

# Geochemical characterisation of the Mississippi Valley Type Pb-Zn-Cu and Ba mineralisation in the Lower Cretaceous sediments of the Coastal Basin, Gabon, Central Africa

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## GEOLOGICAL CONTEXT:

The Kroussou area is located in central western Gabon where two major geological domains are distinguished:

- the Permian to recent Coastal sedimentary Basin;
- a horst of Archaean to Palaeoproterozoic basement belonging to the Kimezian Supergroup metamorphosed around ca. 2.0-2.1 Ga (Tack et al., 2001). It was also reworked during the Neoproterozoic West Congo Orogeny (Pan-African).

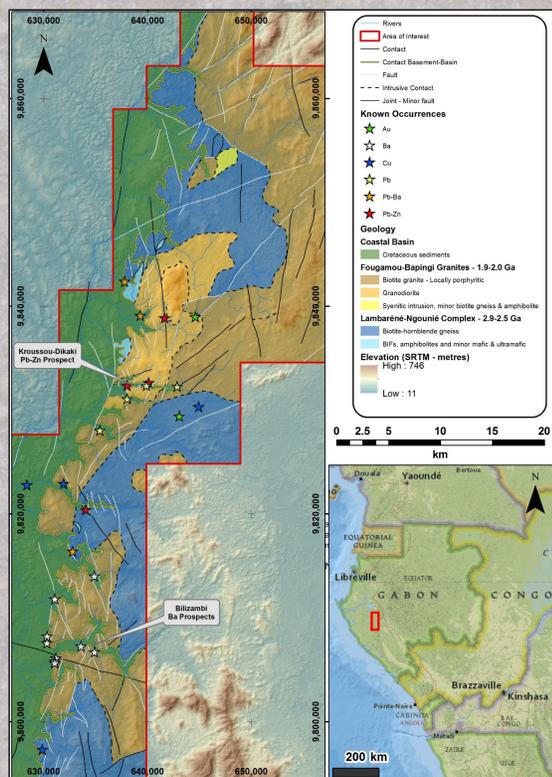
Known Pb-Zn mineralisation is comprised of disseminated coarse-grained galena and finer-grained sphalerite hosted in clastic and carbonate-rich sediments of the Upper Cocobeach Formation (Lower Cretaceous). The contact of the sediments with the basement follows kilometre-long embayments and is frequently marked by metre-large blocks of barite locally associated with pyrite and galena.



Coarse-grained arkose  
33.10% Pb - 0.96% Zn  
Dikaki Prospect



Quartz/feldspar-rich limestone  
9.69% Zn - 2.30% Pb  
Dikaki Prospect



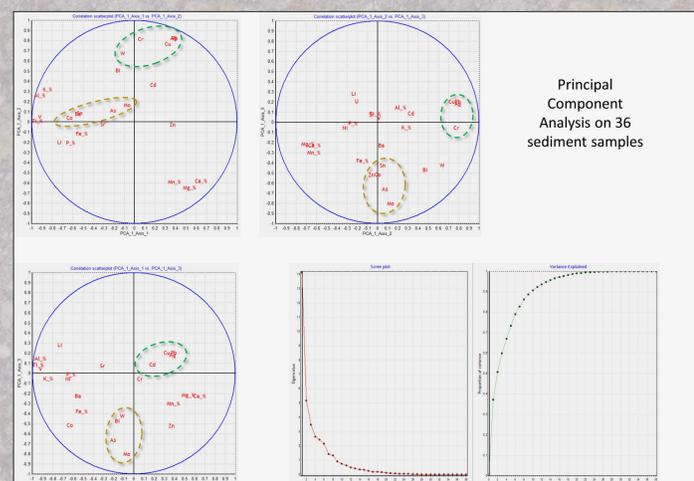
## ELEMENT ASSOCIATIONS:

A total of 60 samples of sediment and basement lithologies were sampled as part of two mapping programs by SRK Consulting in 2014 and 2015.

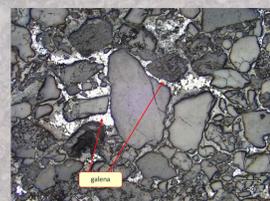
A Principal Component Analysis (PCA) was conducted on 36 sediment samples and identified two main associations:

1. A strong Pb-Cu-Ag-Cr±Cd±W association corresponding to the coarse-grained clastic sediments
2. A weaker Zn-Mo-As-Co association supported by calcareous sandstones and carbonates.

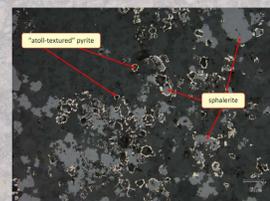
A weak Zn-Ca-Mg-Mn association is also observed on the correlation scatterplots.



Petrographic work on mineralised samples has confirmed the predominance of Zn with carbonates and Pb with clastic sediments although most sphalerite-rich samples also contain galena. Fine-grained carbonate matrices are common in the sandstones and arkoses.



Coarse-grained quartz and feldspar clasts in carbonate- and galena-dominated matrix (MB029b)



"Atoll-textured" pyrite enclosing either sphalerite or open cavities within a fine-grained carbonate matrix (MB054)

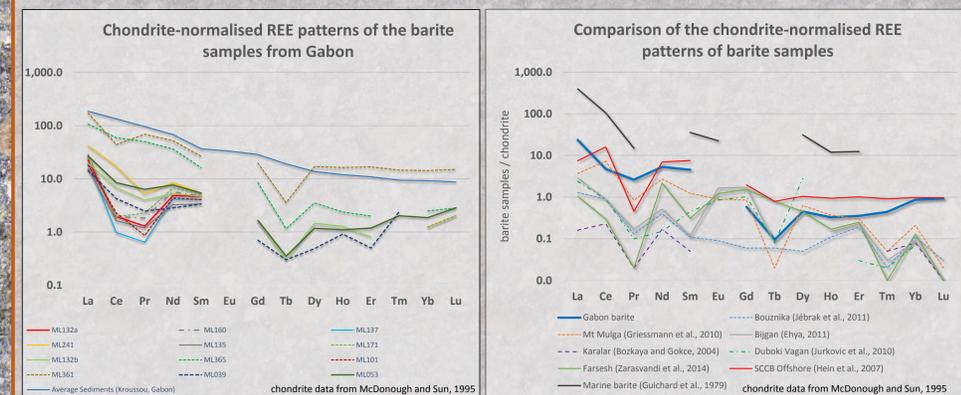
## REE DISTRIBUTION IN BARITE SAMPLES:

The REE distribution of 12 samples of barite and barite-rich sandstones was studied to understand how the barite is formed in the context of the Coastal Basin.

The REE content was assayed by ICP-AES and ICP-MS methods, with the exception of Eu as interferences are observed between Ba and Eu.

Most samples show an enrichment in light REE's and a low enrichment to depletion of REE's heavier than Eu.

REE signatures were compared to published data on barite of marine/pelagic or hydrothermal origins. The barite samples from Gabon show strong similarities with samples from the rifted continental margin of Southern California Continental Borderland (SCCB, Hein et al., 2007) associated hydrothermal fluids along faults. Our samples also share textural similarities with those of the SCCB as they display replacement of the sediments by barite and local brecciation. These characteristics were observed in several places along the margin of the Coastal Basin in Gabon.



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## CONCLUSIONS:

Two end-members of the Pb-Zn mineralisation can be defined:

- a Pb-Cu-Ag-Cr±Cd±W association hosted in coarse-grained arkoses and quartz sandstones with carbonate and baritic matrix. This type can be likened to Mississippi Valley Type (MVT) deposits of the Laisvall sub-type.
- A Zn-Mo-As-Co±Ca±Mg association hosted in (impure) carbonates and closer in affinity to MVT *sensu stricto*.

The REE signature of the Ba mineralisation observed along and in-between the embayments suggests a hydrothermal origin and precipitation from low temperature fluids.