MANTLE XENOLITHS ALONG THE CVL : A REVIEW

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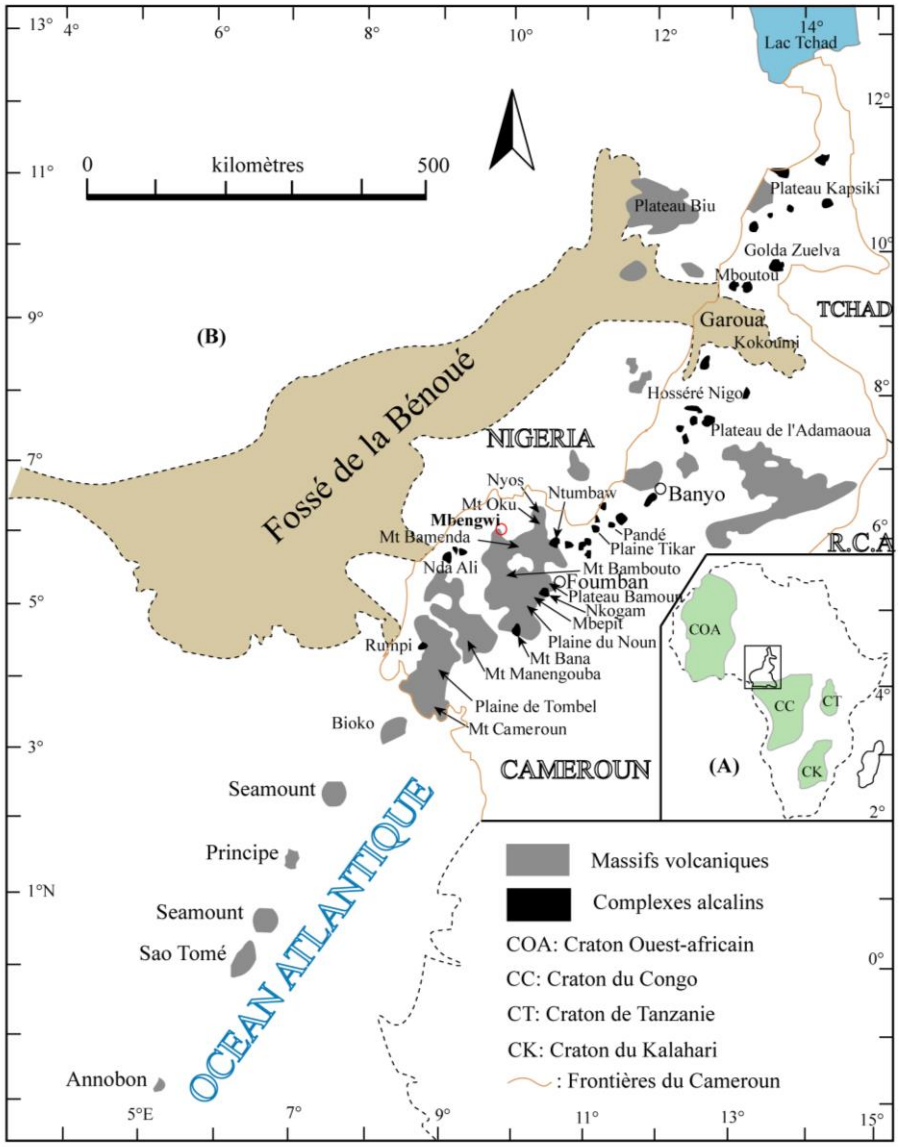
OUTLINE

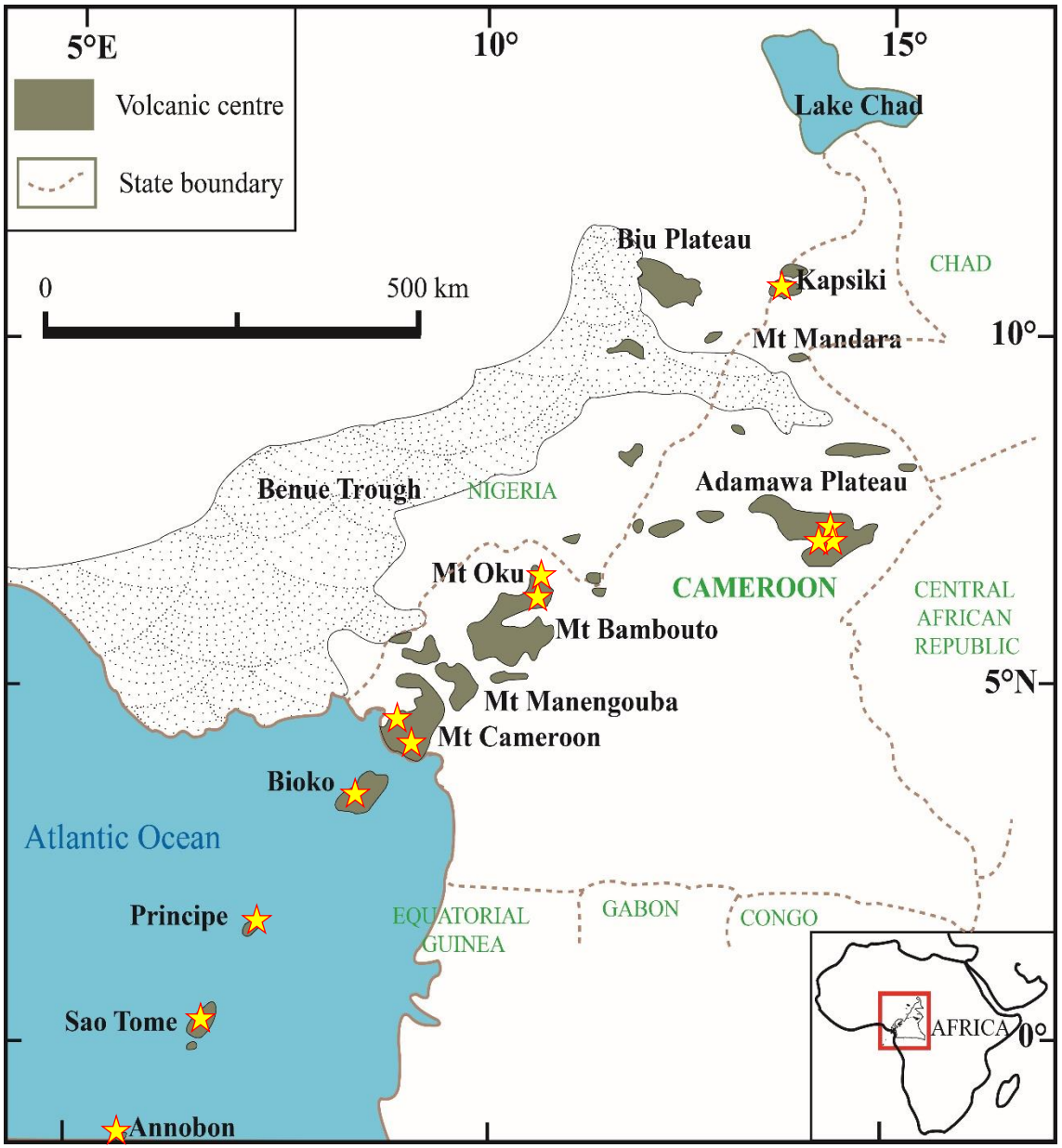
- The CVL: Magmatism, age and activity
- Location of mantle xenoliths along the CVL
- Host rocks
- Classification
- Main petrographical and chemical features
- Summary and perspectives

THE CVL



- ✓ Alcalin (± transitionel)
- ✓ Série bimodale
  - ❖ Bto-Bda et Manengouba : série complète
  - ❖ Frontière Océan-cont: absence terme felsiques
- ✓ Ages
  - ❖ 70 – 40 Ma: massifs anorogéniques
  - ❖ 40-30 Ma: volcans N Cameroun (Bénoué, Kapsiki Golda Zuelva)
  - ❖ 30- Récent: autres volcans
- ✓ Sismicité: ≤ 4,8 (Richter)
- ✓ Mt Cameroun seul actif

LOCATION OF STUDIED MANTLE XENOLITH

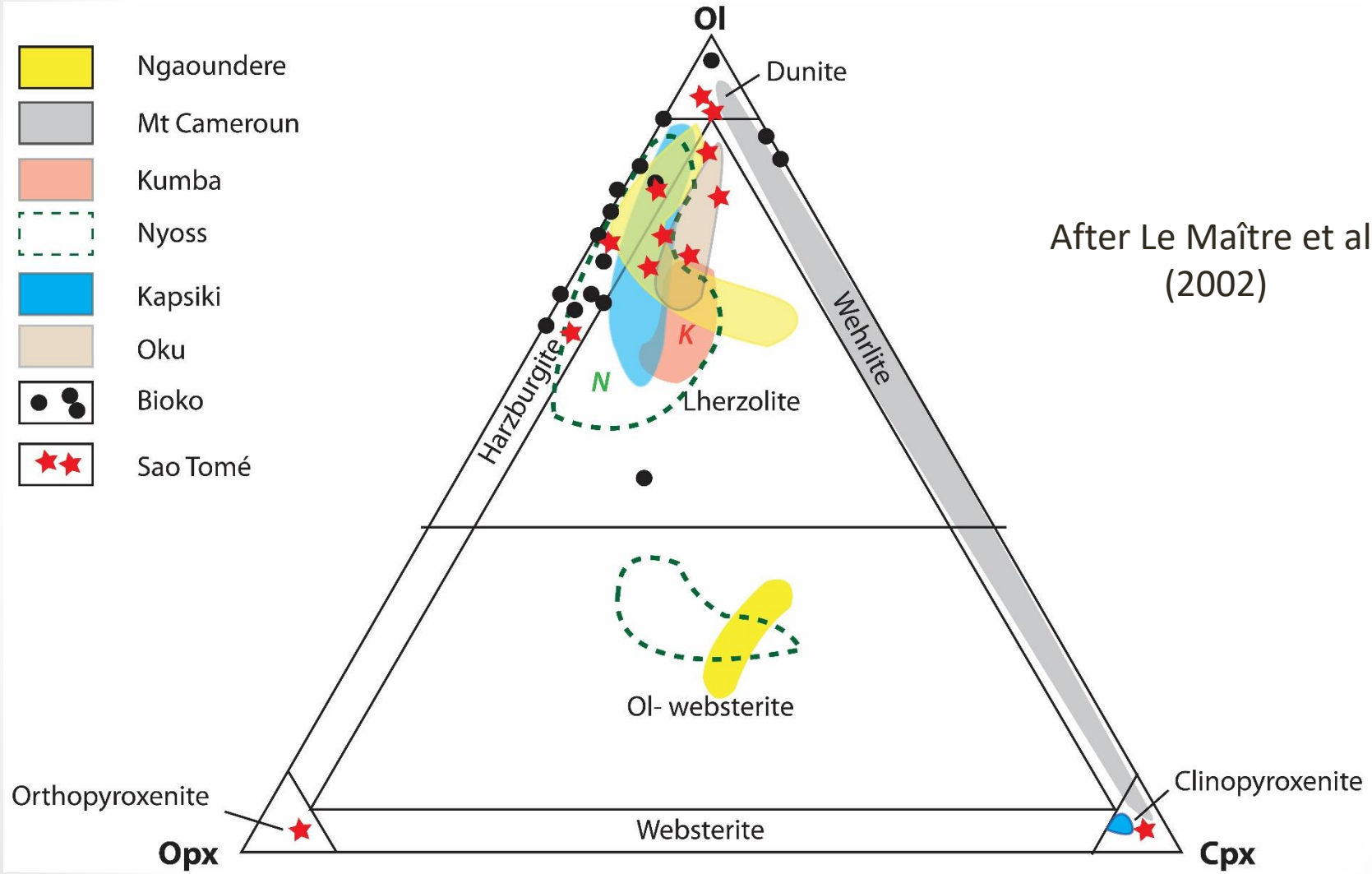


HOST ROCKS

- **Alkali basalts** *(Kapsiki, Youkou, Mt Cameroon, Kumba, Nyos, Sao Tomé)*

- **Basanites** *(Ngaoundéré; Mt Cameroon, Sao Tomé)*

CLASSIFICATION

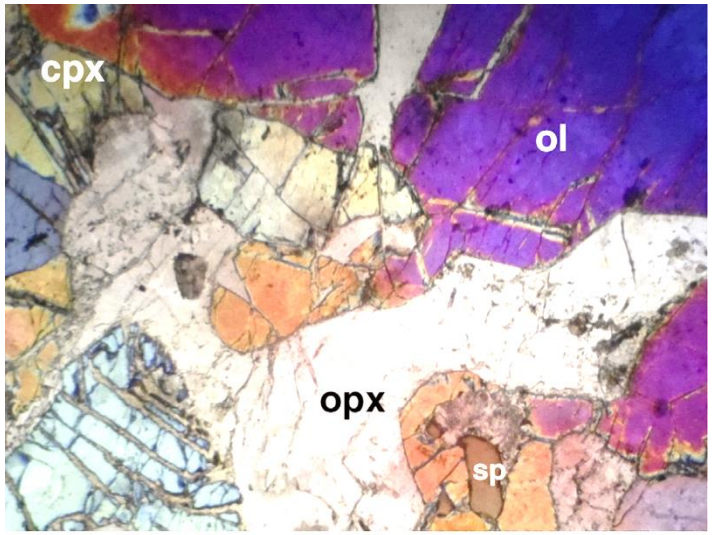


After Le Maître et al. (2002)

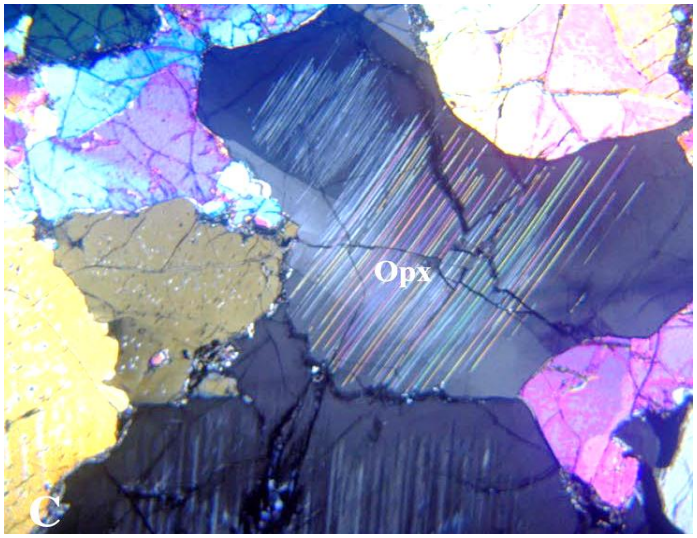
Most abundant: spinel lherzoite and spinel harzburgite

TEXTURES

✓ protogranular

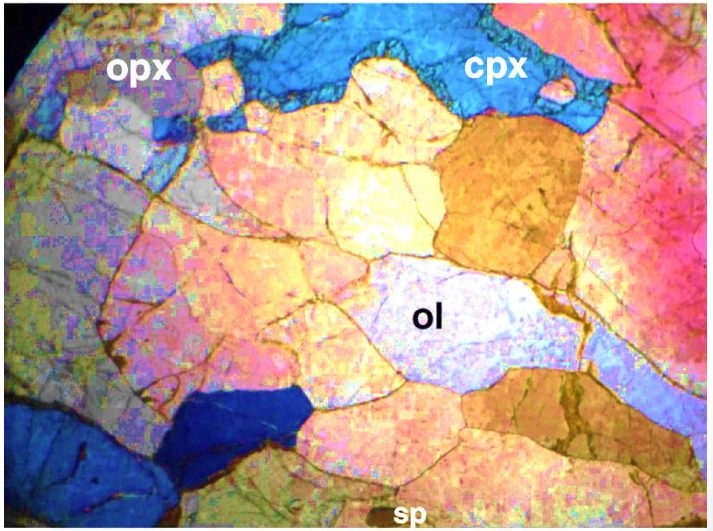


(lherzolite)



(olivine websterite)

✓ **mosaïc equigranular** (cpxenite)



✓ **porphyroclastic** (harzburgite)

ADAMAWA (Nkouandou et Temdjim., 2011; Nkouandou et al., 20

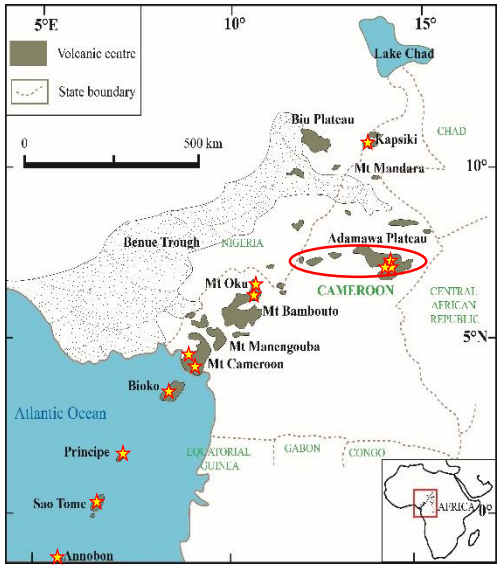
- **Amphiboles : pargasite + pargasitic hornblende in some websterite** *(Ngaoundere Plateau)*

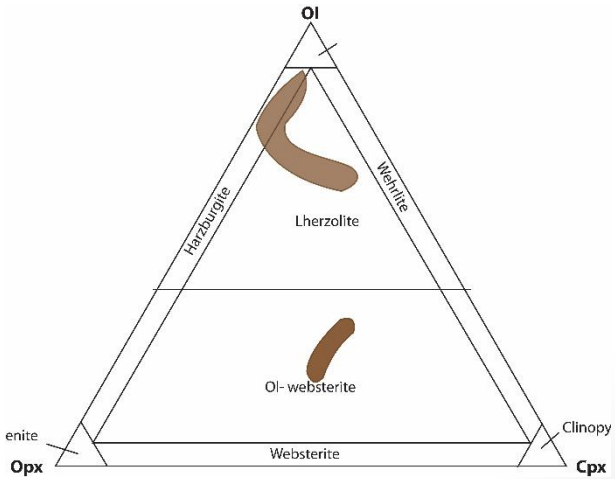
- **Similar Mg# *(Mg# Ol = 89.55–90.46; Mg# Opx = 90–91)*, suggesting equilibration within the mantle.**

- **Mineral equilibrium T : 835 - 1160 °C ; depths : 26 –83 km** *(Presence of various type of xenoliths)*

- **Ca- metasomatism** *(high CaO/Al_2O_3)*

- **Refertilized depleted mantle**



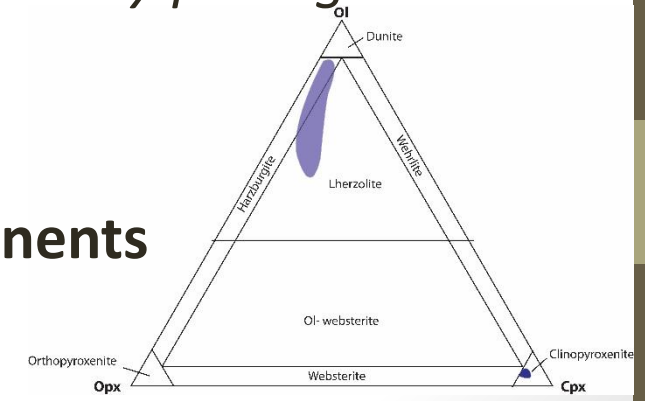


KAPSIKI *(Tamen et al., 2015)*

- **Presence of clinopyroxenites + plagioclase lherzolites**

- **Two P-T equilibrium stages**
  - **993 - 1026°C; 9–12 Kbars (core of large Cpx and Opx crystals) ⇔ spinel lherzolites equilibration conditions.**
  - **858 -979°C ; 7–9 Kbars (pyroxene neominerals) ⇔ re-homogenisation under plagioclase spinel lherzolites facies conditions.**

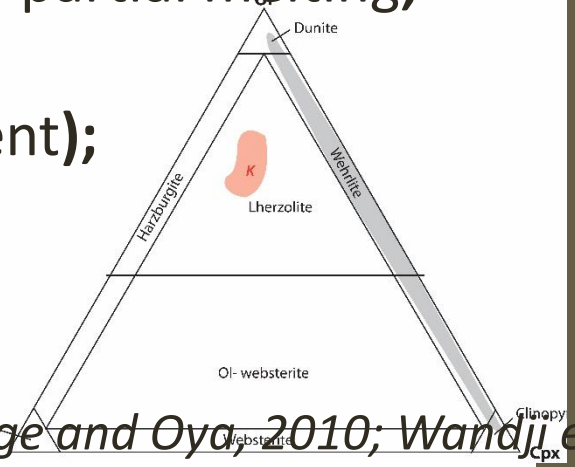
- **low temperatures deformations** *(witnessed by protogranular and porphyroclastic textures)*;
- **Heteregeneous mantle**
- **Presence of depleted and fertile components**
- **Carbonate metasomatism**



KUMBA - Mt CAMEROON

1- KUMBA *(Teitchou et al., 2007)*

- **Homogeneous fertile mantle (**low degree of partial melting**;**
- **Light cryptic metasomatism (** LREE enrichment**);**
- **T: 885–1030 °C**

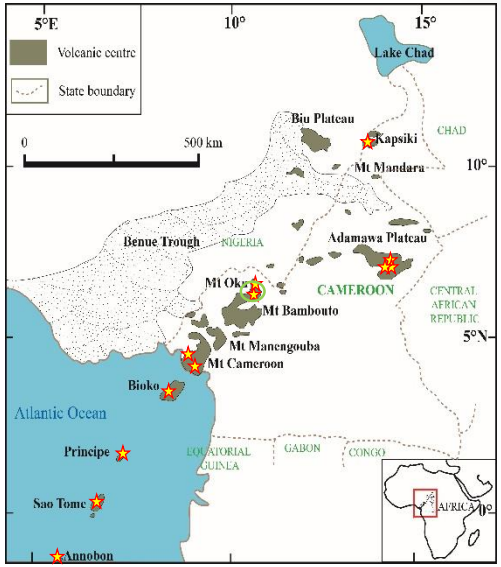


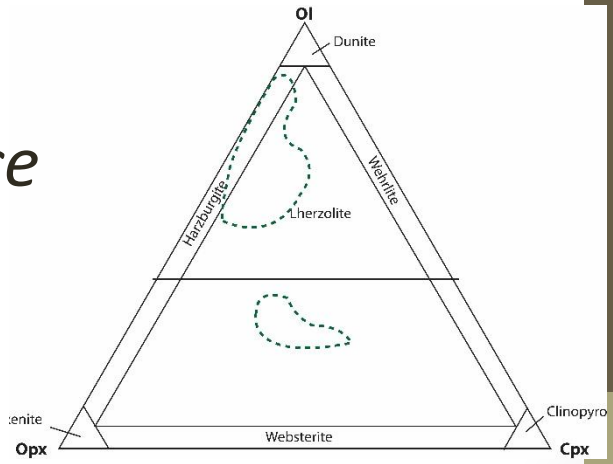
2- Mt CAMEROON **(***Ngwa et al., 2019; Metsukage and Oya, 2010; Wandji et al., 2009; Ngounouno et al., 2007)*

- **Cpxenite + Opxenite+ Plagioclase and Ti-Pargasite bearing wehrlite**
- **T: 690 -1000°C**
- **Higher degree of partial melting in Bioko (25 -30%)**
- **2 types of metasomatism**
  - ✓ **Fe-Ti metasomatism (presence of Ti-Pargasite)**
  - ✓ **Carbonate metasomatism along the ocean-continental boundary**

NYOS *(Teitchou et al., 2011; Temdjim et al., 2004)*

- ✓ **Presence of pyroxenite;**
- ✓ **low degree of partial melting (<5%)**
- ✓ **T: 900 – 1025°C ;**
- ✓ **Carbonatic metasomatism** *(presence of hydrous minerals such as pargasite, phlogopite);*
- ✓ **Fertile depleted and heteregeneous mantle**

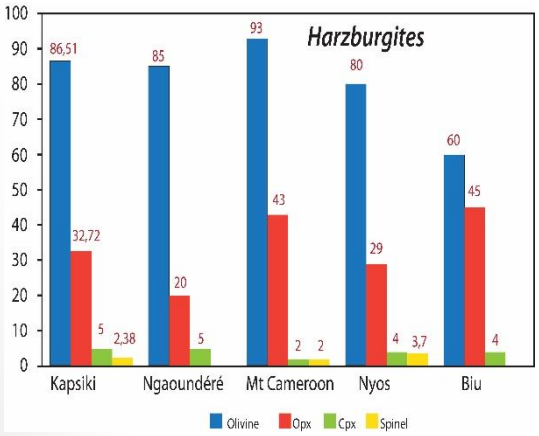


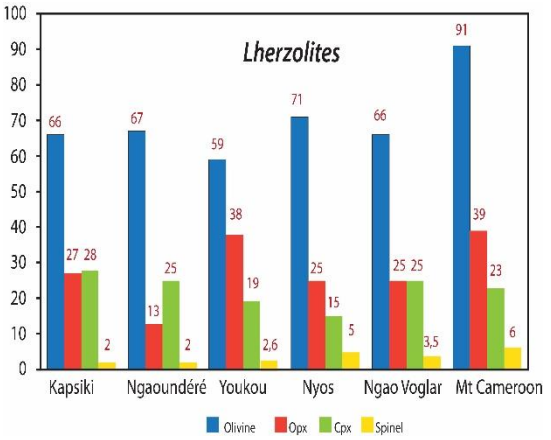


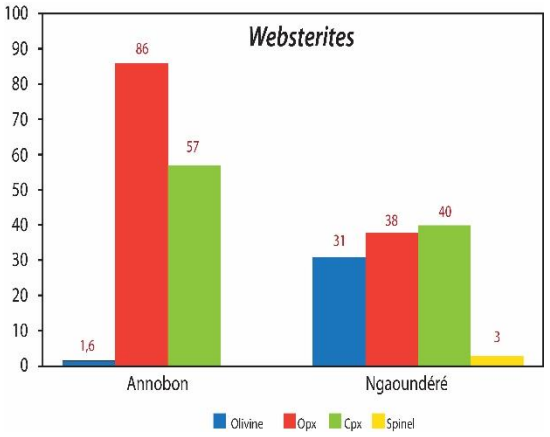
SUMMARY

1. Chemical composition

- **Peridotites**
  - spinel lherzolites
  - spinel harzburgite
  - Dunite and wehrlite
- **Pyroxenites**
  - Clinopyroxenite
  - Orthopyroxenite
  - websterite







2. Partial melting: highest = Bioko: 25-30%, lowest = Nyos;<5%;

3. **Equilibrium T of Xenolith: 690°C** *(Mt Cameroon)* **– 1160°C** *(Adamawa)*

4. **Heteregeneous mantle except in Kumba;**

5. **Depleted** *(Adamawa)* **or fertile (high Al_2O_3 and CaO e.g.** *Kumba)* **mantle or both;**

6. **Metasomatism**
   - ❖ **Modal**
     - ✓ **Carbonatic** *(Kapsiki, Nyos, ocean-continent boundary, Adamawa)***;**
     - ✓ **Fe-Ti** *(Mt Cameroon);*
   - ❖ ***Cryptic*** *(Kumba: LREE enrichment)*

PERPECTIVES LithoCOAC ?

Target = Still unexplored area along the CVL

Petrochemical Characterization of the SCLM beneath

1. **Possible Mantle- overlying magmatism links**
   (partial melting and metasomatism in particular);

1. **Define the type of mantle beneath the study area**
   - **Orogenic mantle?** *(mostly harzburgitic- low carbonatic metasomatism intensity)*
   - **Rifted mantle?** *(harzburgitic to lherzolitic - intensely reworked by silicate melt percolation related to rifting - impossible to recognize its protolith)*
   - ***Asthenosphere-derived mantle*?** *(lherzolite-dominated - refertilized harzburgitic protolith reworked by melts coming from upwelled asthenosphere)*

See Puziewicz et al., 2020

Thanks!