

Spatiotemporal Dynamics of Geothermal Parameters Along the Cameroon Volcanic Line: Characterization and Evolutionary Trends

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Abstract

Introduction: Cameroon's location along the Cameroon Volcanic Line (CVL)—a 1600 km magmatic structure with oceanic and continental segments characterized by active volcanism (e.g., Mount Cameroon eruptions) and the presence of 130 documented thermal springs (Le Maréchal, 1976)—suggests high potential for geothermal energy development. Despite this, the resource remains largely untapped, with no comprehensive contemporary studies conducted to fully assess capacity. The region also faces unique geohazards from limnic-phreatomagmatic eruptions, tragically demonstrated by CO₂ release events at Lakes Monoun (1984) and Nyos (1986), fundamentally linking volcanic gas dynamics to immediate societal risk.

This study addresses critical research gaps by examining challenges and evolutionary trends surrounding geothermal exploration in Cameroon. Specifically, it seeks to:

- Characterize the current status and spatio-temporal distribution of geothermal manifestations along CVL based on existing data
- Identify and analyze primary barriers (policy, institutional, and technical) constraining geothermal development
- Propose a detailed, multi-disciplinary surface exploration framework to unlock Cameroon's geothermal potential and mitigate volcanic gas hazards

Methodology: The research employed a comprehensive literature review focusing on Cameroon's energy sector, geothermal manifestations, and existing policies. This involved analyzing academic papers, government documents, and technical reports on renewable energy and the CVL. This approach allowed for:

- Consolidation of historical geothermal data, notably the location and temperature of thermal springs (up to 74°C at WoulnDé)
- Identification of non-technical barriers to exploration through thematic synthesis
- Establishment of a current baseline of knowledge among academics and stakeholders regarding geothermal energy

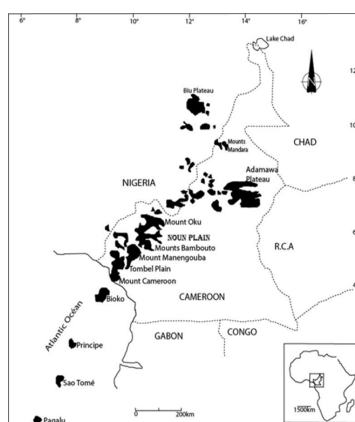


Figure 1 Cameroon Volcanic Line (simplified from Marzoli et al., 2000)