

REVIEWER'S REPORT

Manuscript No.: IJAR-59311

Title: Morphologie et morphogenese dans le Nord de la Cote d Ivoire. La part du climat actuel dans le modele de la sequence cuirassee dvOunangakaha (Region de Korhogo)

Recommendation:

Accept as it is

Rating	Excel.	Good	Fair	Poor
Originality		√		
Techn. Quality			√	
Clarity		√		
Significance			√	

Reviewer's ID: JPR-006

Detailed Reviewer's Report

1. Central Objective of the Study

The research evaluates how current and sub-current tropical climates interact with inherited ancient landforms to shape the modern ferricrete landscape sequence in Ounangakaha, northern Côte d'Ivoire.

2. Geographical and Topographical Setting

The study area is located near Korhogo between latitudes 8°5'–9°48'N, resting on a gently undulating plateau that sits at an average altitude of 300 to 400 metres.

3. Underlying Geological Substrate

The regional relief is built upon a diverse crystalline basement featuring an alternation of Baoulé-type granites, Birimian schists, greenstones, and intrusive Bondoukou-type granites.

4. Identification of Three Paleoclimatic Levels

Landscape analysis reveals three distinct ancient steps protected by iron crusts: the highest bauxitic surfaces, an intermediate relief level, and an upper glacis system.

5. The High Bauxitic Surface (Level A)

Positioned around 500 metres in altitude, this oldest surface features a finely vacuolar crust enriched with gibbsite and iron oxides, which acts as a protective shield against vertical erosion.

6. Characteristics of the Intermediate Relief (Level B)

Consisting of a series of hillocks reaching up to 450 metres, this level lacks heavy structural induration but displays localized iron gravels that point to a degraded, ancient intermediate crust.

7. The Upper Glacis (Level E)

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Situated around the 300-metre mark, this level is marked by a vacuolar, heterogeneous ferricrete that is progressively dismantling and releasing weather material downslope.

8. Dissection into Croups and Plateaus

The upper glacia is heavily fragmented by perpendicular networks of valleys and lowlands, transforming the landscape into isolated, gravel-covered ridges, small plateaus, and minor inselbergs.

9. The Old Low Glacia (*Bas-Glacia*)

Formed at the base of the upper glacia, this unit consists of a thick mantle of sandy-loamy colluvium and alluvium bound together by a thin, highly discontinuous scoriaceous iron carapace.

10. Sedimentary Stratigraphy of Low Glacia

Soil pit excavations reveal surface carapaces underlain by poorly worn gravel lenses, indicating strong lateral sediment contribution and historical choking of valley bottoms.

11. Methodology via Photo-Interpretation

Stereoscopic mapping using aerial photography allowed researchers to trace slope ruptures, group isomorphic topographic facets, and systematically delineate individual landform units.

12. Experimental Field Parcels for Erosion

Researchers isolated rectangular fields with upstream ditches to measure real-time soil loss and solid discharge carried by tropical downpours into collection troughs.

13. Runoff Estimation via the Rational Method

The study utilized the rational formula ($Q = C \times I \times A$) to calculate precise runoff coefficients by crossing local drainage areas with historical regional data.

14. Climate Context and Recent Trends

The region experiences a humid tropical climate with a marked dry season; however, data from 1961 to 2016 reveals a 7% drop in total rainfall and a shift toward severe seasonal irregularities.

15. The Seasonal Morphogenic Crisis

The most intense erosion occurs during early-season downpours when the soil—dried out by the dry season and stripped bare by bushfires—lacks any protective plant cover.

16. Runoff Dynamics vs. Topography

Runoff coefficients soar up to 0.7 during heavy storms ($>60 \text{ mm/h}$), primarily impacting linear valley channels and the transitional break-of-slope zones (*knicks*).

17. The Domain of Mechanical Aggression

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High-slope environments behave as zones of aggressive erosion where sheet wash and diffuse runoff actively strip away quartz particles and iron gravels.

18. The Domain of Chemical Alteration

In contrast to slopes, lowlands and valley floors act as highly accumulative environments where prolonged moisture drives intense chemical weathering and pedogenesis.

19. Formation of New Functional Low Glacis

A modern, functional low glacis is developing along valley borders through groundwater sapping and sheet wash, slowly hardening via ongoing iron migration from older upper crusts.

20. Peripheral Depressions

Crescent-shaped, marshy depressions are forming at the foot of high reliefs; they act as moisture traps that collect iron solutions, driving highly localized modern crust induration.

19.Result Discussion:

The landscape is split into an **eroding hillslope domain (36–42 kg/s loss)** and a **depositional valley domain (74–82 kg/s gain)**. Savanna vegetation acts as a seasonal shield against flood peaks, but late dry-season bushfires strip this protection right before heavy downpours hit. Simultaneously, dissolved iron dynamically migrates from higher duricrusts to lowland marshes, where water table fluctuations trap it to form new crusts.

20.Conclusion:

Paleoclimatic legacy establishes the core vertical layout of the land, while modern surface processes merely refine lowland channels and valley slopes. The current bioclimatic system acts **predominantly as a soil-forming (pedogenic) agent** rather than a major landscape-sculpting force. This continuous accumulation and iron transfer prove that lowland marshes and glacis-terraces are actively developing landforms.

21.Limitations of the Work:

The study completely lacks **absolute radiometric dating**, forcing a reliance on a purely relative historical chronology. Additionally, the highly detailed quantitative erosion measurements are entirely local to the **Ounangakaha sequence**. This restricted micro-scale focus means the numerical models cannot be directly extrapolated to other regions.

22.Applications of the Work:

Pinpointing a **four-fold early-season erosion spike** allows agricultural authorities to precisely schedule cover crops and agroforestry protections. Furthermore, identifying highly erodible matrices and high-

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runoff slope knicks provides crucial data for civil engineers. This ensures the safe design and positioning of road networks, culverts, and structural foundations.

23.Recommendations of the Work:

Environmental policies must strictly regulate late dry-season biomass burning to prevent stripping protective vegetation cover right before aggressive tropical downpours. Future savanna assessments should also **merge mechanical transport models with geochemical iron-leaching studies**. This integrated approach is essential to fully capture how these crusted landscapes alter over time.