

Clustered high volcanicity in the Central sector of the Main Ethiopian Rift

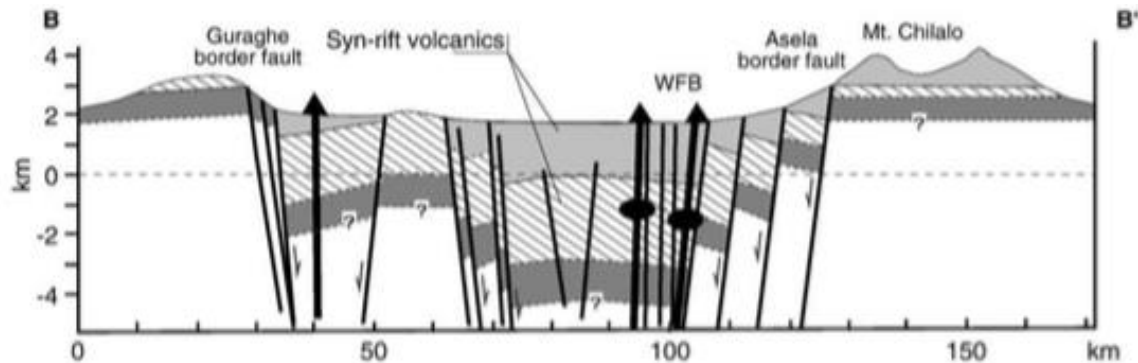
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Area of interest: Central MER

Intermediate stage between incipient rifting and oceanization

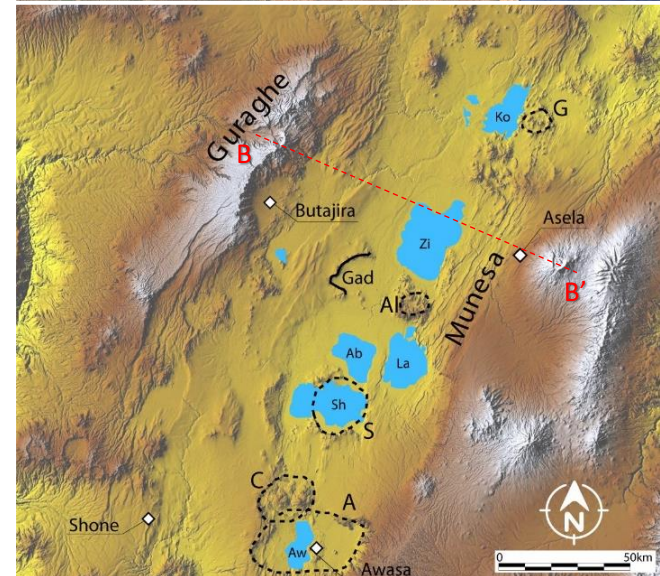
Main goals of this study:

- **Stratigraphy and geochronology of the main eruptions** in the last 4 Ma
- Reconstruct a **model of rift evolution in this sector of the MER** (relations between tectonic and volcanic activity)



Correlation strategies of the volcanic products:

- Fieldwork evidence, stratigraphy and dispersal data
- Geochronology (29 new $^{40}\text{Ar}/^{39}\text{Ar}$ datings)
- Geochemistry (whole rock combined with XRF-portable Niton analyses, which represents a useful tool to discriminate volcanic deposit on the field)



The main products of volcanic activity

Focus on the Eastern margin of the rift

High volcanicity of this sector of the
MER

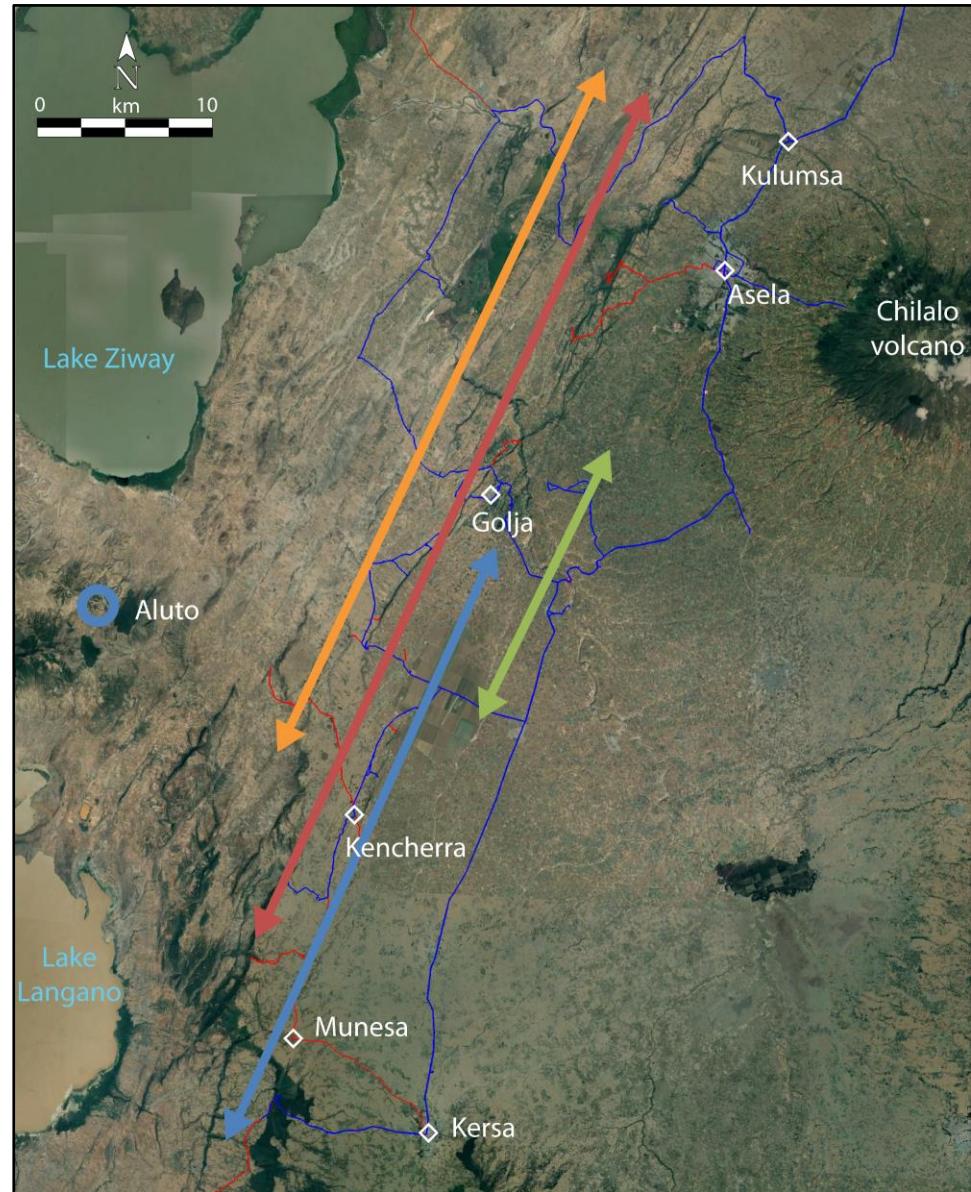


Large ignimbritic sheets:

- **Munesa Crystal Tuff**
(WoldeGabriel et al.)
- **Kencherra Ignimbrite**
- **Golja Ignimbrite**
- **Katar Ignimbrite**

→ **Stratigraphic markers**

Several minor interlayered products:
minor ignimbrites, scoria, basalts
(Bofa basalts)



Munesa Crystal Tuff (3.5 Ma)

- Large volume $> 10^3 \text{ km}^3$
- Dispersal area: 3000 km^2



Correlated to a ~400 m thick highly crystal-rich deposit within the geothermal wells of Aluto.

Source: uncertain, from the Rift floor

Munesa Crystal Tuff (3.5 Ma)



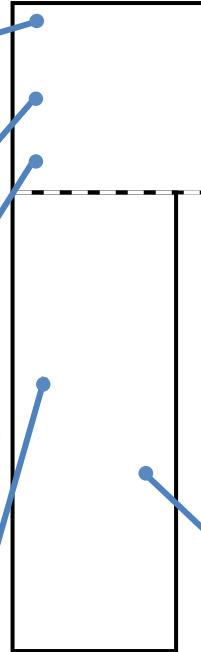
FACIES

Moderately to poorly welded, crystal-rich, pumice-bearing

Densely welded, highly crystal-rich (40-50 % vol) Sd and Qz, minor mafic minerals; columnar jointings

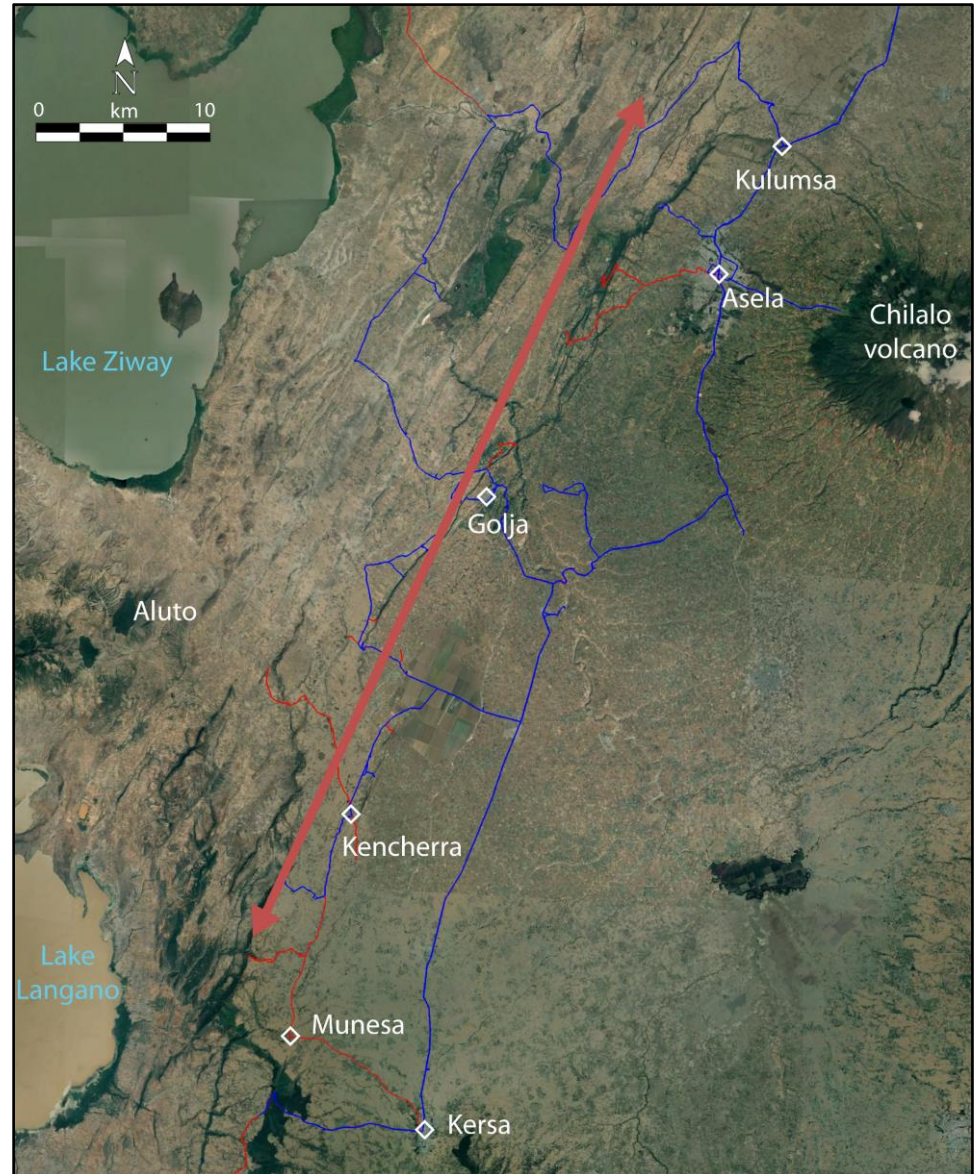
> 60 m

> 150 m

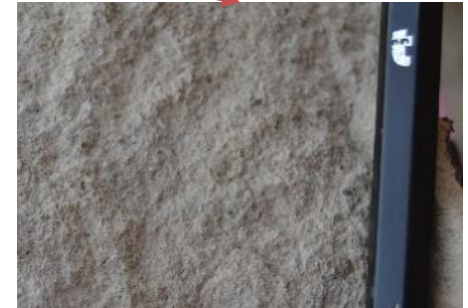
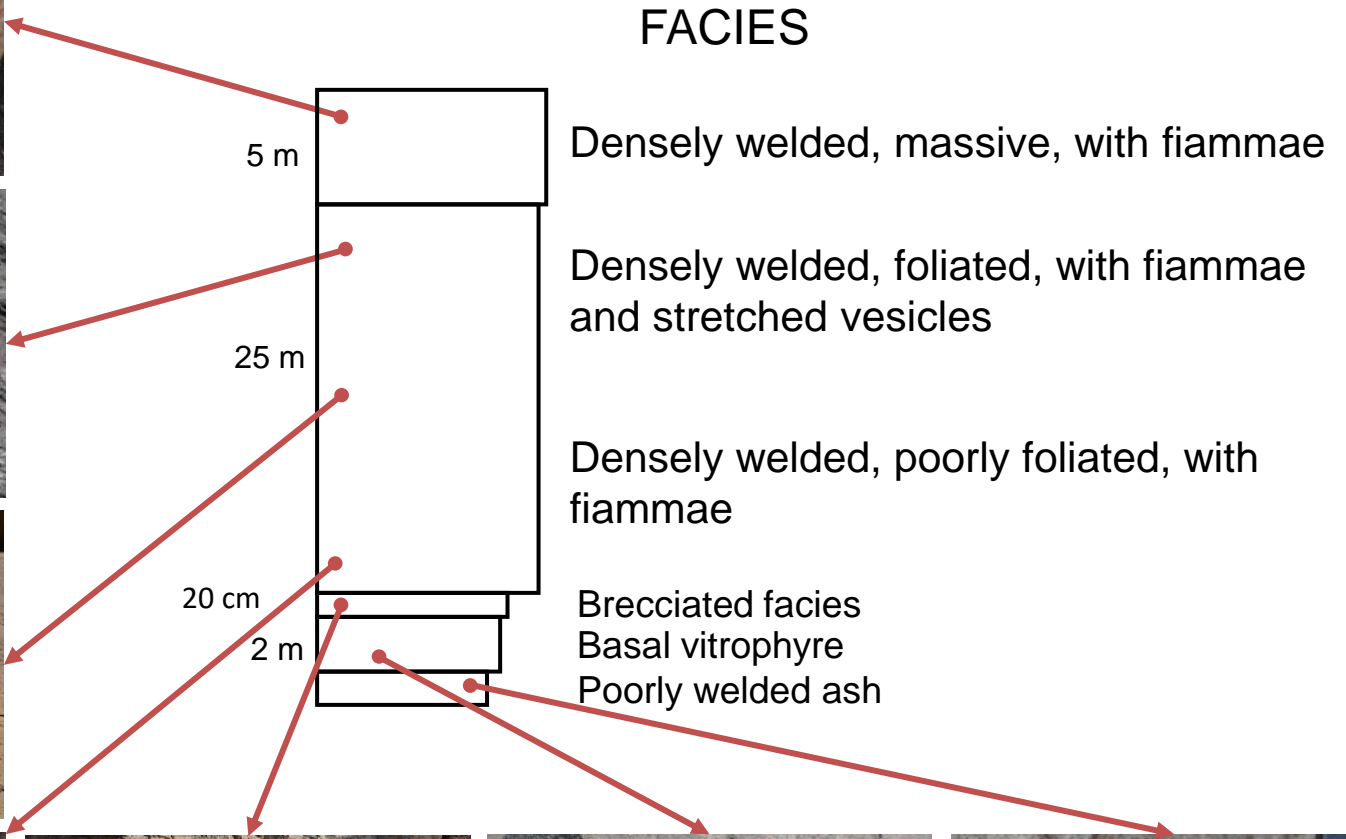
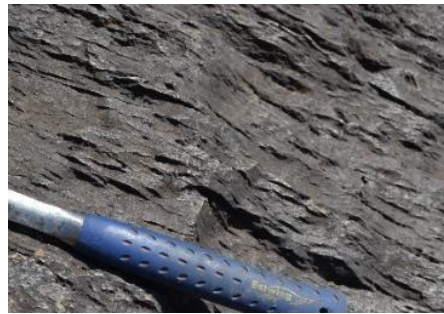
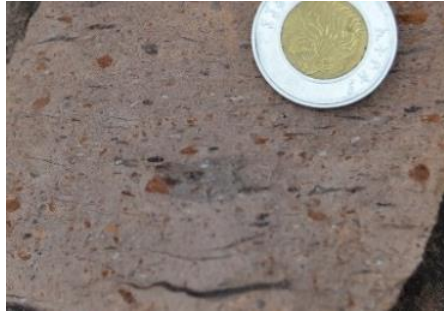


Kencherra Ignimbrite (1.27 Ma)

- Low Aspect Ratio Ignimbrite, thickness nearly constant over wide areas
- Max volume: 10^2 km^3
- Dispersal area: 2000 km^2



Kencherra Ignimbrite (1.27 Ma)



Kencherra Ignimbrite (1.27 Ma)

Polarity and **flow directions** determination thanks to kinematic markers within in the foliated facies (rolling objects; σ - and δ - structures; embriicated clasts in fiammae; folds in vesicles)



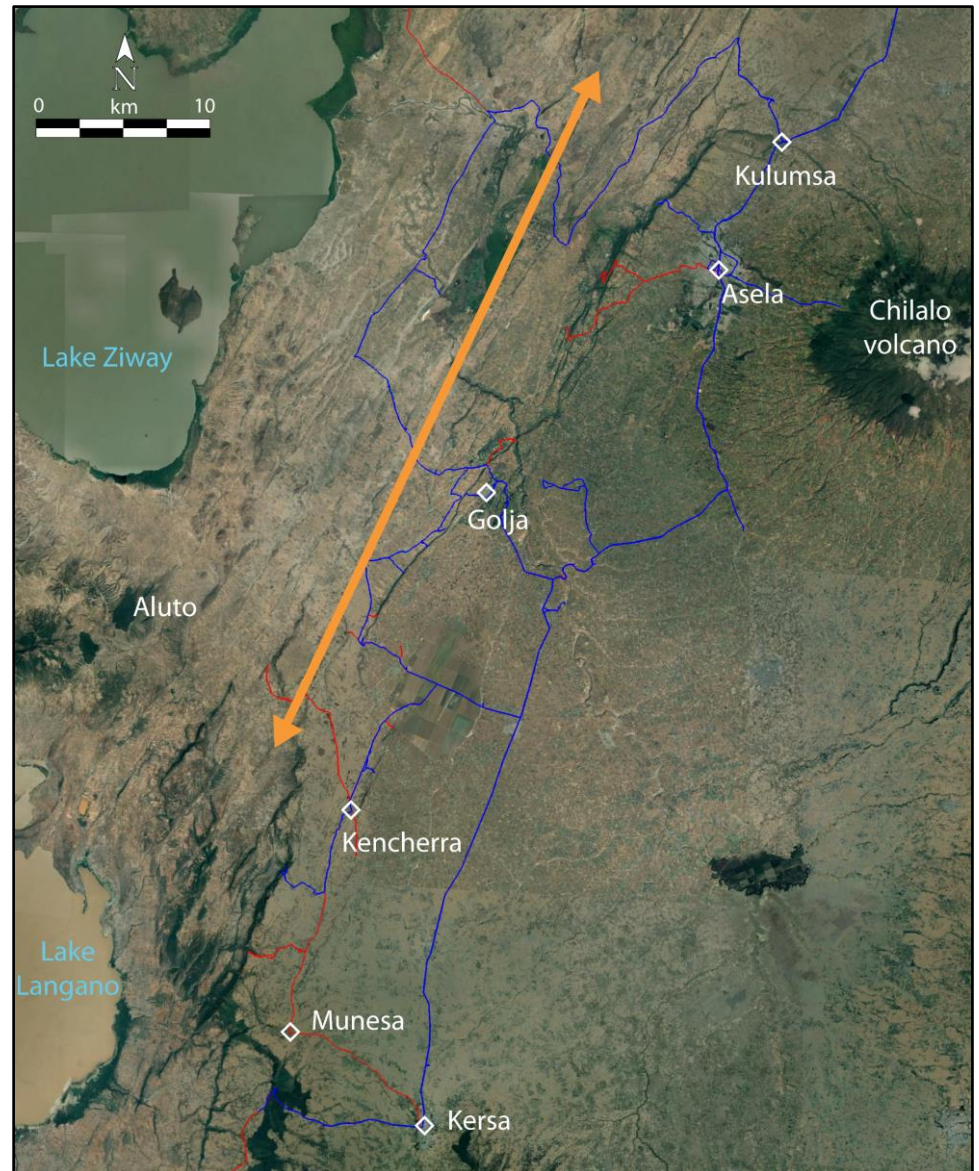
Source: area of Aluto volcano

Golja Ignimbrite (1.24 Ma)

- Low Aspect Ratio Ignimbrite, thickness nearly constant over wide areas
- Max volume: 10^2 km^3
- Dispersal area: 1500 km^2

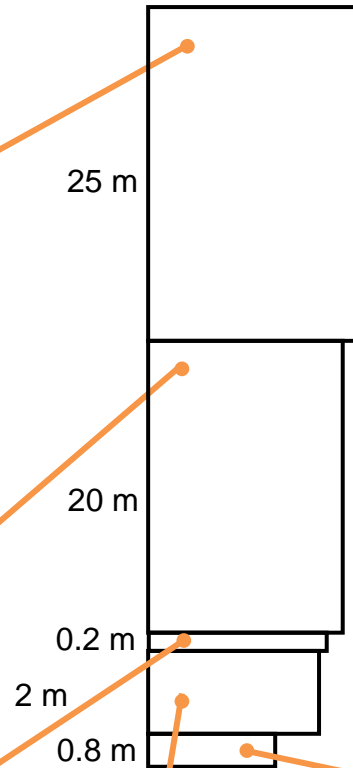


Source: uncertain, from the Rift floor



Golja Ignimbrite (1.24 Ma)

FACIES



Lithified, zeolitized, scoria-bearing, fumarolic pipes

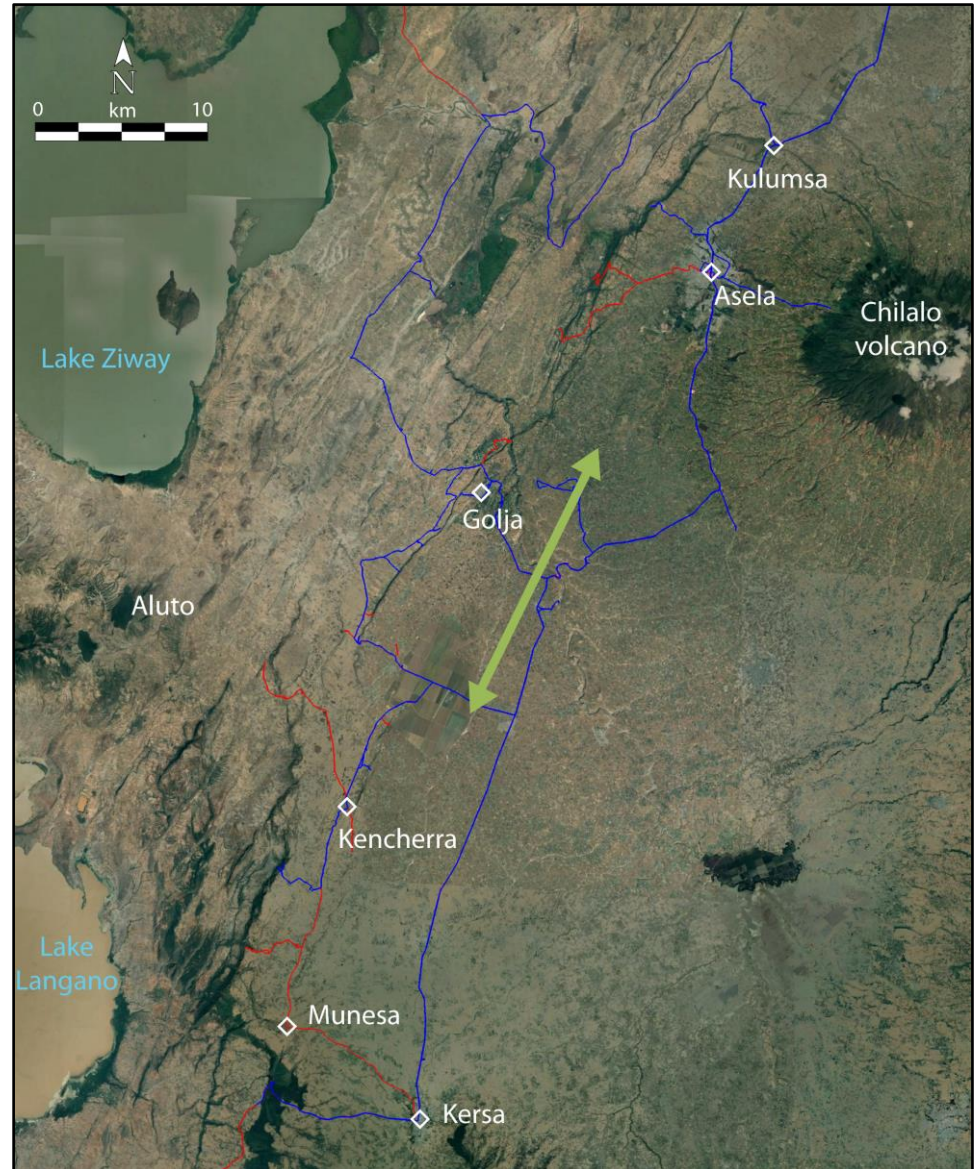
Poorly welded to unwelded, lithic-rich, obsidian fiammae and undeformed white pumice and black scoriae

Brecciated facies

Basal vitrophyre, obsidian fiammae
Fallout lapilli and poorly welded ash

Katar Ignimbrite (290 ka)

- Greenish ign. with small fiammae
- Dispersal area > 200 km²
- Tentatively correlated with recent activity of the main volcanic centers of the Rift floor (Aluto, Gedemsa ?)



Geochronological scheme

Clustered volcanism:

(phases of high volcanicity interspersed with periods of rest of volcanism)

- **3.5 Ma** (MCT)
- **1.9 – 1.6 Ma** (mafic products)
- **1.3-1.2 Ma** (Kencherra -Golja Ign.)
- **0.8-0.7 Ma**
- **0.3 Ma** (Katar Ign.)
- **0.2 Ma** (Aluto Ign.)

