

# Development of Physical Sciences in Africa and Tribute to Prof. Francis Allotey

**17-19 October 2018**  
**EAI FR, Kigali RWANDA**

## OVERVIEW OF GEOPHYSICAL WORK ALONG THE CAMEROON VOLCANIC LINE (CVL)

**TABOD Charles**

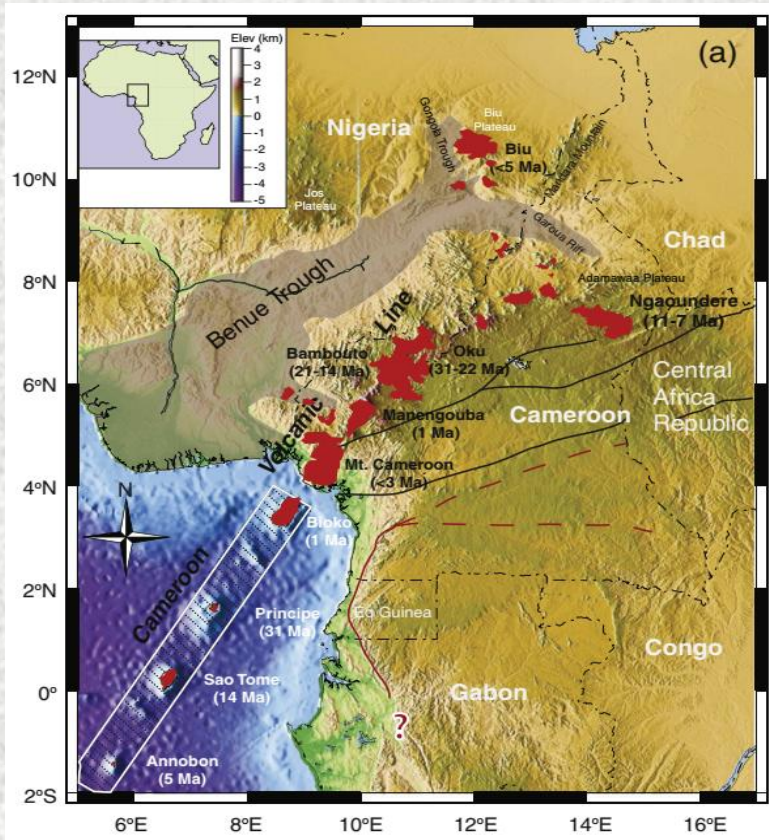
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and*

*Dean , Faculty of Science, The University of Bamenda*

# PLAN

- **Introduction**
- **Work covering the CVL**
- **The Congo Craton**
- **The Sedimentary Basins**
- **The Adamawa Fault Zone**
- **The Highlands of South-western Cameroon**

# THE CAMEROON VOLCANIC LINE





# Introduction

- We have used geophysical techniques to improve on man's scientific knowledge of the subsurface and the search for water in Cameroon. The principal methods of investigation we have used include:
  - Gravity
  - Geoelectricity
  - Audio-Magnetotellurics
  - Seismology

# Introduction

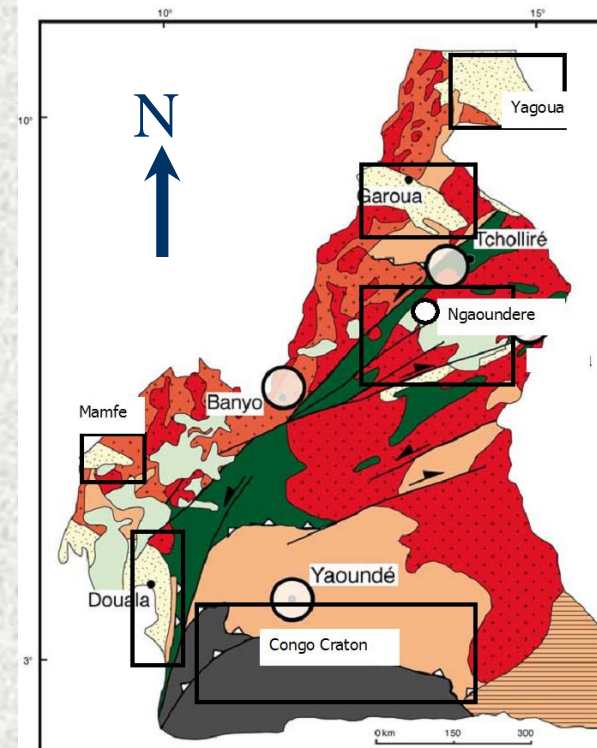
- Our research work has been carried out both over the whole of Cameroon and in specific regions of Cameroon:
  - Congo Craton
  - Sedimentary basins
  - Adamawa Fault Zone, and
  - Highlands of south-western Cameroon
- *This work has generally been carried out with colleagues in the Universities and research institutes and Masters and PhD students*

# Introduction

## *Location of case study areas*

### Case study regions from north to south:

- Yagoua basin
- Garoua basin
- Adamawa plateau
- Mamfe basin
- Douala basin
- Congo Craton





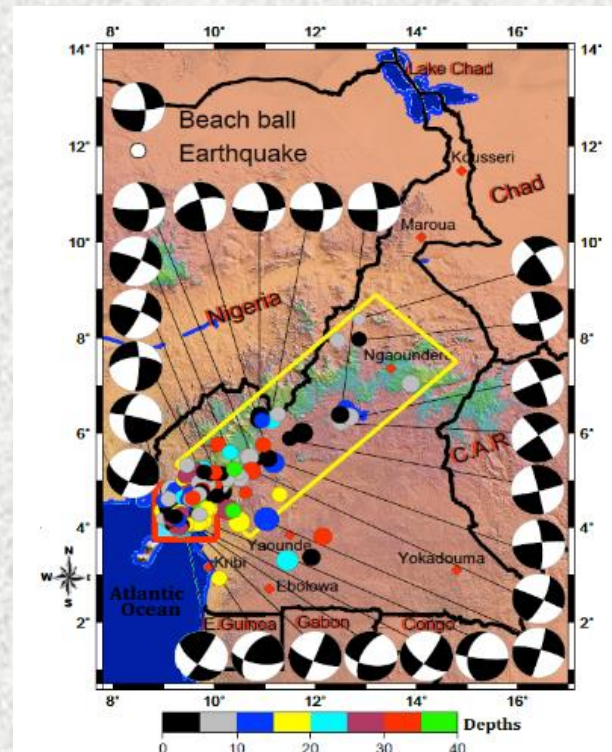
# Work covering the CVL: Seismology

Felt earthquakes of magnitude  $> 3.5$ , since 1852

- Fairhead, 1985
- Ambraseys and Adams, 1986
- Ambeh et al., 1989
- Tabod et al., 1992
- Ateba et al., 1997
- Ntepe et al., 2004
- Tokam et al., 2010

# Work covering the CVL: Seismology

## Instrumental Seismicity

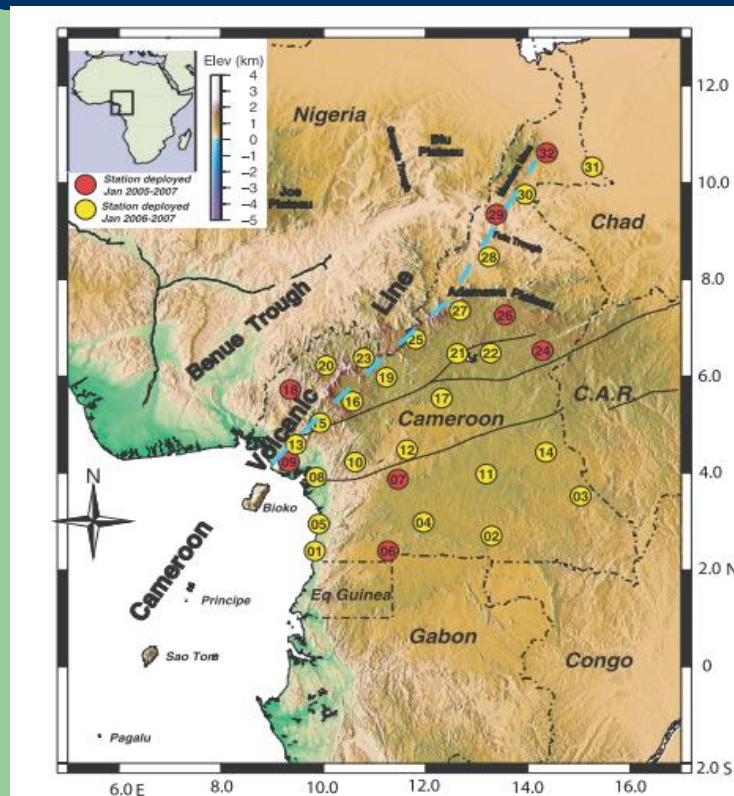


- Ngatchou et al., 2015  
Seismicity mainly around the Mt. Cameroon volcano and predominantly strike-slip movement along faults



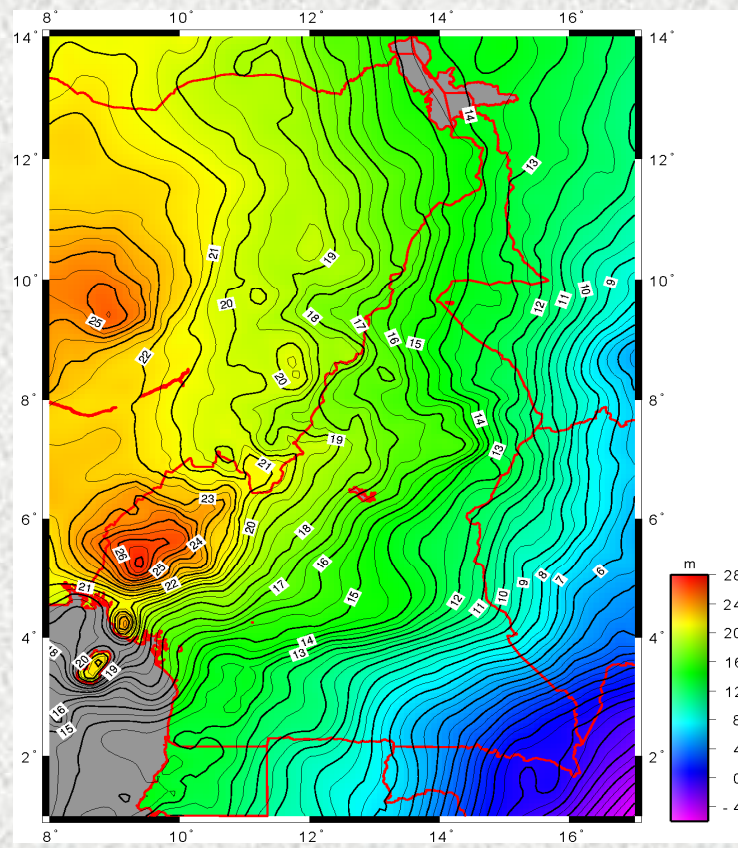
# Work covering the CVL: Seismology

## Broadband network



- 32 broadband seismic stations
- **Reusch et al., (2009)** using P and S arrivals from teleseismic events performed a tomographic study of the Upper Mantle across Cameroon.
- **Tokam et al., (2010)** used joint inversion of Rayleigh wave group velocities and receiver functions to show that crustal thickness
- **Fishwick, (2010)** used the surface waves tomography
- **Gallacher and Bastow (2012)** stacked receiver functions to study crustal structure
- **Guidarelli and A. Aoudia (2016)** Inverted Rayleigh waves lithospheric structure.

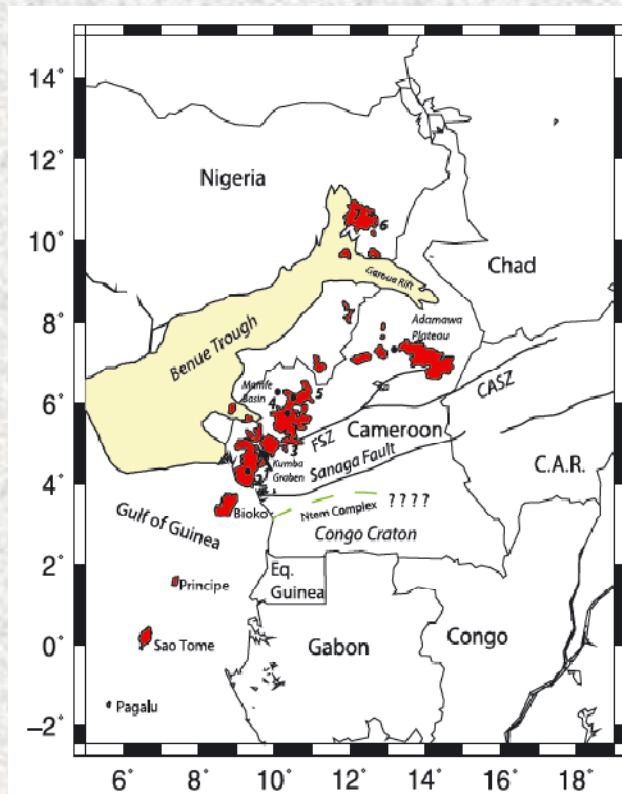
# Work covering the CVL : Gravity



- **Marcel et al (2018)** upward continuation, horizontal gradient and Euler deconvolution techniques
- **Marcel et al. (2016)** Moho discontinuity depth along the **CVL** and found values ranging from 19 to 34 km
- **Kamguia et al., 2005.** The first geoid model for Cameroon (CGM05) has been determined using both land and offshore gravity data



# The Congo Craton



- The deep structure across the Congo Craton and the Pan-African mobile belt is modelled using gravity data
- **Owona et al. (2011)** Found crustal thicknesses of up to 45 km
- **Tadjou et al. (2009)** Found mean Moho depth of about 47 km across the Congo craton and the Pan-African fold belt



# The Sedimentary Basins

## *Yagoua, Far North Cameroon*

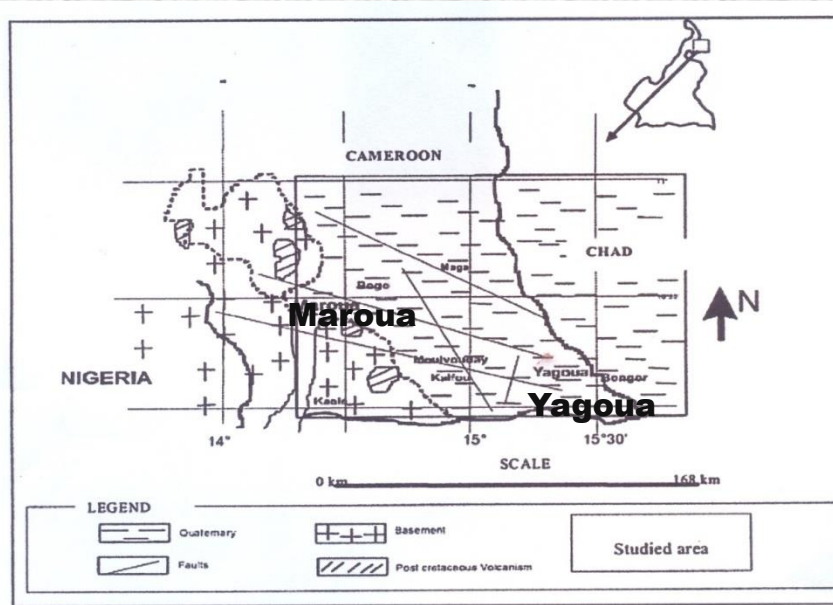


Fig. 1. Simplified geological map of the region from Elf Serepca, 1981; and Genik, 1992, modified.

- **Njandjock et al., 2006**  
Sediments in the **Yagoua basin** in the far north of Cameroon found to be about **3 km** from the spectral analysis of gravity data

# The Sedimentary Basins

## *Garoua, North Cameroon*

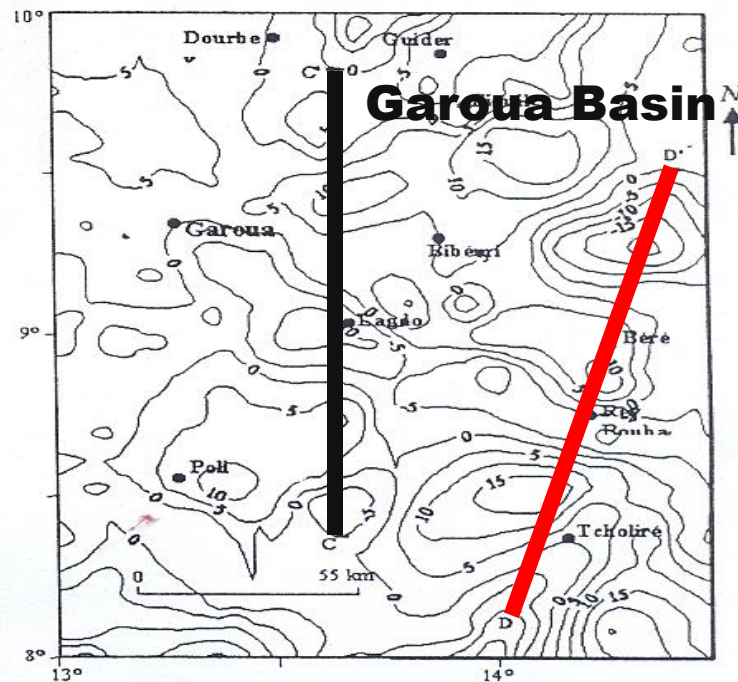


Figure 5. Third-order residual anomaly map of the Garoua region.

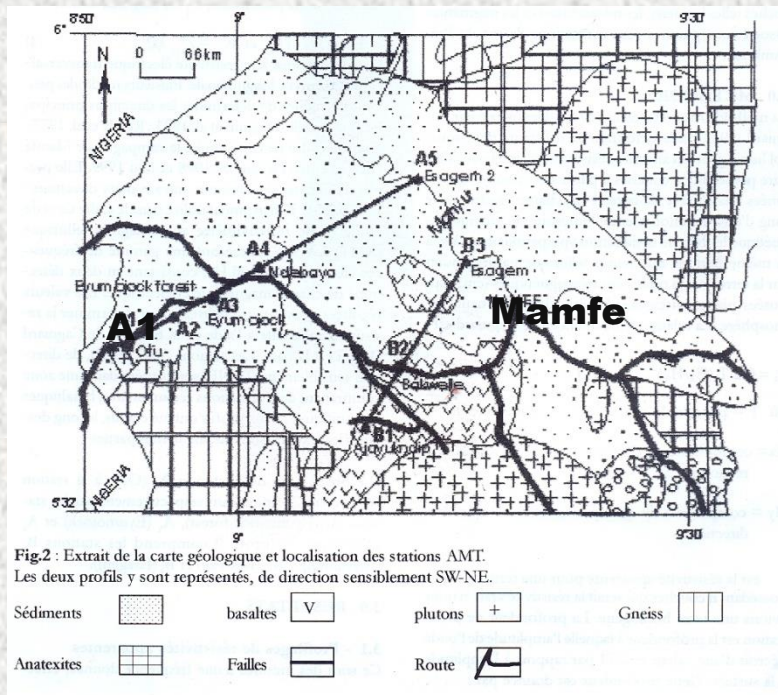
and magnitude of these anomalies also depend on the local geology of the area.

- **Kamguia et al., 2005**  
The thickness Sediments found to be about **4 km**
- The continental crust below the basin is also found to be thinner (about 24 km) than the normal crust



# The Sedimentary Basins

*Mamfe, South West Cameroon*



- **Ngando et al., 2004** The results reveal the existence at depth attributed to water saturation. From audio-magnetotelluric surveys



# The Sedimentary Basins

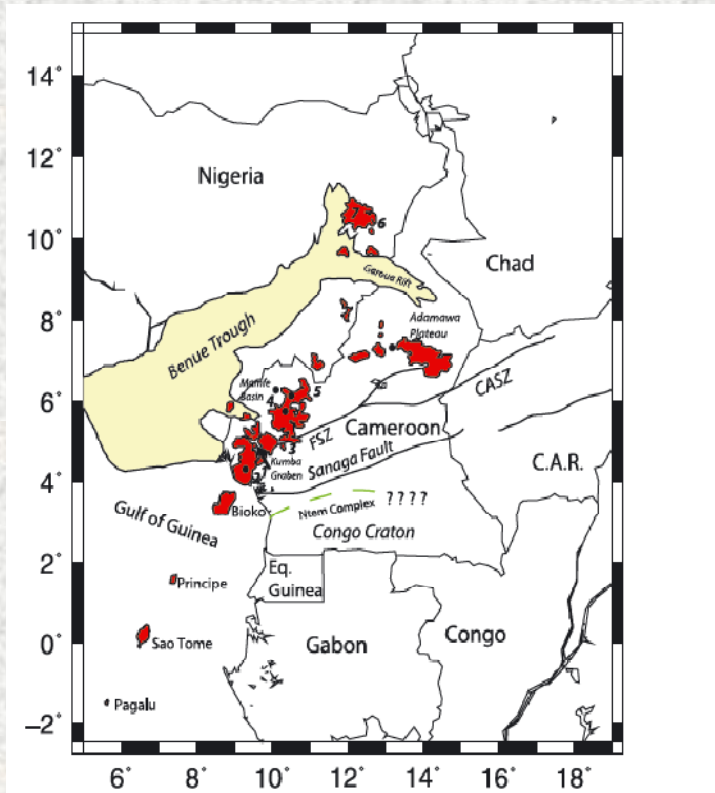
*Douala/Kribi, Littoral*

Using gravity,

- Ndikum et al., 2017, Ndikum et al., 2014, Koumetio et al., 2014 and Owona et al., 2011

found crustal thicknesses of 28 km and two separate blocks of less than 26 km with very low density contrast.

# The Adamawa Fault Zone and the Highlands of South Western Cameroon



- Bouba et al., 2017
- Jean Marcel et al., 2016
- Noutchogwe et al., 2006
- Kande et al., 2006

Results from gravity suggest the presence of a dense intrusion of probably basaltic composition at about 8 km and which may be related to the **Cameroon Volcanic Line**.



# Thanks for your kind attention

## *Some field work pictures*

