STRATIGRAPHY OF THE VOLTAIAN BASIN:
- a 'superficial' view

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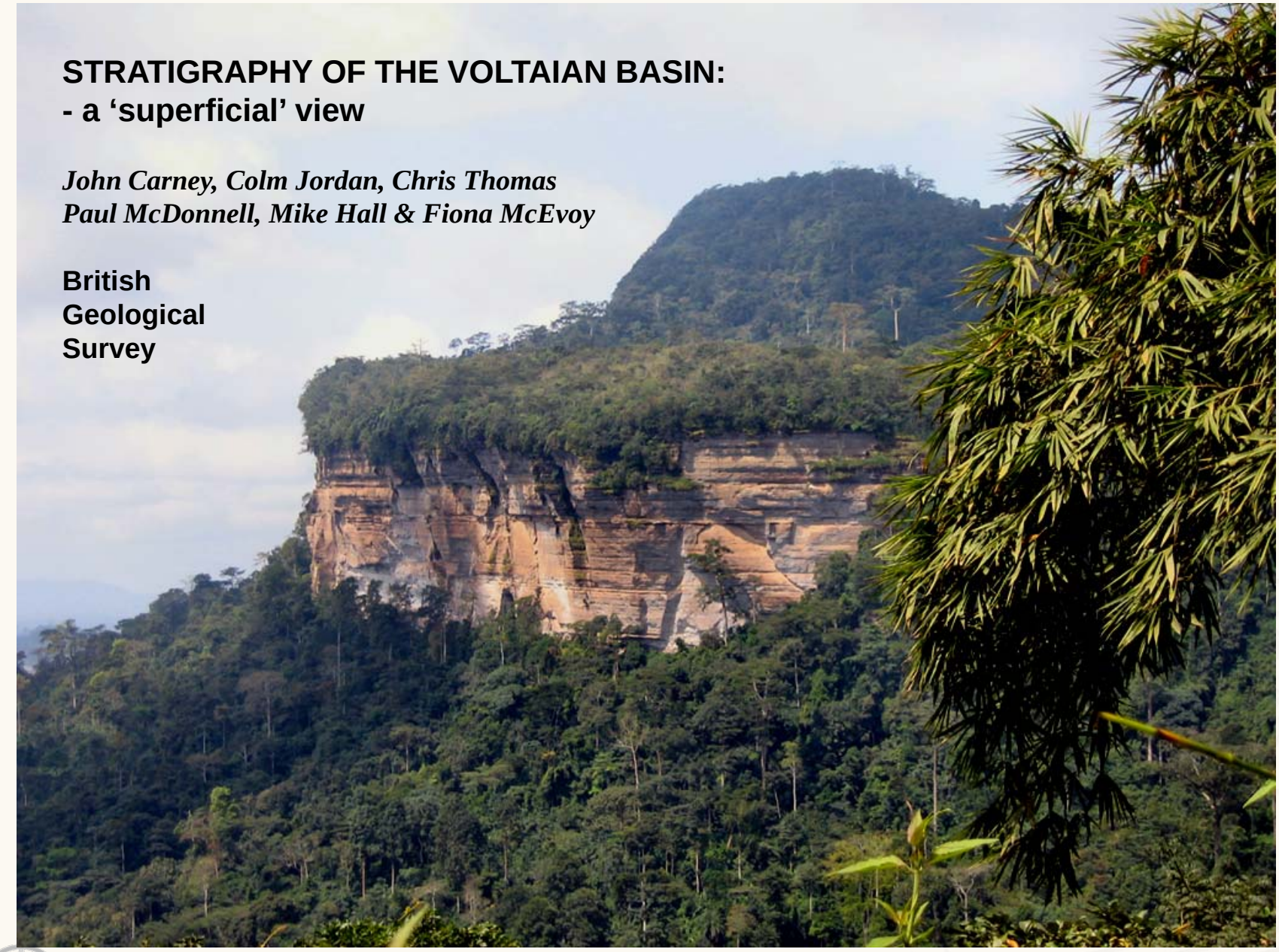
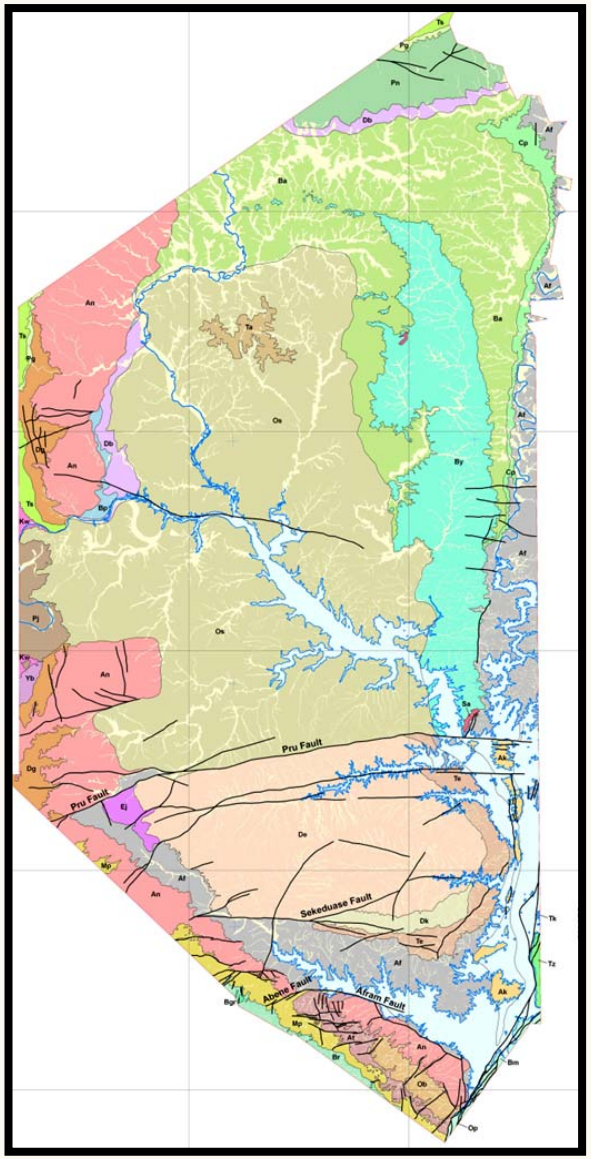
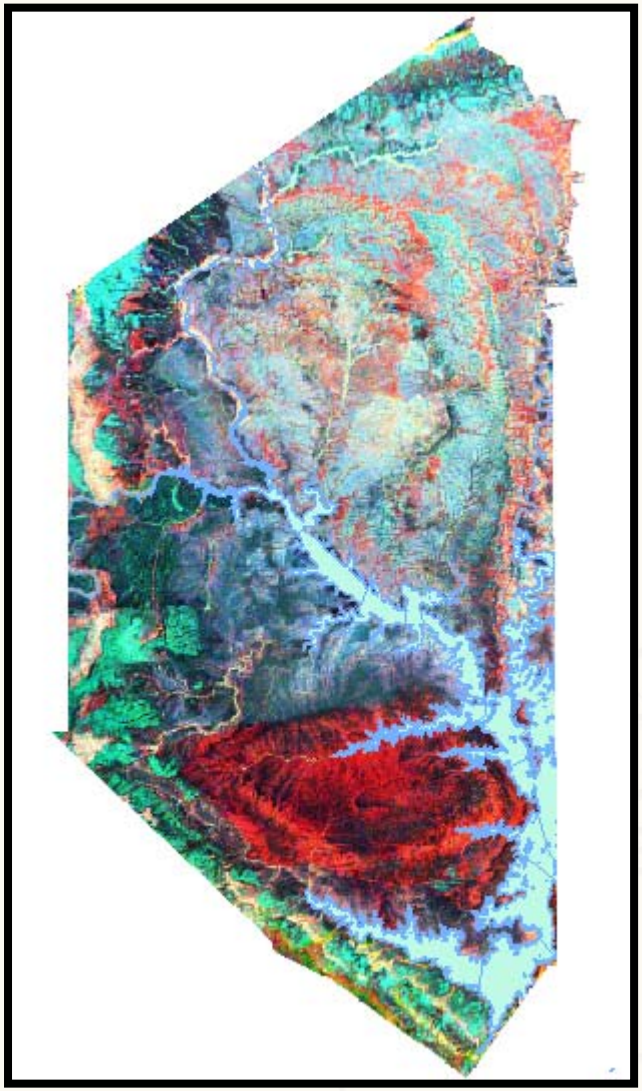
Paul McDonnell, Mike Hall & Fiona McEvoy

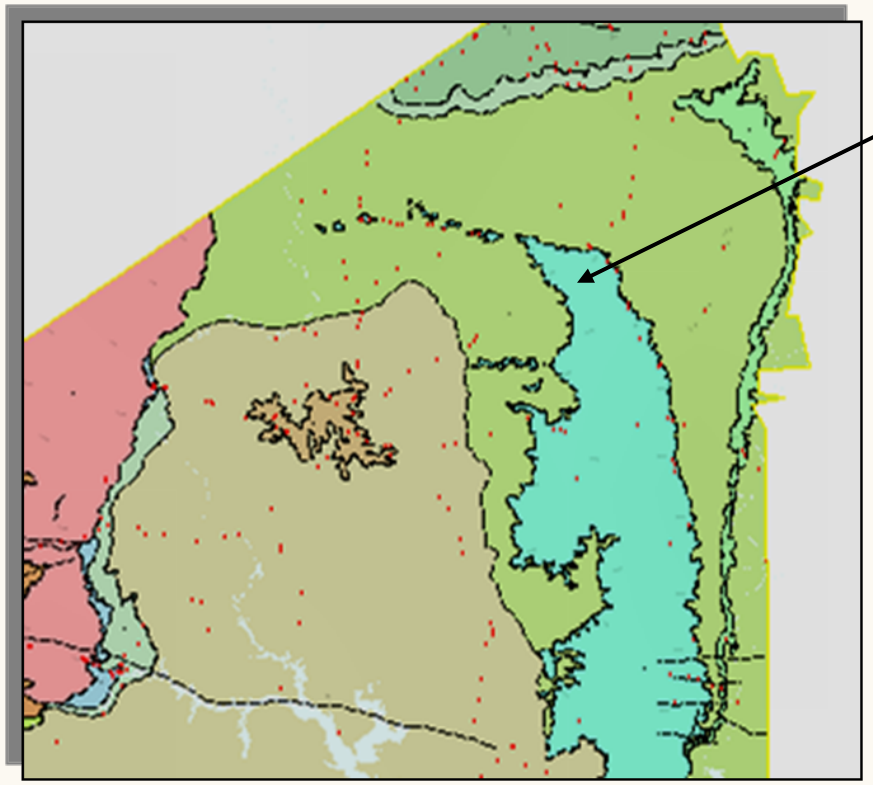
British
Geological
Survey



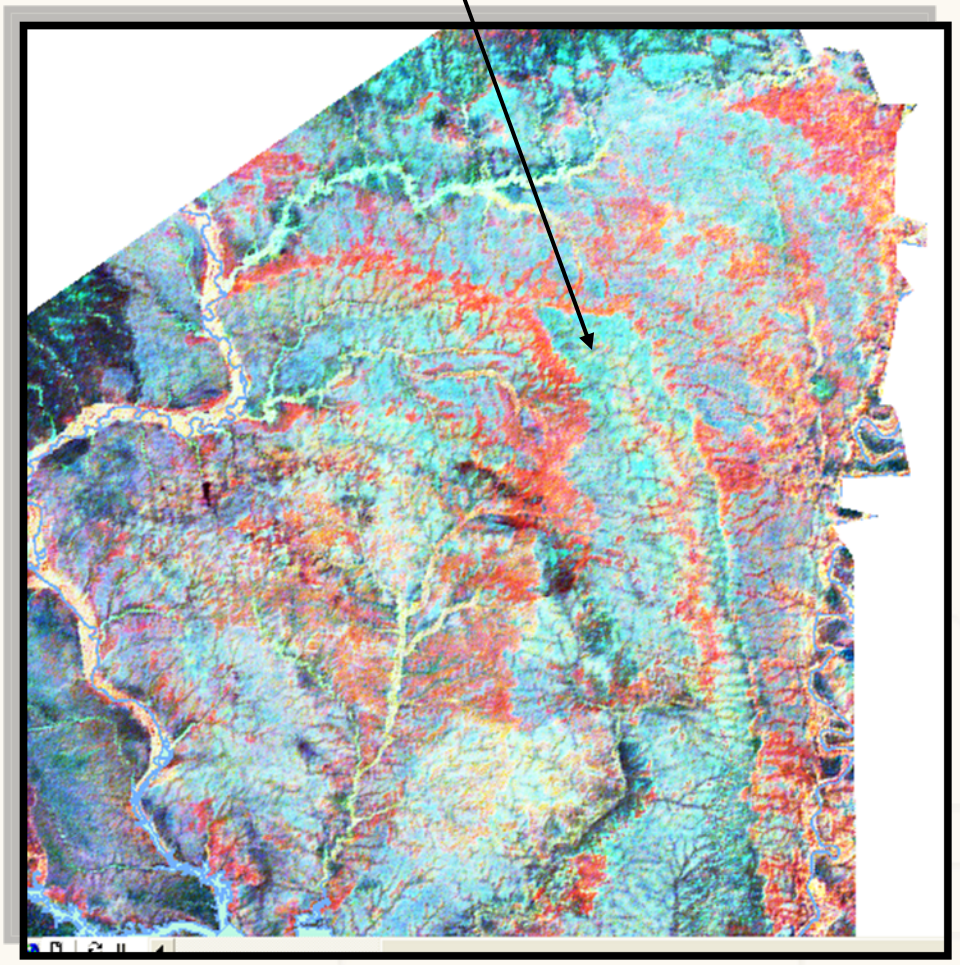


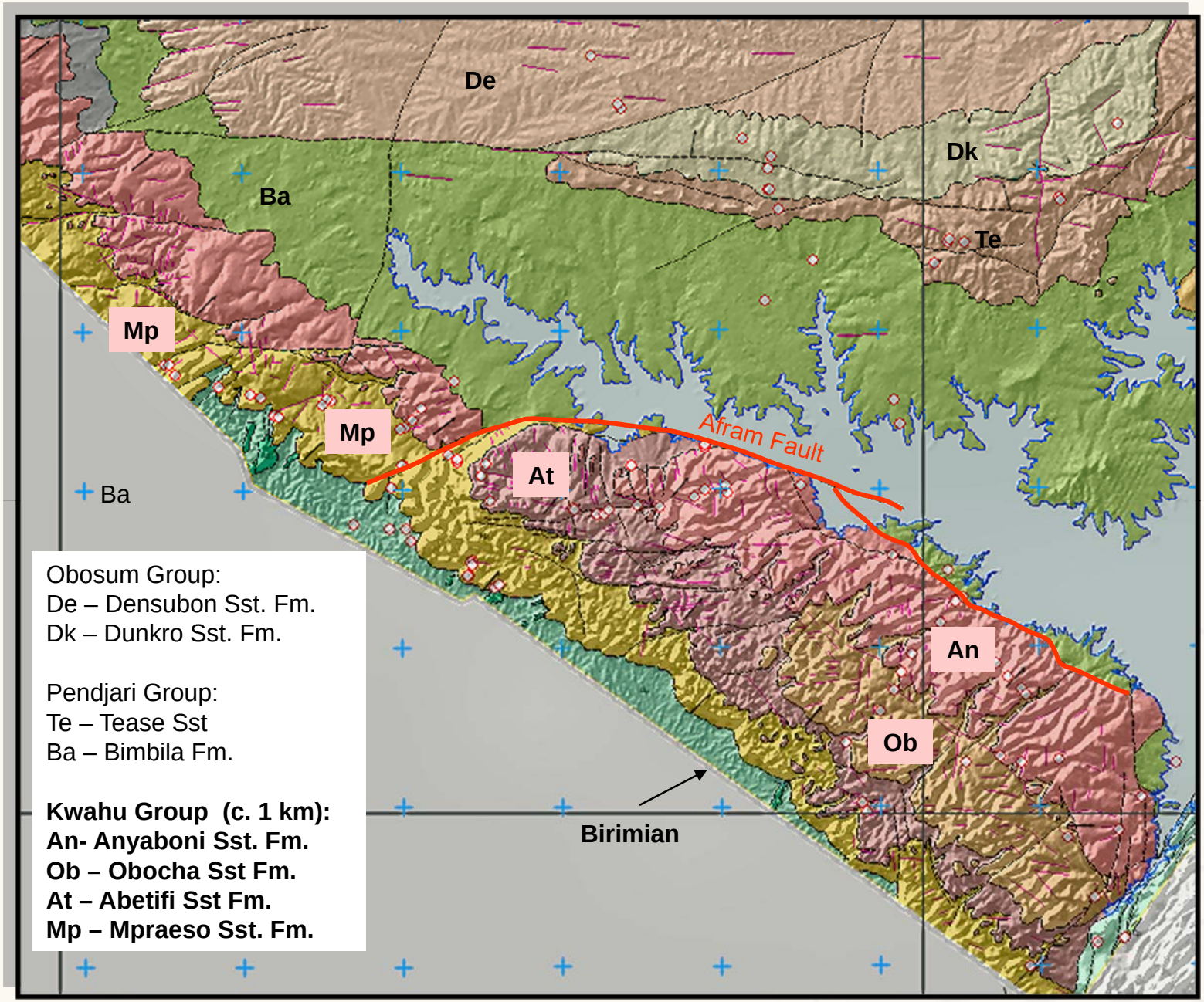


Integration with FUGRO radiometric map (at right)

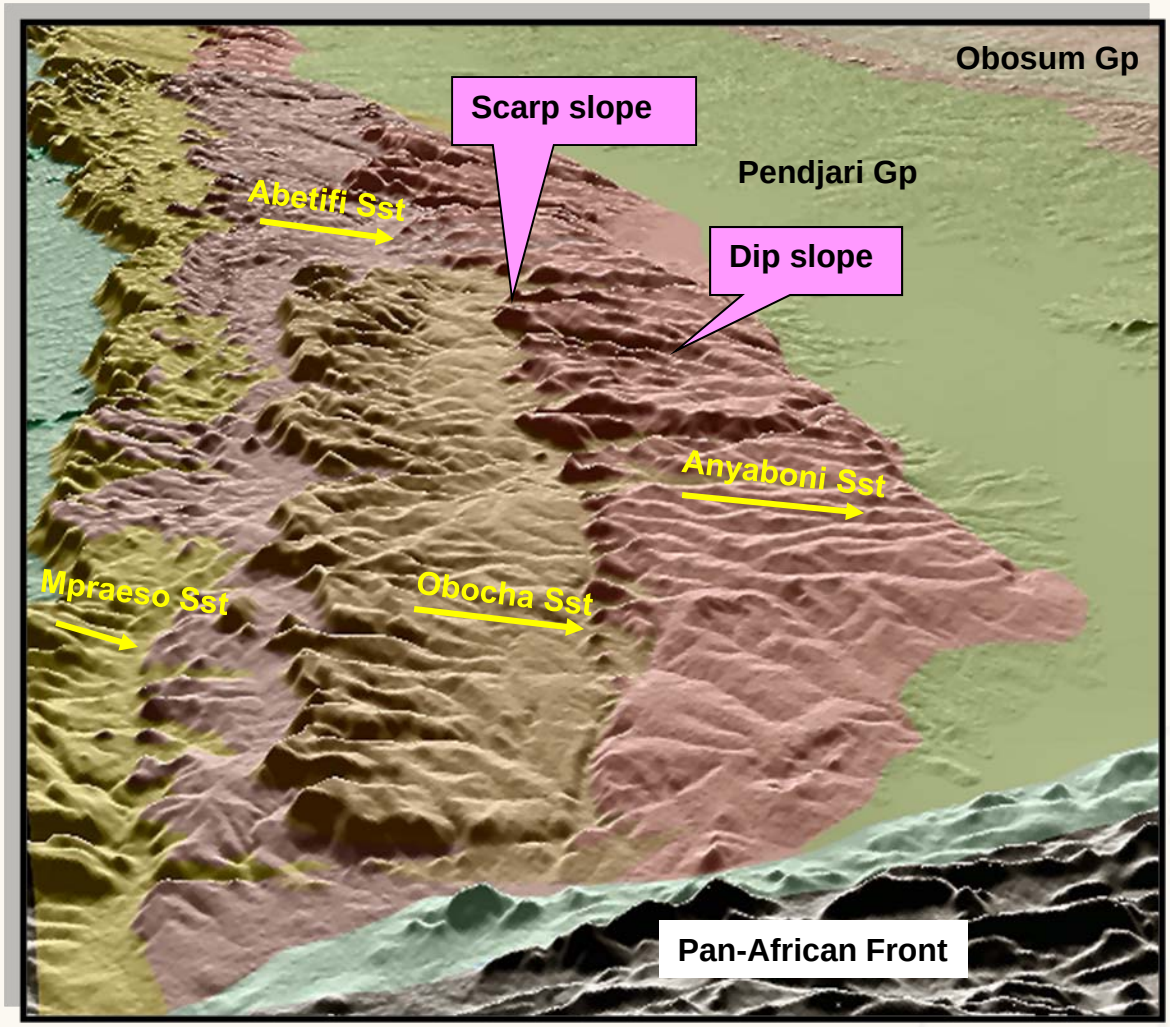


Bunya Sandstone



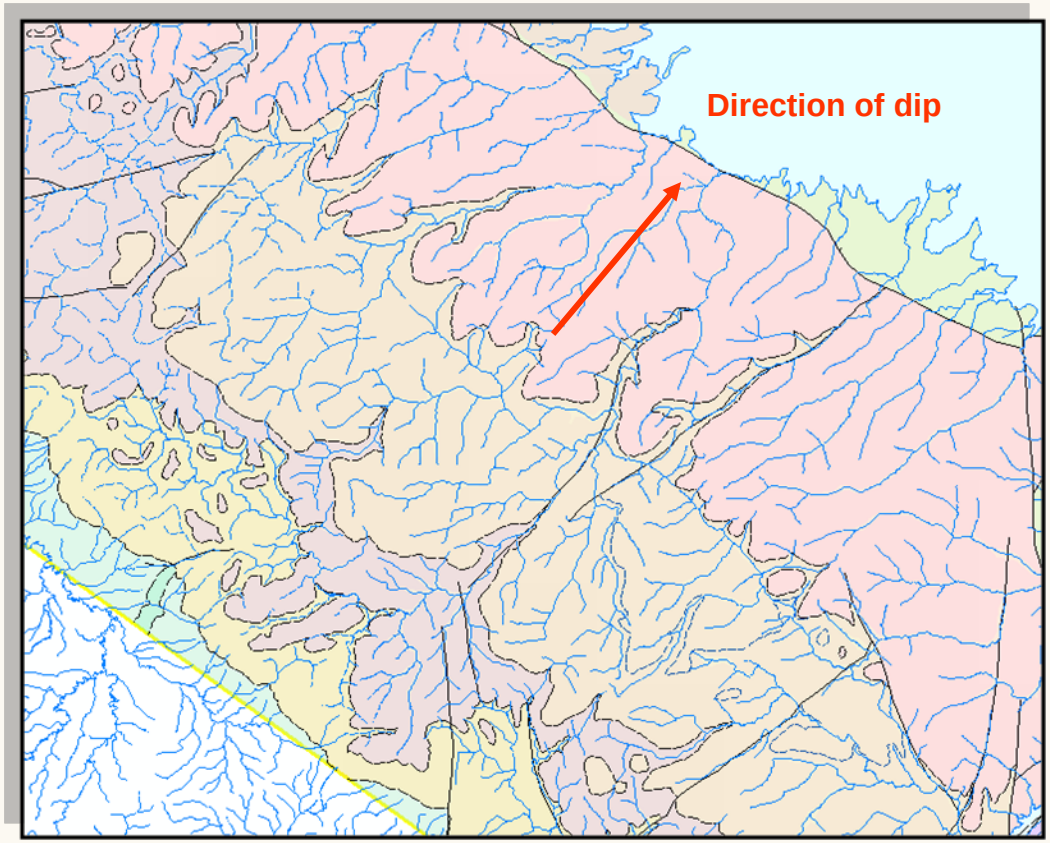


SOUTHERN VOLTA BASIN: KWAHU GROUP

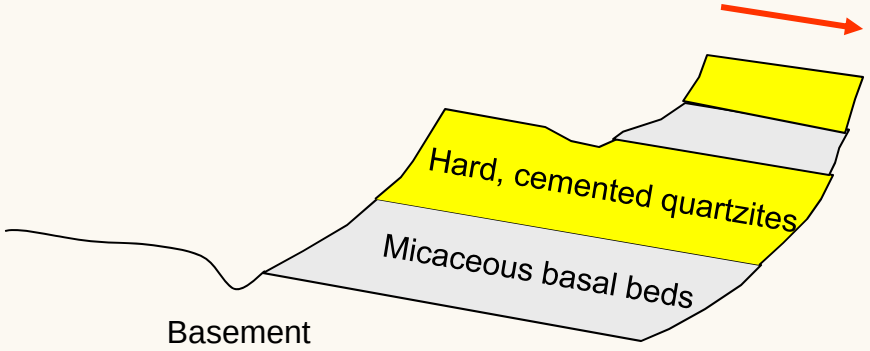


Oblique view of Kwahu Group outcrop, looking NW. The main geological units are draped over the topographic DTM. Yellow arrows indicate the dip slopes of the named sandstone units identified during the Project

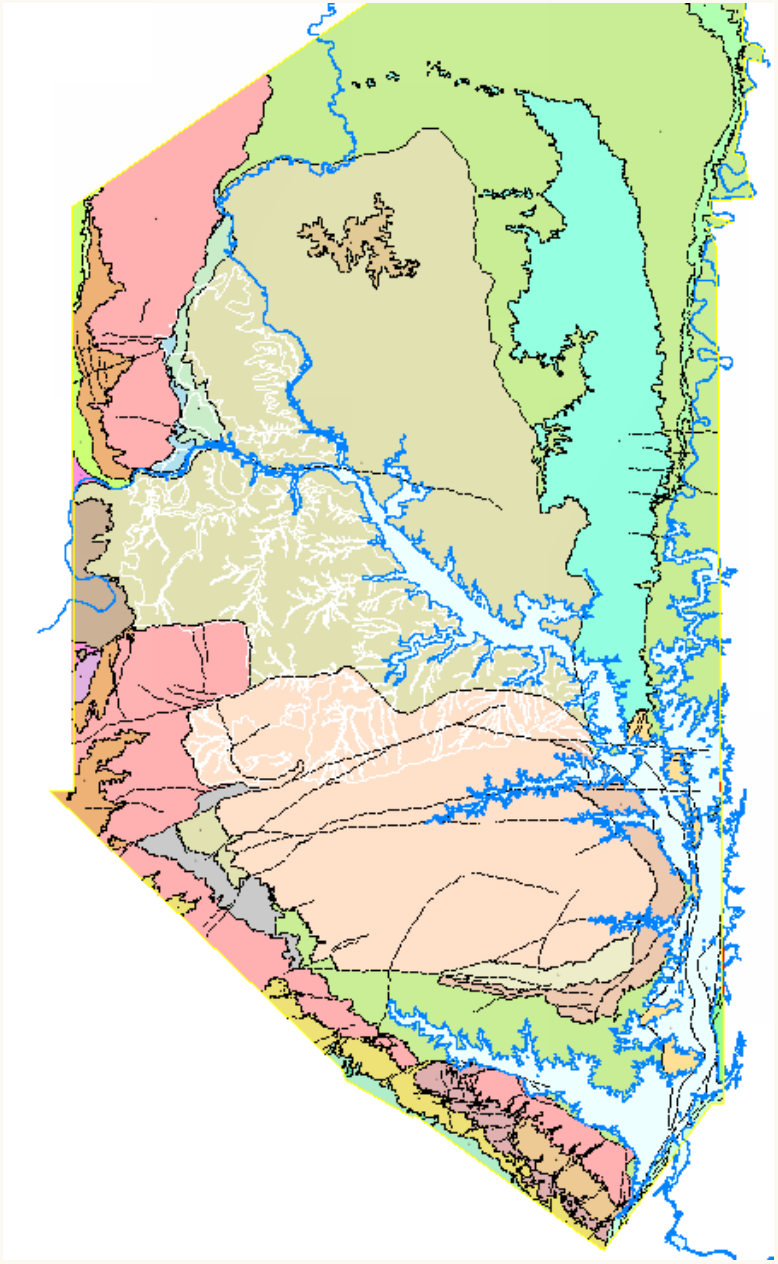
Formation of featured Terrain in the Kwahu Group



Trellis drainage pattern: Caused by strike- parallel and dip- parallel stream systems. The former excavate along the strike of the 'softer' strata, which crop out along the base of the sandstone units



Formation of scarp and dip slopes due to the differential erosion of 'soft', flaggy and micaceous basal strata

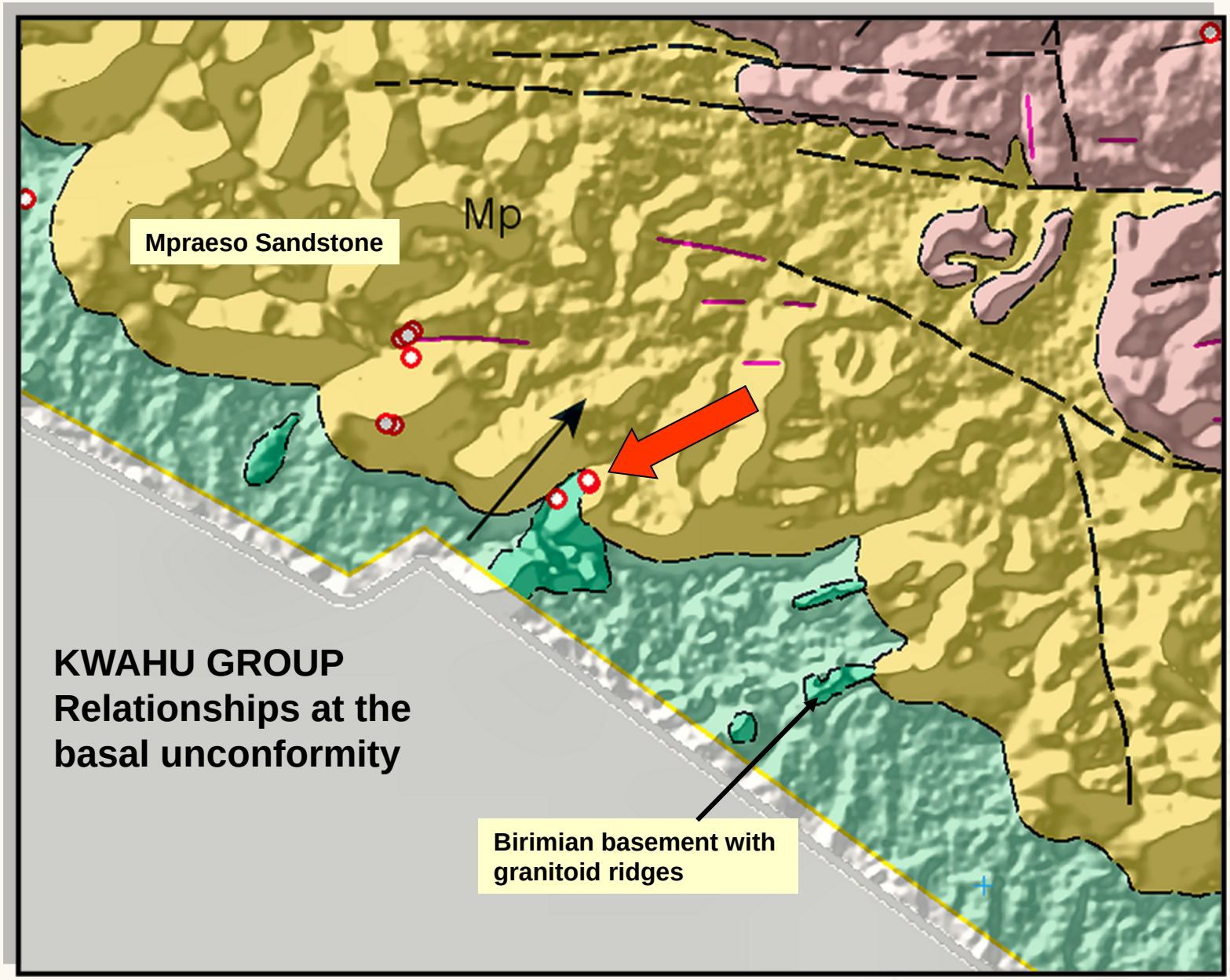


VOLTAIAN SUPERGROUP:

Obosum Group

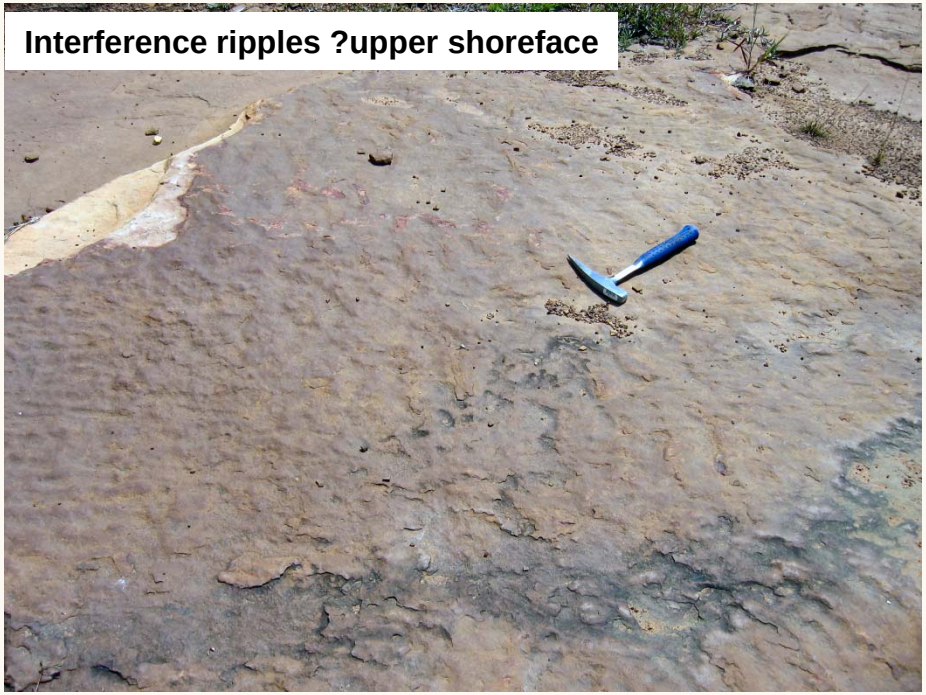
Pendjari Group

Kwahu and Bombouake groups

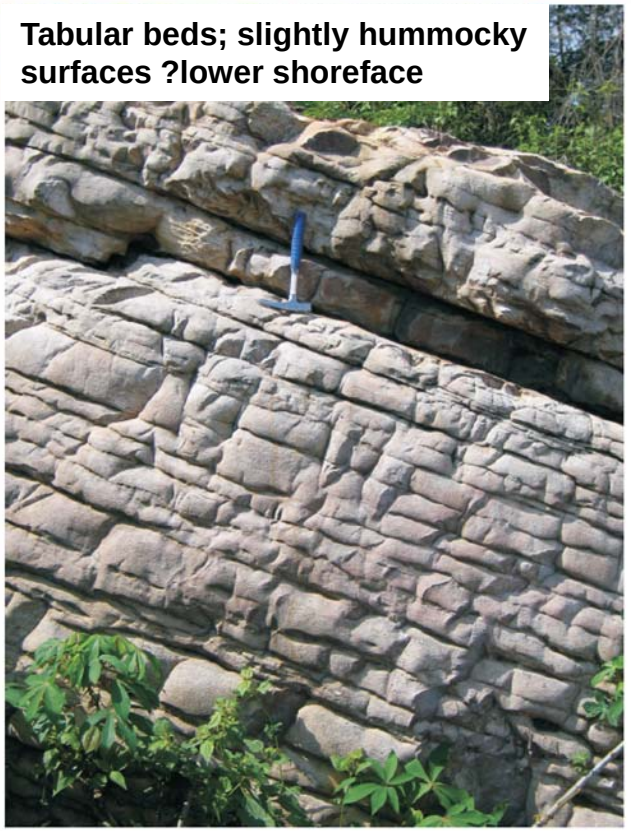


Basal unconformity of Kwahu Group (Mpraeso Sandstone) on Birimian granitoid

Tabular-planar bedding in the Mpraeso Sandstone Formation; upper part of Kwahu escarpment



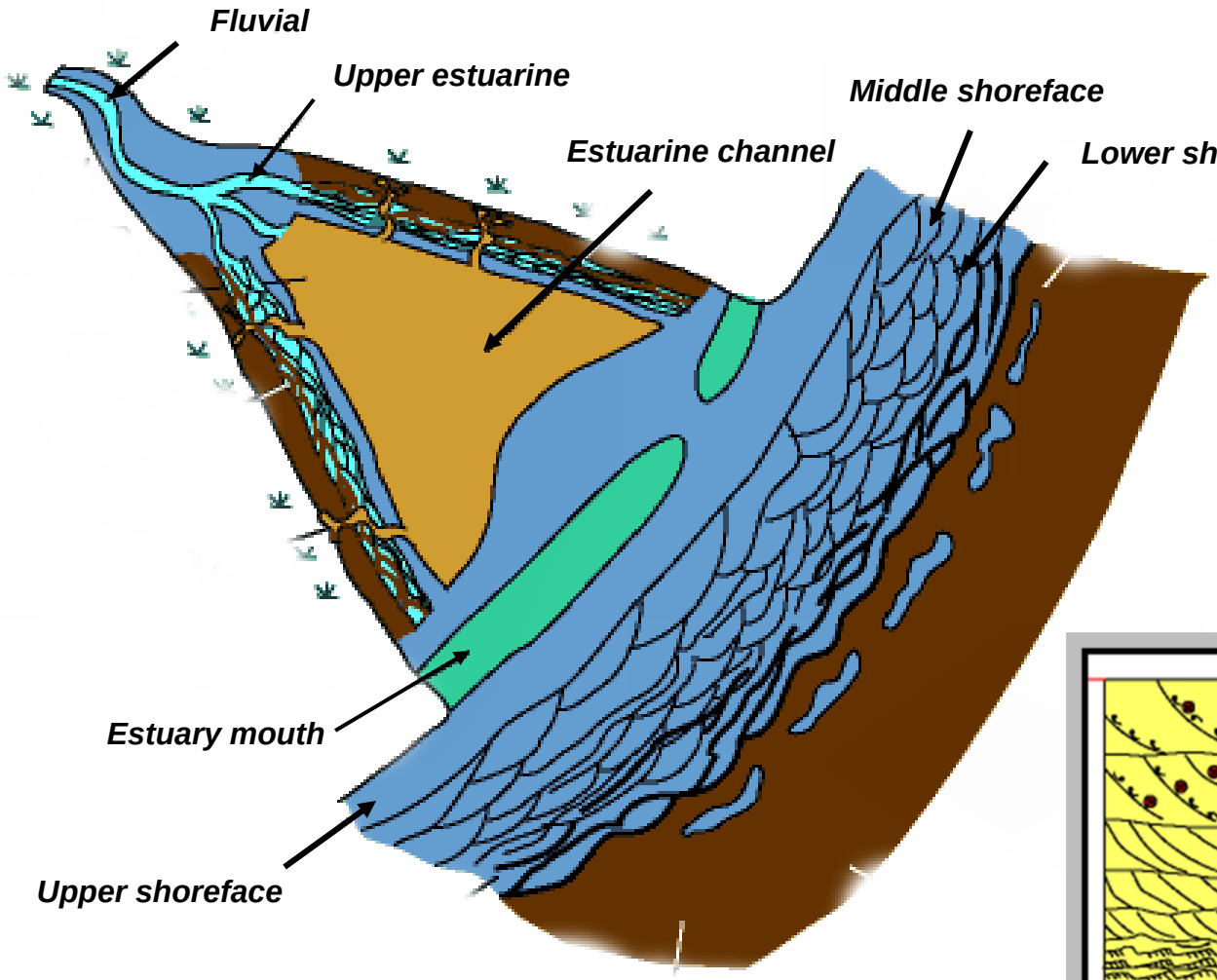
Interference ripples ?upper shoreface

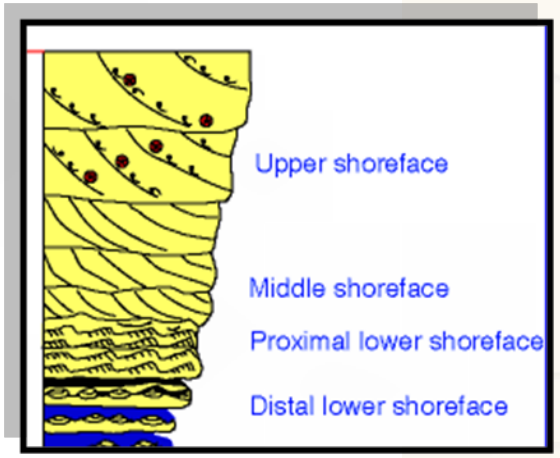


Tabular beds; slightly hummocky surfaces ?lower shoreface

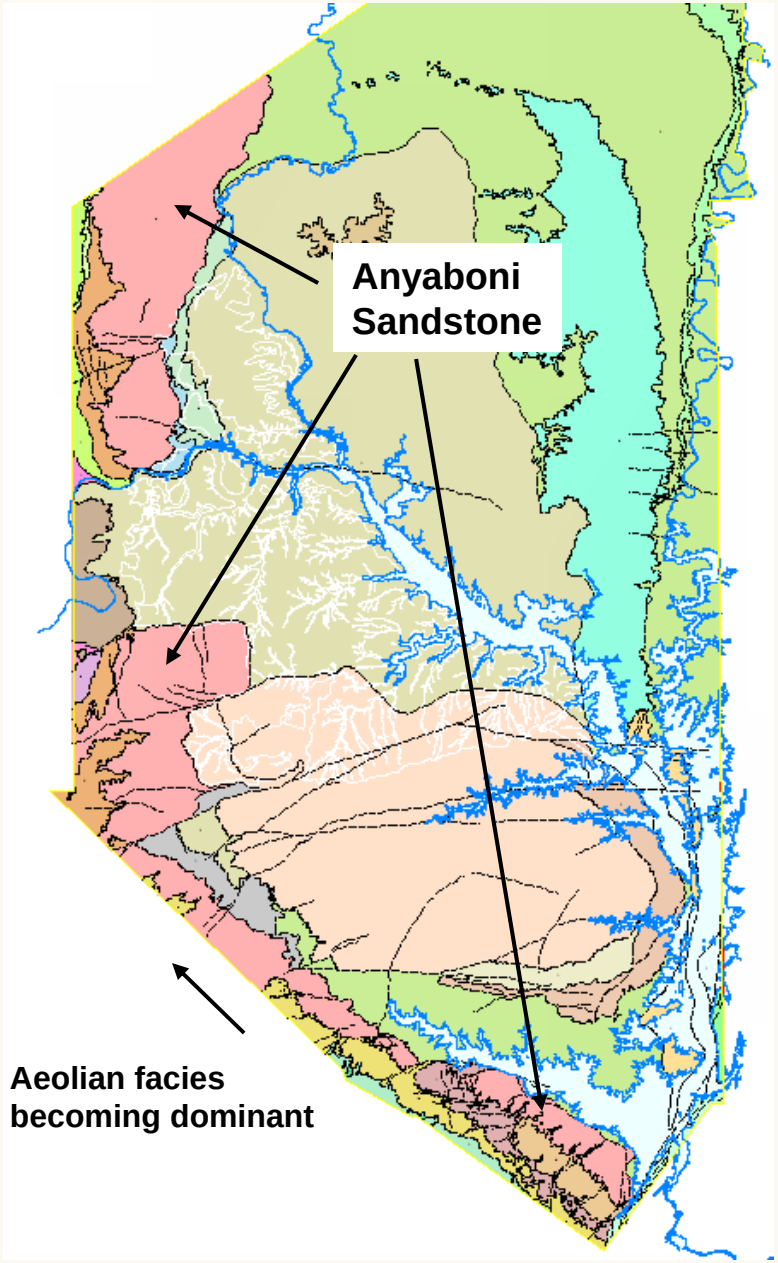
Herring-bone cross bedding ?upper shoreface

Sedimentary structures in the Abetifi Sandstone Formation, indicative of shallow-water marine reworking





Possible facies model for Kwahu/Bombouaka Group sandstone formations



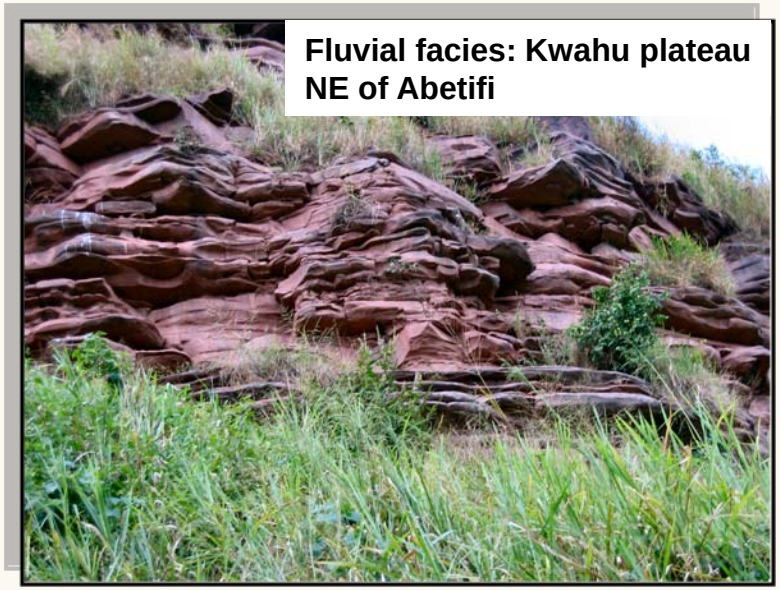
Anyaboni Sandstone

-very widespread outcrop

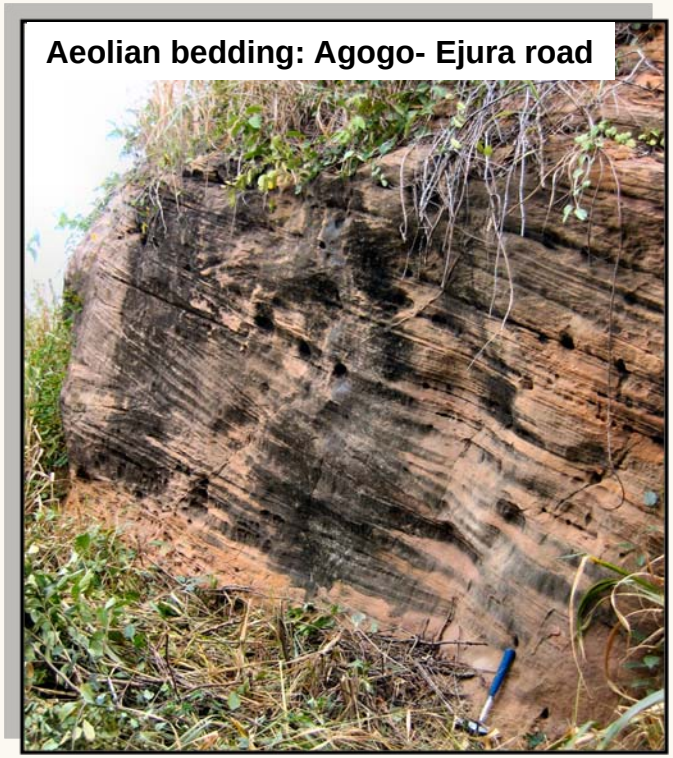
- terrestrial facies

- a complex of fluvial and aeolian sandstones, with aeolian bedforms dominating to the NW

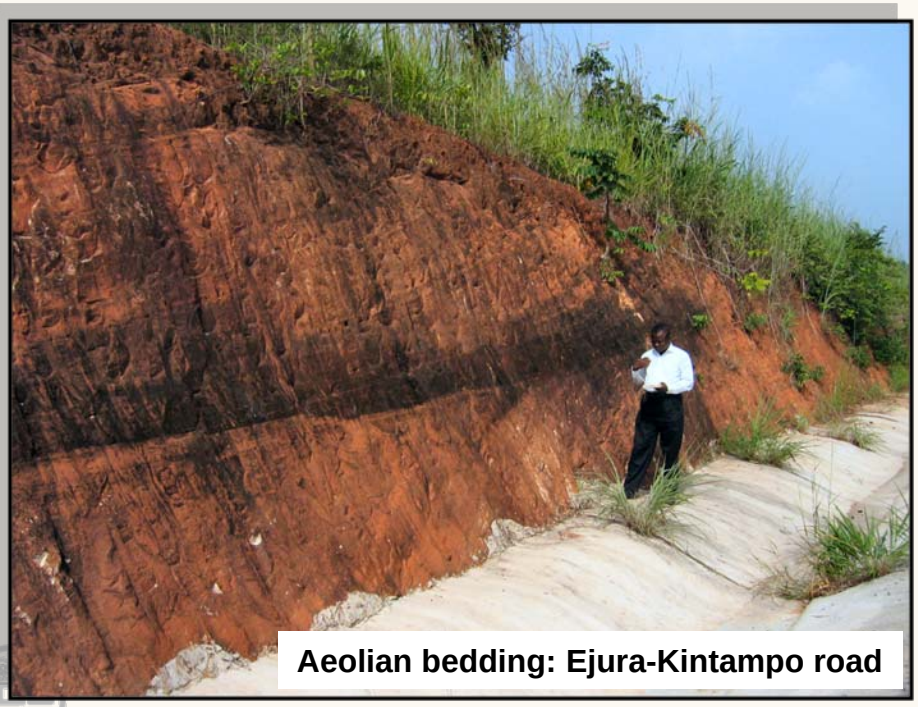
-classified as subarkoses, derived from Birimian basement to SW (Anani 1999, but this only refers to the SE outcrops)



Fluvial facies: Kwahu plateau NE of Abetifi

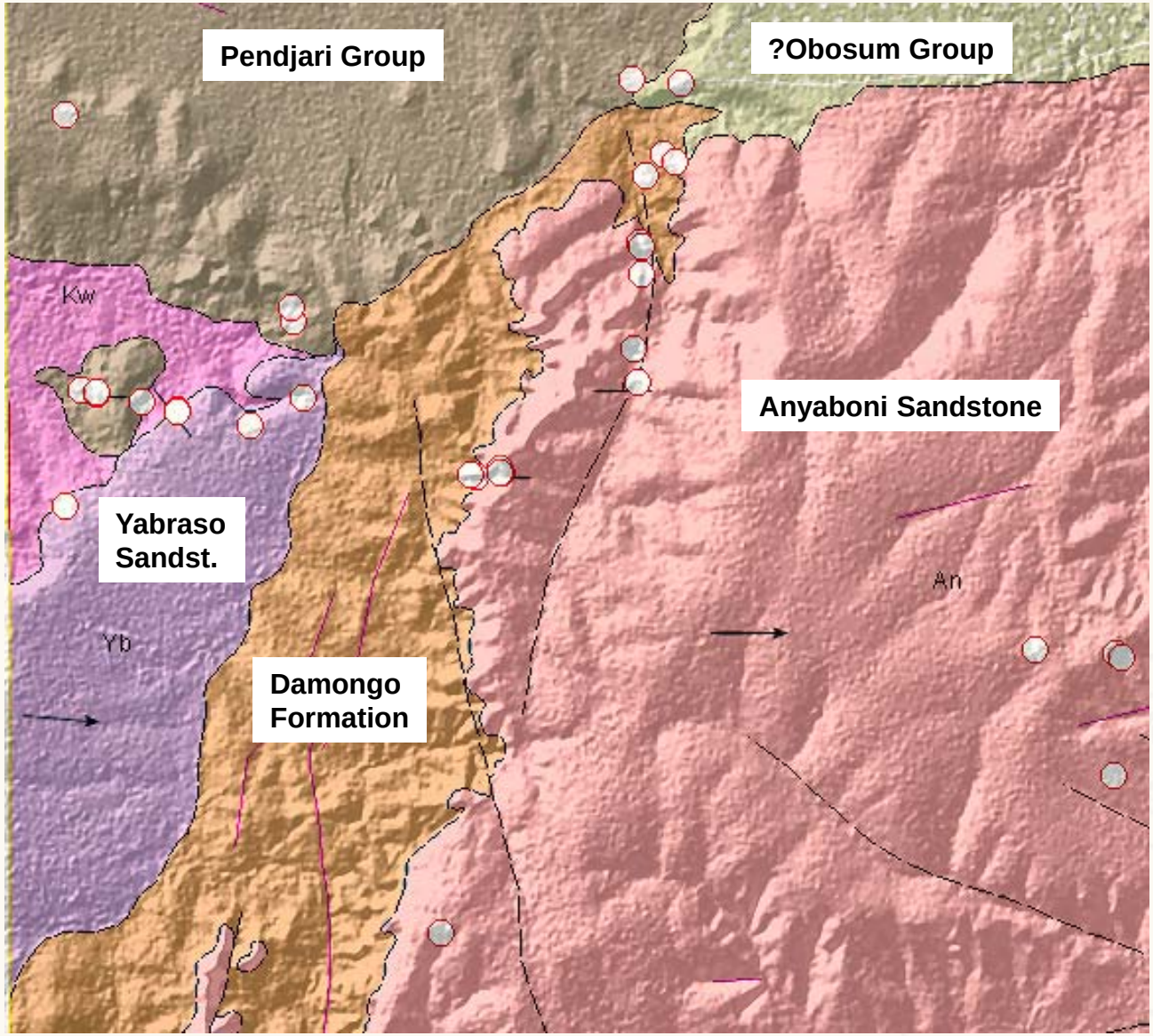


Aeolian bedding: Agogo- Ejura road



Aeolian bedding: Ejura-Kintampo road

Lithofacies variations in the Anyaboni Sandstone



Kwahu Group geology around Kintampo

Fluvial facies

Aeolian facies

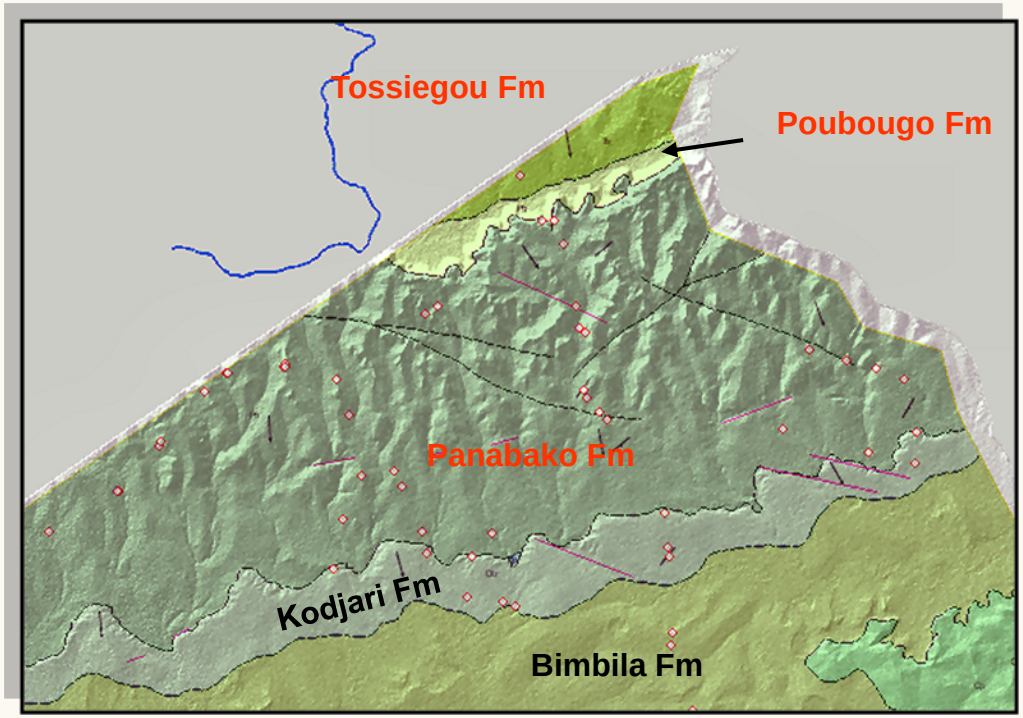
Anyaboni Sandstone
W of Kintampo

Kwahu Group stratigraphy west of Kintampo

Units recognised:
Anyaboni Sandstone
Damongo Fm.
Yabraso Sandstone
(=Tossiegou Formation?)
Lower siltstones and mudstones

Yabraso Sandstone Formation (=Fuller Falls Sandstone, Tossiegou Formation):

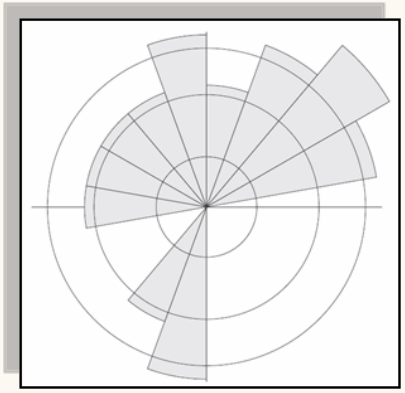
Pebbly, mature ?upper shoreface sandstones



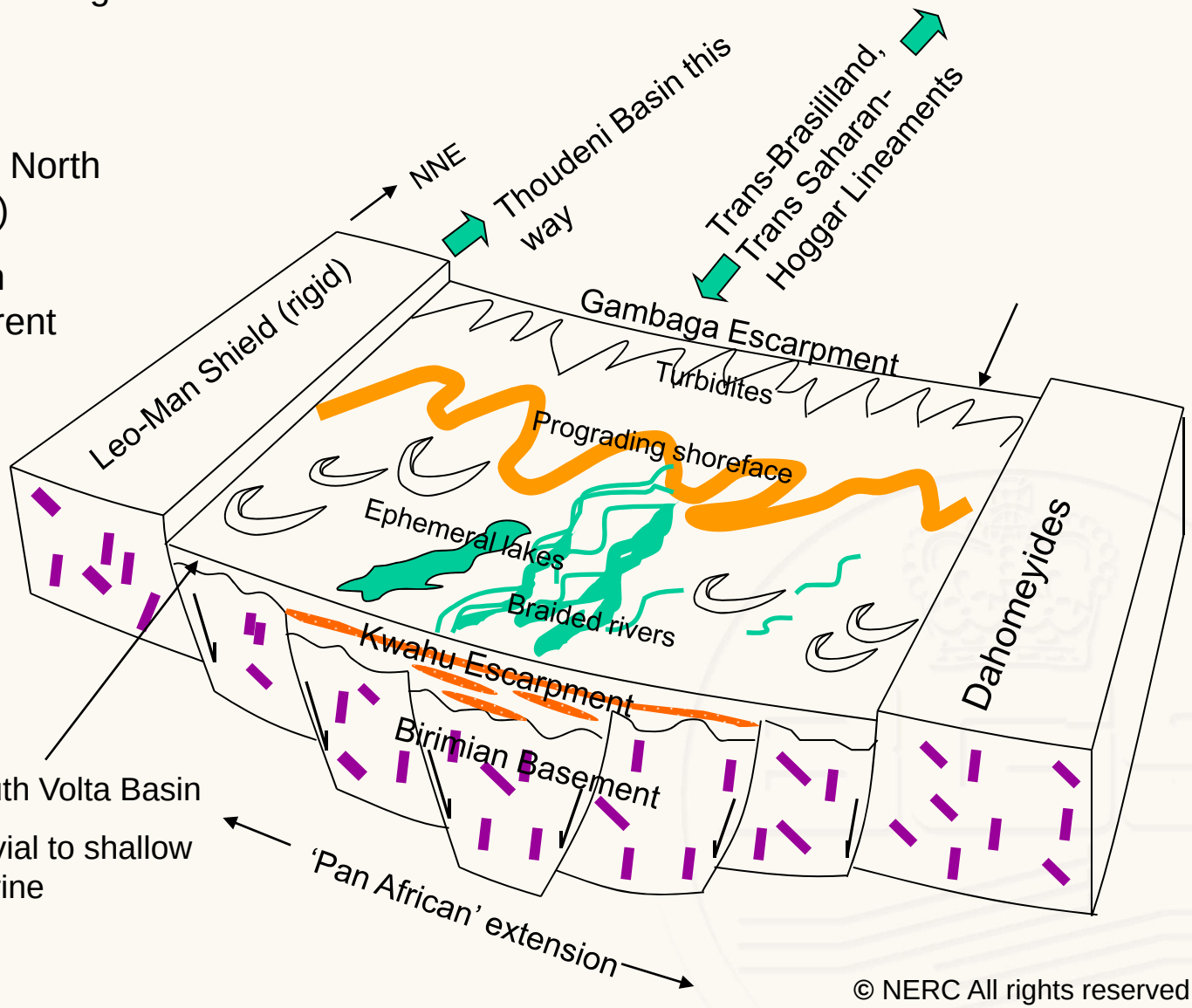
Bombouaka Group geology (units highlighted in red): Gambaga area

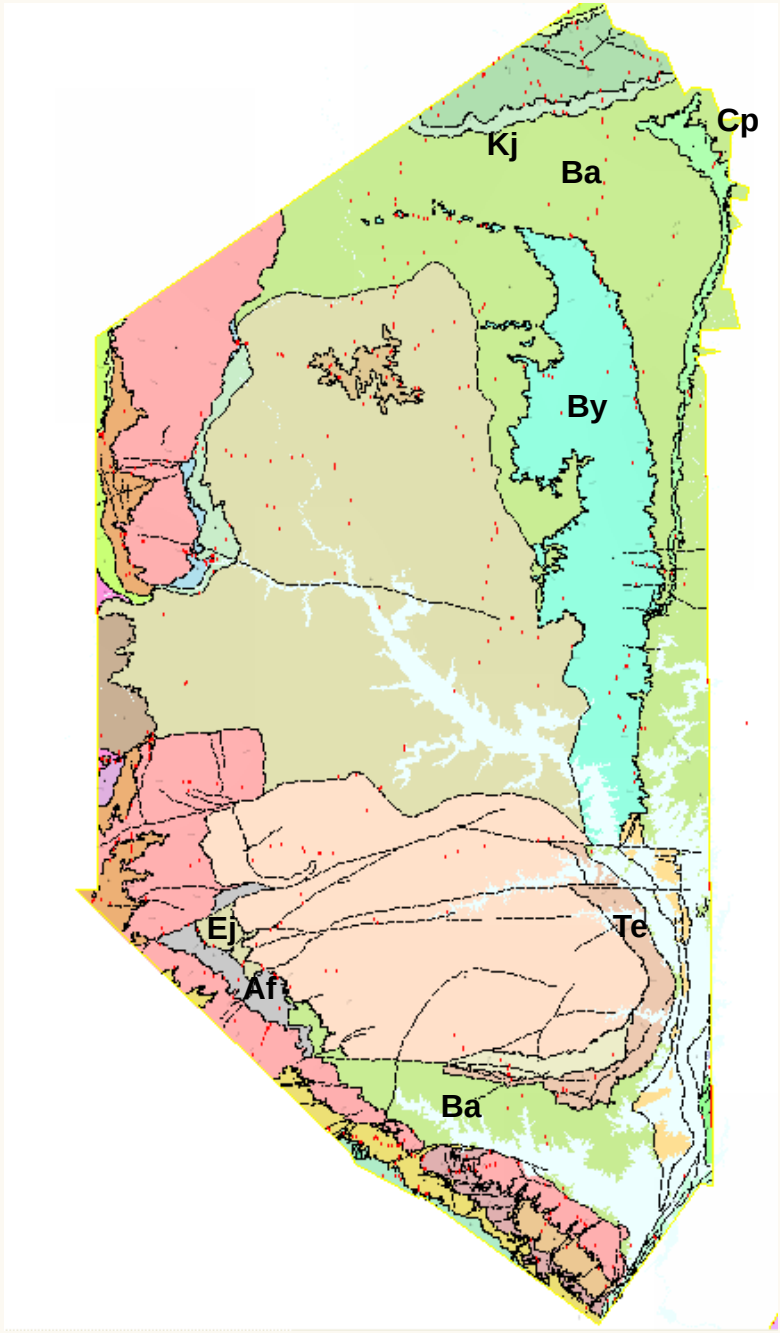
SUMMARY OF FACIES RELATIONSHIPS IN THE KWAHU/BOMBOUAKA GROUPS

- Post – Grenville
- Pro-grading fluvial fill with shoreface deposits (oscillating shorelines at times)
- Aeolian deposits
- Marine fan deposits in North (Gambaga Escarpment)
- Derivation mainly from Amazonia (south in current coordinates)



Kwahu Group currents (n = 17)





Pendjari Group

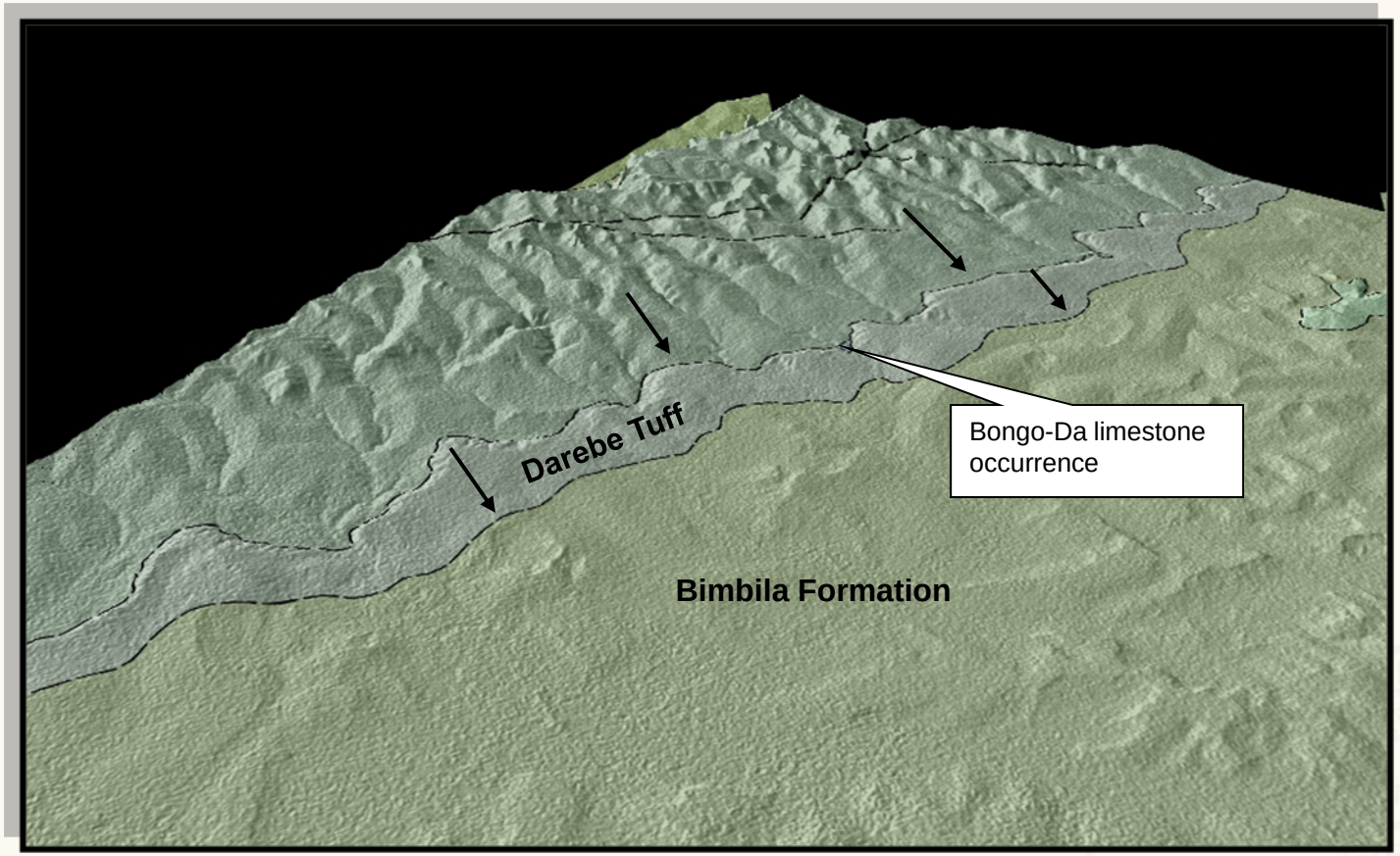
Bimbila Formation (Ba)
- **Bunya Sandstone Member (By)**
- **Chereponi Sandstone Member (Cp)**

Tease Sandstone Formation (Te)

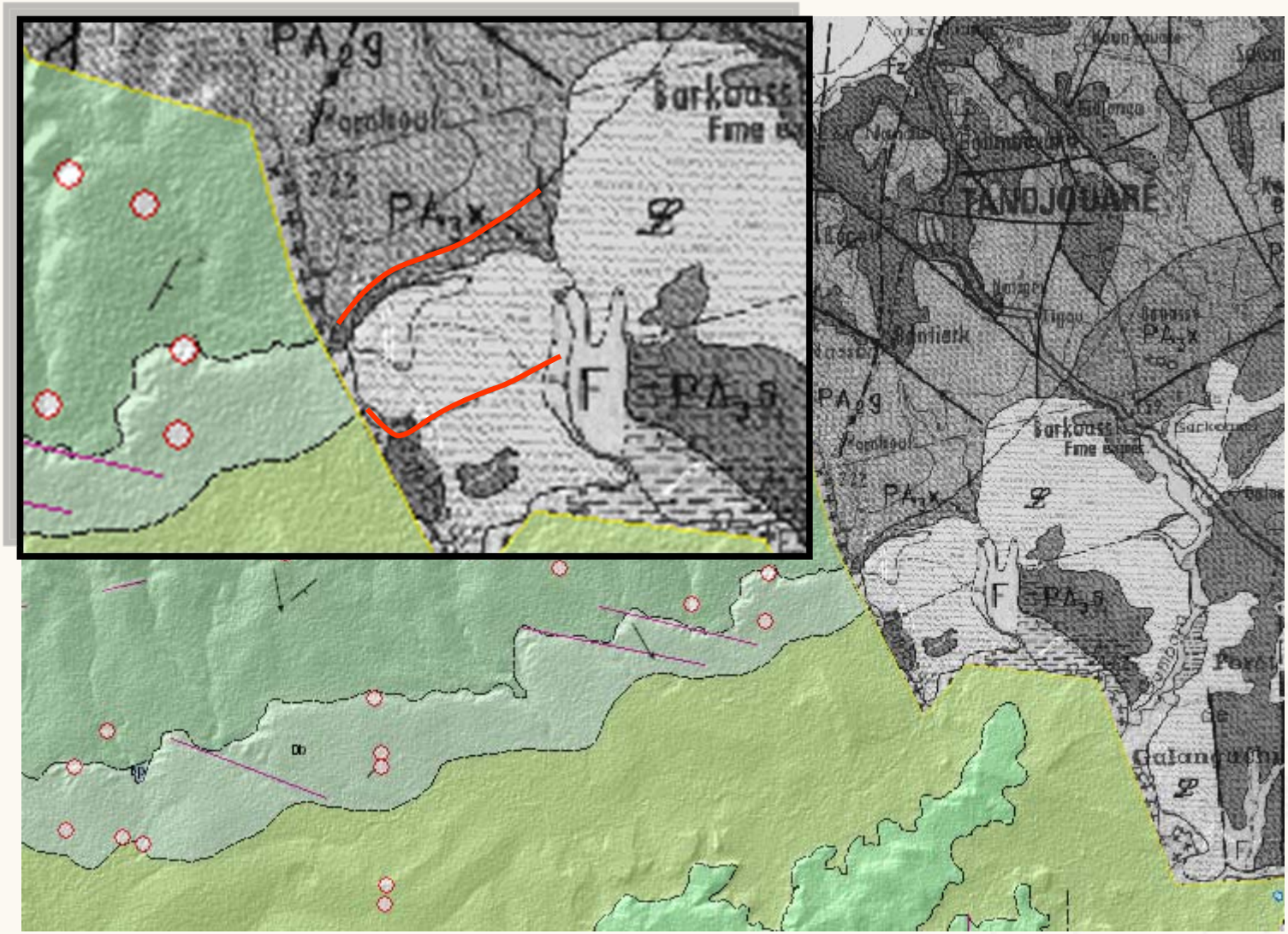
Ejura Sandstone Formation (Ej)

Afram Formation (Af)

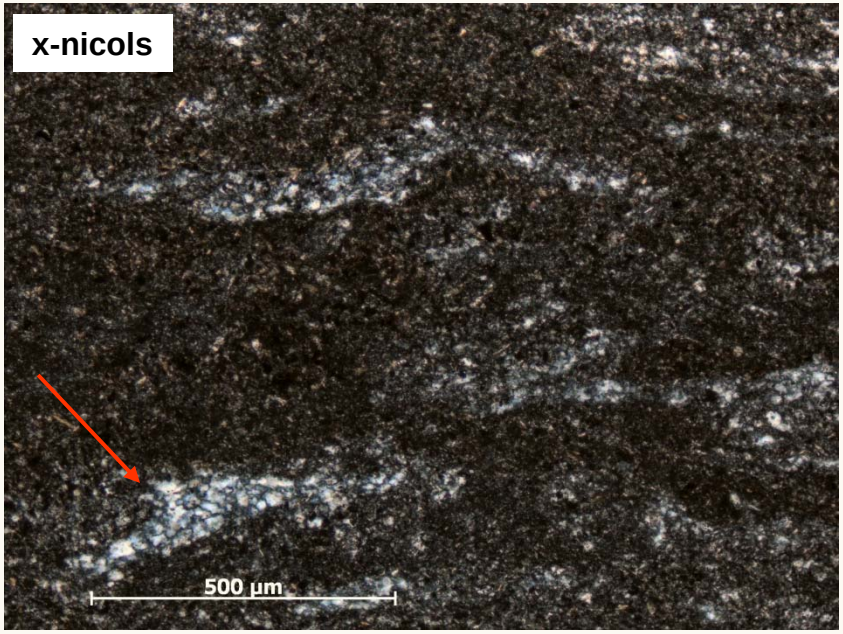
Kodjari Formation (Kj)
- **Darebe Tuff Member (Db)**
- **Buipe Limestone Member (Bp)**

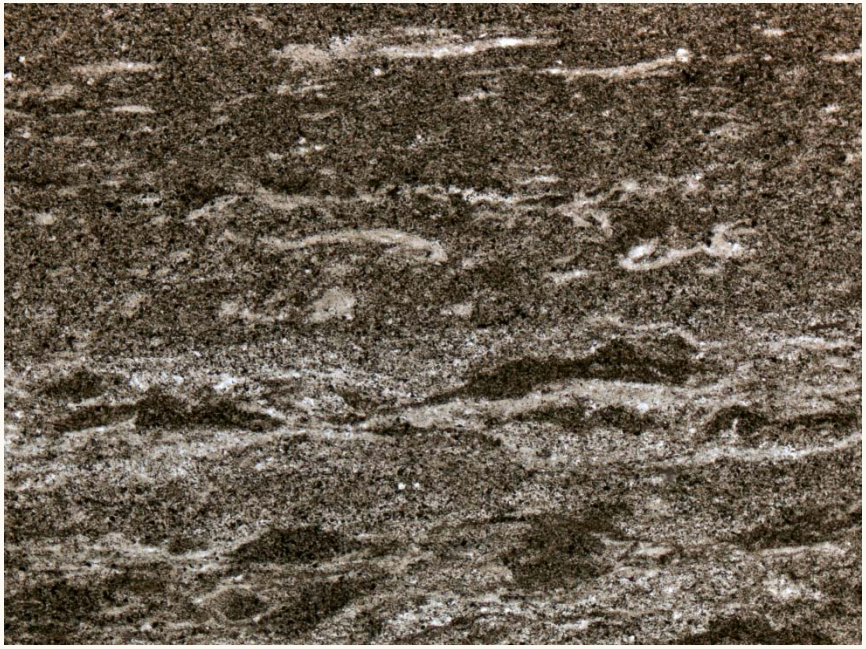


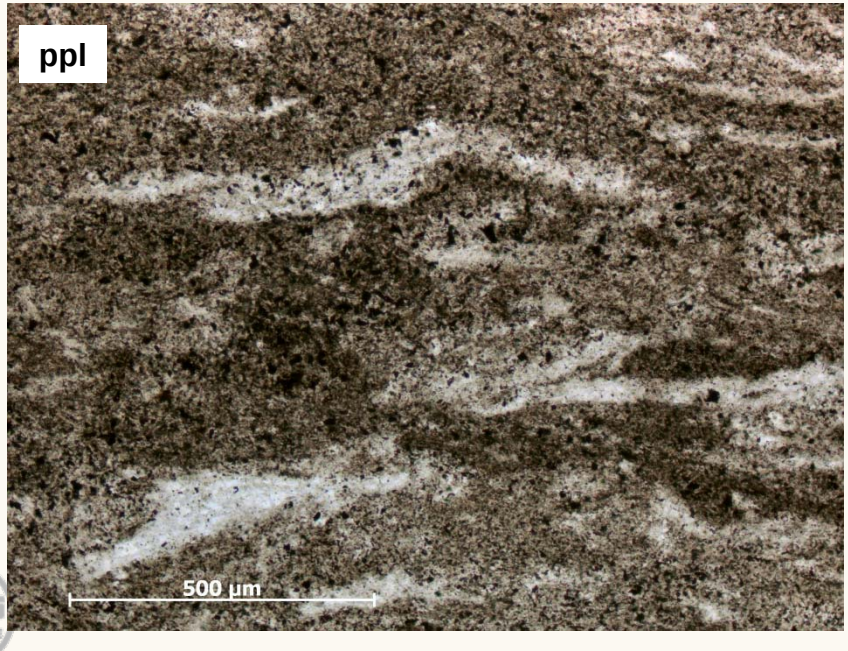
Geology-draped DTM showing the unconformable contact of the Pendjari Group on the Panabako Formation (Bombouaka Group). Note that the Bombouaka dip slope passes beneath the basal Pendjari Group unit, which here is the Darebe Tuff



Join with Togo geology (PA_3X = Silexites)



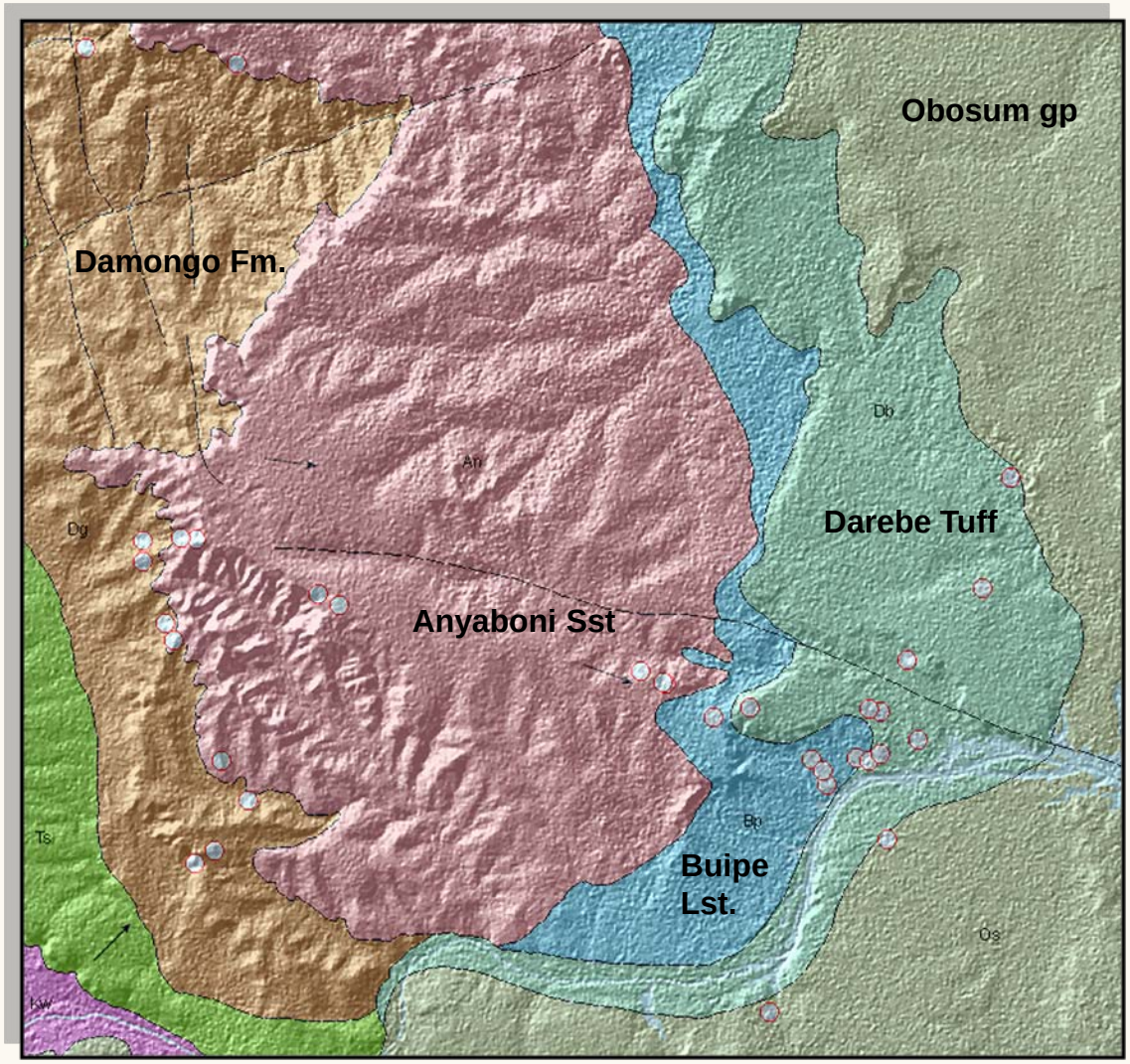




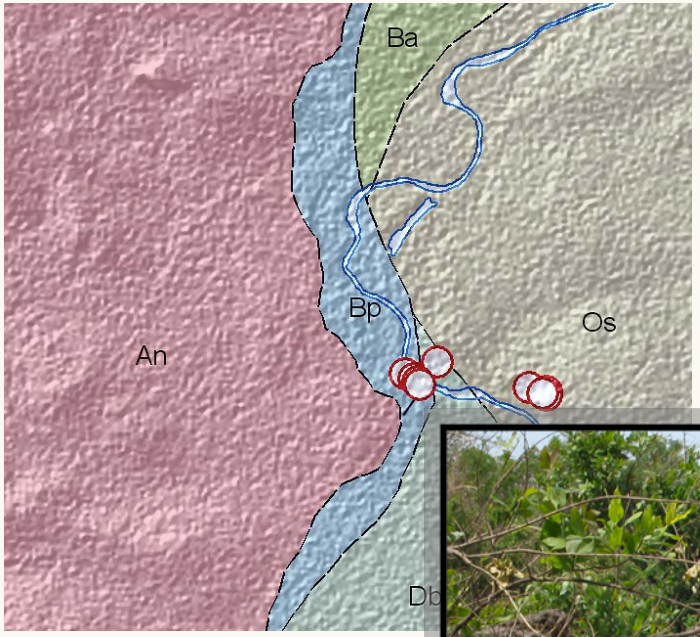
Thin sections of Darebe Tuff

(arrow points to bubble-wall outline in volcanic ash shard)

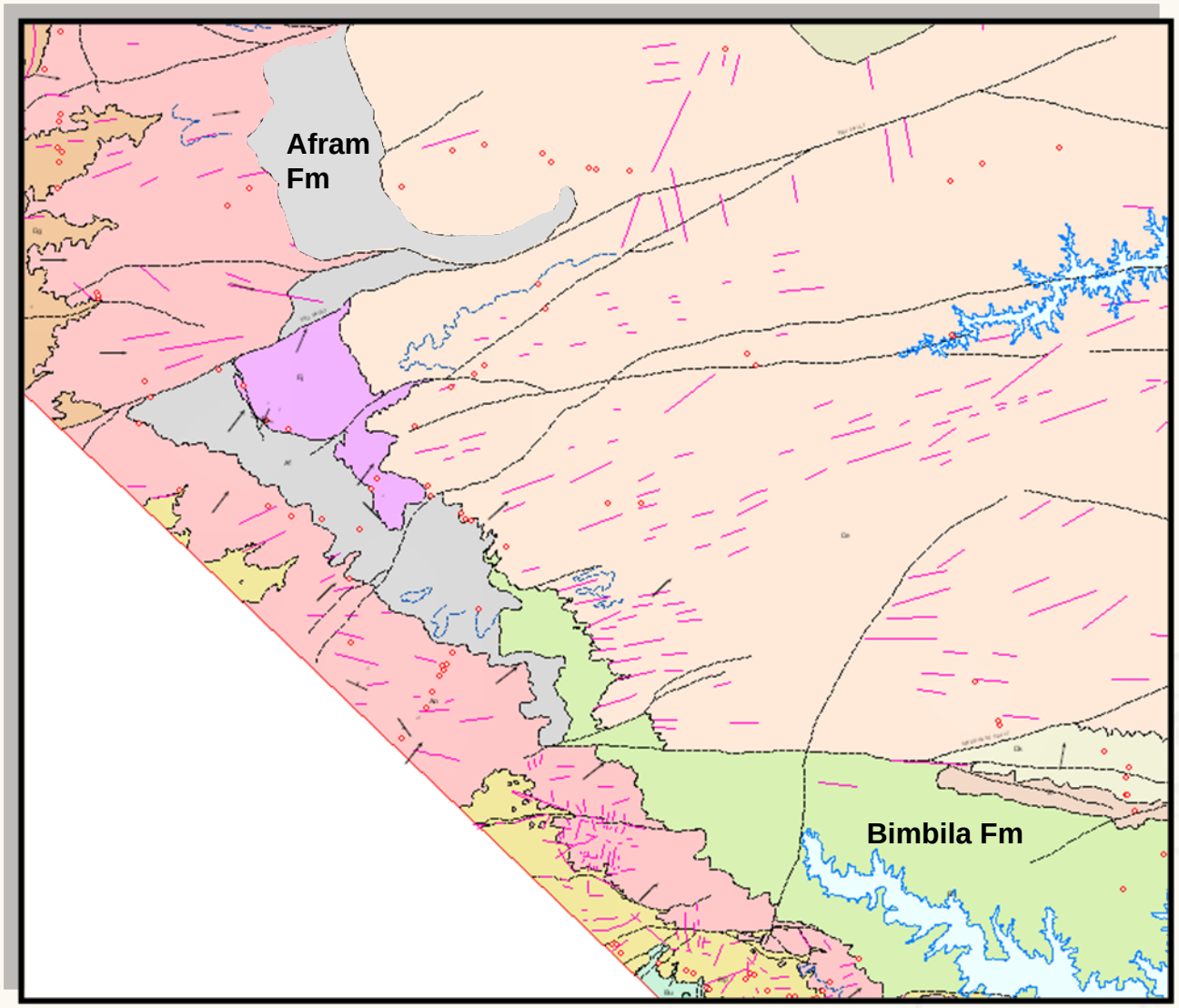
Buipe area



The Kodjari Fm. outcrops are produced by integrating DTM-derived geology with the sketch map of Mitchell (1960)



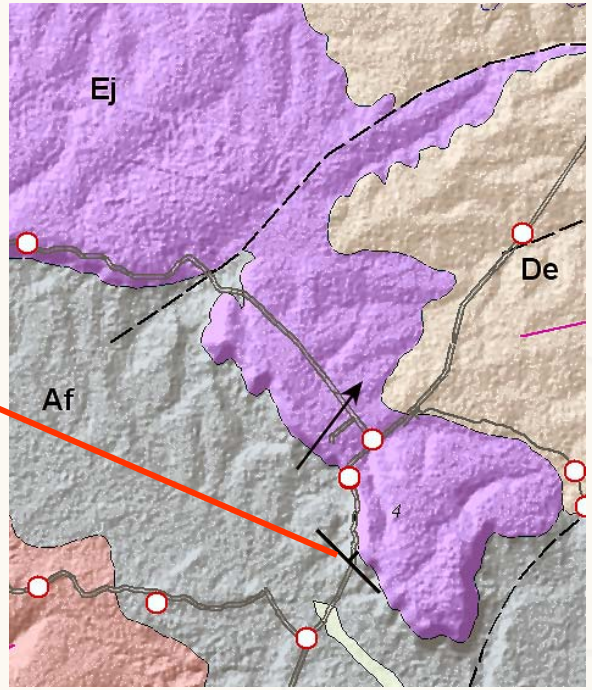
North of Daboya landing:
unconformity (arrowed) of Buipe Member
on chert-veined, dune-bedded Anyaboni Sandstone

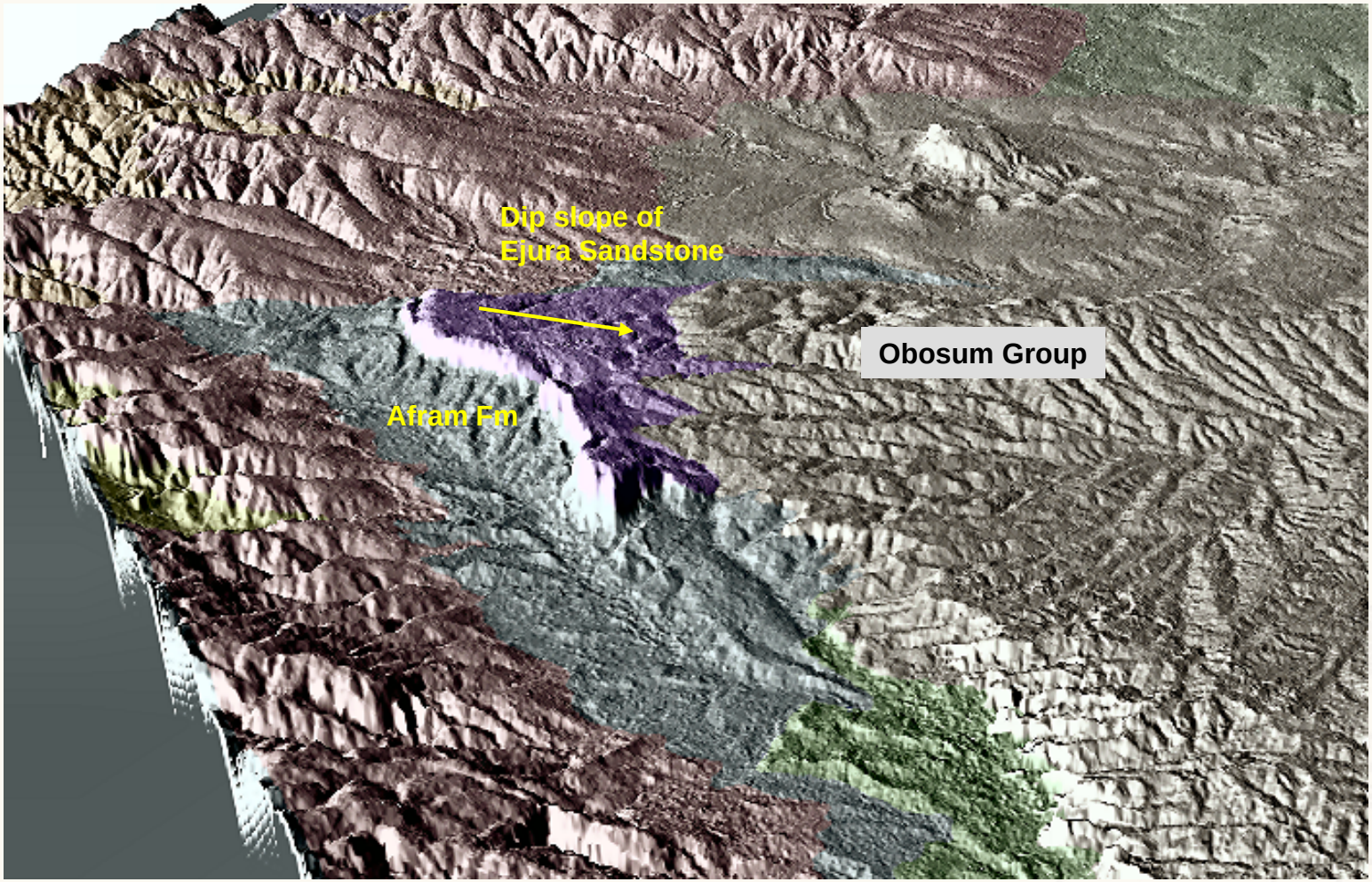


Middle and upper Pendjari Group – Afram and Bimbila formations

Afram Formation

Red beds below the Ejura Sandstone on the Ejura escarpment.

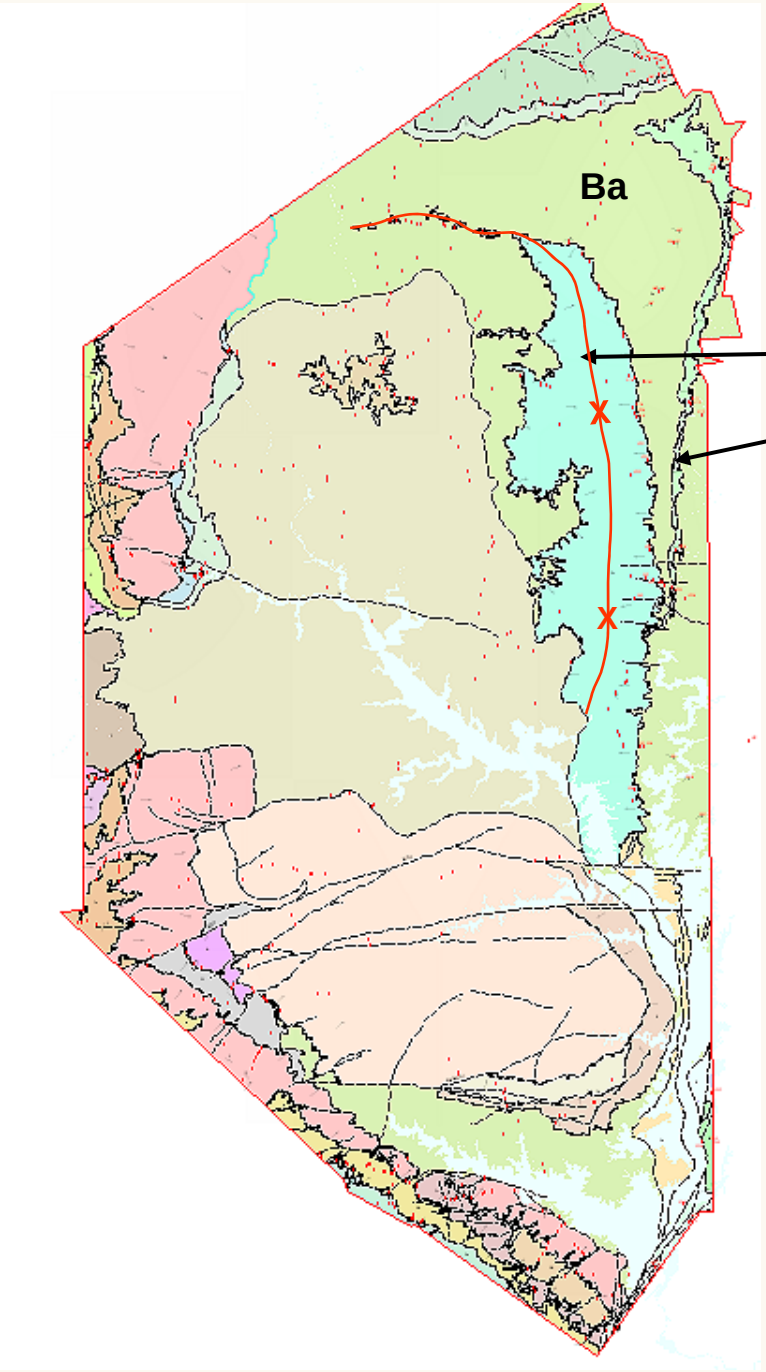




STRATIGRAPHICAL RELATIONSHIP OF THE EJURA SANDSTONE

Ejura Sandstone:

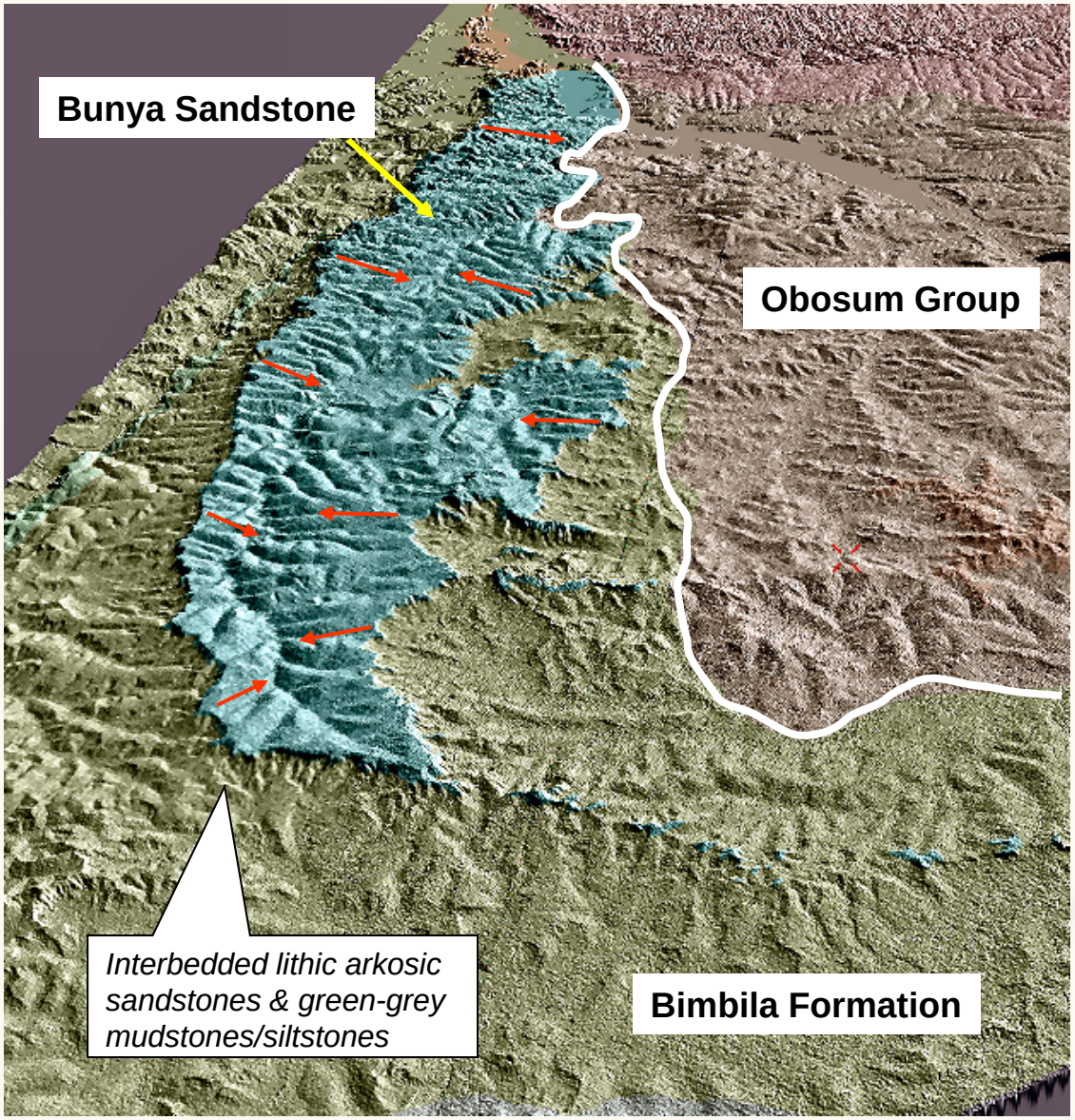
Very mature quartzite, showing channels and possible symmetric, standing wave-ripples



Pendjari Group:

Bimbila Formation (Ba)
Bunya Sandstone Member
Chereponi Sandstone Member

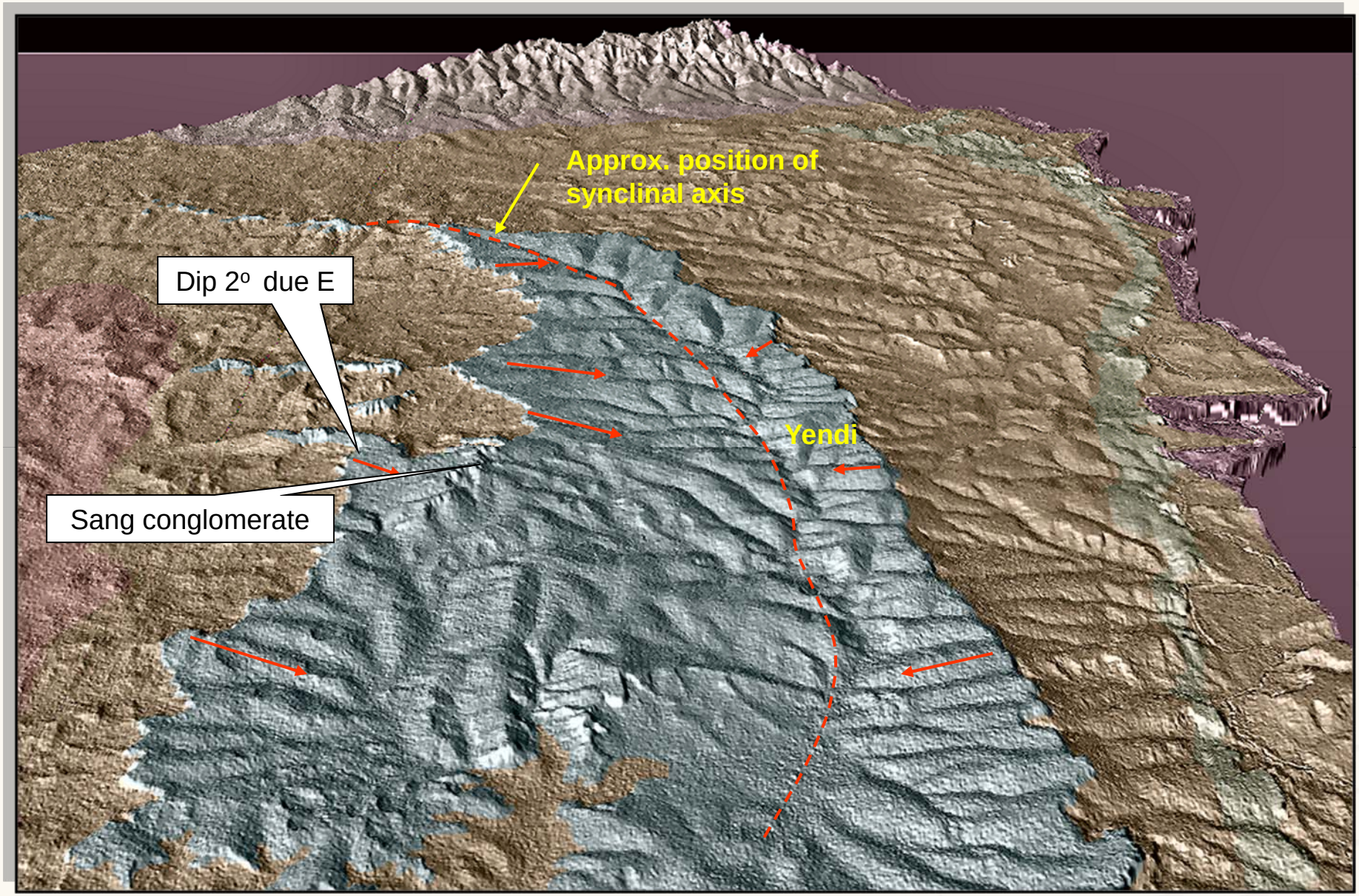
Daka Syncline



Bunya Sandstone

View of outcrop and Daka Syncline, looking south

Dip-slope, from remote imagery

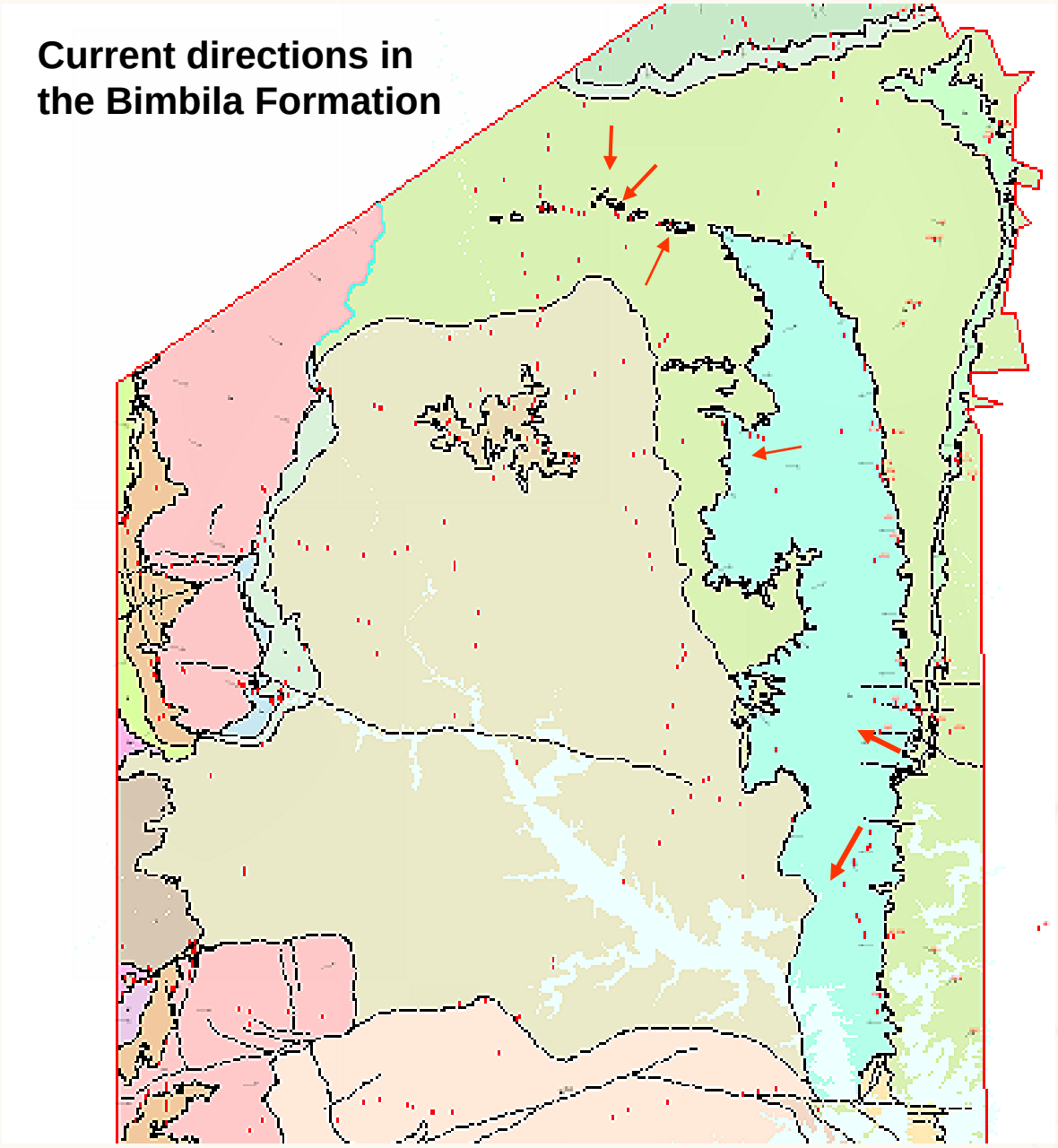


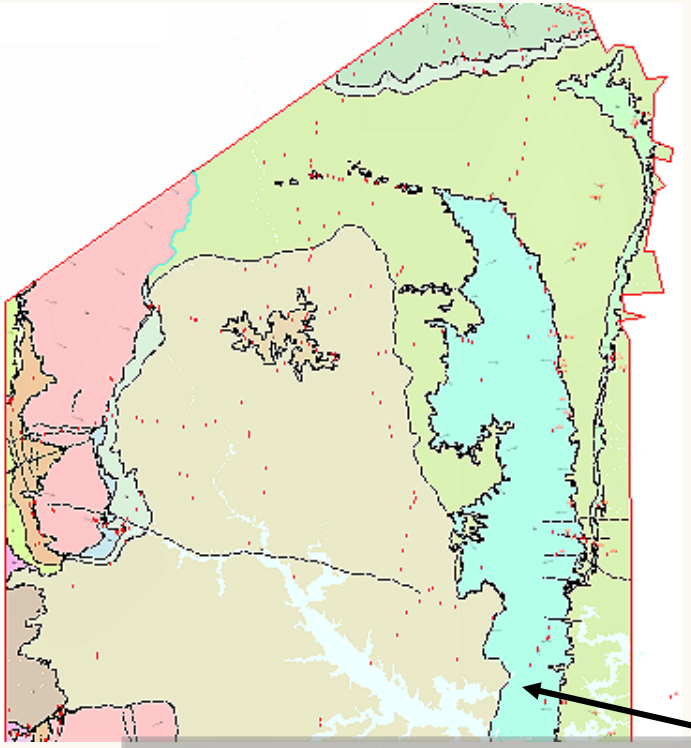
Direction of tectonic dip, inferred mainly from dip slope morphology

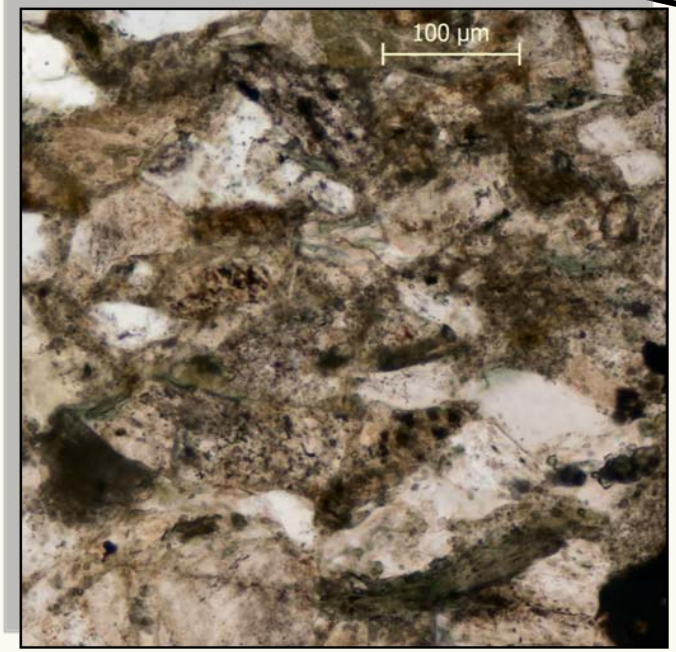
Oblique DTM of the Bunya Sandstone and Daka Syncline, looking N

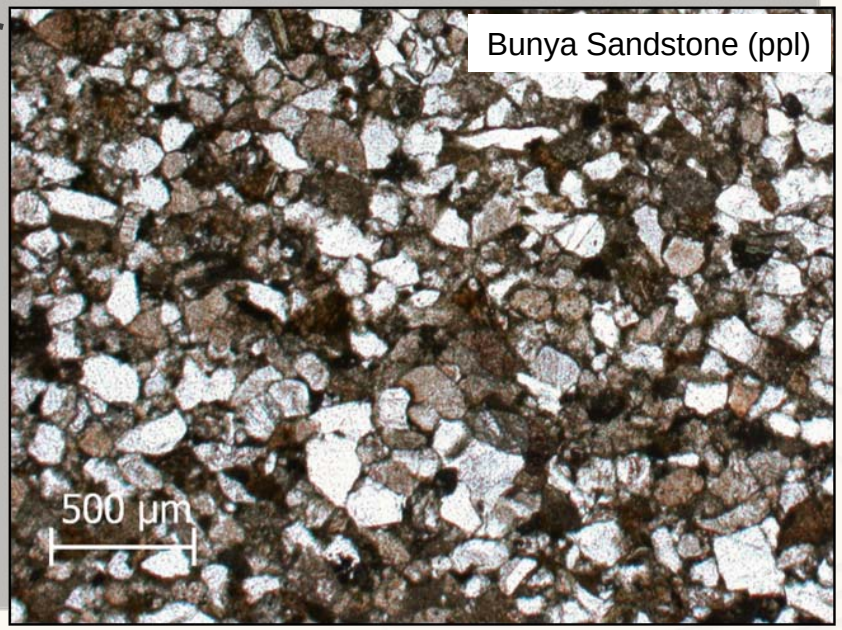
Sang conglomerate

Current directions in the Bimbila Formation



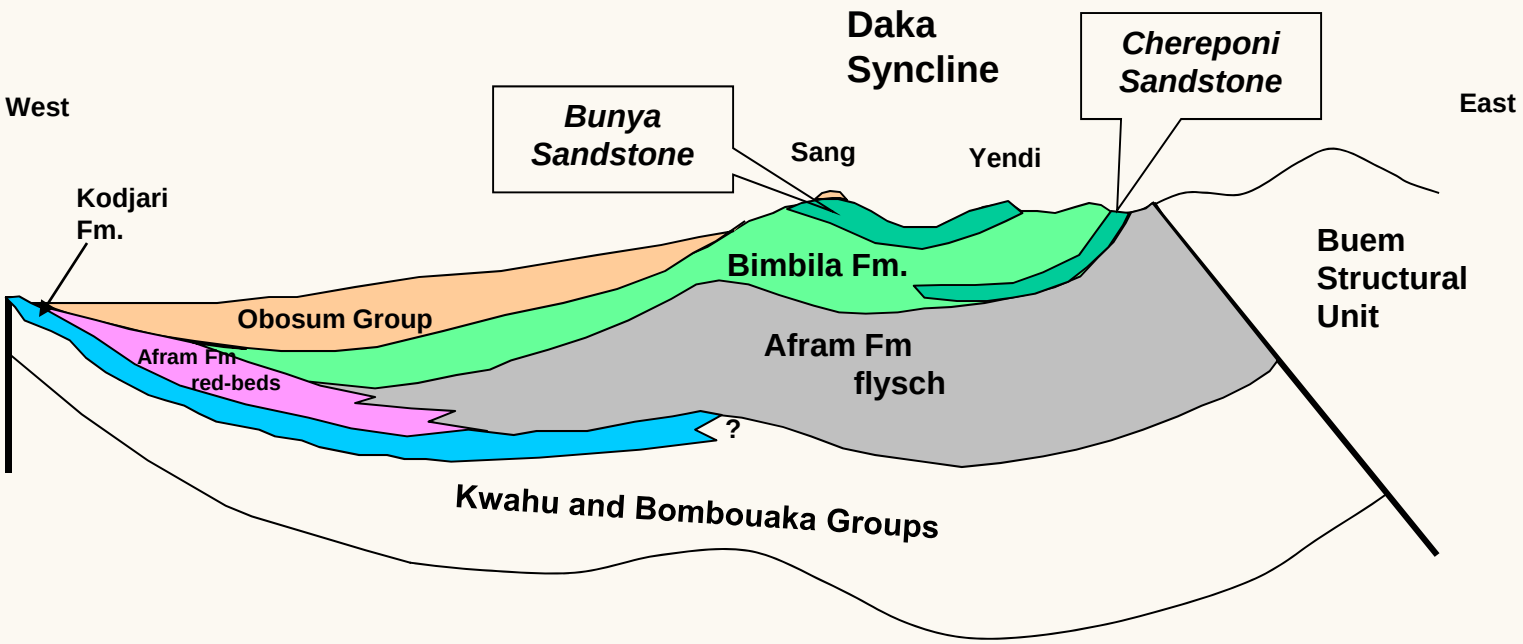


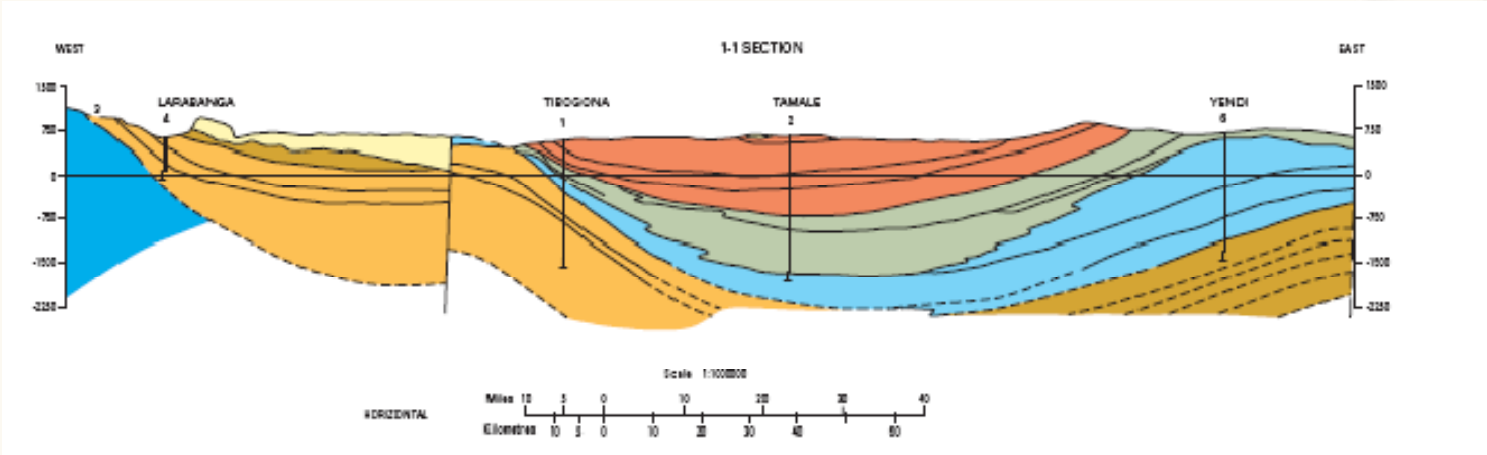




Bunya Sandstone (ppl)

Simplified structure of the Pendjari and Obosum groups (in part, after Affaton, 1990)



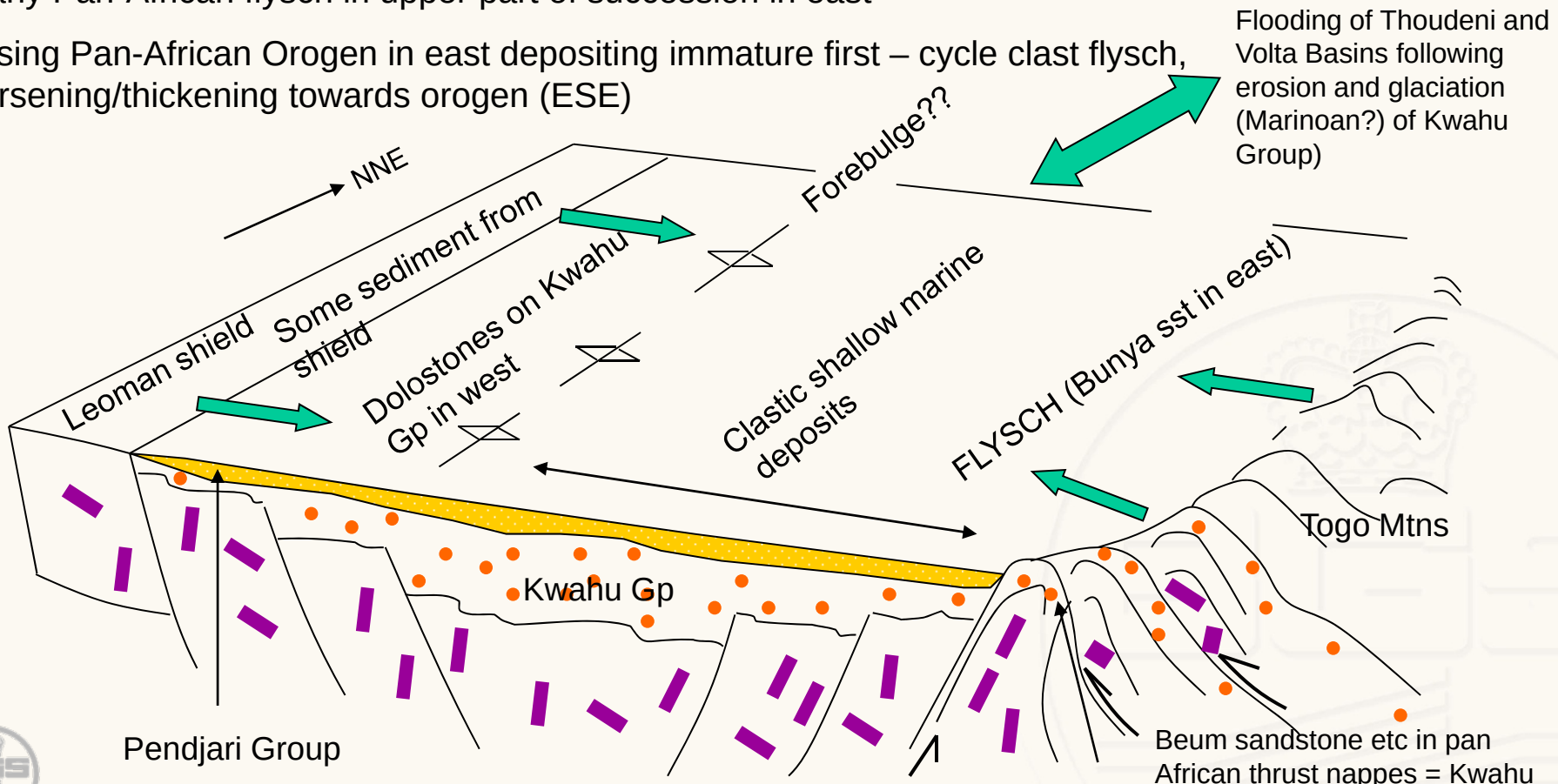


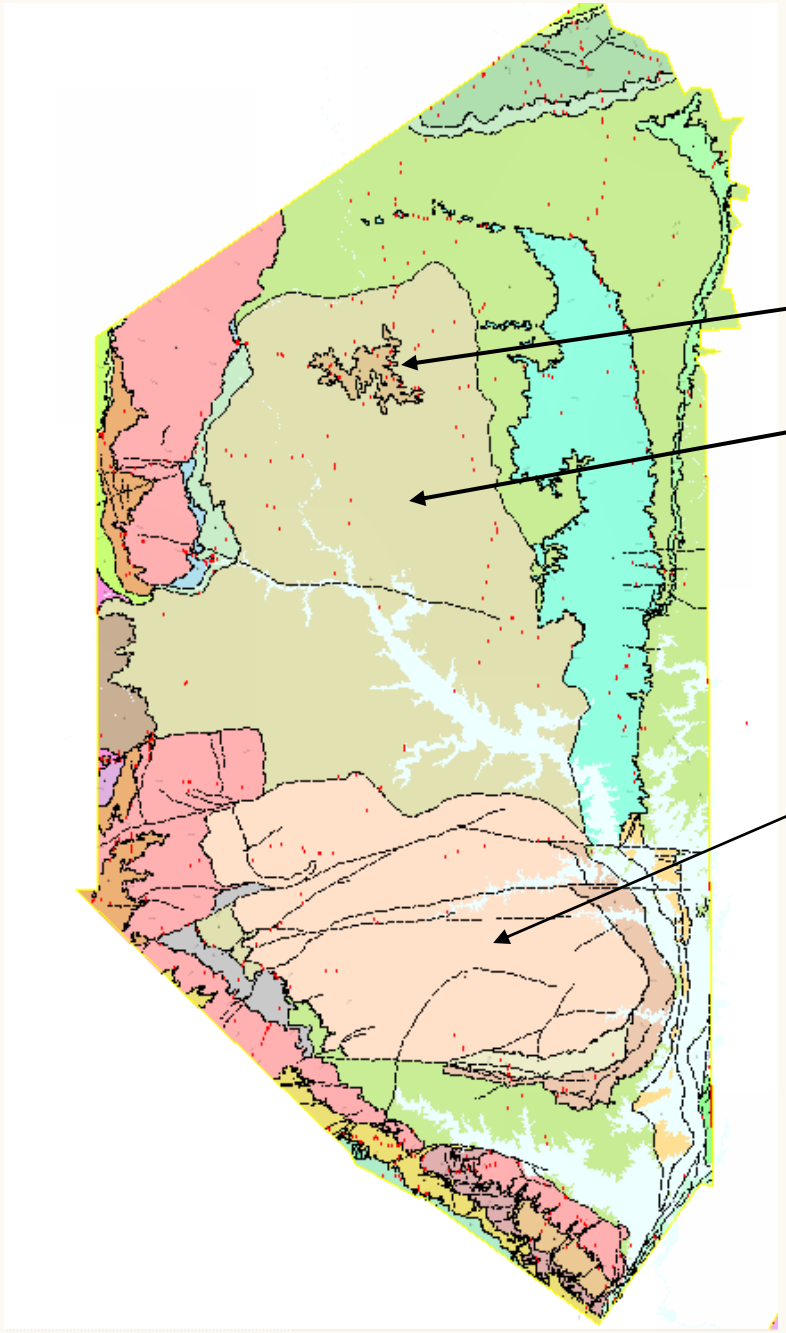
Seismic section (Bozhko 1964)

**Bimbila Formation, just below Bunya Sandstone:
Microbial structures and a possible Vendobiont.
Such organisms are typical of Ediacaran assemblages
(c. 575-540 Ma)**

Pendjari Group 'Times' (end)

- Flooding of intercontinental basins
- Unconformable on Kwahu group
    - Post – glacial eustatic flooding
- Cap dolostones developed on tillite in Togo and on eroded Kwahu Group in Volta Basin
- Shallow marine deposits
- Early Pan-African flysch in upper part of succession in east
- Rising Pan-African Orogen in east depositing immature first – cycle clast flysch, coarsening/thickening towards orogen (ESE)



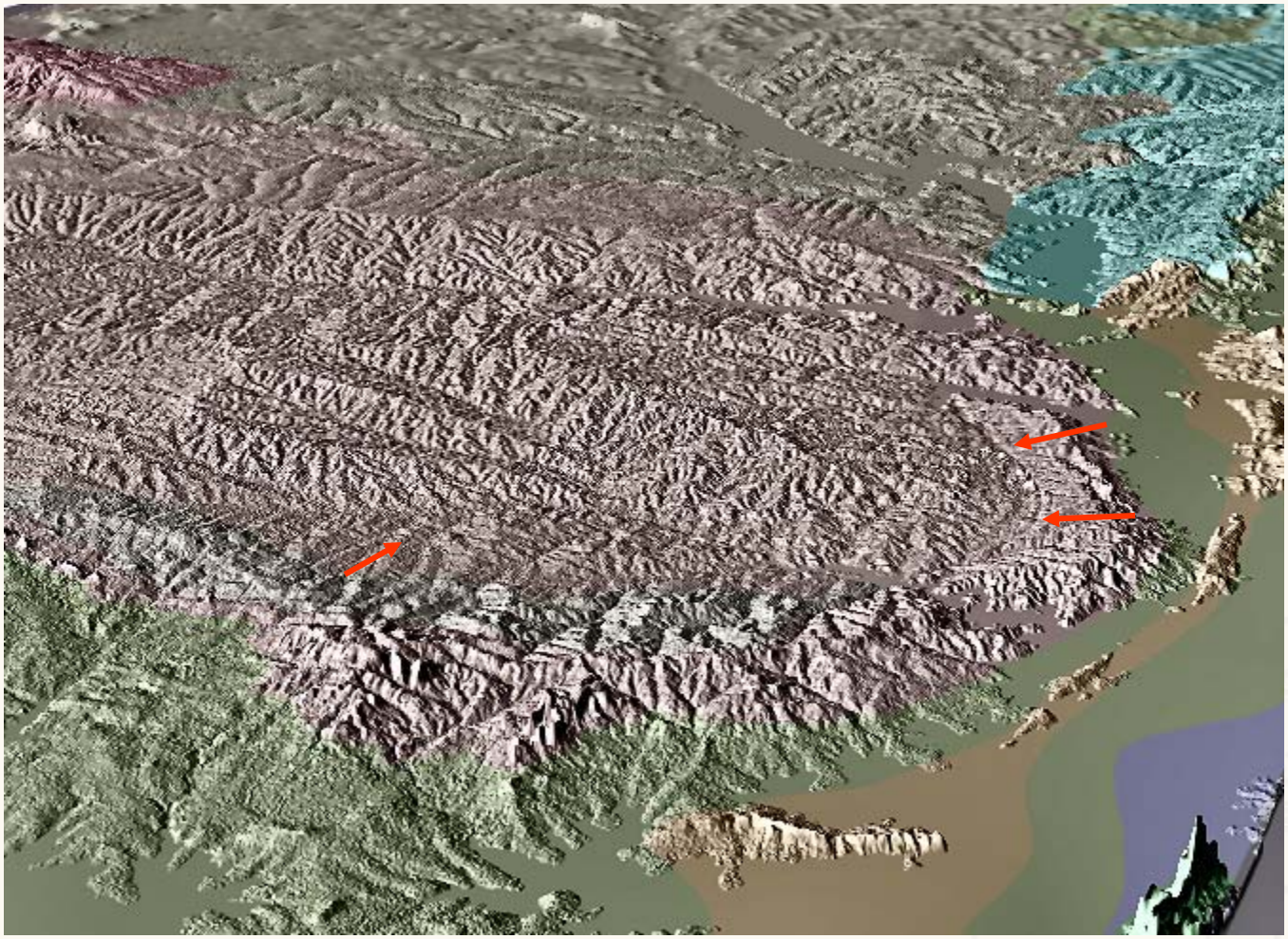


OBOSUM GROUP

Tamale Sandstone

Undivided: mudstones, siltstones & sandstones

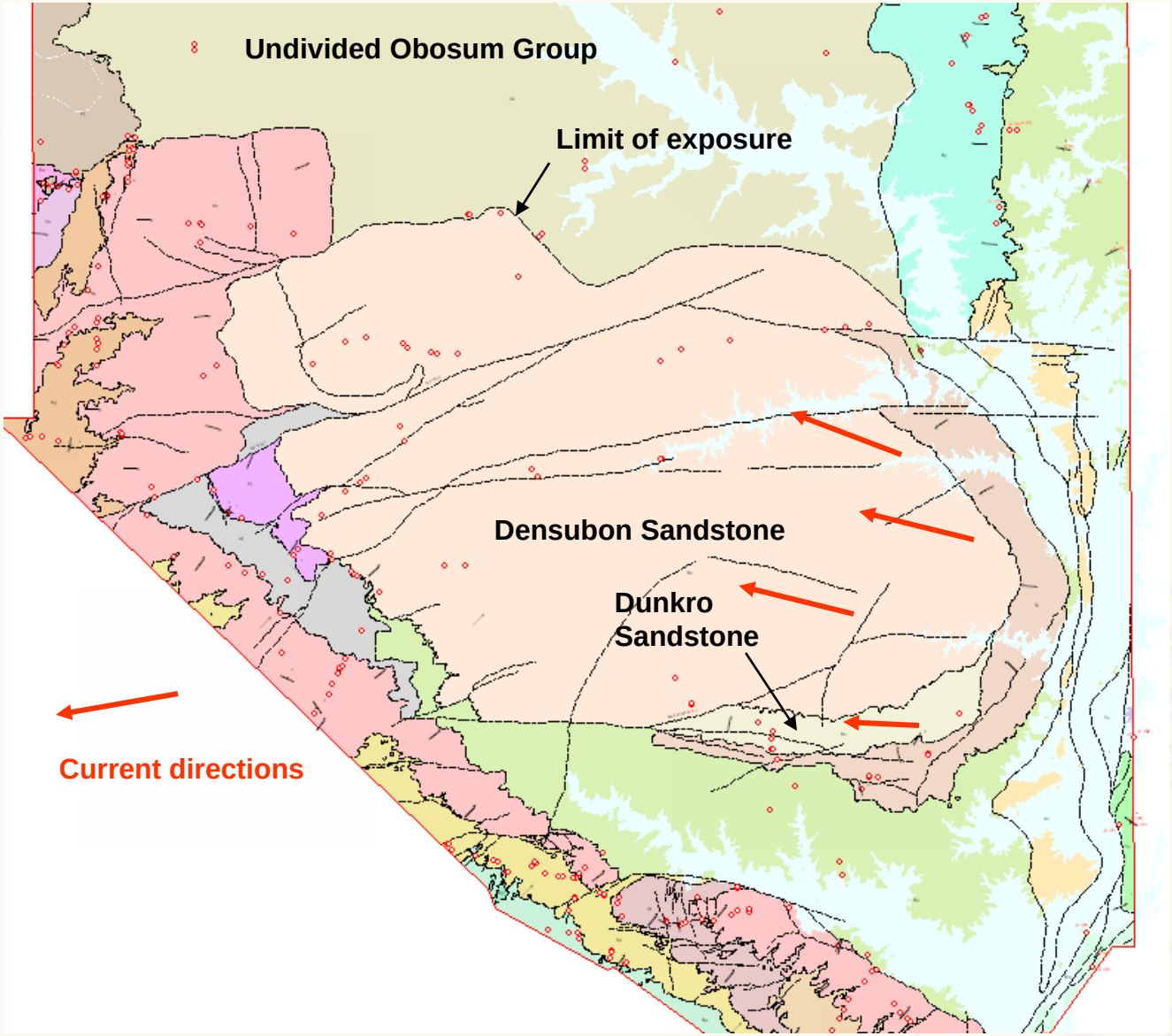
Sandstones of the Obosum syncline



Generalised direction of dip

Oblique DTM view of the Obosum Syncline

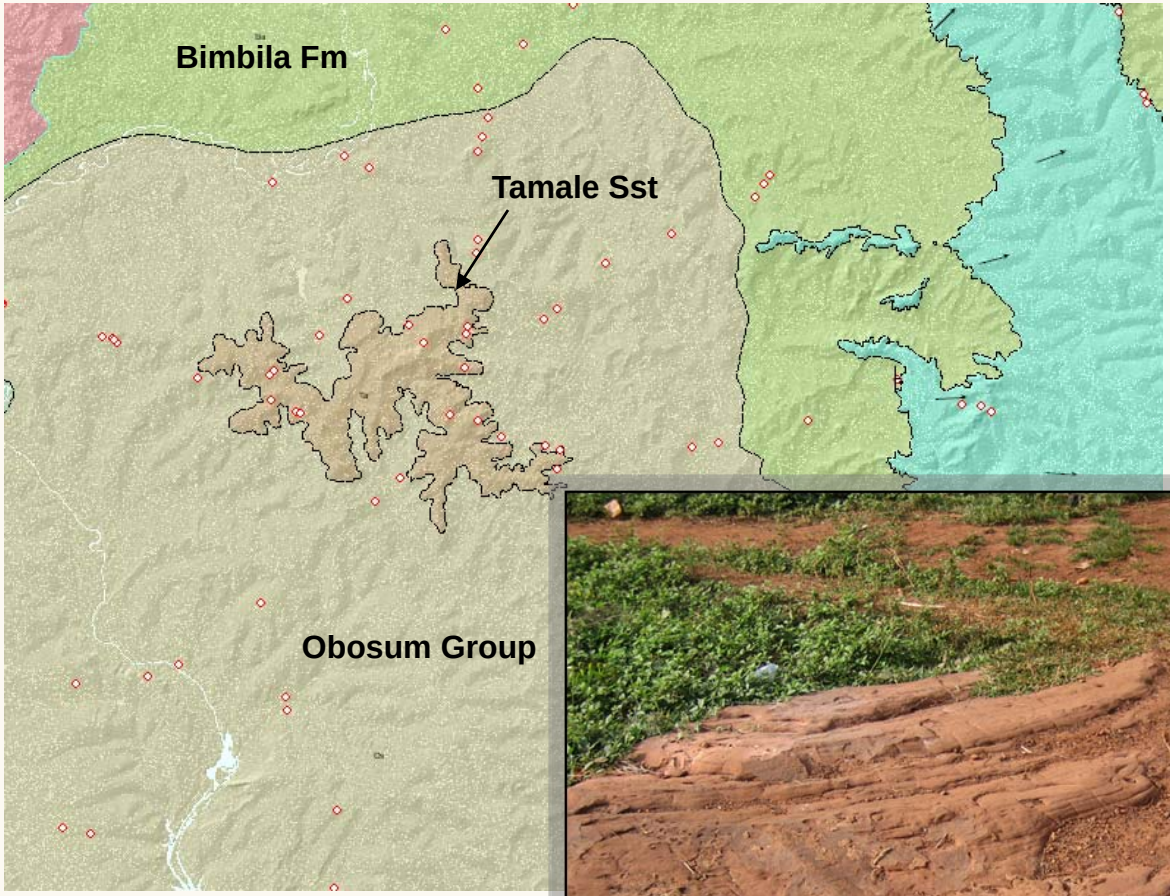
Obosum Group, southern outcrop

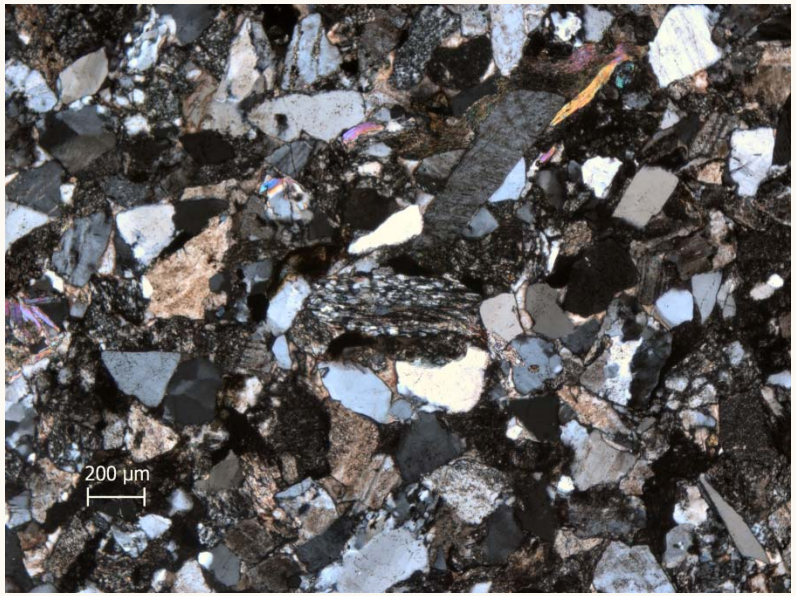


Dunkro Sandstone Formation, Obosum Group

Terrestrial, molasse-type sedimentation, with possible sheet flood or debris-flow conglomerate lenses

Tamale Sandstone Formation

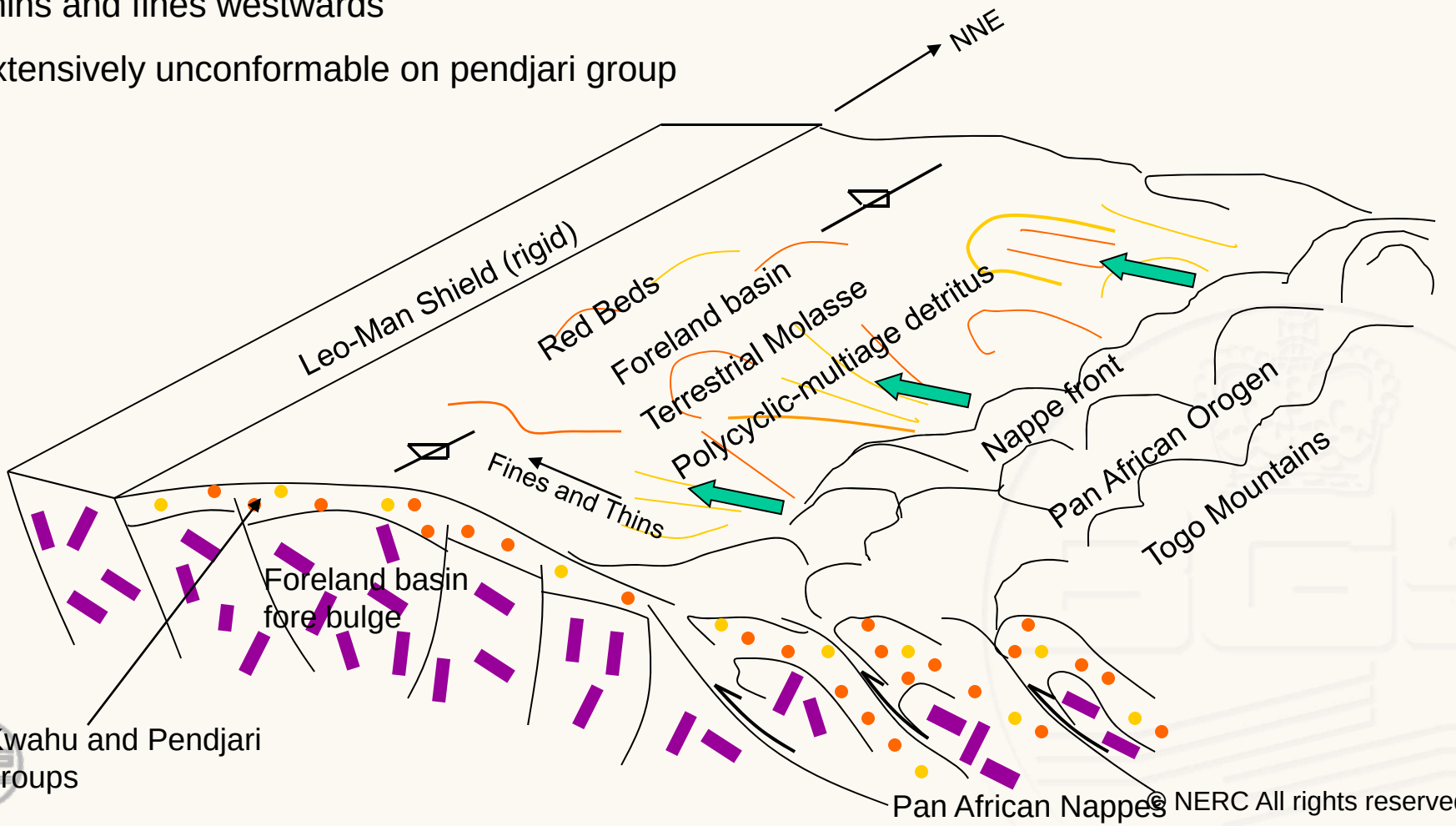


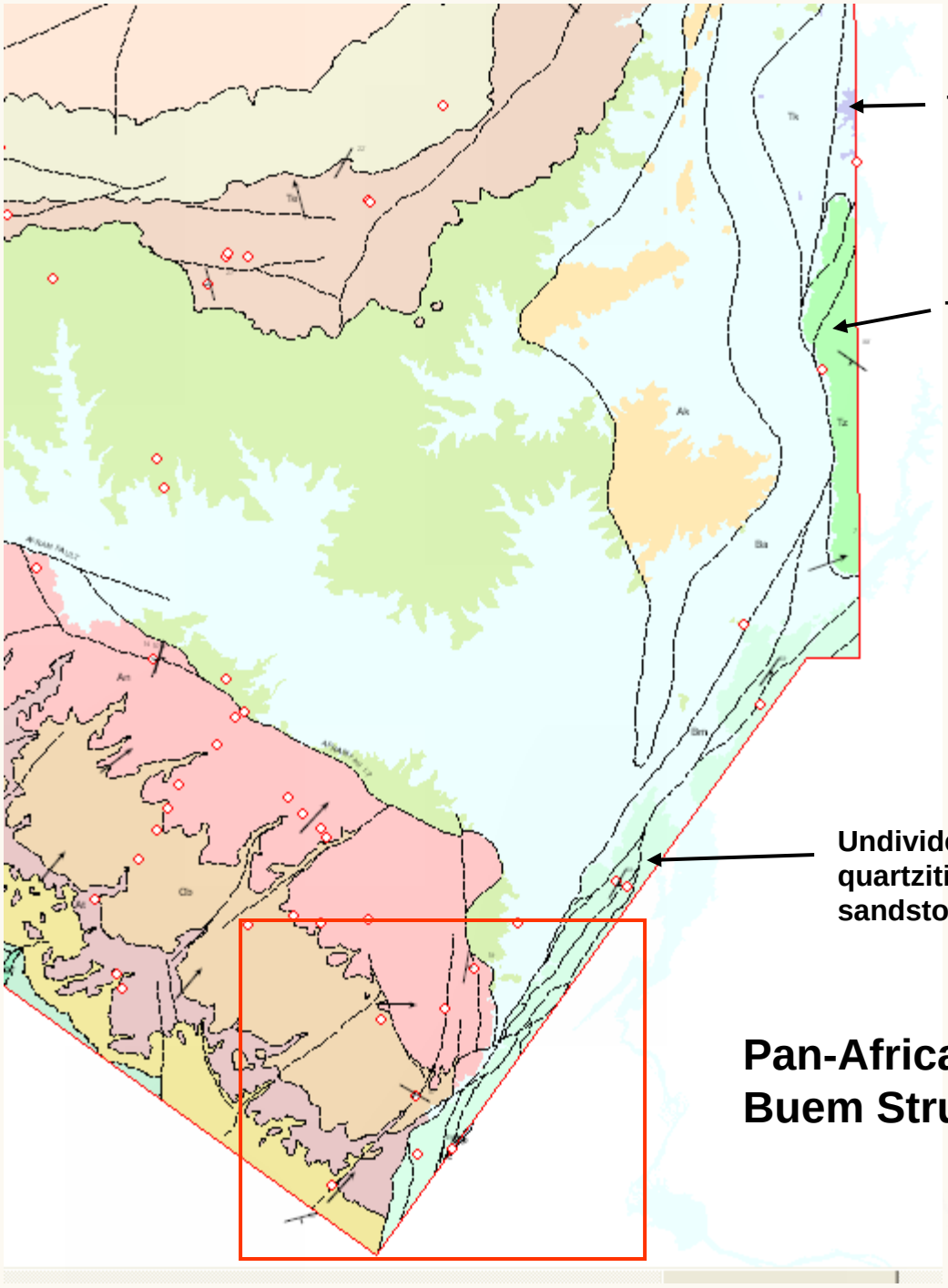


Thin section of Dunkro Sandstone
Obosum Group

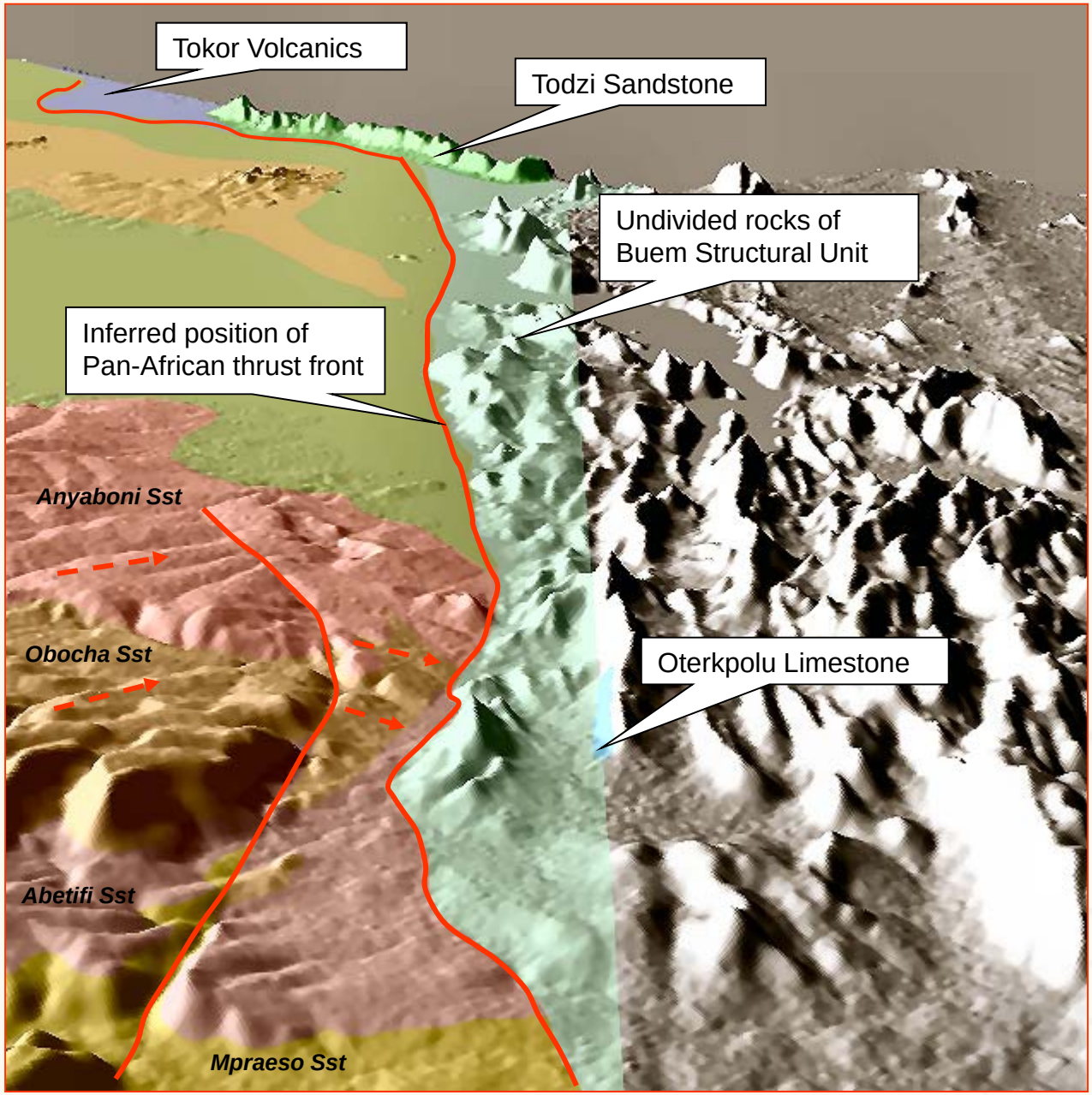
Obosum Group ‘Times’

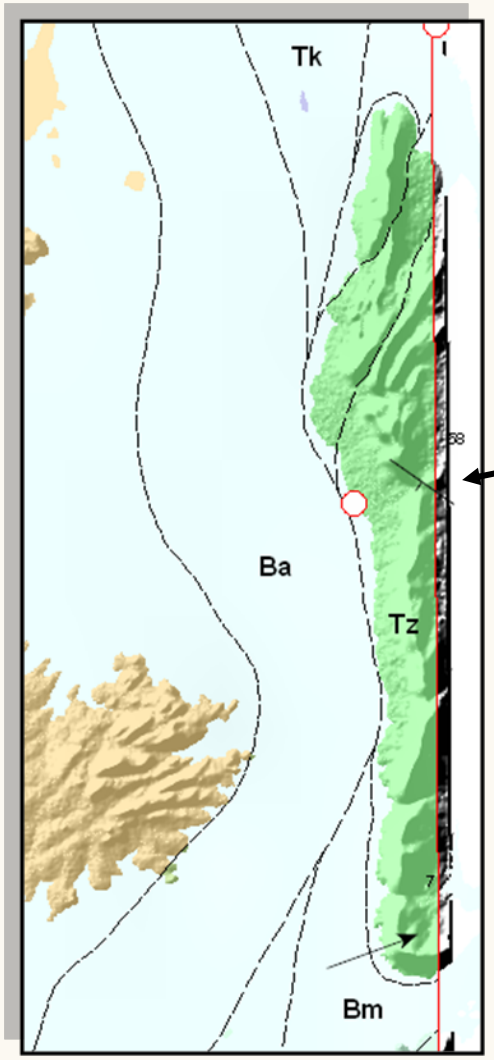
- Mid to late Pan African foreland basin fill
- Terrestrial Red Bed molasse, dominantly fluvial, braided rivers and flash flood wadi deposits
- Immature, poorly sorted polycyclic and multi-age detritus
- Thins and fines westwards
- Extensively unconformable on pendjari group





Pan-African Domain: Buem Structural Unit

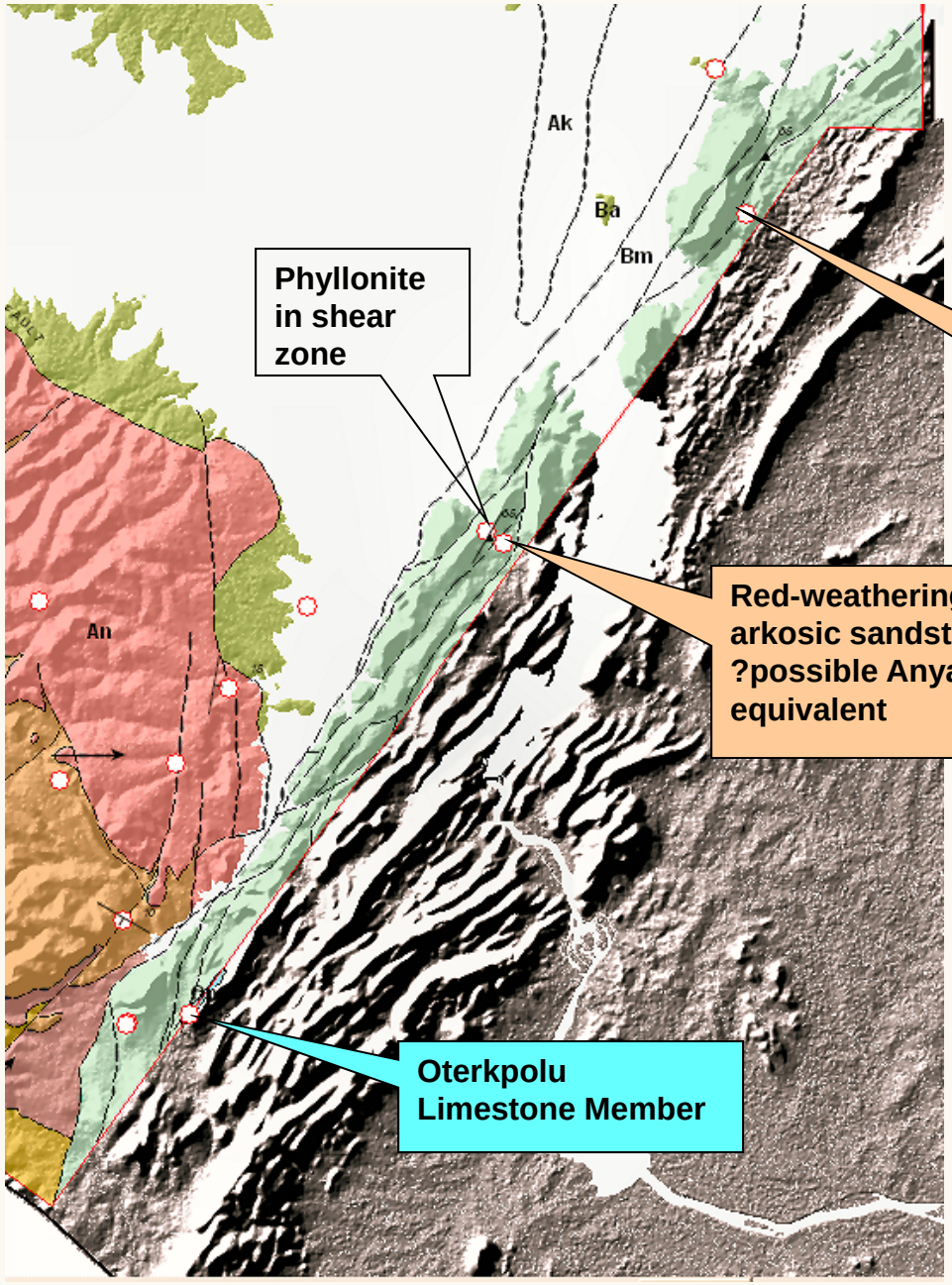




Buem Structural Unit:

Todzi sandstones, here consisting of a pebbly diamicton (conglomerate with volcanic clasts in a grey-green, muddy matrix. Possible debris flow or lahar?) Intercalated in white quartzitic sandstone

Observations in strata of the 'undivided' Buem unit



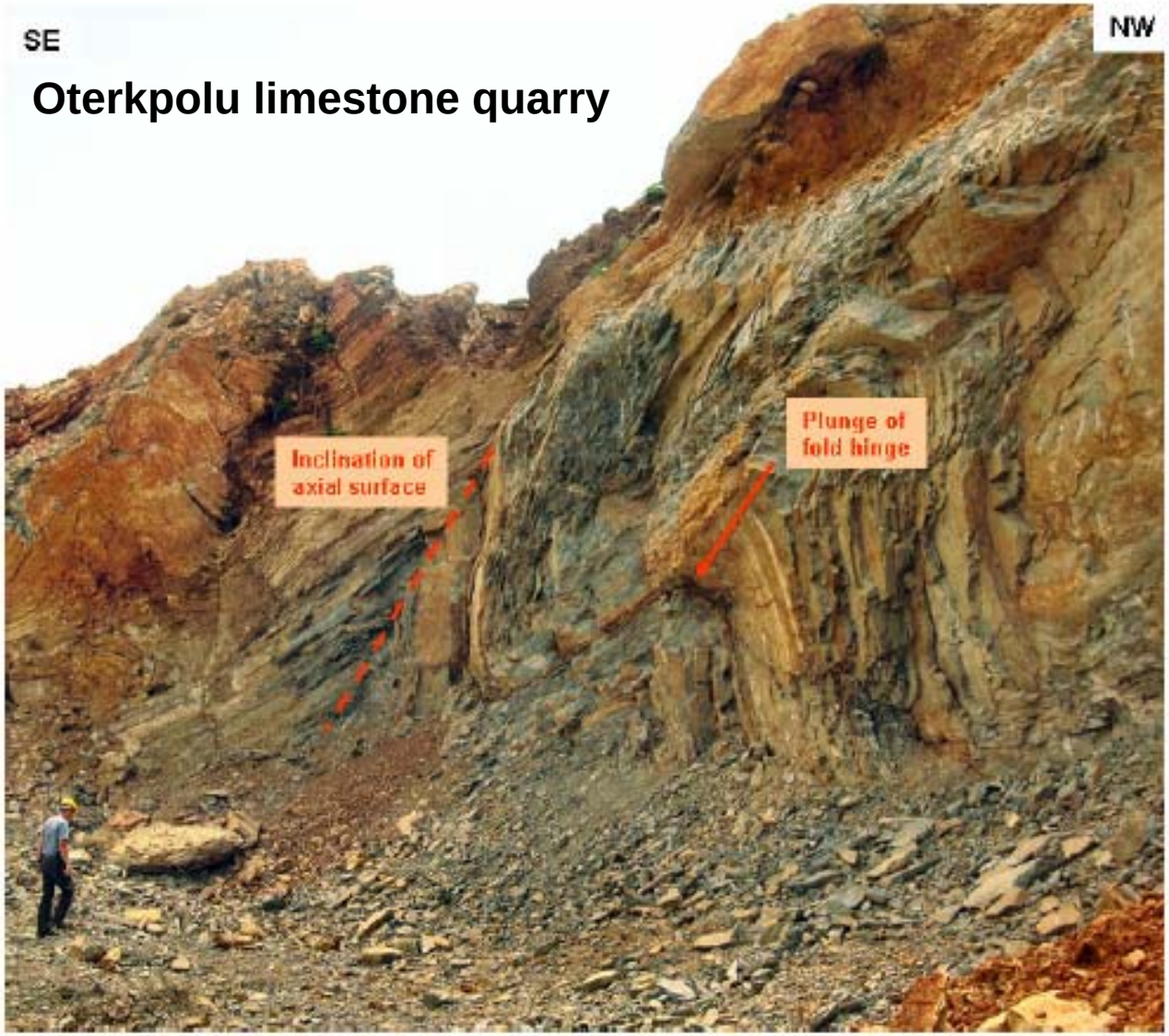
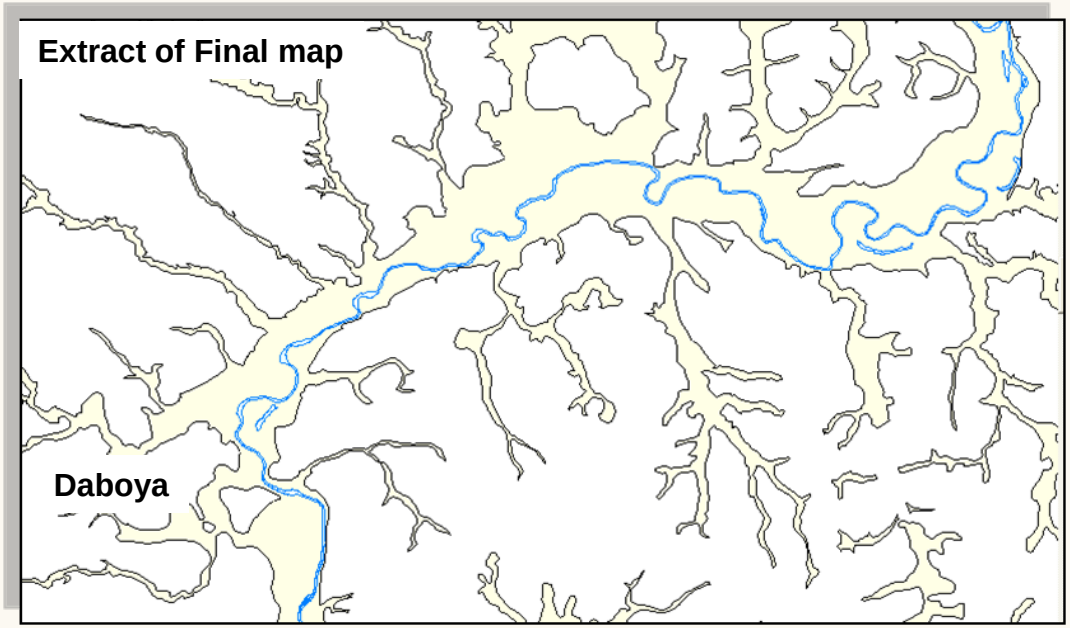


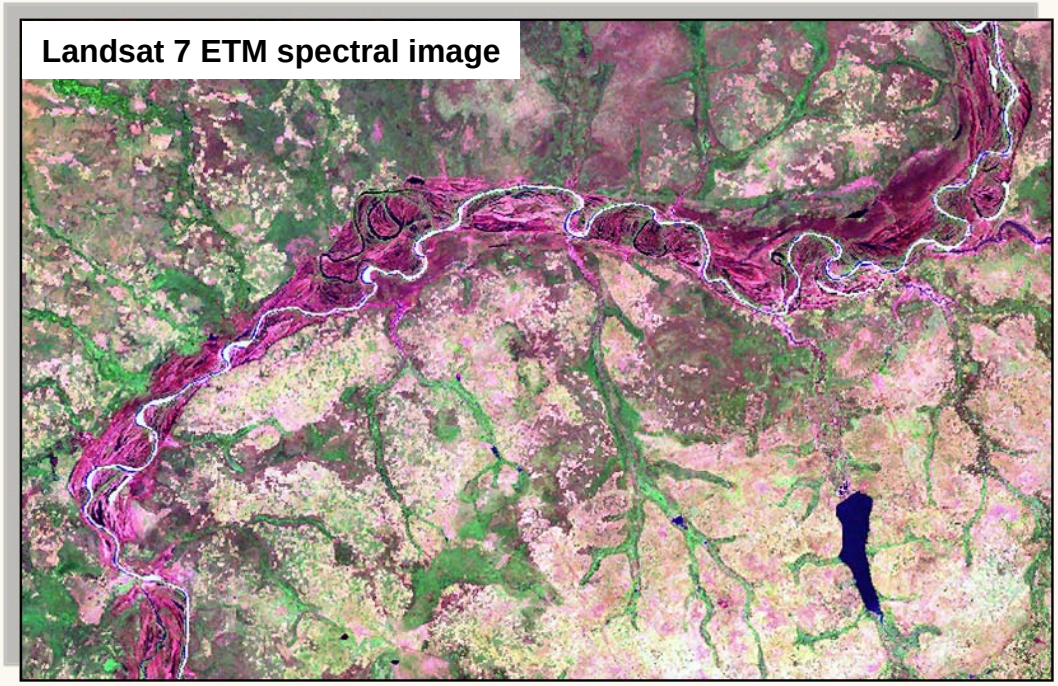
Figure 52 Reclined fold with south-plunging hinge exposed on working quarry face (photo was taken looking south)

Oterkpolu Limestone

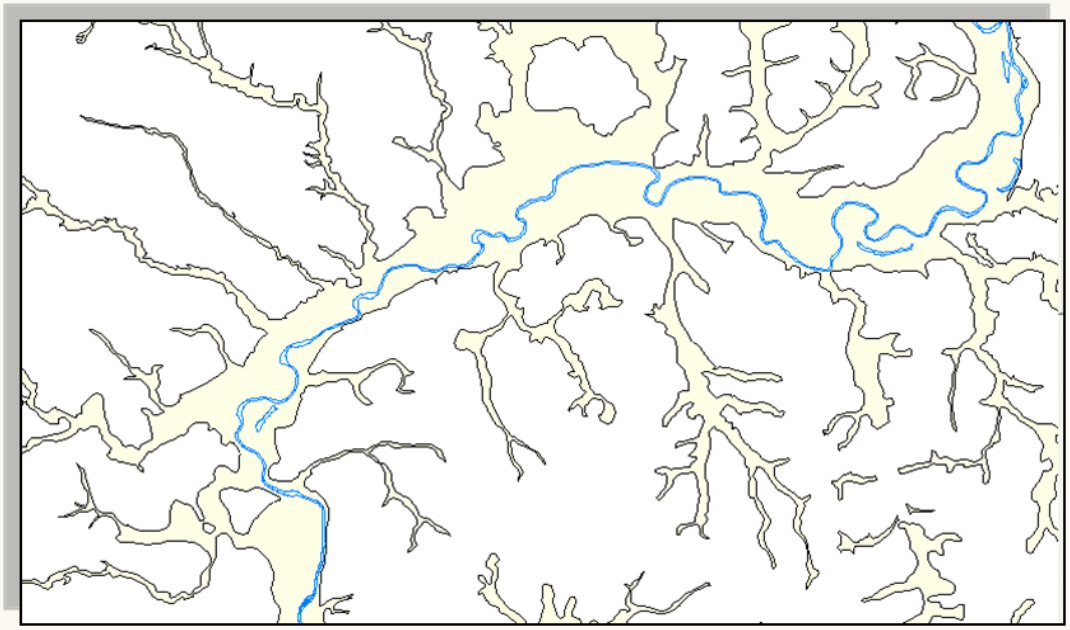
Buipe Limestone

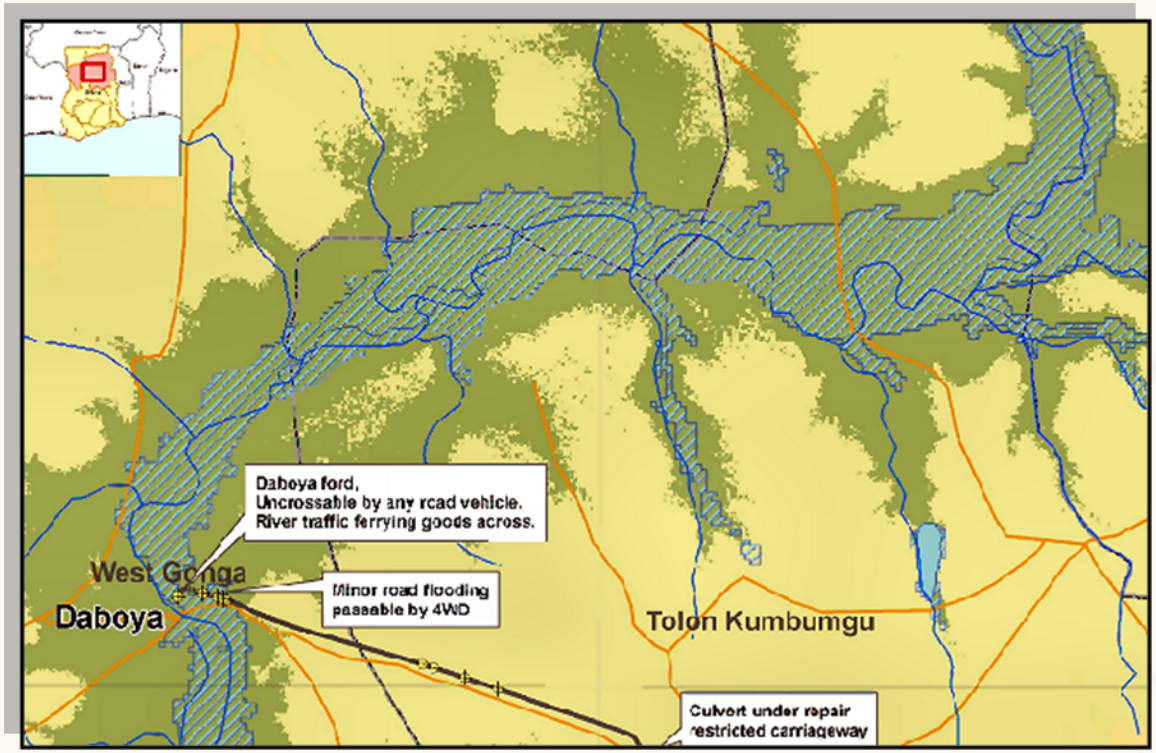
Similarities, or just coincidence?





REMOTE MAPPING OF QUATERNARY ALLUVIUM AROUND DABOYA





Comparison of floodplains (Quaternary alluvium, in yellow) with extent of 2007 flooding:

Conclusion: geological maps can be useful indicators of where this and other types of geohazard are likely to occur