
ressources minérales  
risques naturels

Geosciences pour une Terre durable

brgm



▼ VISUALISER LES DONNÉES

▼ RECHERCHER DES DONNÉES

▼ DONNÉES ET SERVICES

▼ THÉMATIQUES

▼ MOBILES

- +

Zoom

Localisation

Données

Légendes

Impression

**Données**

**Thèmes**

Dossiers sur le sous-sol

Forages d'eau

Anciens sites industriels

Mouvements de terrain

Cavités souterraines

Aléa retrait-gonflement

Cartes géologiques

**Fonds**

Cartes géologiques

Cartes topographiques

Echelle : 1 / 25 000 000

800 km

Système de projection : Longitude/Latitude

X : -1.92 Y : 48.35

Aller directement à ...

[VISUALISER LES DONNÉES](#)[Rechercher des données](#)[Données et services](#)[THÉMATIQUES](#)[Visualiseur standard](#)[Visualiseur simplifié](#)[Géoservices OGC](#)[Cartes géologiques](#)[Sites et sols pollués](#)

# Description of the MineralInfo web portal

The screenshot shows the homepage of the MineralInfo website (<http://www.mineralinfo.fr/>). The page is framed by a blue browser window. At the top, there's a navigation bar with links for Fichier, Edition, Affichage, Favoris, Outils, Accueil | Minéralinfo, and a search bar. Below the navigation is a toolbar with icons for Webmail BRGM, Bendnote, Log In, and various site suggestions. The main menu includes ACCUEIL, ACTUALITÉS, ECOMINE, DOSSIERS, LA MINE EN FRANCE, and SE CONNECTER. On the right, there's an OK button.

The header features the "minéralInfo" logo and the subtitle "LE PORTAIL FRANÇAIS DES RESSOURCES MINÉRALES NON ÉNERGÉTIQUES". To the right are four ministerial logos: MINISTÈRE DE L'ENVIRONNEMENT, DE L'ÉNERGIE ET DE LA MER, MINISTÈRE DE L'ÉCONOMIE ET DES FINANCES, and MINISTÈRE DE L'ÉDUCATION NATIONALE, DE L'ENSEIGNEMENT SUPÉRIEUR ET DE LA RECHERCHE.

The main content area has a large banner image of a mountain landscape at sunset. Overlaid on the banner is the title "Matières premières minérales primaires et secondaires non énergétiques" and the subtitle "Ressources naturelles et recyclées pour satisfaire des besoins essentiels de la société." Below the banner is a navigation bar with links for POLITIQUES PUBLIQUES, ACTEURS, MATIÈRES PREMIÈRES, MINES ET CARRIÈRES, CARTES ET DONNÉES, and POUR COMPRENDRE.

The left sidebar contains a section titled "Présentation générale" with text about the website's purpose and a link to "Le Plan Ressources pour la France". The right sidebar contains a section titled "Toutes les actualités" with two news items: one from 04/05/2017 about the "Plan Ressources pour la France" and another from 03/05/2017 about PanAfGeo.

At the bottom right, there's a 100% zoom indicator.

<http://www.mineralinfo.fr/>

# MinerallInfo web portal

- Overview:

- The MinerallInfo portal is the tool to disseminate public information from the French national network on mineral raw materials (public administration, companies, professional federations and technical institutions);
- It has been initiated by the ministry in charge of raw materials, and is dedicated to all institutional and economical stakeholders, as well the general public, in order to inform on issues related to non-energetic mineral raw materials (metals, industrial minerals and construction materials);
- It is accessible on the web at <http://www.mineralinfo.fr/>
- It is developed and maintained by BRGM;
- The data provided in the portal covers the four major domains of the sector: potential and economy of continental and offshore primary resources, demand from the industry, recycling of secondary resources and research, international aspects;
- All data and information in the portal is publicly and freely accessible.

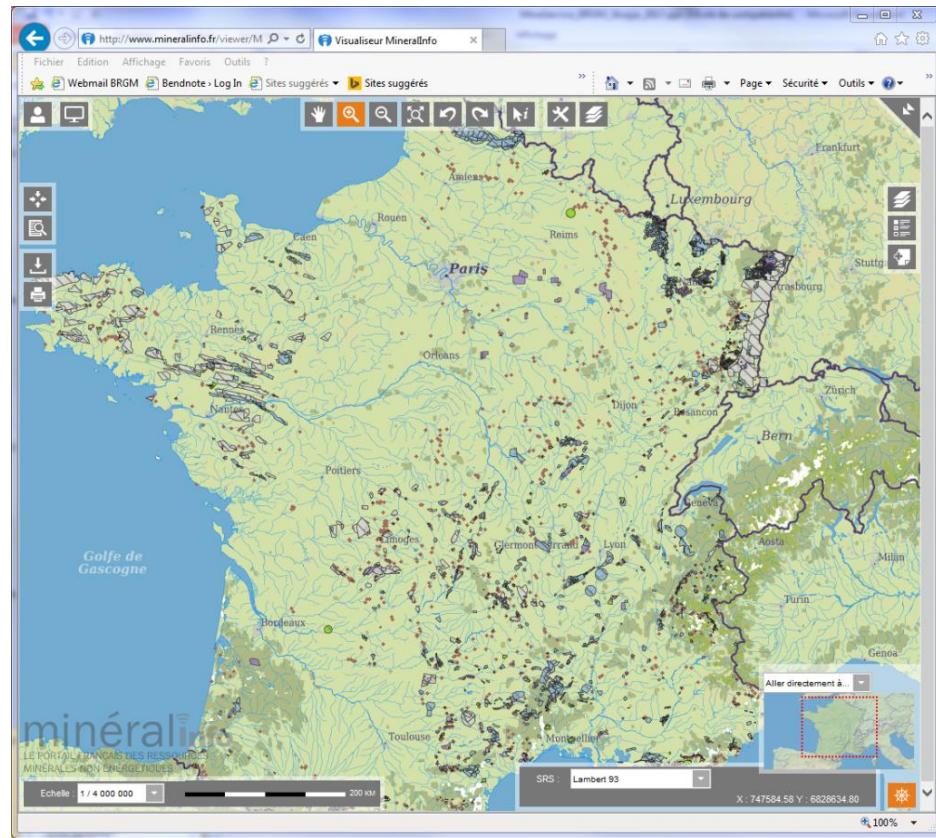


# Description of the MineralInfo web portal

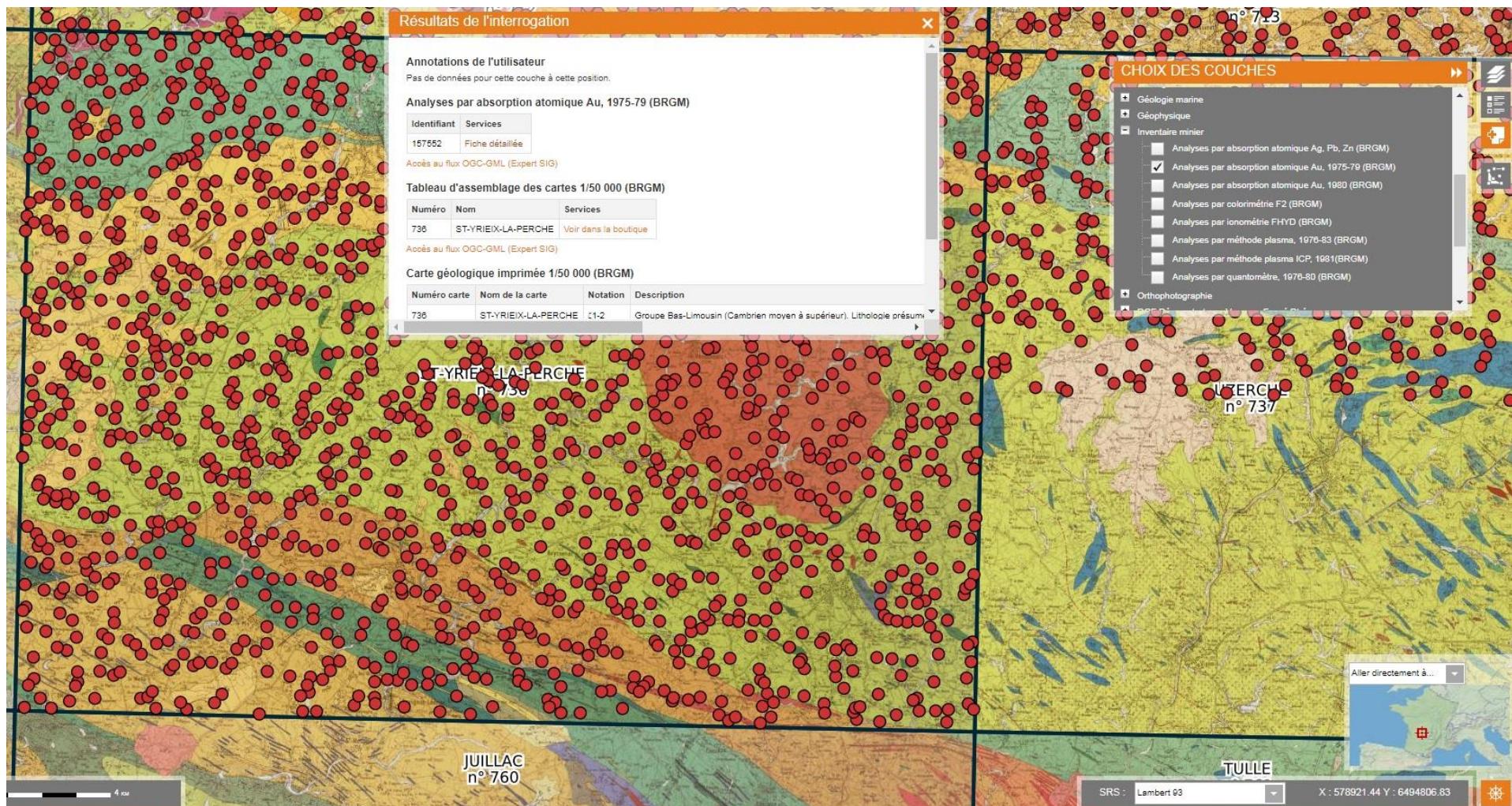
- Data in the map portal

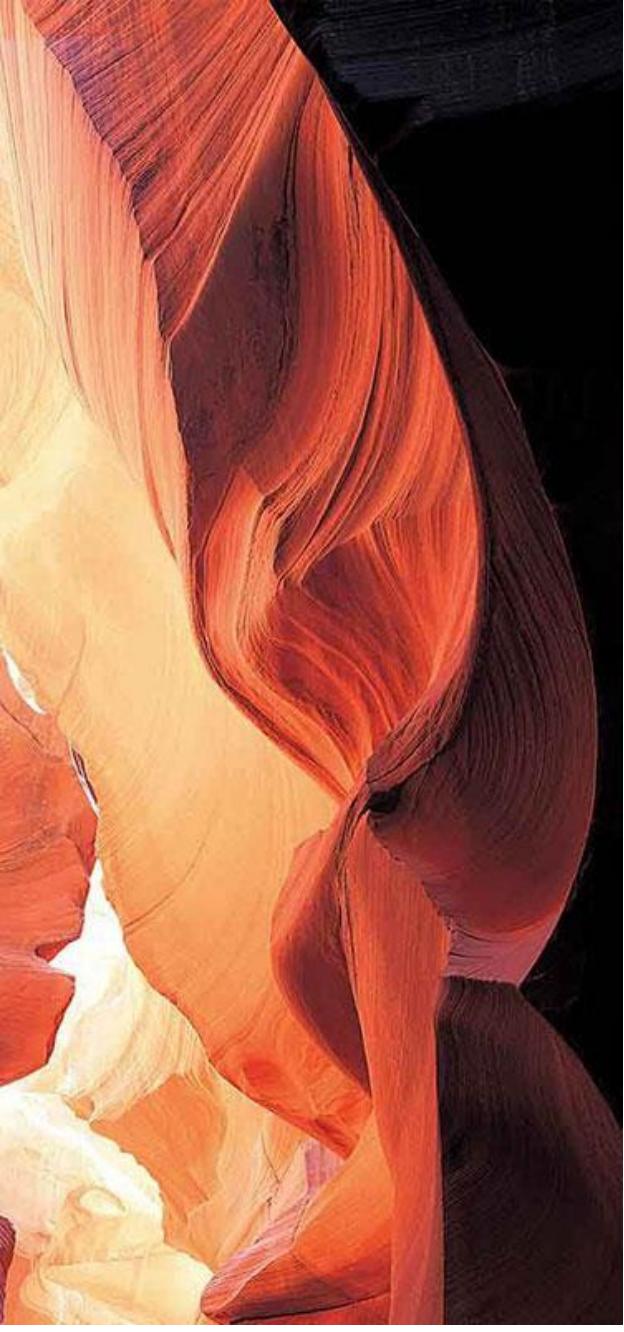
- Data layers categories:

- Quarries and materials [5 layers]
    - Geological maps [13 layers]
    - Topographic maps [1 layer]
    - Topographic maps [5 layers]
    - Anthropogenic Concentrations (ProMine) [5 layers]
    - Basement Database (BSS) [7 layers]
    - Protected Areas [14 layers]
    - Exploitation of marine aggregates [1 layer]
    - Deposits (ProMine) [11 layers]
    - Geophysics [3 layers]
    - Occurrences, deposits, favorability (ProMine) [25 layers]
    - Mining Inventory - Alluvial pan concentrates [55 layers]
    - Mining Inventory – BRGM Geochemistry BRGM [72 layers]
    - Mining Inventory – SNEA(P) Geochemistry [44 layers]
    - Mining Inventory - Methods of Analysis [8 layers]
    - Mines - Main Substances [1 layer]
    - Orthophotography [1 layer]
    - National Standards for Mining Titles [7 layers]



<http://www.mineralinfo.fr/>

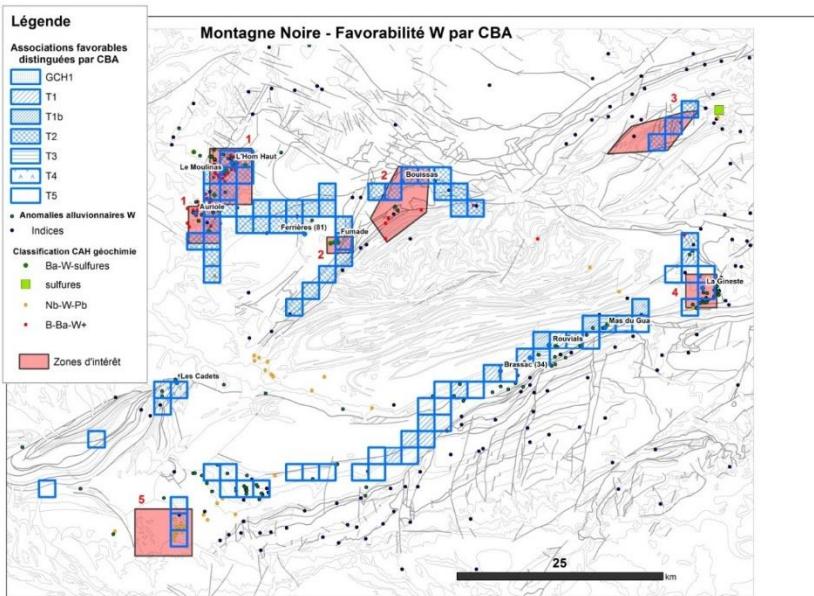




# Mining data in France Data valorisation

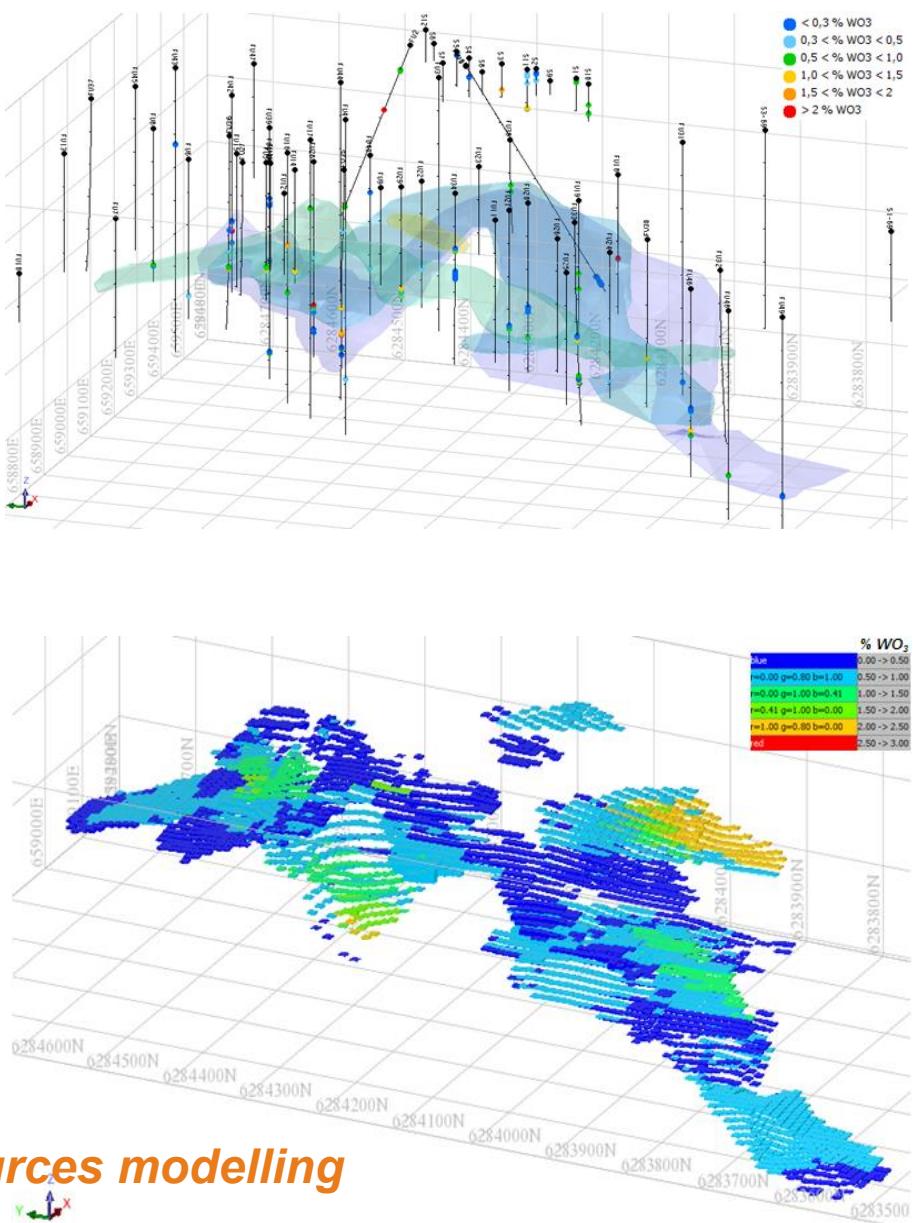
# From old exploration data (>20 years) to up-to-date modelling

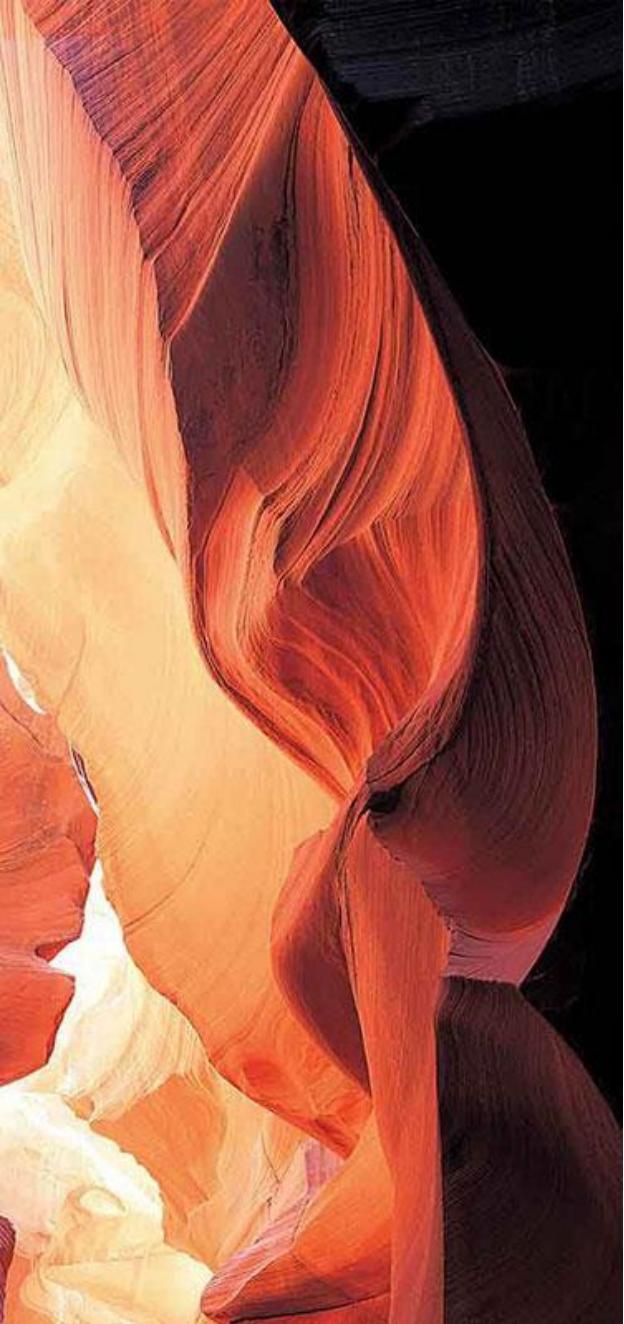
## Predictivity mapping



- Organizing and interpreting old data
- Estimating of potential undiscovered resources
- Synthesis at district scale

→ 3D resources modelling





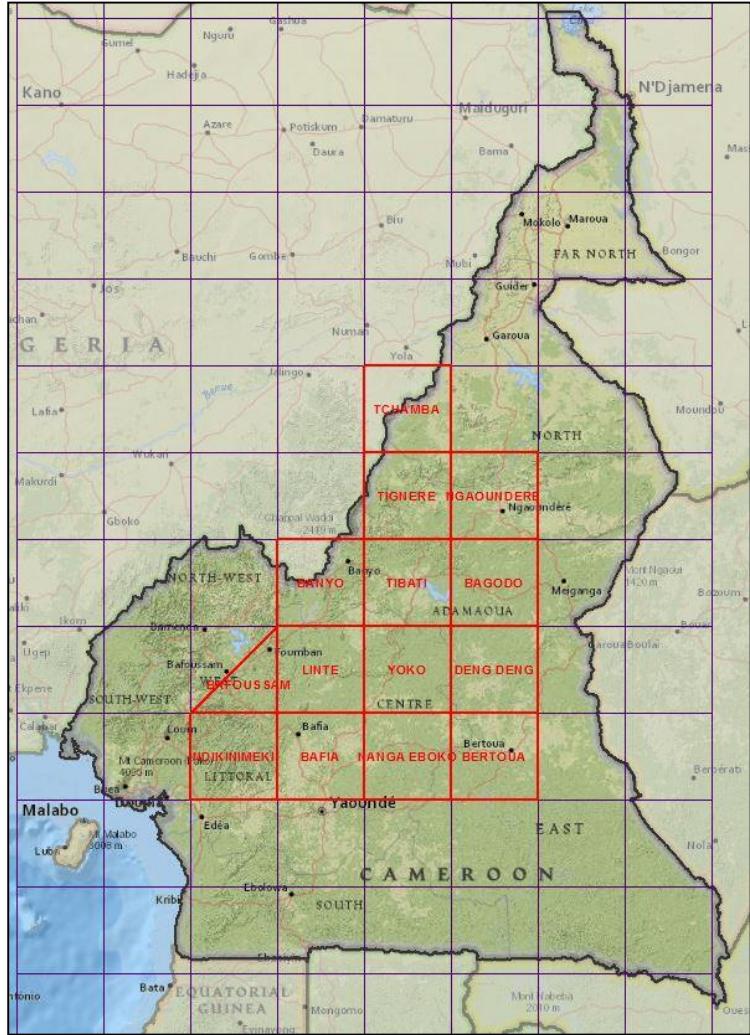
BANQUE MONDIALE



# Projet GEO4CAM



## **Project Objectives :**

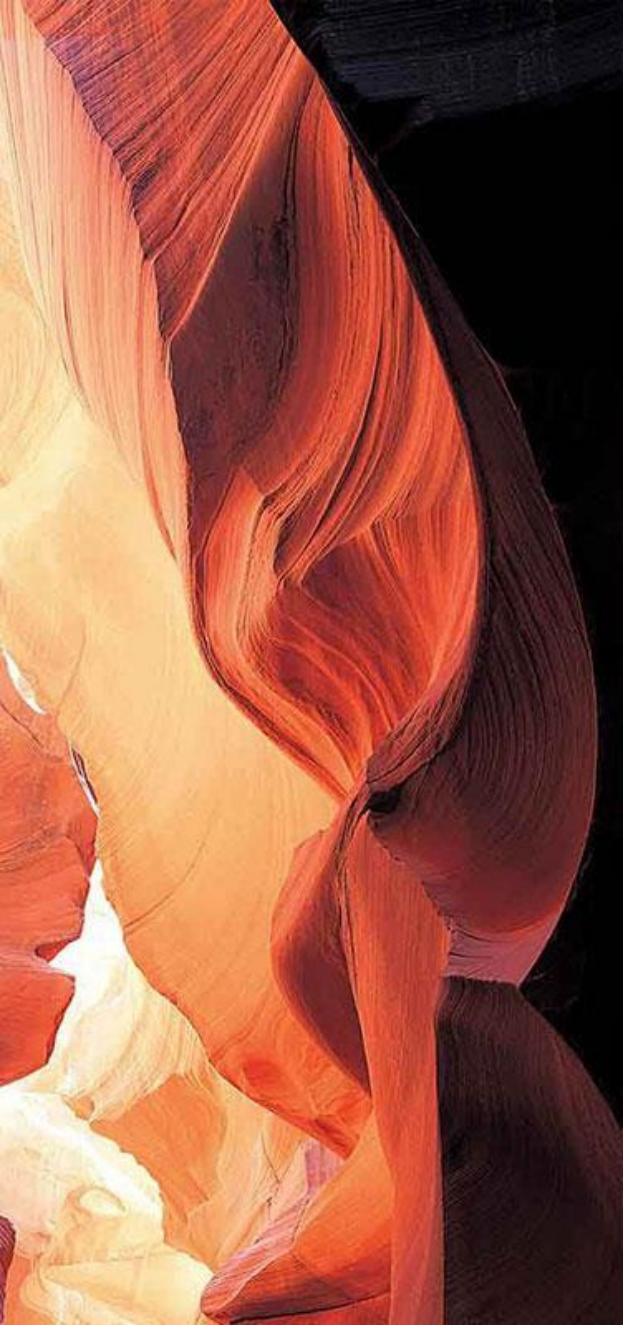


PRECASEM project

## *« Projet de Renforcement des Capacités dans le Secteur Minier ».*

### **3 work packages :**

- 13.5 new geological 1/200 000ème ;
  - Geochemical prospecting campaign ;
  - Conception and set up of an adapted GIS;



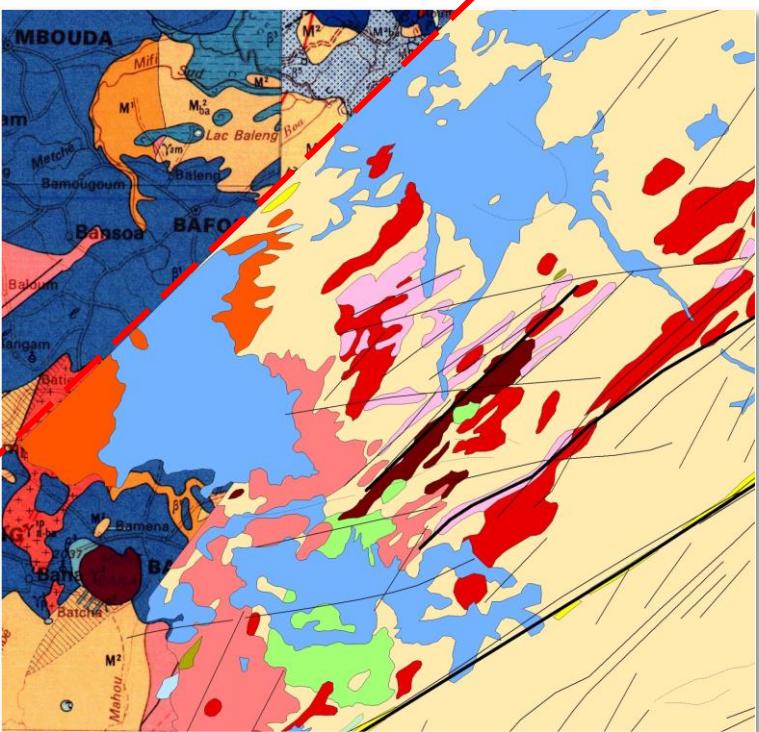
# Mining data in Cameroun Data acquisition

## Field geology & capacity building



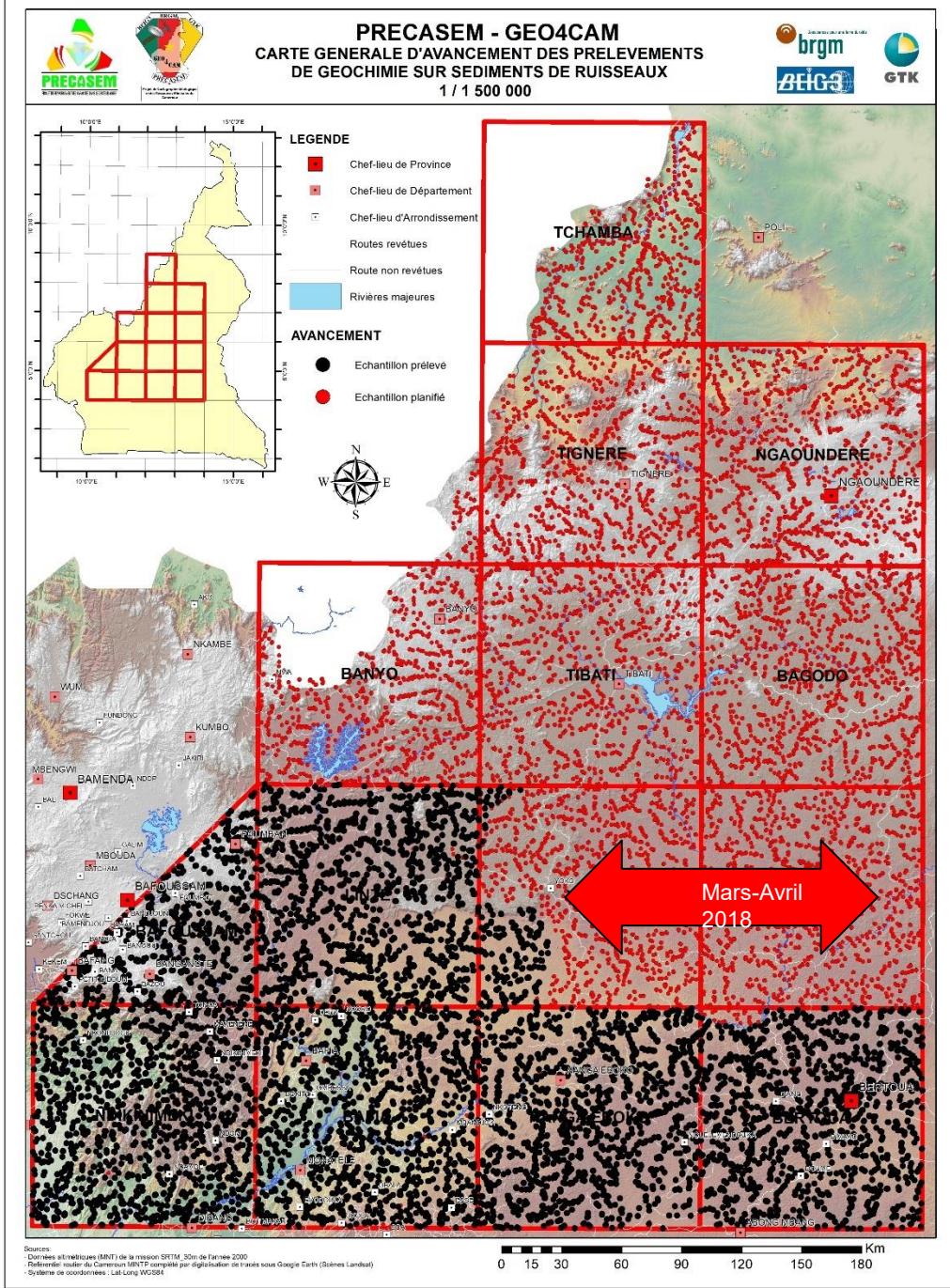
- Results :

- Updated geological maps (1/200 000 scale) ;
- Set up of a national lithotéque



## Geochemical Prospection





# Geochemical Prospection

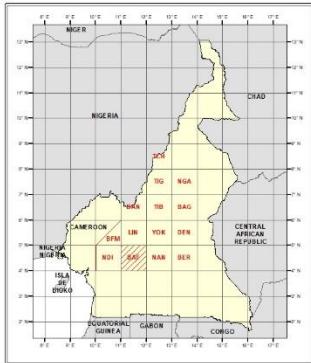
*Interpretation in progress...*



### Carte des anomalies géochimiques

## BAFIA

1/200 000



#### INFRASTRUCTURES

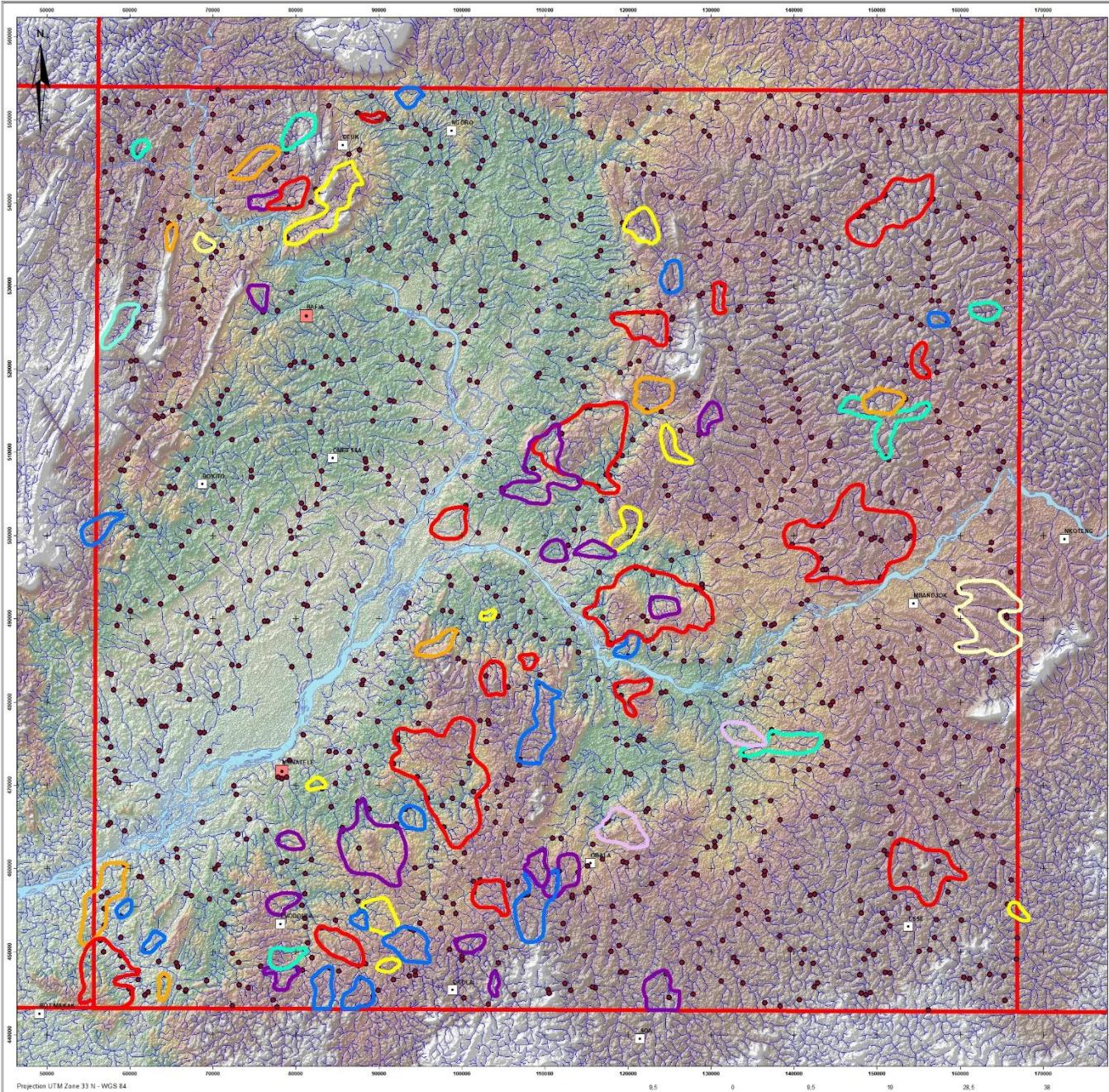
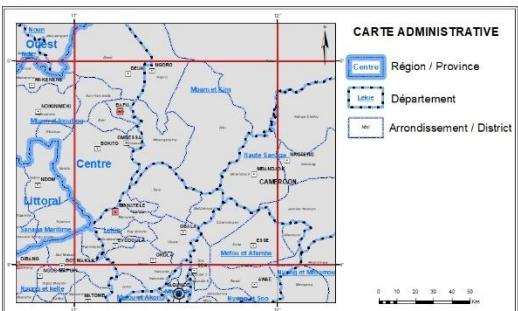
- VILLE / Chef-lieu de Province
- VILLE / Chef-lieu de Département
- VILLE / Chef-lieu d'Arrondissement
- Village / Habitations isolées

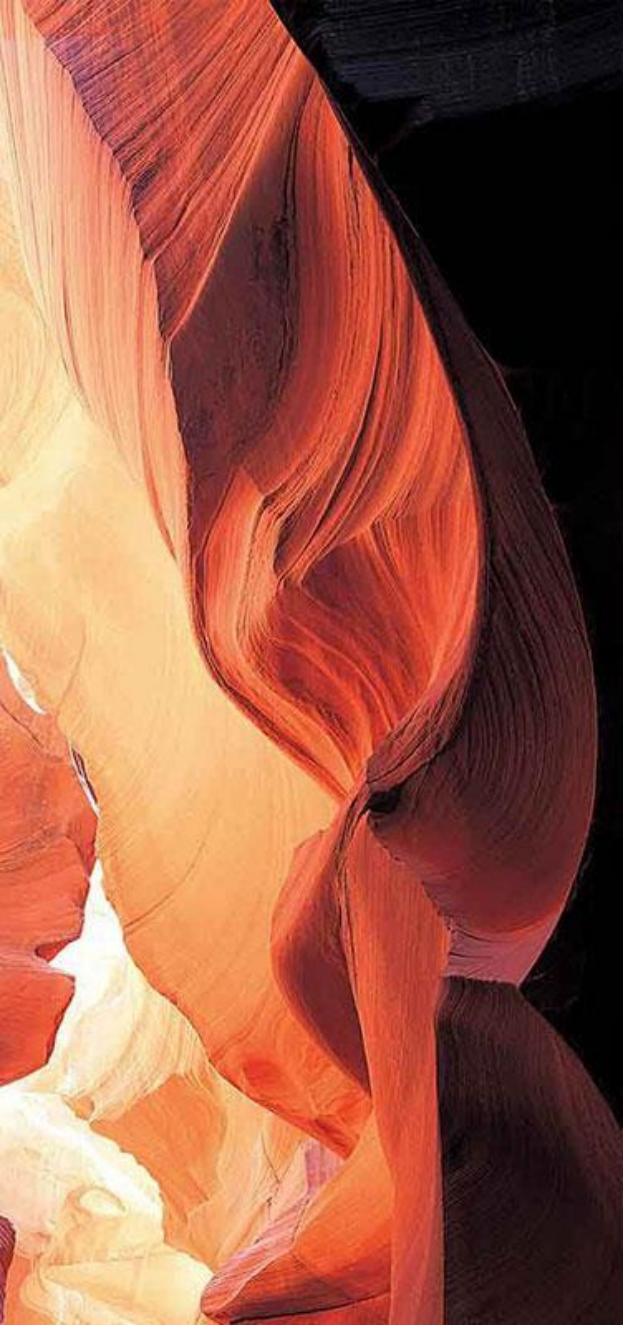
#### HYDROGRAPHIE

- Rivière importante / Fleuve / Lac
- ~~~~ Cours d'eau
- Marécage

#### Anomalies géochimiques

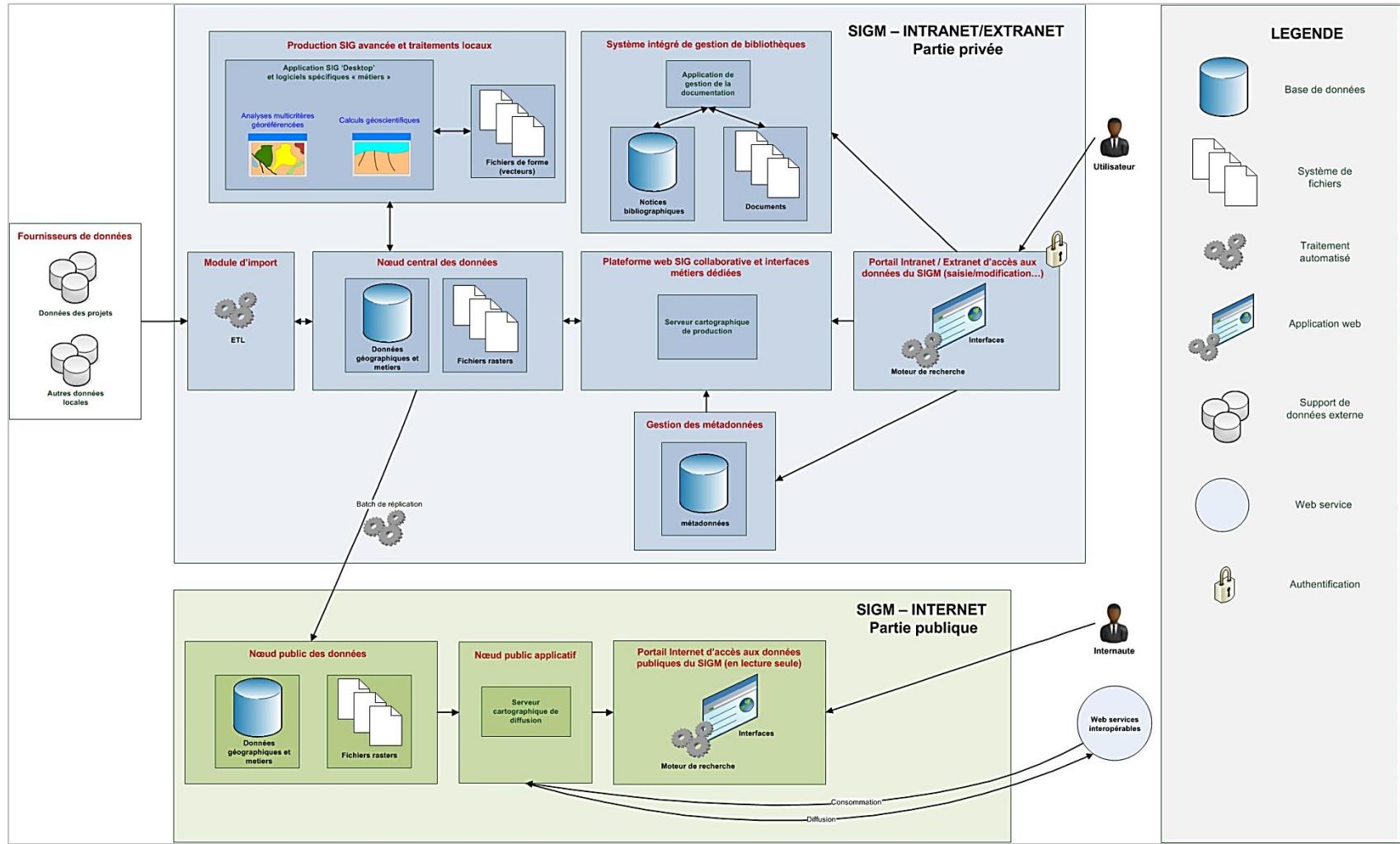
- Métaux précieux
- Métaux rares (Li, Sn, W, Be, Nb, Ta...)
- Métaux d'affinité mafique/ultramafique (Ni, Cr, V...)
- Métaux de bases (Cu, Zn, Pb...)
- Minéraux lourds (Ti, Zr...)
- Métaux énergétiques





# Mining data in Cameroun Data valorisation

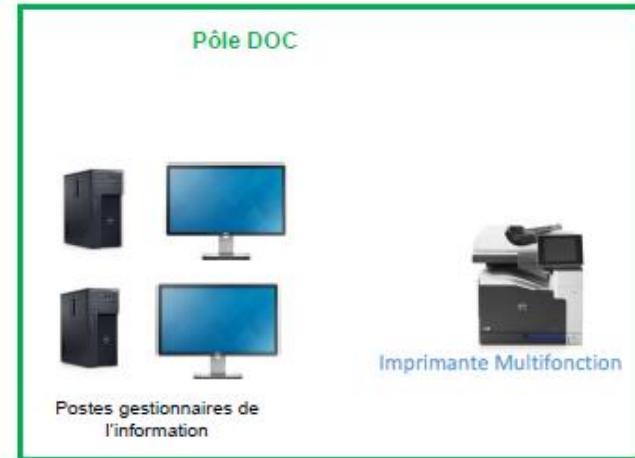
# SIGM architecture proposition



# IT infrastructures : adapted !



Armoire forte pour stocker les sauvegardes bandes







## POC SIGM

**Données préliminaires**

## Bibliothèque

Mes favoris Contenu de mon organisation Contenu Esri

### Cartes à l'affiche de l'atlas dynamique

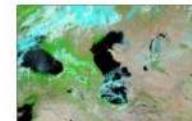
Trier par : Les plus récentes

#### Cartes

Afficher

##### Tout

- Imagerie
- Fonds de carte
- Cartes historiques
- Données démographiques et de style de vie
- Paysage
- Océans
- Observations de la Terre
- Systèmes urbains
- Transports
- Frontières et lieux
- Cartes de narration



MODIS (Burn Scars and Flooding)



MapWorld Global Basemap



Eri Drought Tracker



One World, Many Voices: Endangered



Interesting Places



Linz, Austria Scene

#### Apps



## Contenus

+ Ajouter Un Élément ▾ Crée ▾ Partager X Effacer Disposer ▾ Changer De Propriétés

Dossiers

NOUVEAU ▾ EFFACER

Données préliminaires

Géorouge Est

Geocoding Tools

Geometry

Géochimie

Géologie Africaine 1 / 10 000 000

Géologie Africaine 1/10 000 000

mon appli test

PrintingTools

PublishingTools

PublishingToolsEx

SampleWorldCities

WMS

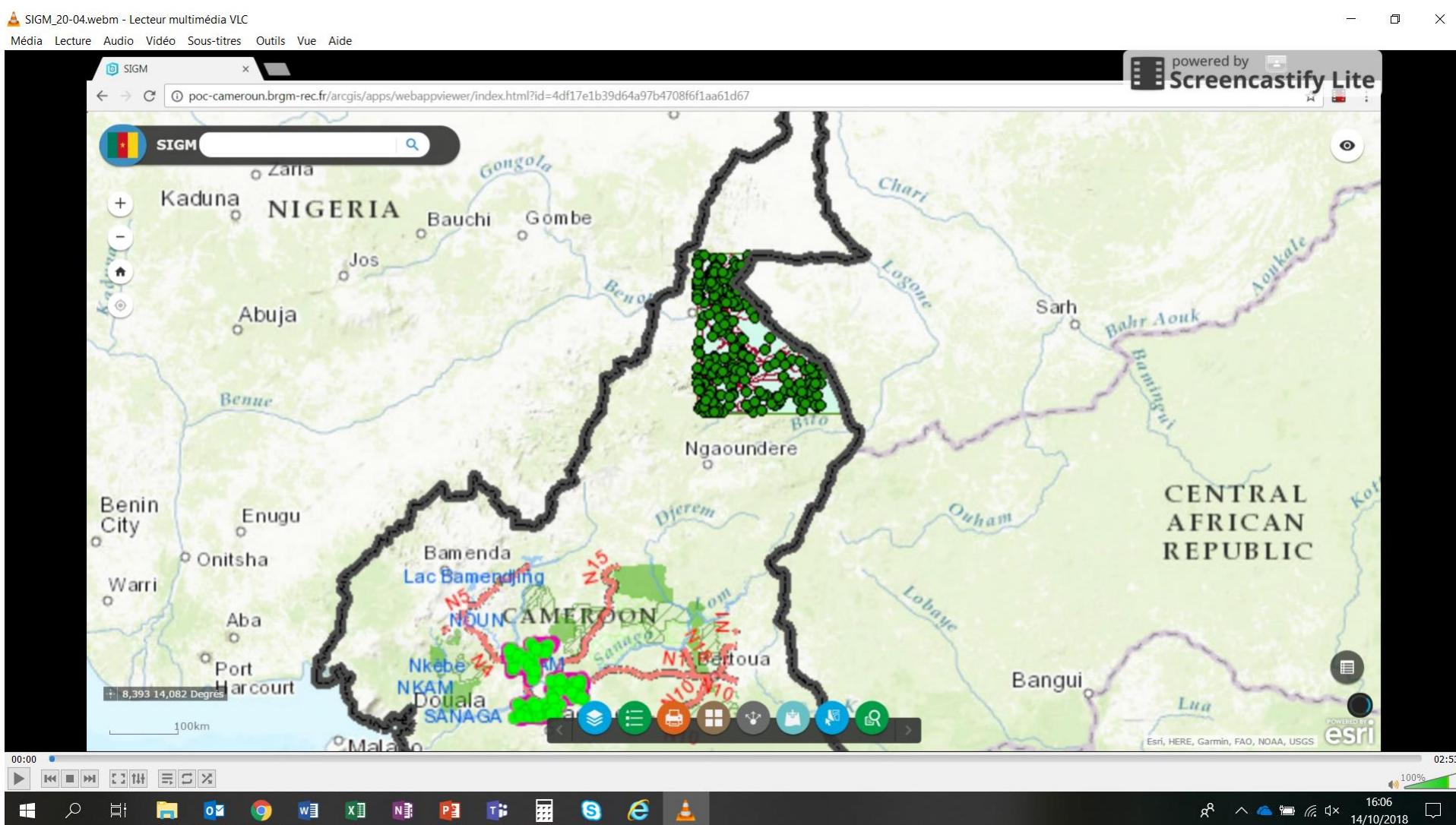
Type	Modifié	Partagé
Web Map	29 mars 2017	Organisation
Map Image Layer	29 mars 2017	Organisation
Geoprocessing Service	16 mars 2017	Non partagé
Geometry Service	16 mars 2017	Non partagé
Web Map	29 mars 2017	Organisation
Map Image Layer	29 mars 2017	Organisation
Web Map	29 mars 2017	Non partagé
Map Image Layer	29 mars 2017	Organisation
Web Mapping Application	24 mars 2017	Non partagé
Geoprocessing Service	16 mars 2017	Non partagé
Geoprocessing Service	30 mars 2017	Non partagé
Geoprocessing Service	30 mars 2017	Non partagé
WMS	16 mars 2017	Non partagé

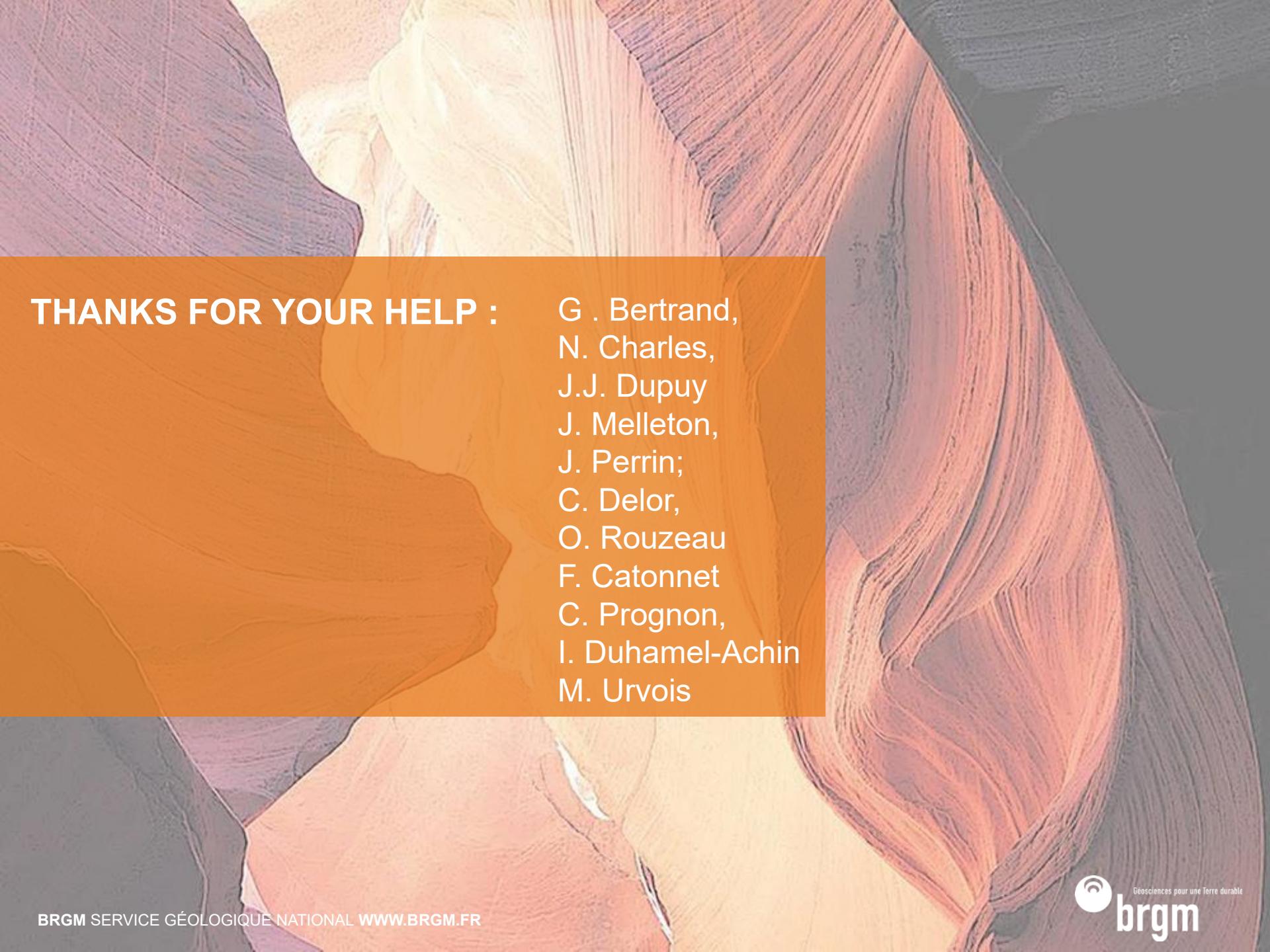


République du Cameroun

21/04/2017

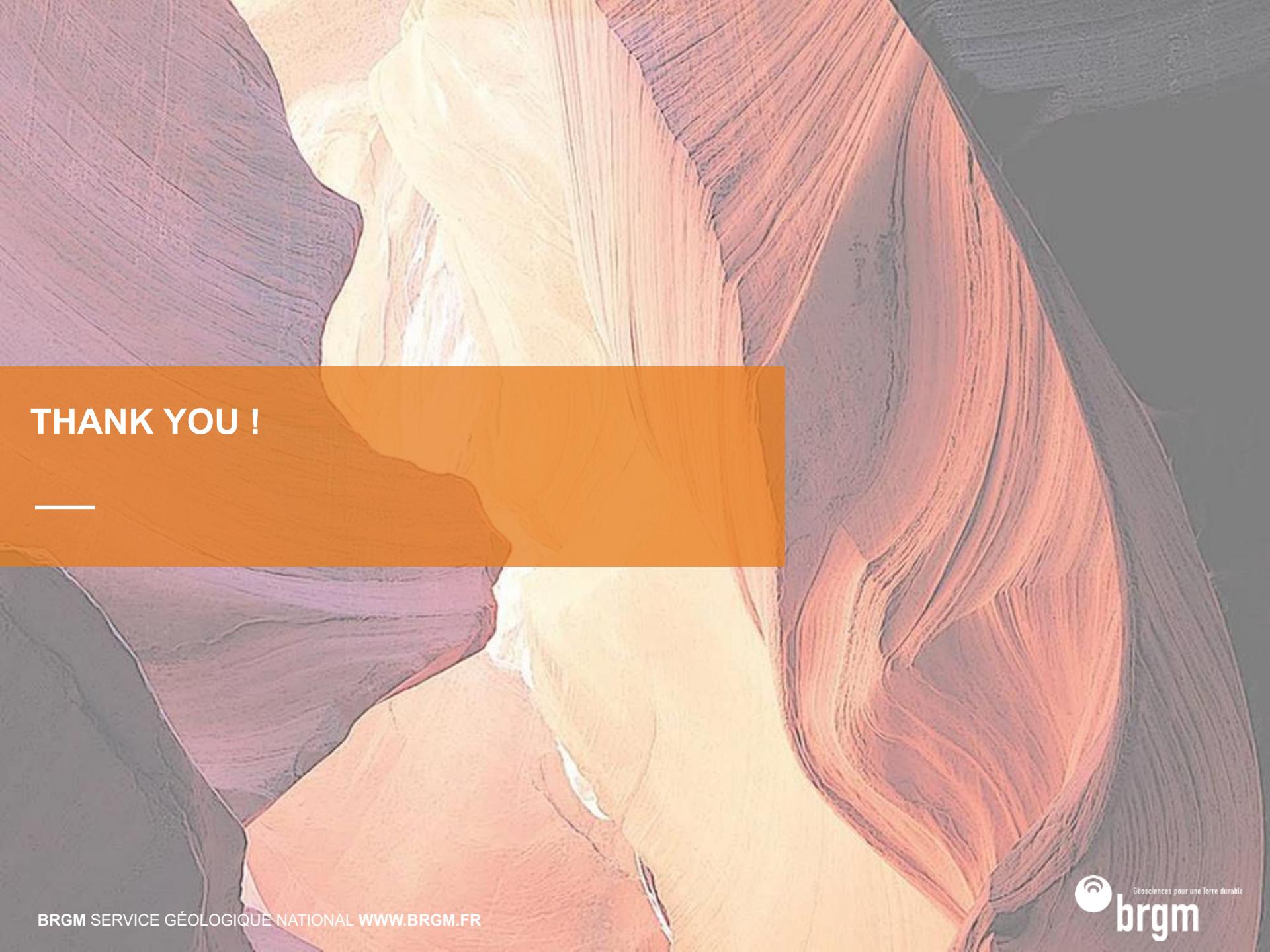
## Demonstration :





**THANKS FOR YOUR HELP :**

G . Bertrand,  
N. Charles,  
J.J. Dupuy  
J. Melletton,  
J. Perrin;  
C. Delor,  
O. Rouzeau  
F. Catonnet  
C. Prognon,  
I. Duhamel-Achin  
M. Urvois



THANK YOU !

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