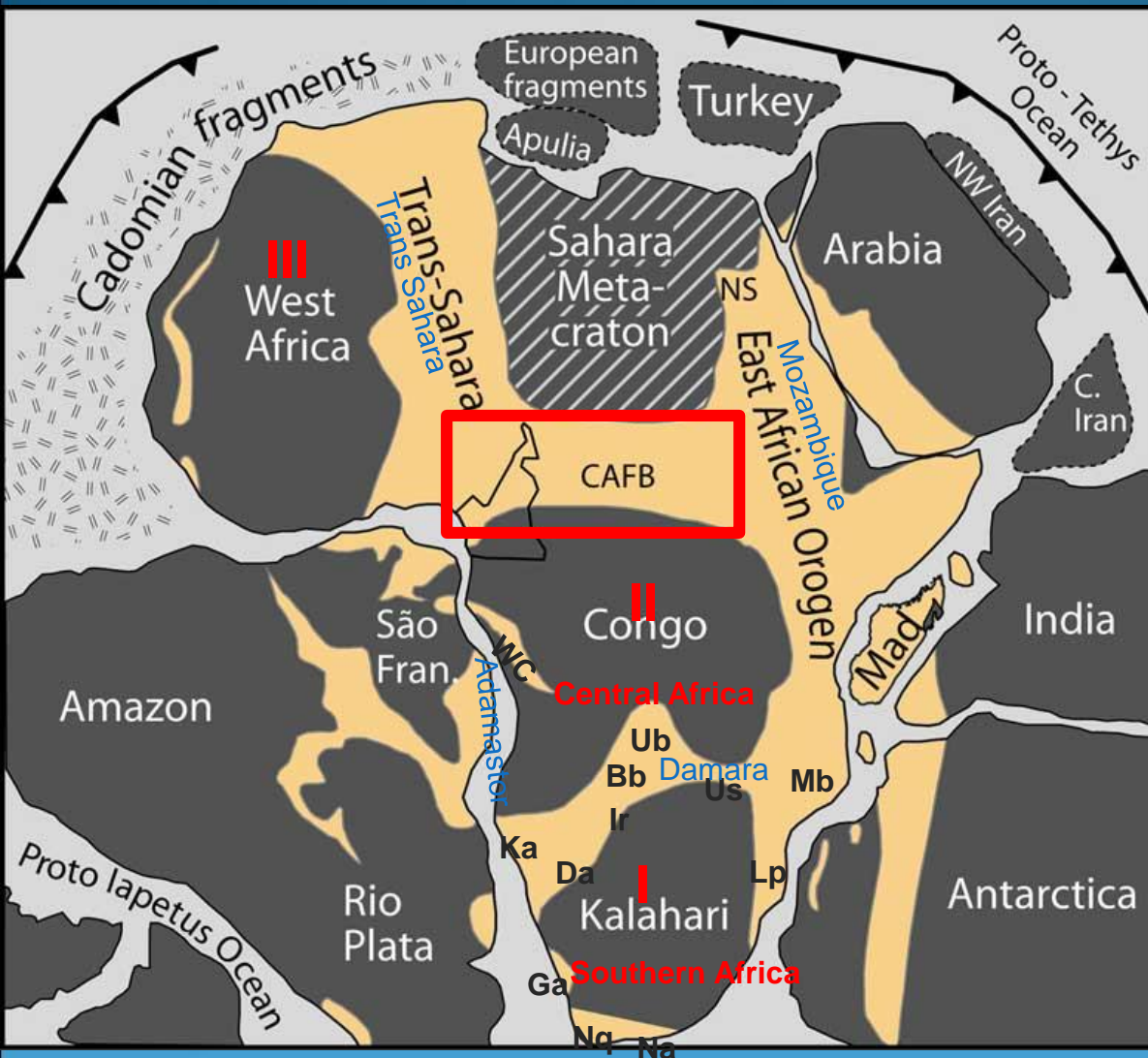


Neoproterozoic evolution of the Central African Fold Belt (CAFB) from Cameroon to Central African Republic and Chad, and correlations with NE Brazil

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PAN-AFRICAN SYSTEM OF OROGENIC BELTS IN AFRICA



Pan-African event (Kennedy, 1964) or mobile belts surrounding older cratons or shields are essentially resulting from closure of several major NP oceans (Black, 1966, 1967, 1978; Kusky et al., 2005; Kröner and Stern, 2005; Pankhurst et al., 2008)

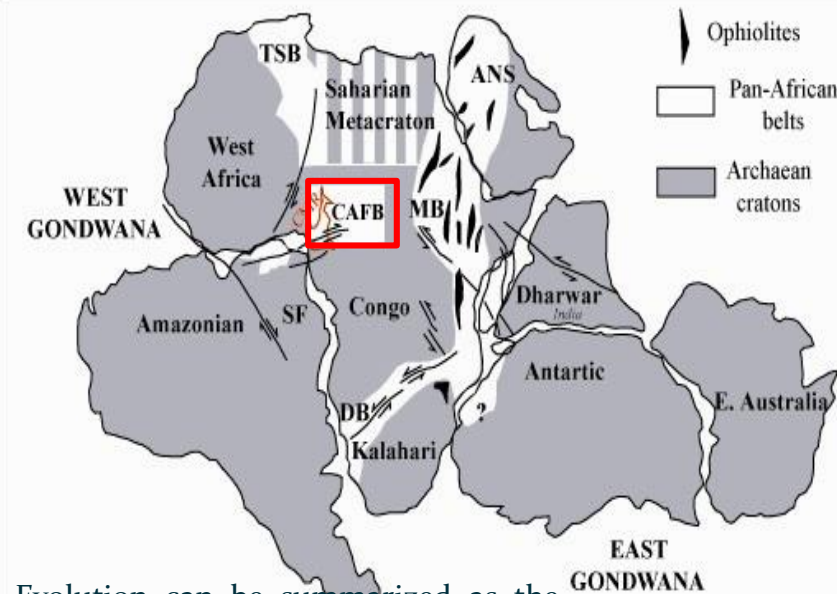
Pan-African formations in Central Africa region belong to a fold belt known as Central African Fold Belt (CAFB, Toteu et al., 2001, 2004); Centrafrica Belt (Penaye et al., 1993); Panafrican North-Equatorial Fold Belt (Nzenti et al., 1988), Oubanguides Belt (Poidevin, 1983), or Central African Orogenic Belt (CAOB)

This fold belt north of the Congo Craton was recognized in the 1960s by the widespread occurrence of ca. 500–600 Ma Rb–Sr whole rock and mineral ages (Lasserre, 1964, 1967; Lasserre et Soba, 1976)

Central Africa is known as a geologically complex area that underwent a long history of reworking of Archaean and PP terranes, NP arc accretion, sedimentary basin formation, subduction, collision and extrusion tectonics during the final amalgamation of West Gondwana

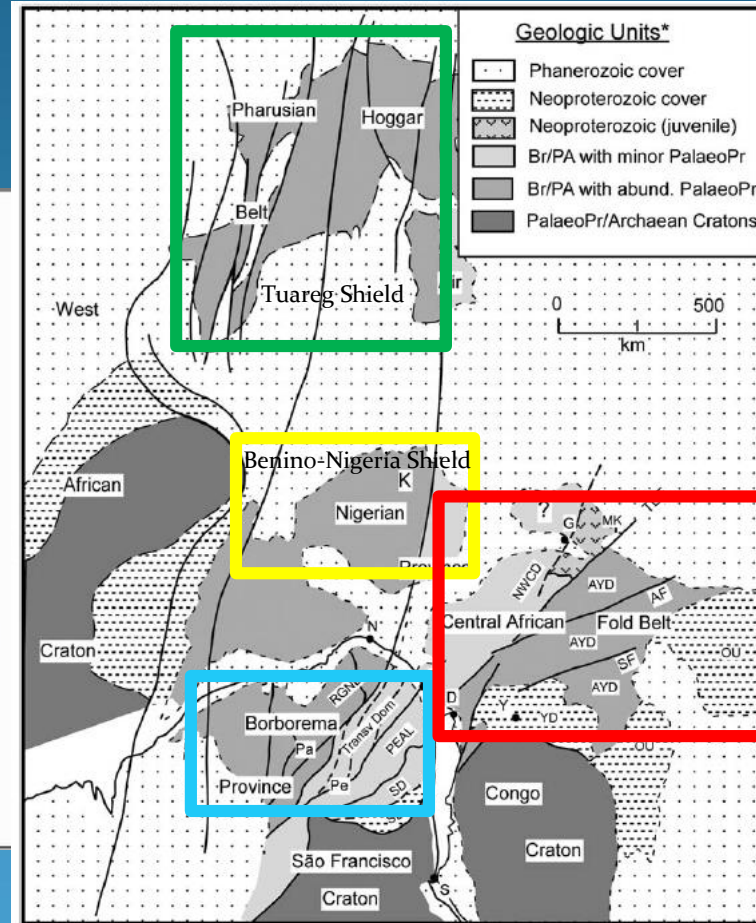
CENTRAL AFRICAN FOLD BELT IN THE GONDWANA SUPERCONTINENT

Disparate geological domains of continental and oceanic origin, derived from juvenile volcanic arcs or continental magmatic arcs accreted around older blocks throughout the NP (ca 750-550 Ma)



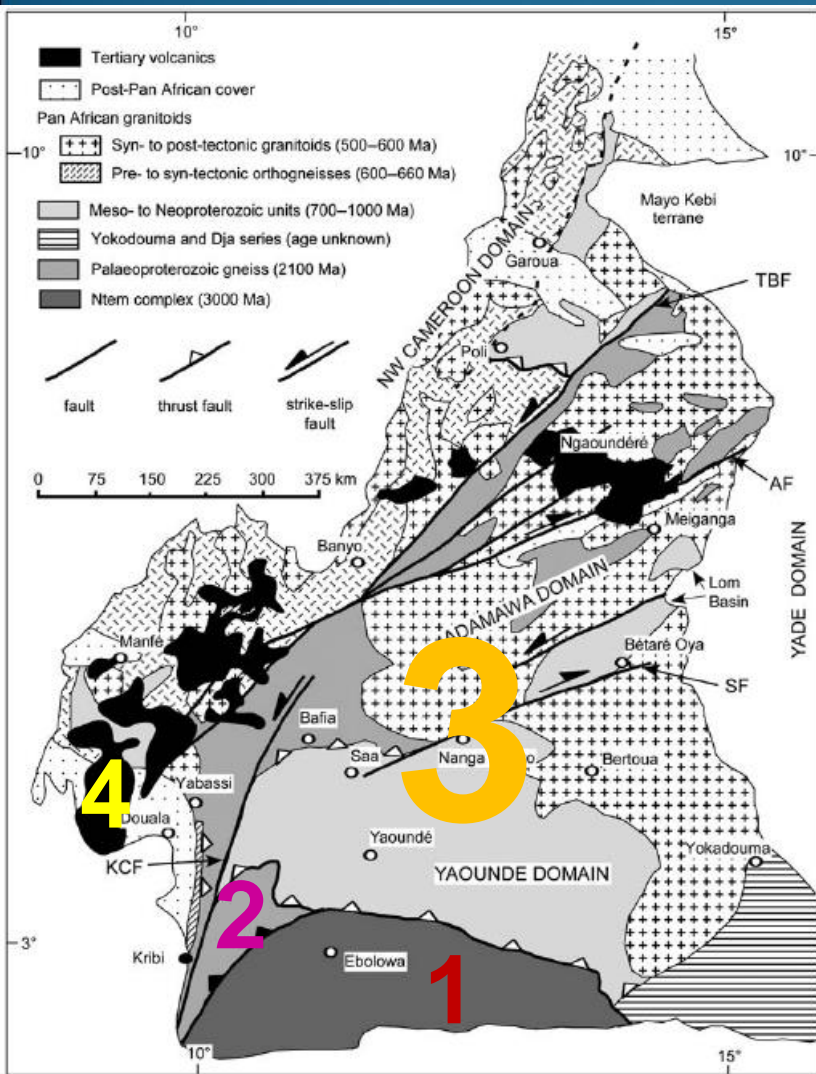
Evolution can be summarized as the result of the convergence and collision

Paleogeographic reconstruction of the Gondwana supercontinent showing the relations between the CAFB and the surrounding cratons, ca 500 Ma (Modified from Piper, 2000 and Bouyo Houketchang, 2010)



Portion of West Gondwana about 500 Ma showing inferred geological provinces or terranes and potential correlations from Brazil to West-Nigerian Africa (Modified from Van Schmus et al., 2008)

CENTRAL AFRICAN FOLD BELT IN CAMEROON



The geological history of Cameroon consists of an amalgamation of Precambrian terranes that show a long and complex crustal evolution beginning in the early Archaean and extending to the late NP.

Four main lithotectonic units can be distinguished:

- 1- **Archaean Ntem Complex/CC (MA-NA)**
(Banded series «greenstone belt, charnockitic & TTG gneisses; Intrusive series (charnockite, enderbite, TTG, syenite)
- 2- **Archean-Eburnean Nyong Group and its N extension known as Bayomen D**
(BIF, banded gneiss, eclogite, amphibolite, migmatite, supracrustal rocks, granitoids)
- 3- **Pan-African CAFB**
- 4- **Tertiary to Actual volcanism of CL**

Geological sketch map of Cameroon showing major lithotectonic units. Modified from Toteu et al. (2001)

CENTRAL AFRICAN FOLD BELT IN CAMEROON

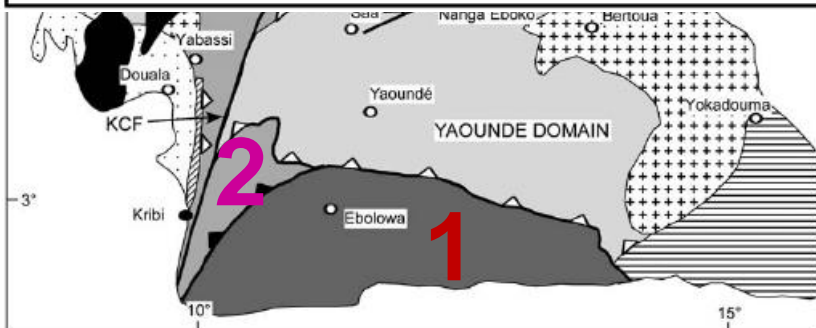
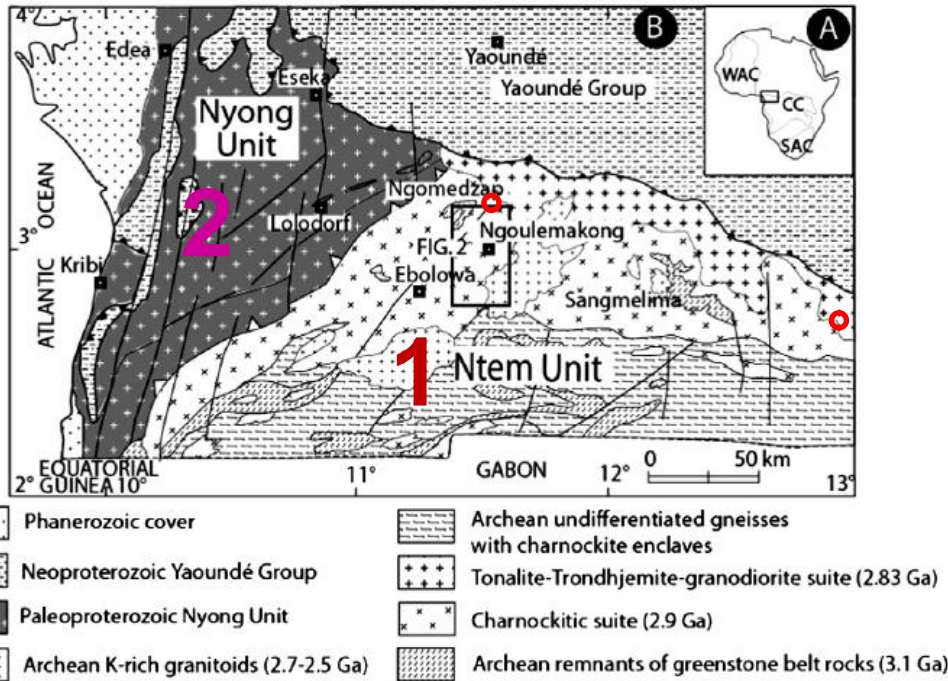
-1- Archaean Ntem Complex/CC

Three main stages of crustal evolution (U-Pb and Sm-Nd): (a) formation of **greenstone belt** at **ca 3.1 Ga**, (b) a major phase with emplacement of **charnockite** and **TTG** b/w **2.8-2.9 Ga** and (c) a final stage corresponding to melting of greenstone belt and TTG at deeper levels to form **K-rich granitoids** between **2.7-2.5 Ga** (Nédélec et al. 1990; Toteu et al. 1994; Tchameni et al. 2000, 2010; Shang et al. 2004)

Talla et al., 2009 provide evidence of early PA magmatic activity at **3477±19 Ma** from xenocrystic zircon with high CL and oscillatory zoned, and Li et al., 2016 yield Hf model age of **3.8 Ga**

-2- A-Eburnean Nyong Group-Bayomen D

-(i) Reactivated part of the NW edge CC / (ii) The N part of the Eburnean-Trans Amazonian West Central African Fold Belt (Lasserre and Soba, 1967; Maurizot et al., 1986; Ledru et al. 1994; Toteu et al. 1994; Feybesse et al., 1998; Penaye et al., 2004; Lerouge et al., 2006; Precasem, 2018). Metamorphic evolution underwent a regime of paired metamorphic belts with UHP eclogite (Loose and Schenk, 2018; Bouyo Houketchang et al.; 2019) prior to HP granulite facies metamorphism at **ca 2,05 Ga**



Geological map of The Archaean Ntem Complex showing major lithotectonic units. Modified from Tchameni et al. (2010).

Rock specimen from the Ntem Complex and the Nyong Group



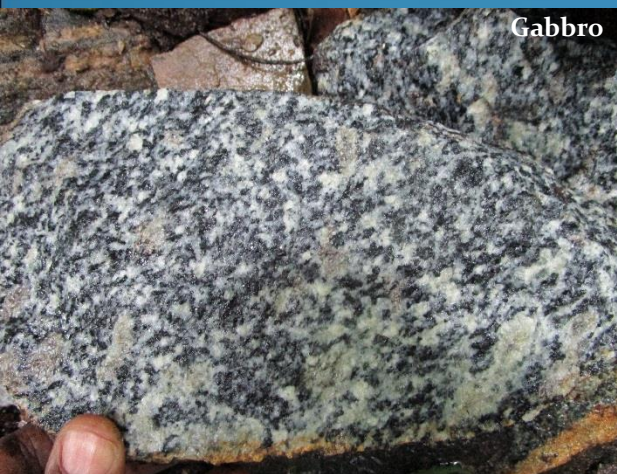
Banded gneiss



Migmatite



Charnockite



Gabbro



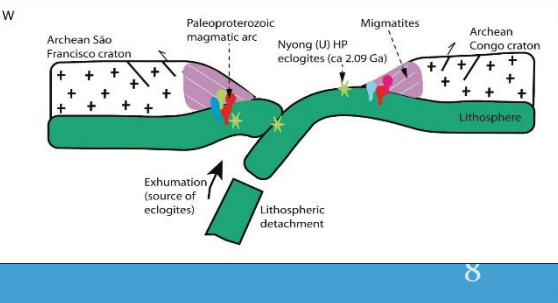
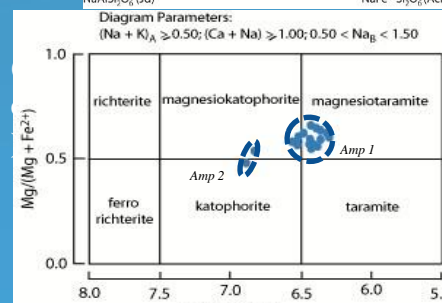
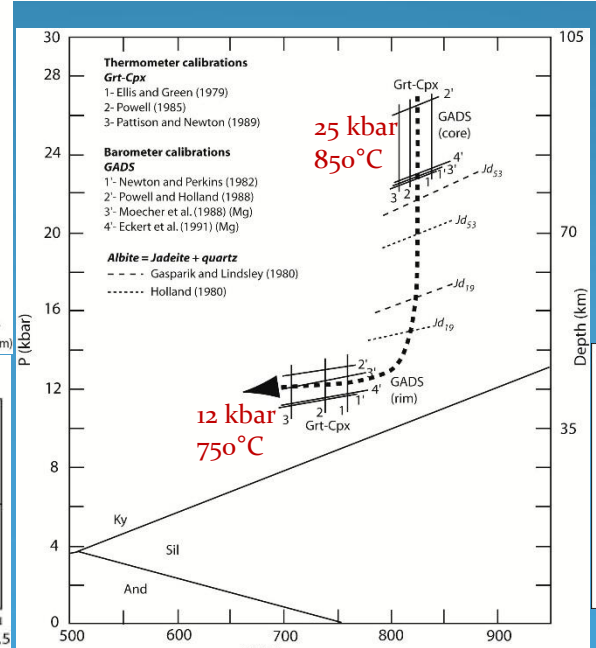
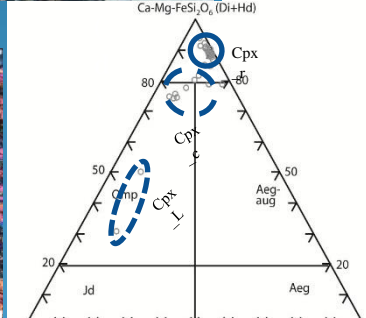
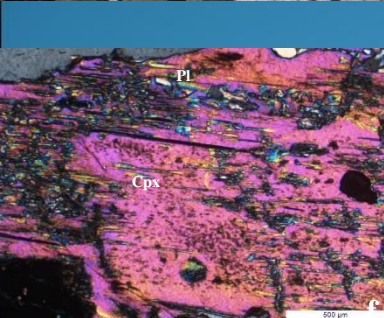
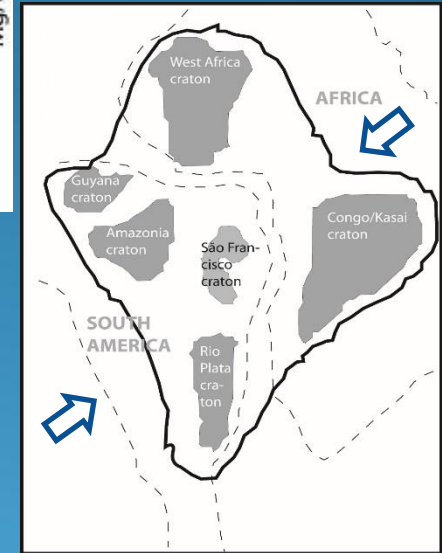
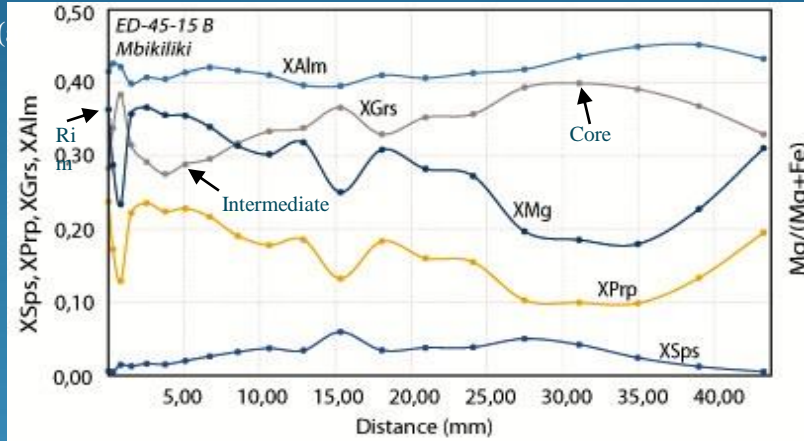
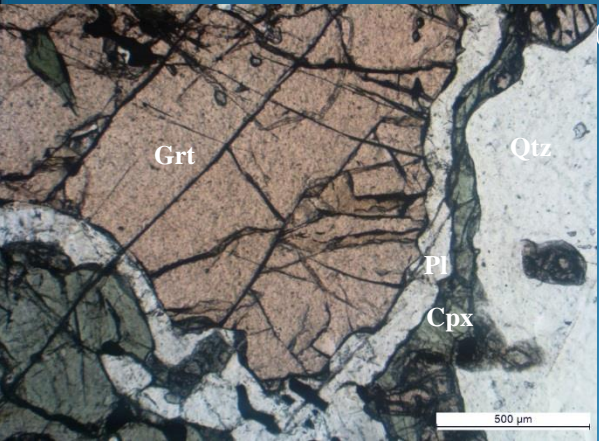
BIF



Eclogite

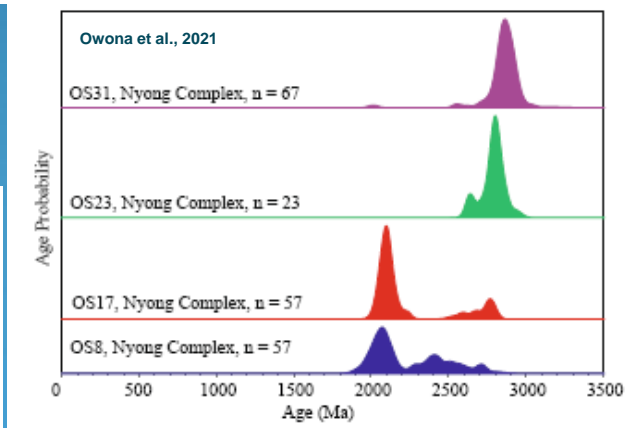
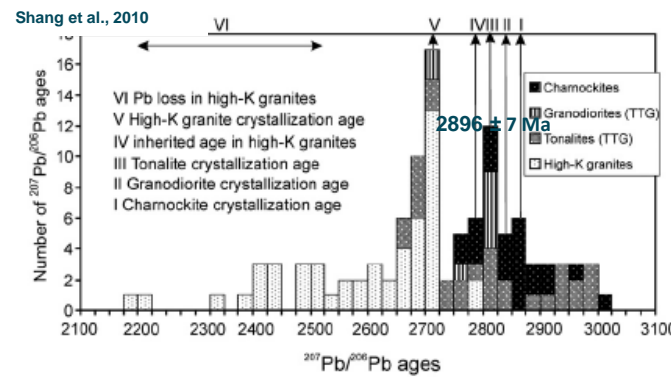
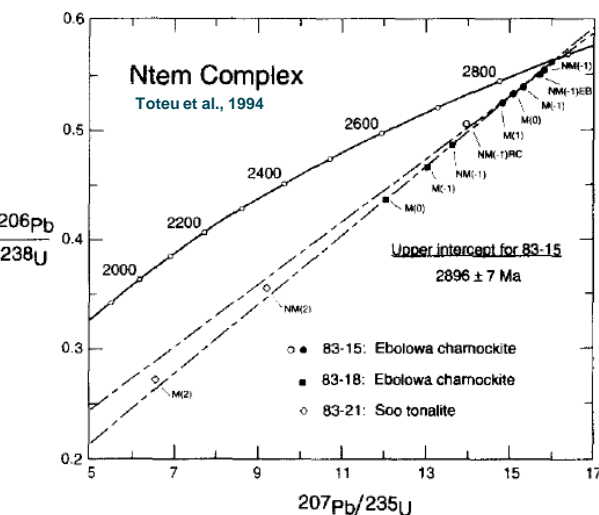
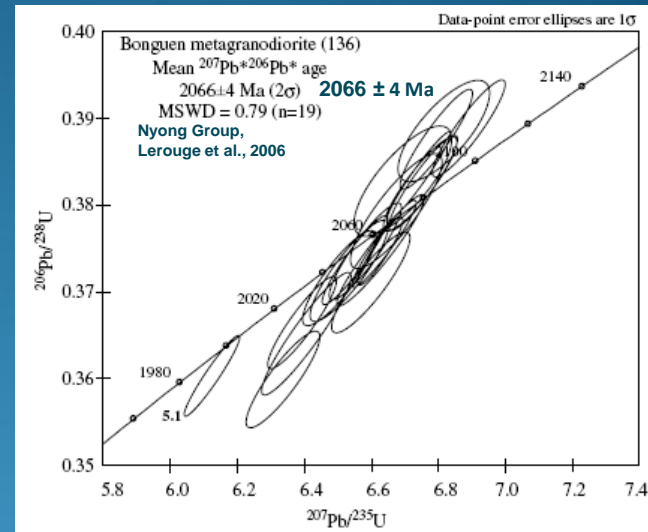
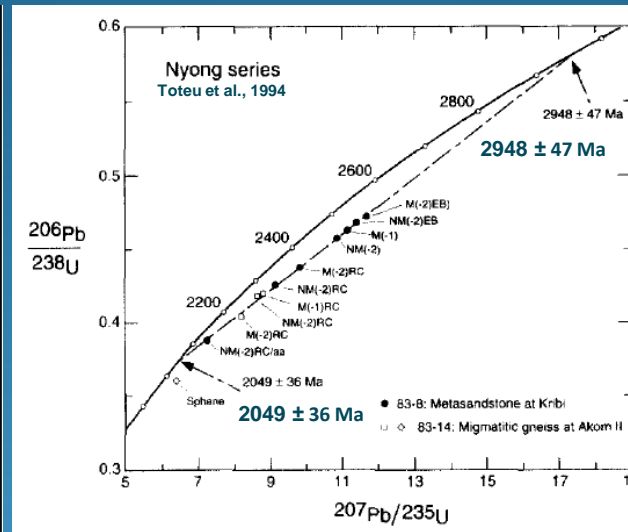
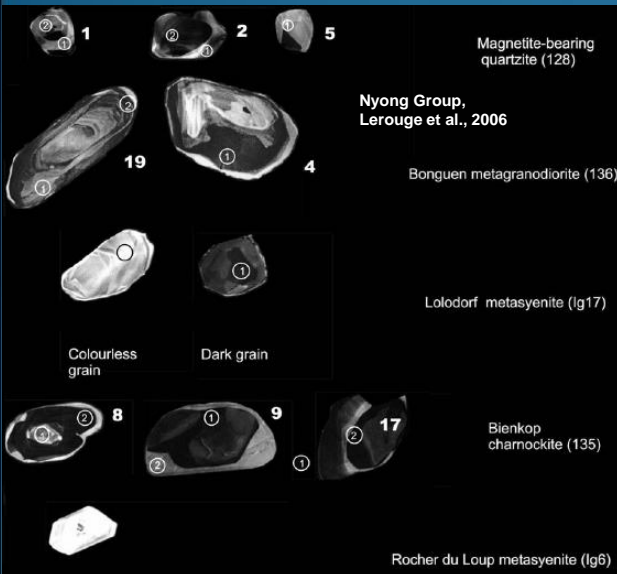
CENTRAL AFRICAN FOLD BELT IN CAMEROON

Petrology and GTB results from the eclogite of the Nyong Group (Bouyo Houketchang et al., 2019)

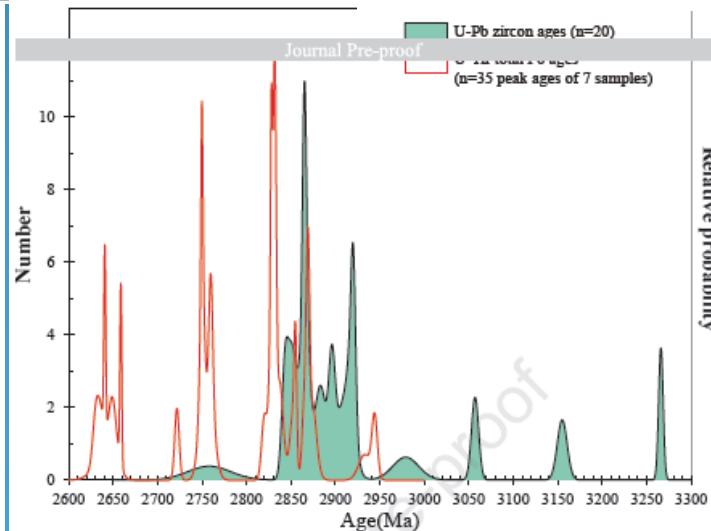
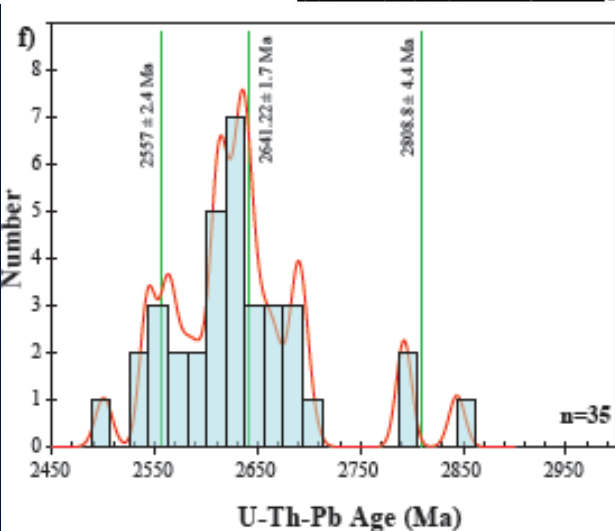
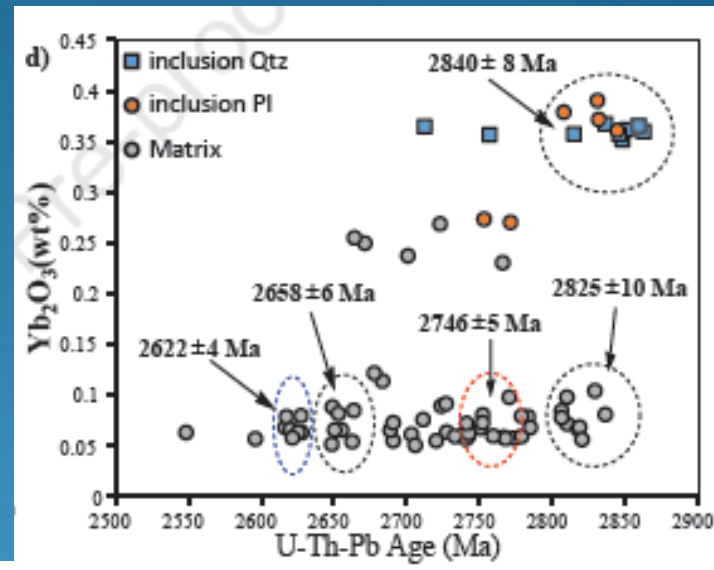
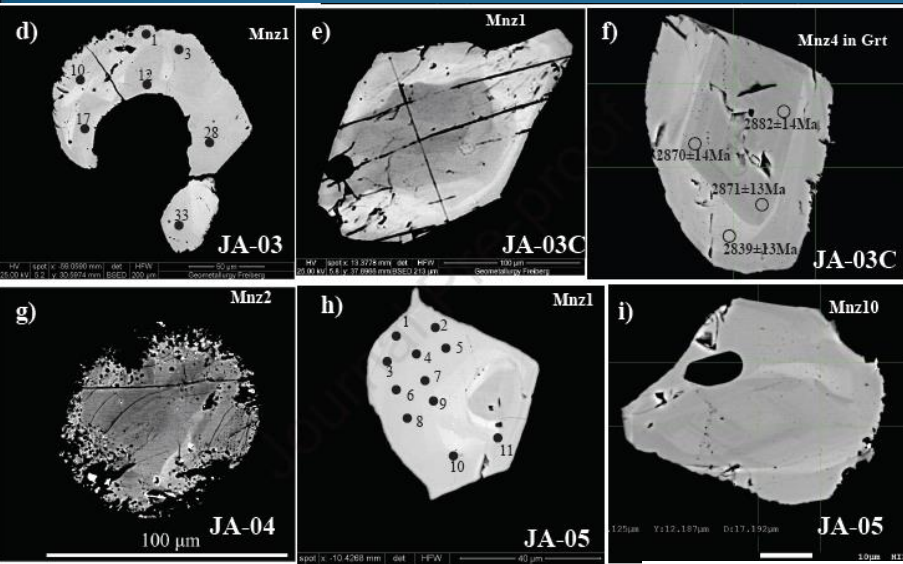


CENTRAL AFRICAN FOLD BELT IN CAMEROON

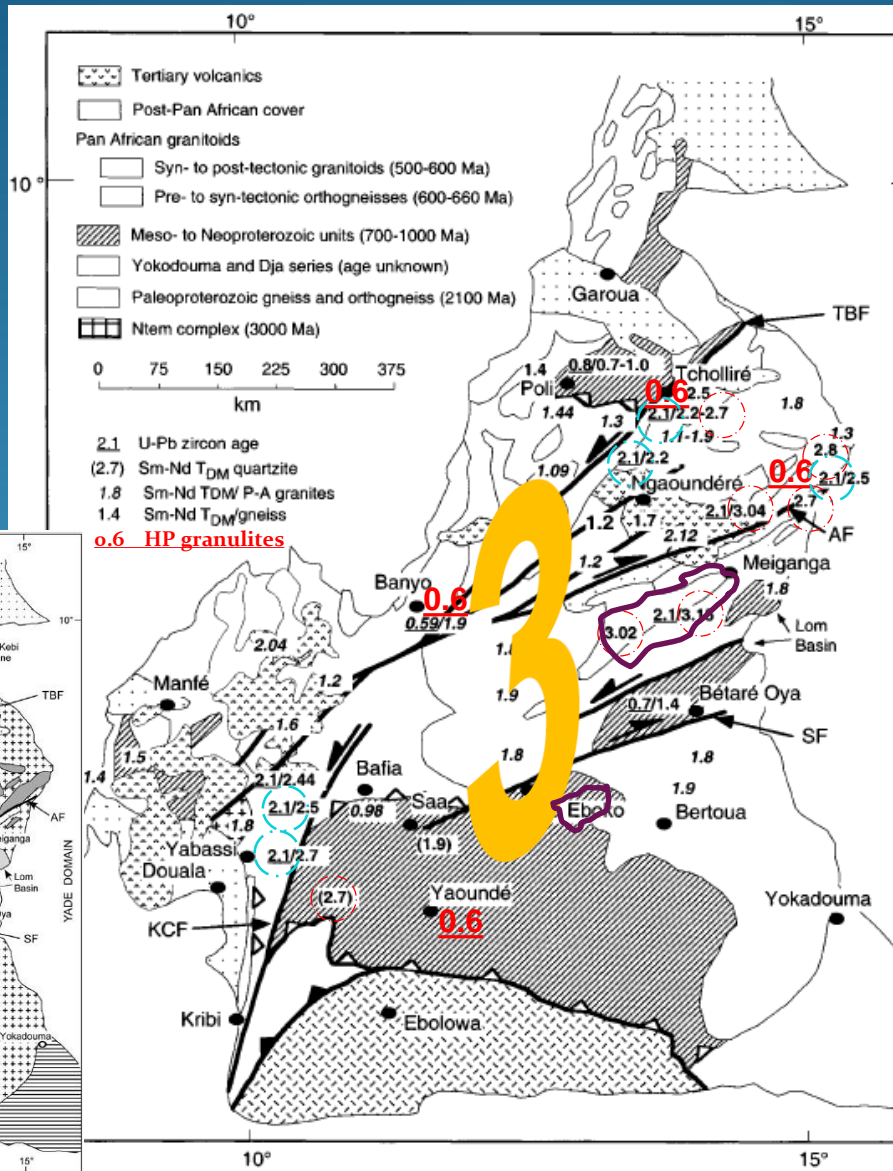
Geochronology results from the Ntem Complex and the Nyong Group (U-Pb zircon dating)



Geochronology results from the Ntem Complex (Monazite dating, Akame et al., 2021)



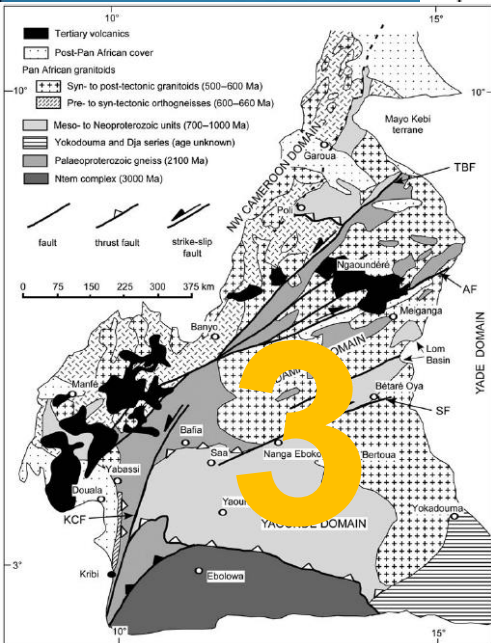
CENTRAL AFRICAN FOLD BELT IN CAMEROON



-3- Pan-African CAFB

- Major Pan African imprints (Metamorphic supra crustal rocks, orthogneiss & abundant Granitoids)
- Windows basement or slices of A & PP rock units (Ntal & Bidinba identified in the Precasem ongoing nation-wide geological mapping project) are also observed
- A, PP, MP, T isotopic signatures as extended CC D

Based on the isotopic, structural and petrographic data, several domains have been distinguished within the CAFB



CENTRAL AFRICAN FOLD BELT IN CAMEROON

CAFB in Cameroon is divided into three domains

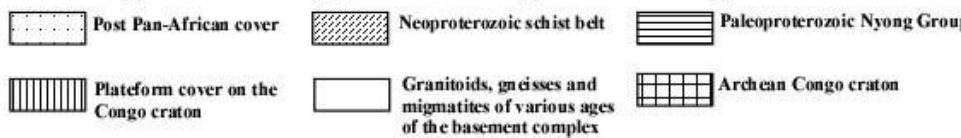
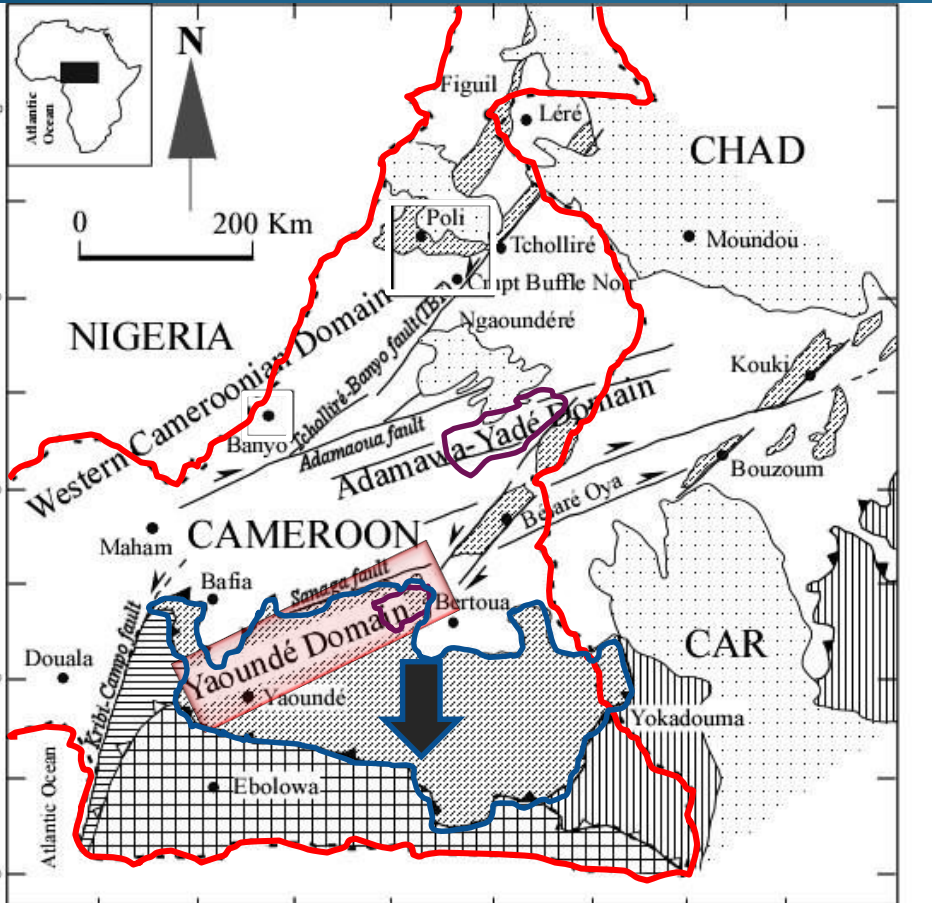
1- NP Yaoundé Domain

Dominated by metasedimentary rocks of the Yaoundé Group (Nzenti et al., 1988; Penaye et al., 1993; Toteu et al., 1994, 2006; Mvondo et al., 2003, 2007; Stendal et al., 2006; Owona et al., 2011; Li et al., 2017) that is para-allochthonous on the CC as a result of a south verging nappe tectonics around 600 Ma. It comprises



Extension to CAR is the Yangana nappe (Toteu et al., proceeding online in GR)

First identification of Archean rocks in the Ydé Nappe (Precasem, 2018)



Geological sketch map of Cameroon showing the main domains of the CAFB. Modified from Toteu et al. (2001).

CENTRAL AFRICAN FOLD BELT IN CAMEROON

CAFB in Cameroon is divided into three domains

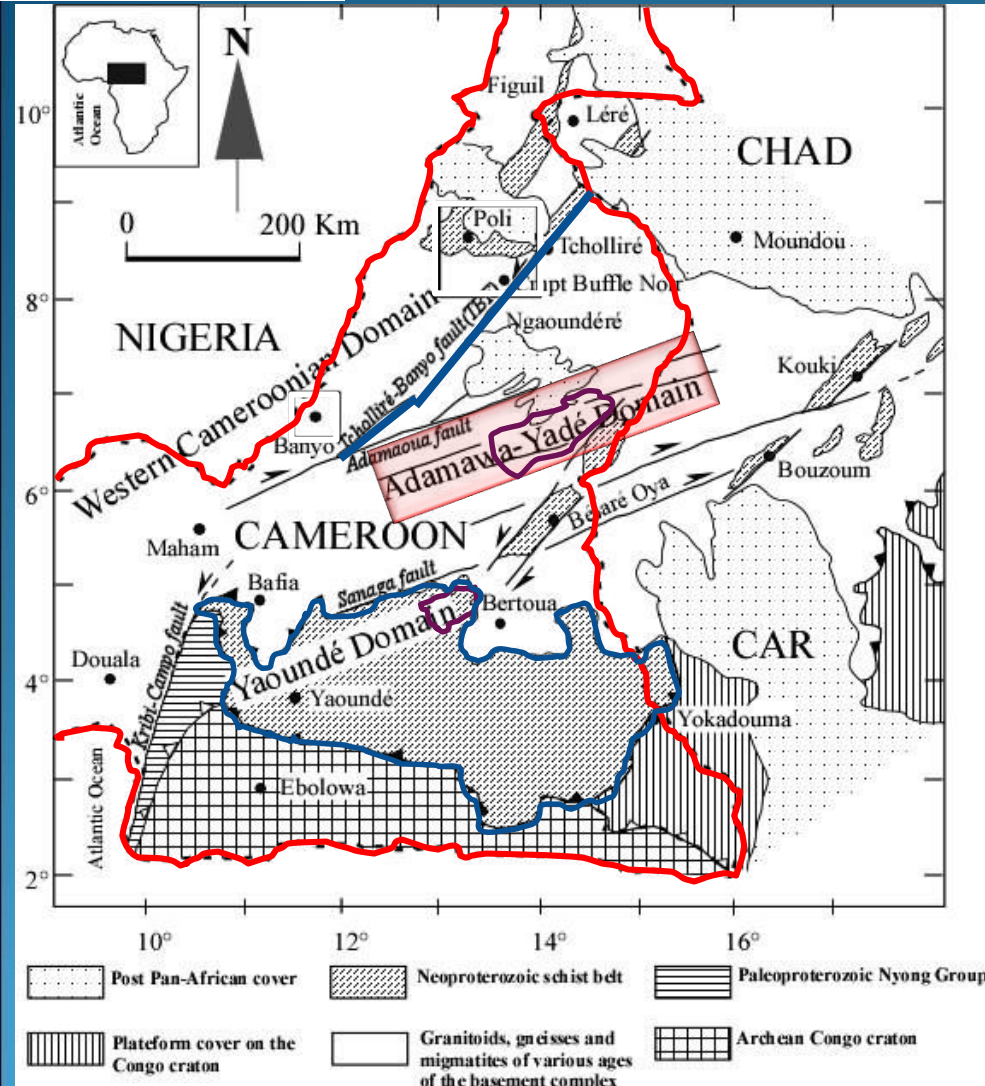
2- Adamawa-Yadé Domain

Location & extension from CMR (Adamawa) to CAR (Yadé) and to Chad (Guéra-Ouaddaï Massifs of South-Central Chad, Shellnutt et al., 2020; Djerosseme et al., 2021; Blades et al 2021)

It is underlain by A-PP basement (BC) and characterized by late Pan-African shear zones and abundant Pan-African granitoids

The regional metamorphism reaching granulite facies is now well constrained around 600 Ma (Bouyo Houketchang et al., 2009, 2013)

AYD also comprises small volcano-sedimentary basins known as the Lom schist belts, interpreted as Pan-African syntectonic basins (Ngako et al., 2003; Toteu et al., 2006). Possible equivalents of these basins are found in the Kouki region in CAR



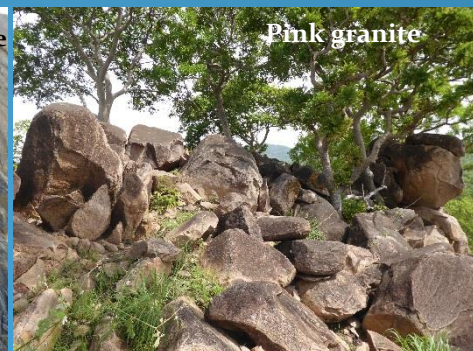
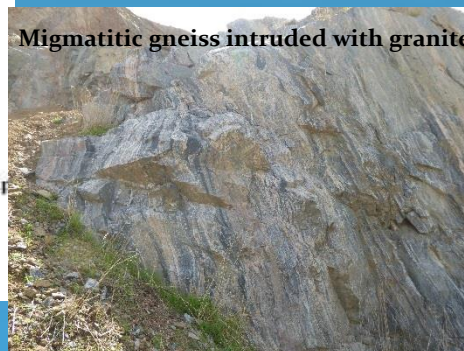
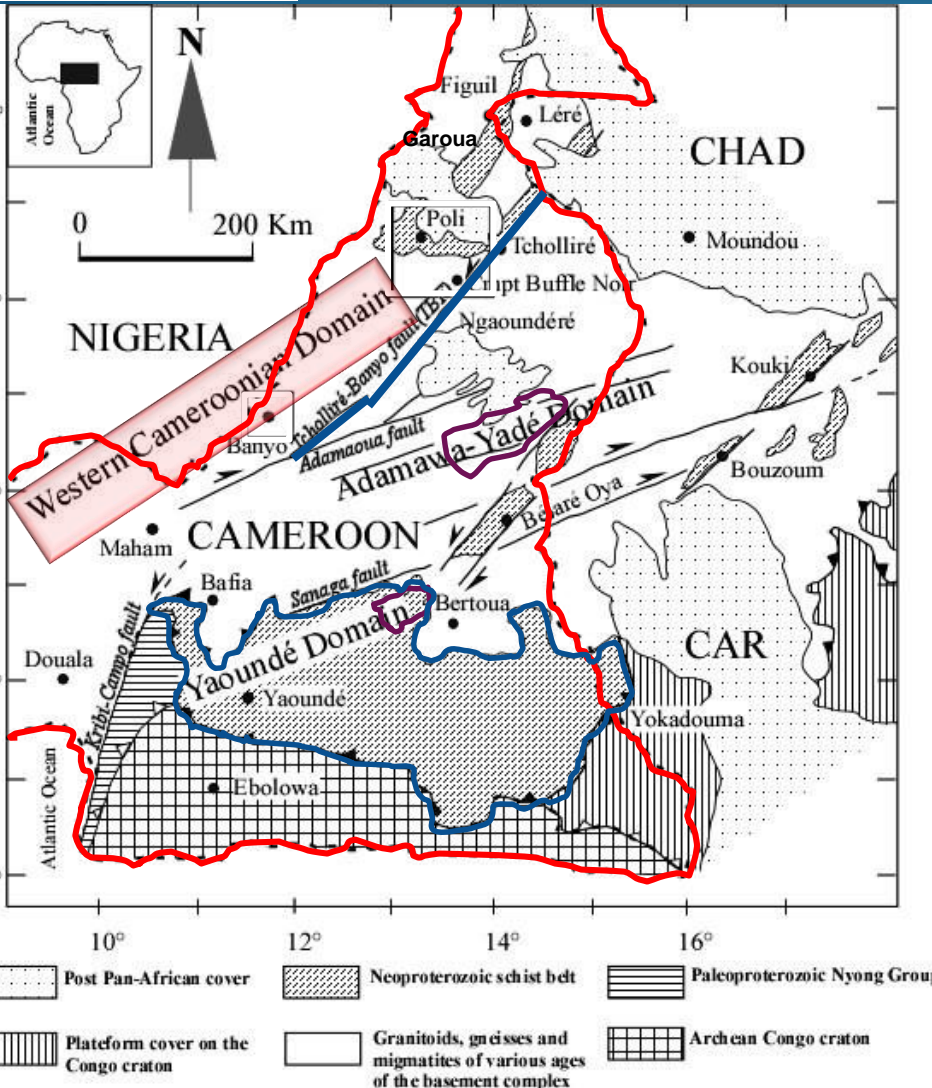
CENTRAL AFRICAN FOLD BELT IN CAMEROON

CAFB in Cameroon is divided into three domains

3- Western Cameroonian Domain

WCD is best represented by the Poli Group including metavolcanics and metasediments in north Cameroon, which extends into Chad with Leré Group, both interpreted as part of a juvenile arc that lies parallel to and on the NW side of the TBSZ (Toteu et al., 2004; Penaye et al. 2006; Van Schmus et al., 2008; Bouyo Houketchang et al., 2015, 2016)

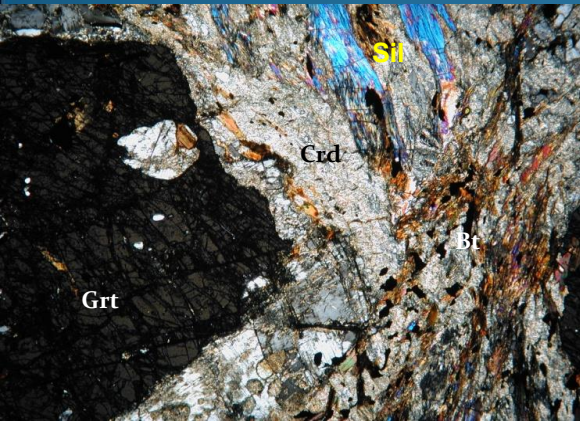
The region displays contributions of PP crust and consists of NP poly-deformed bt-hbl gneisses, orthogneisses, metapelites and grt amphibolites intruded by pre- to late collisional granitoids



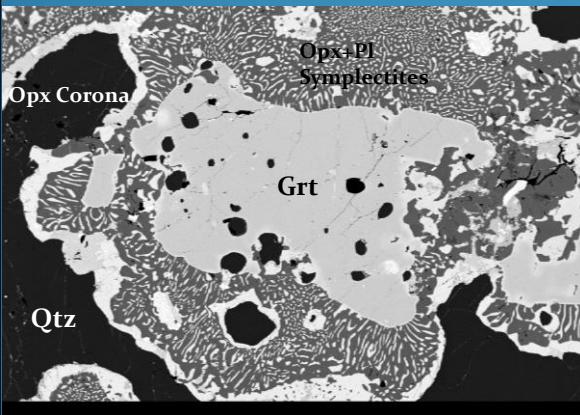
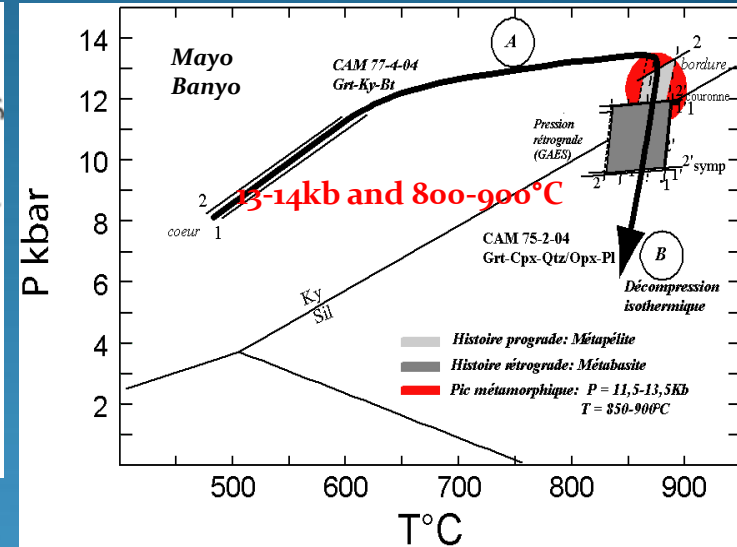
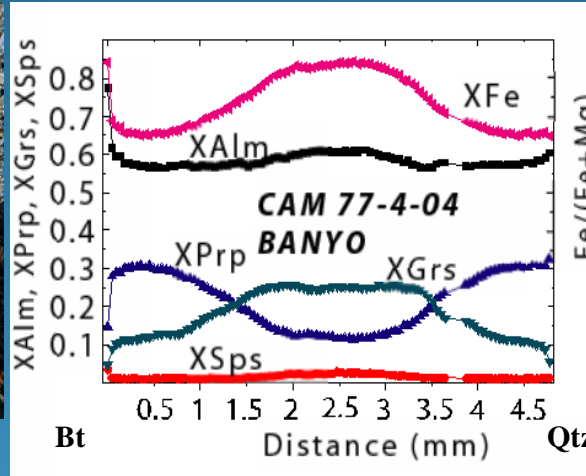
Geological sketch map of Cameroon showing the main domains of the CAFB. Modified from Toteu et al. (2001).

CENTRAL AFRICAN FOLD BELT IN CAMEROON

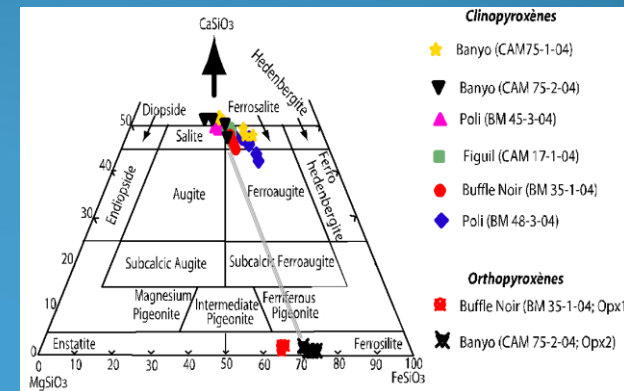
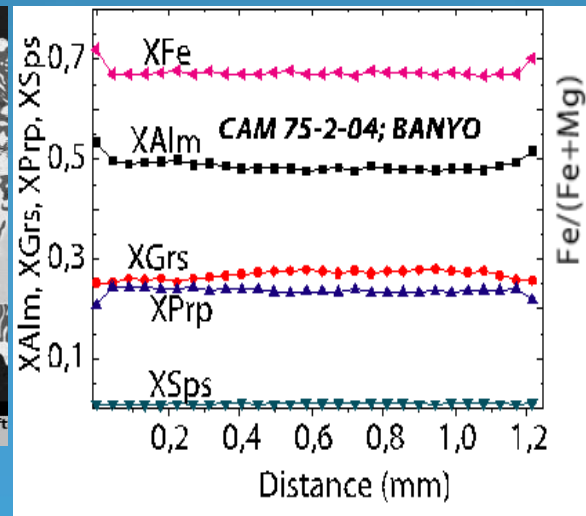
Petrology and GTB results from WCD of the Pan-African CAFB (Bouyo Houketchang et al., 2009, 2013)



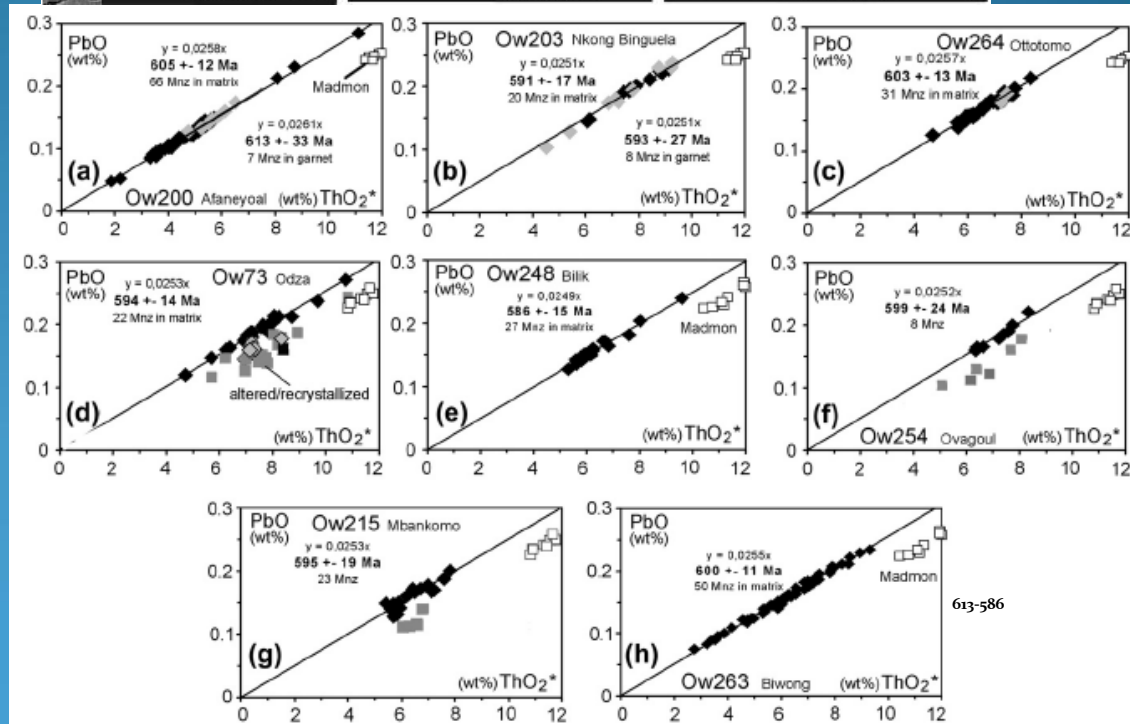
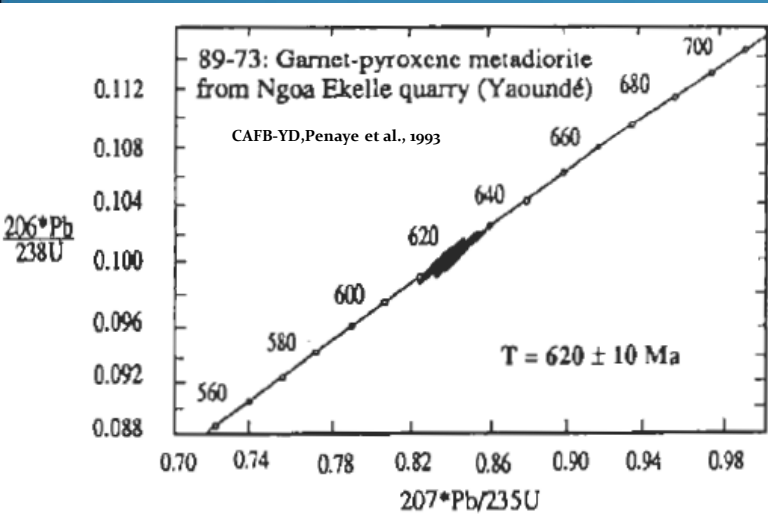
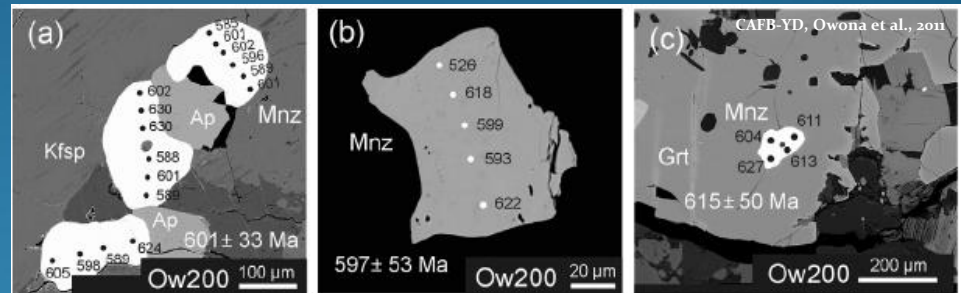
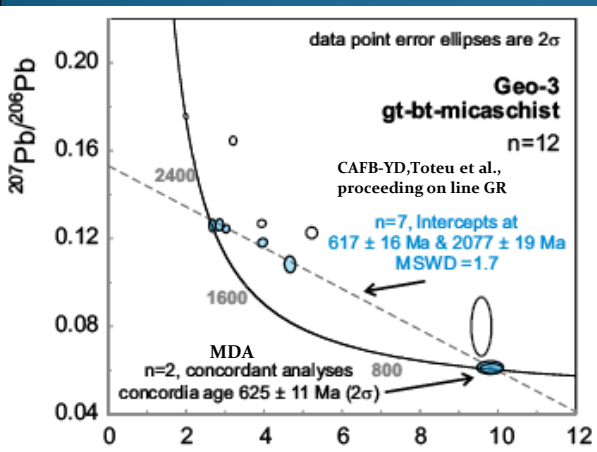
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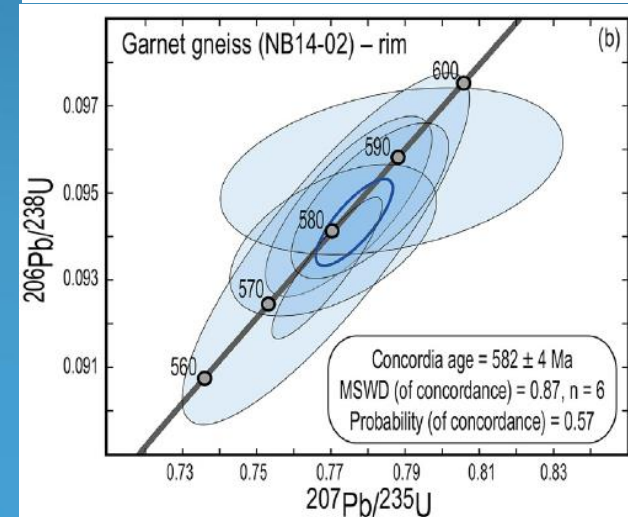
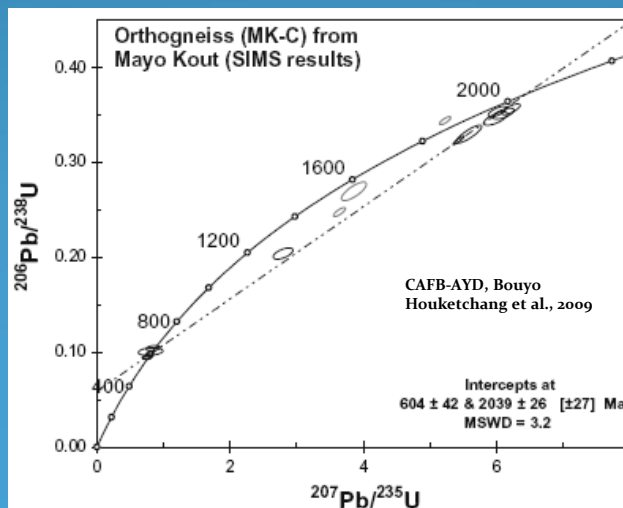
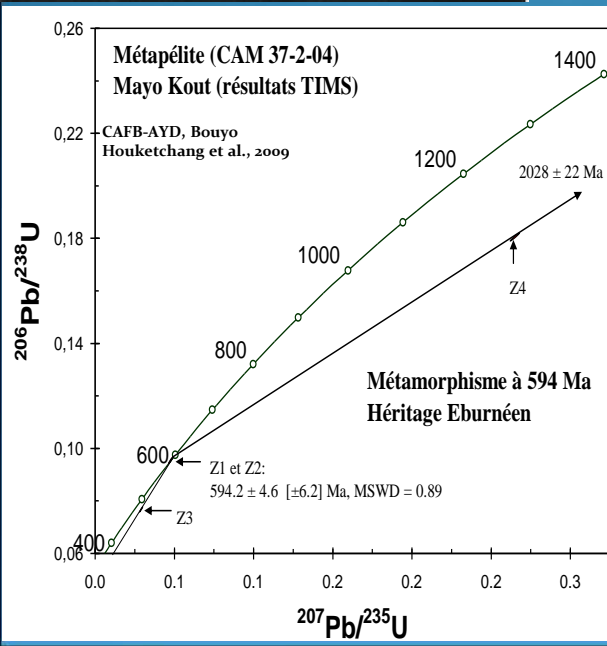
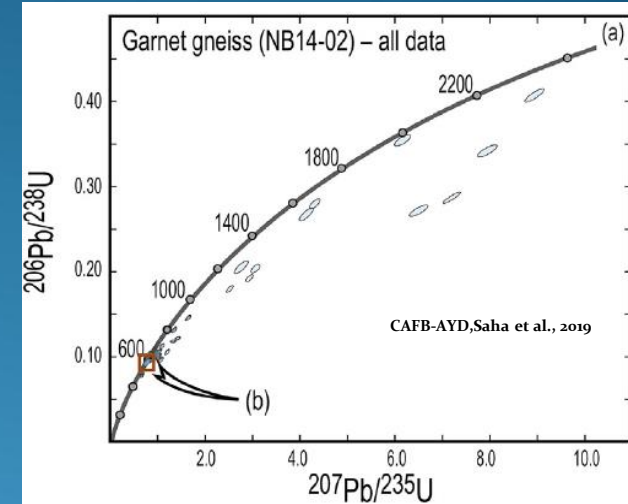
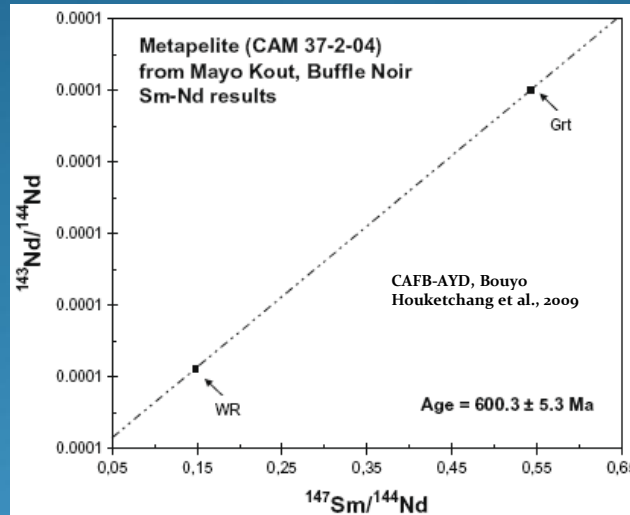
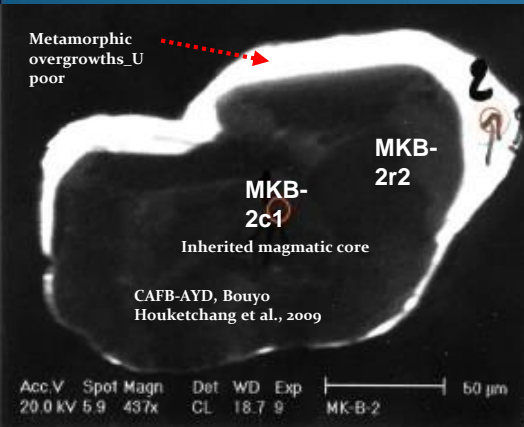
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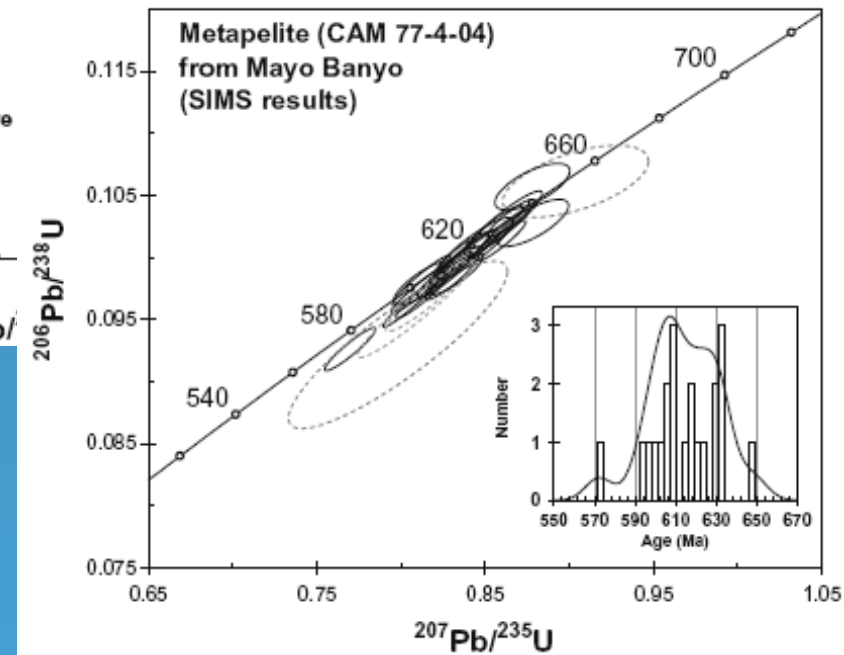
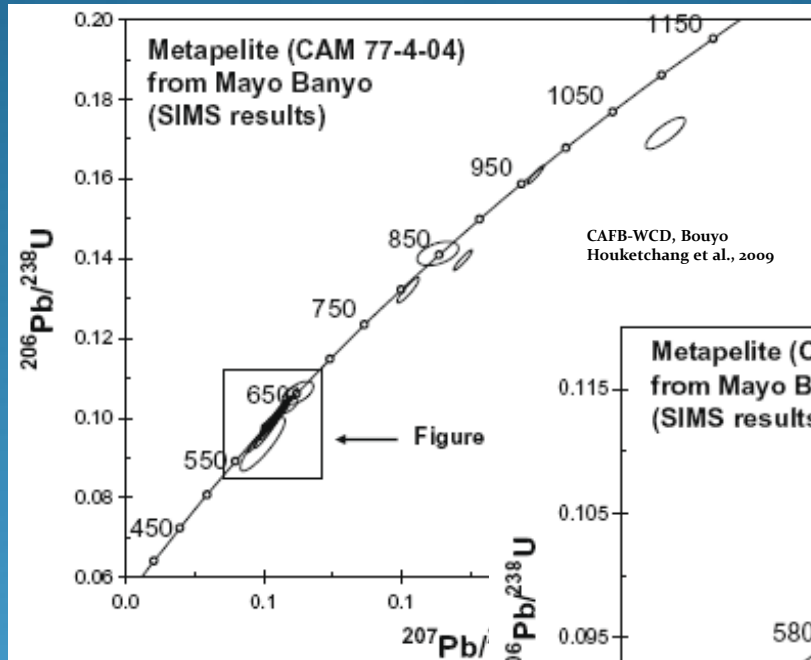
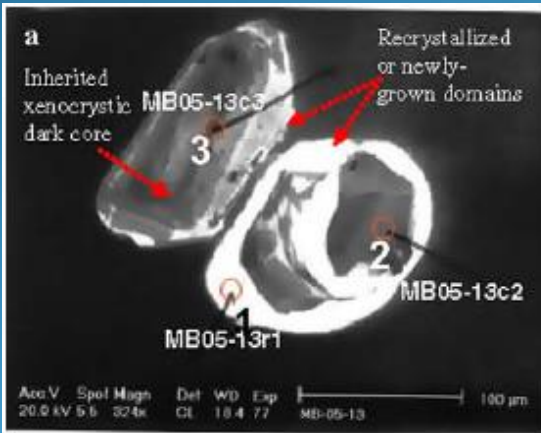
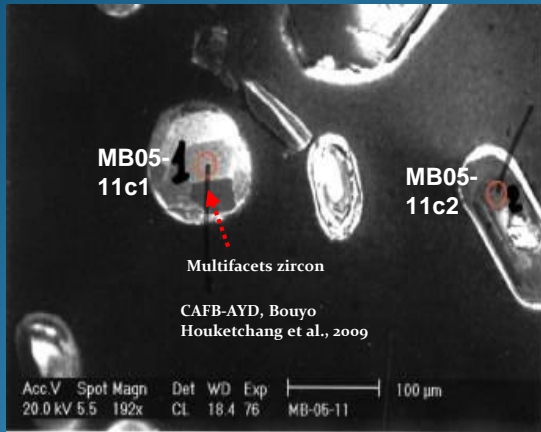
Geochronology results (metamorphic event) from YD of the Pan-African CAFB



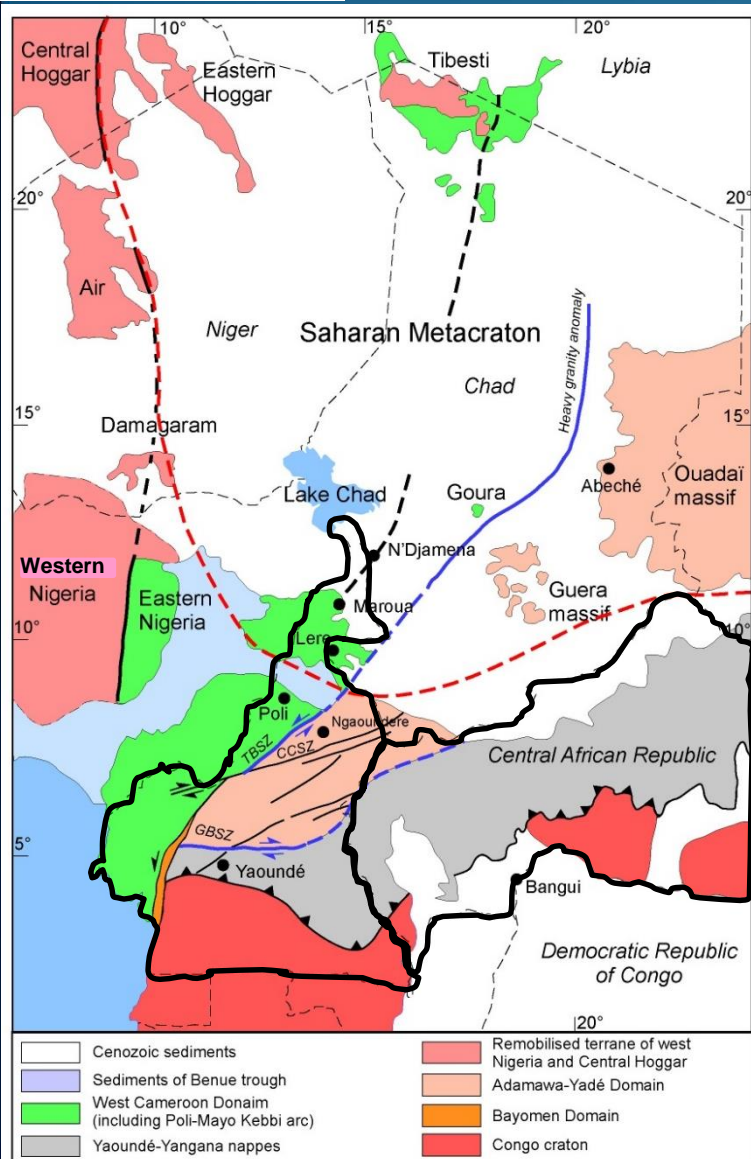
Geochronology results (metamorphic event) from AYD of the Pan-African CAFB



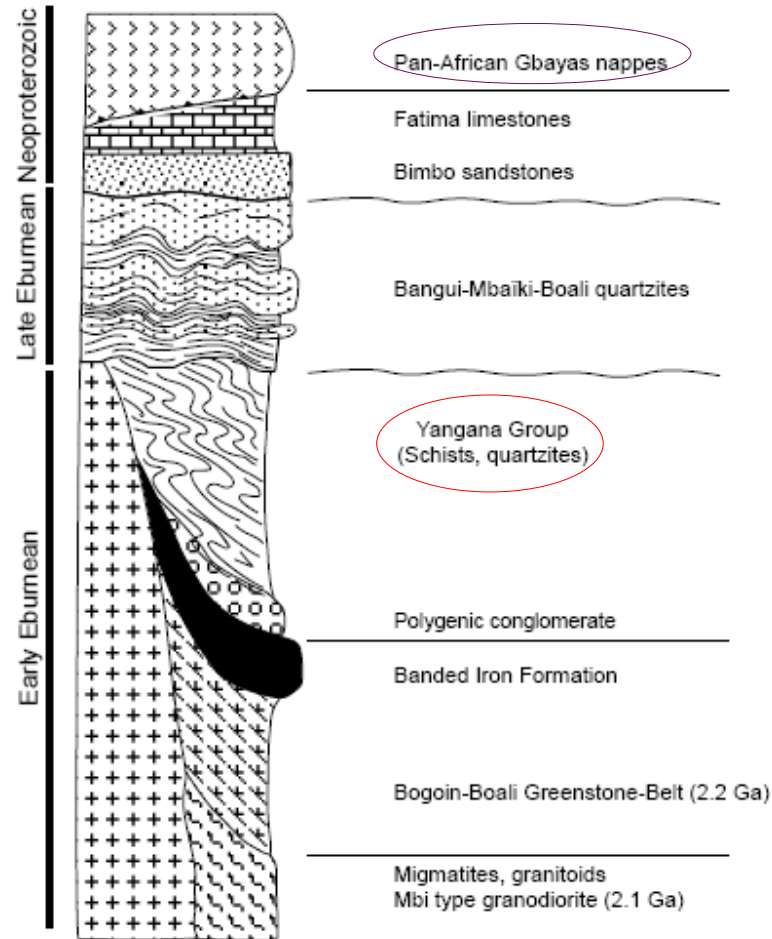
Geochronology results (metamorphic event) from WCD of the Pan-African CAFB



CORRELATIONS BETWEEN THE CAFB IN CAMEROUN AND CENTRAL AFRICAN REPUBLIC



The geology of CAR is outlined in papers by Poidevin (1979), Poidevin and Pin (1986), Pin and Poidevin (1987), Cornacchia and Gorgi (1986), Rolin (1992, 1995, 1998), Toteu et al. (proceeding on line, GR)



Cryogenian MDA of the Yangana Group

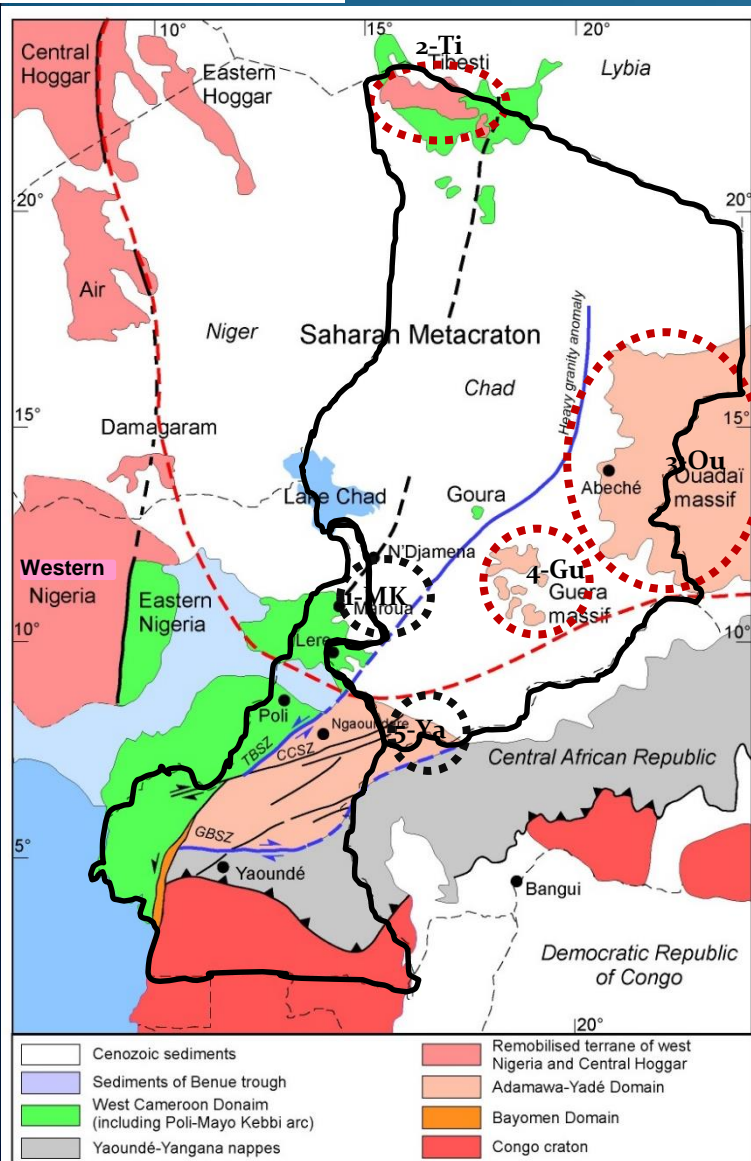
Similar Pan-African metamorphism for both Yangana & Gbayas nappes during Ediacaran

Yaoundé-Yangana represent a single nappe that extends from CMR to CAR

Emplacement of Late MP granitoids

Identification of Archean basement (Sangha-Nola Forest-Damara granitoids: ca 2.8-3 Ga) in the nappe

CORRELATIONS BETWEEN THE CAFB IN CAMEROUN AND CHAD



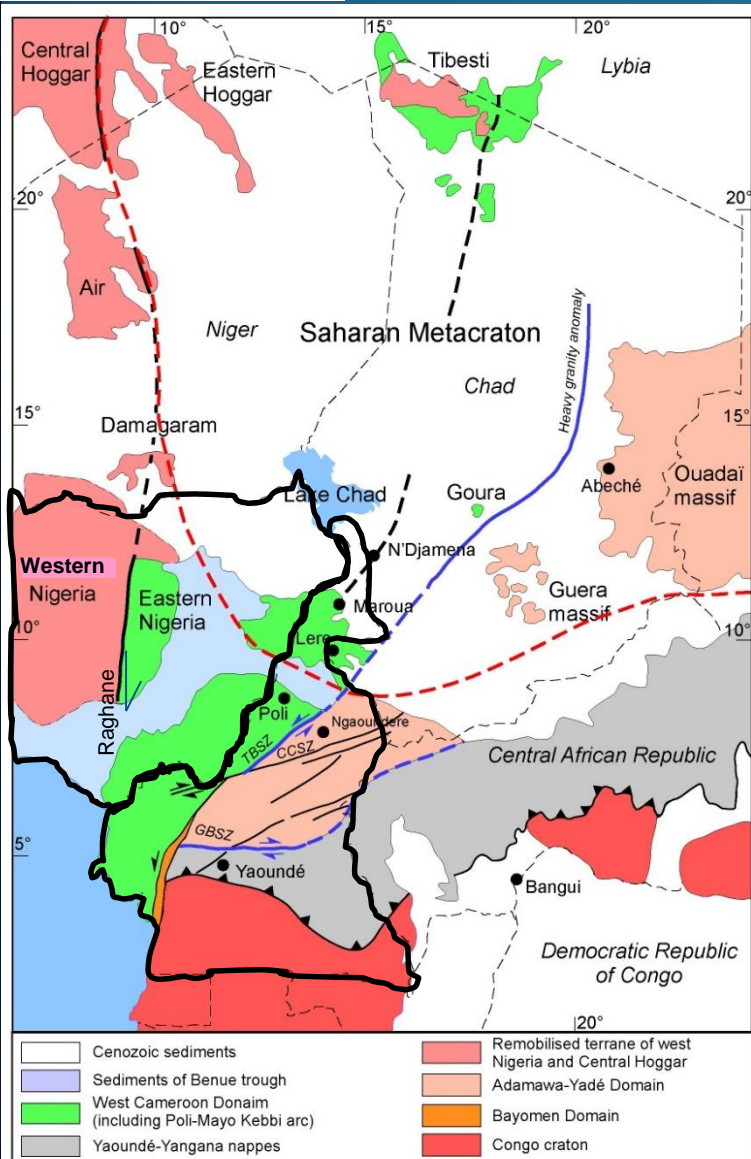
The geology of Chad comprises mostly a Phanerozoic cover overlying a Precambrian basement outcropping in five distinct massifs (Dournang et al., 2006; Penaye et al., 2006; Isseini et al., 2012; Shellnutt et al., 2020; Senghor et al., 2020; Djerosse et al., 2021; Blades et al., 2021):

- 1- Mayo Kebbi massif (SW)
- 2- Tibesti massif (N)
- 3- Ouaddaï massif (E)
- 4- Guera massif (C)
- 5- Yade massif (S)

Three of these massifs, are part of a large, poorly investigated area, described as the **Saharan Metacraton** by Abdelsalam et al. (2002), “a craton that has been remobilized during an orogenic event but that is still recognizable dominantly through its rheological, geochronological and isotopic characteristics” (Abdelsalam et al., 2002; Liégeois et al 2013)

Following Senghor et al, recent work by Blades et al highlight Tonian events (~839 Ma & 787 Ma) (in the **Sudanese Butana/Ouaddaï**) contemporaneous with accretion of juvenile arc terranes of the ANS & EAO and mark subduction to the E of the **SMC**, suggesting a large accretionary complex !!!!

CORRELATIONS BETWEEN THE CAFB IN CAMEROUN AND NIGERIA



Although Nigeria is a neighboring country to Cameroon, its geological correlation does not belong to CAFB, but rather to the Trans-Saharan Belt

The geology of Nigeria (Basement complex, Younger granites and sedimentary basins) is outlined in papers by Wright, 1985; Ananaba & Ajakayie, 1987; Adijabade & Wright, 1989; Caby, 1989; Ferré et al., 1996, 1998; Ferré et Caby, 2007

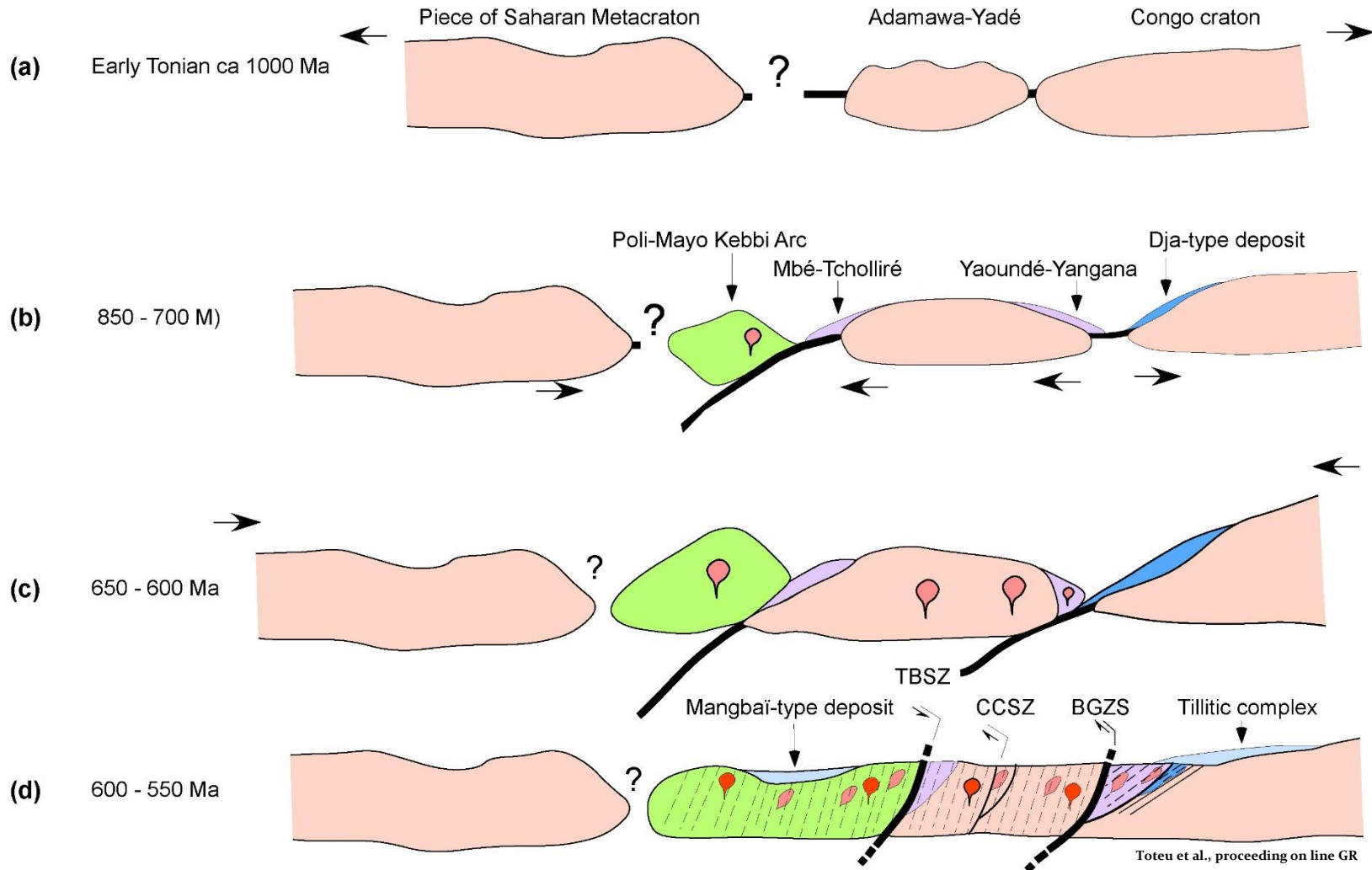
Two main terranes are proposed by Ferré *et al.*, 1996: **Western Nigeria** made up of Archaean basement with monocyclic cover and **Eastern Nigeria** composed of Eburnian (c. 2.0–1.8 Ga) protoliths with no cover

Both terranes also show contrasted metallogenic domains with **Au deposits, banded iron formations and greenstone-type deposits to the west**, and **U and W deposits to the east** (e.g. Woakes *et al.*, 1987)

GEODYNAMIC EVOLUTION OF THE CENTRAL AFRICAN FOLD BELT

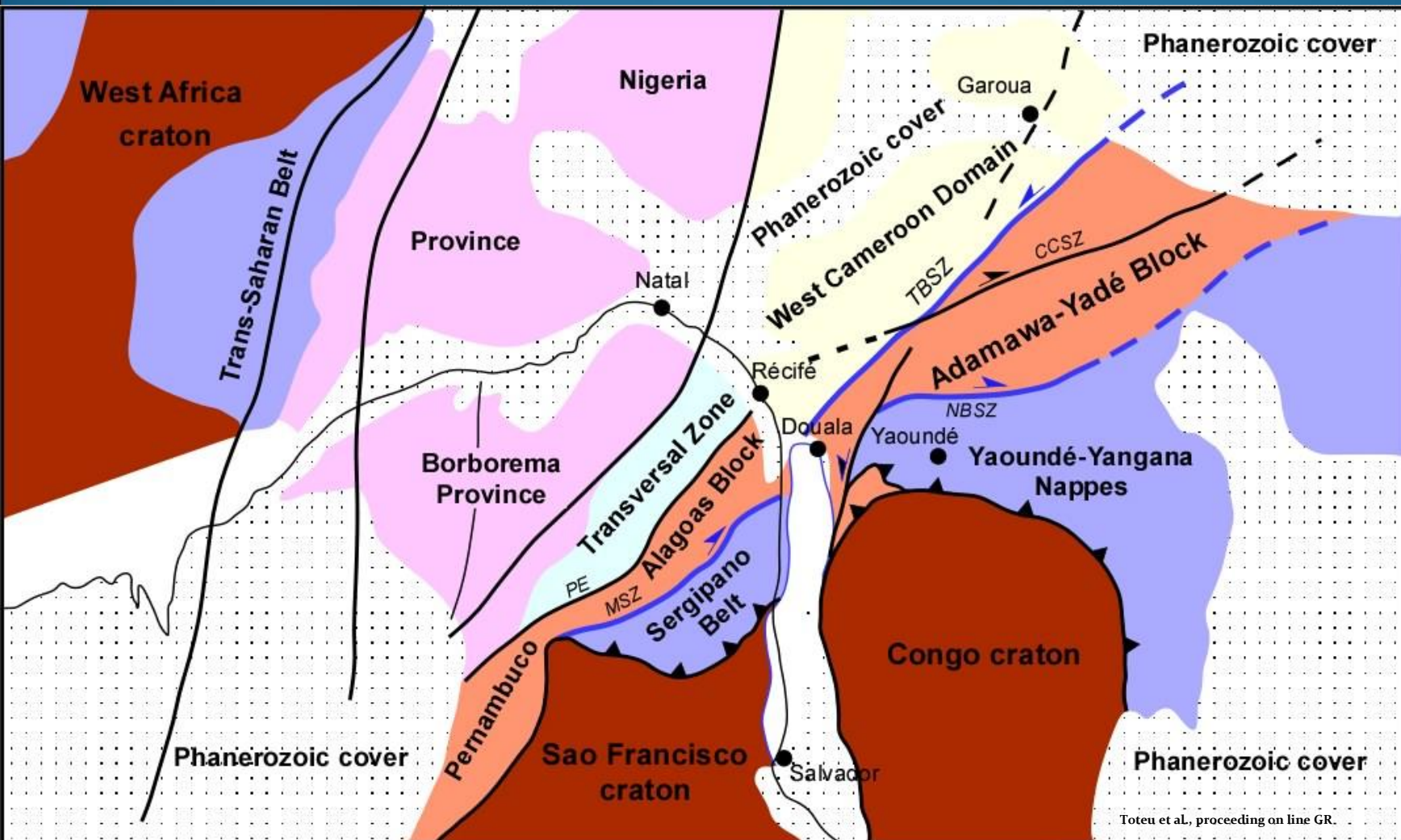
NNW

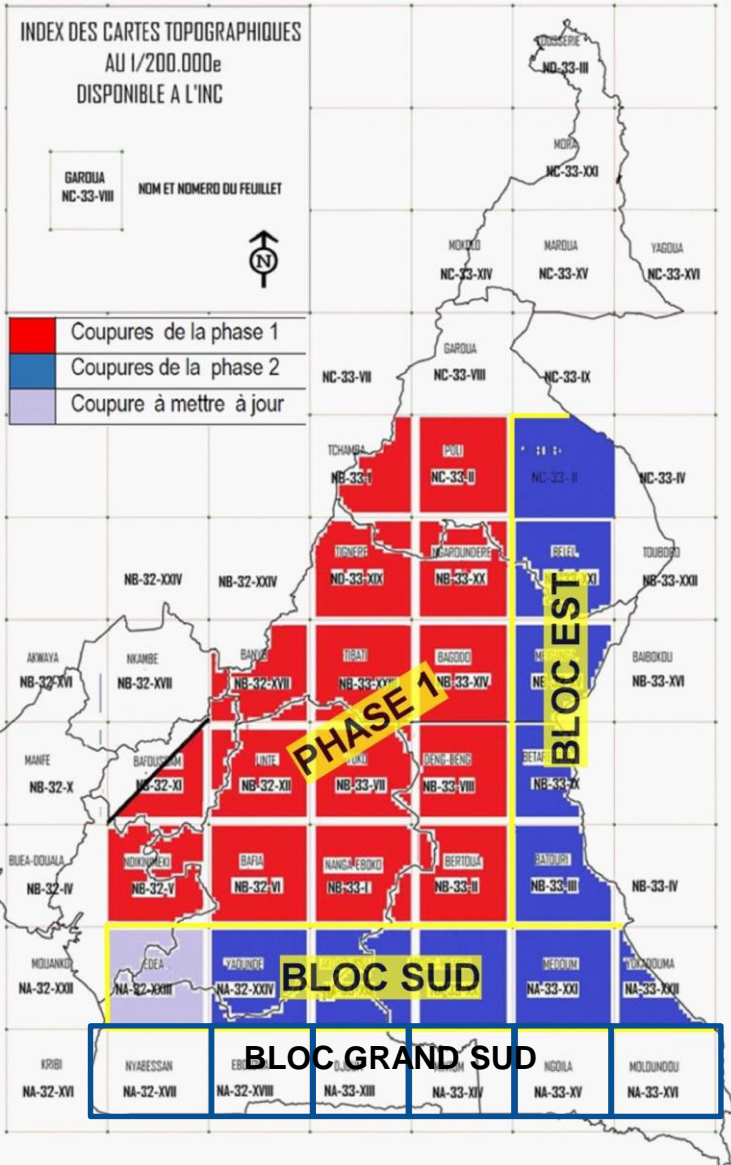
SSE



CORRELATIONS BETWEEN THE CAFB AND THE BORBOREMA PROVINCE OF NE BRAZIL

The most extensive attempt to correlate Central African units with their counterparts in NE Brazil was published by Toteu et al., 2001; Van Schmus et al., 2008, Oliviera et al., 2010, 2015 and Caxito et al., 2020





32 geological maps at 1/200 000

01 summary geological map at 1/500 000

01 summary geological map at 1/1 000 000

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THANK YOU FOR YOUR KIND ATTENTION

