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Structural and geochronological constraints on the early Variscan evolution of the Eastern Moroccan Meseta

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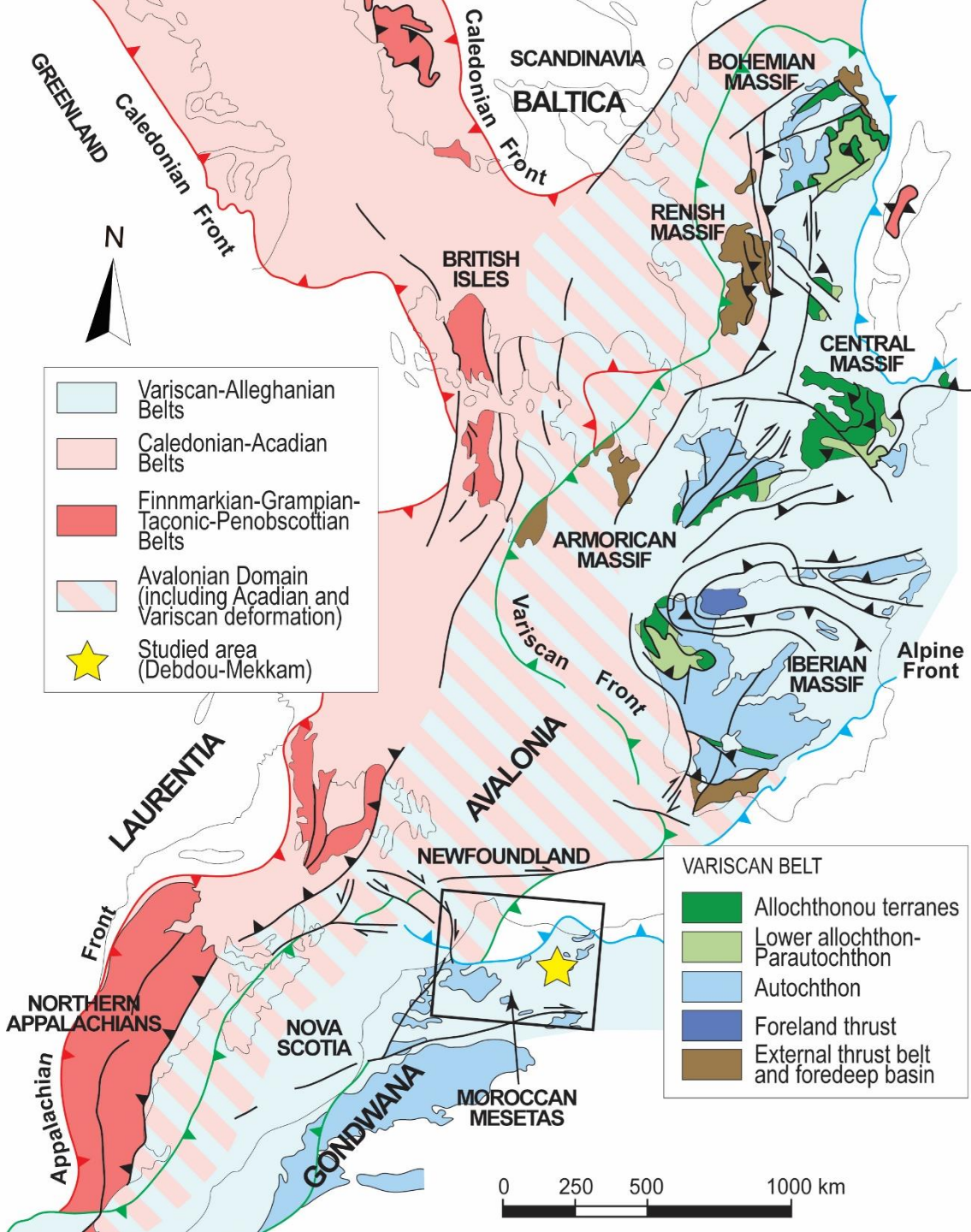
OVERVIEW:

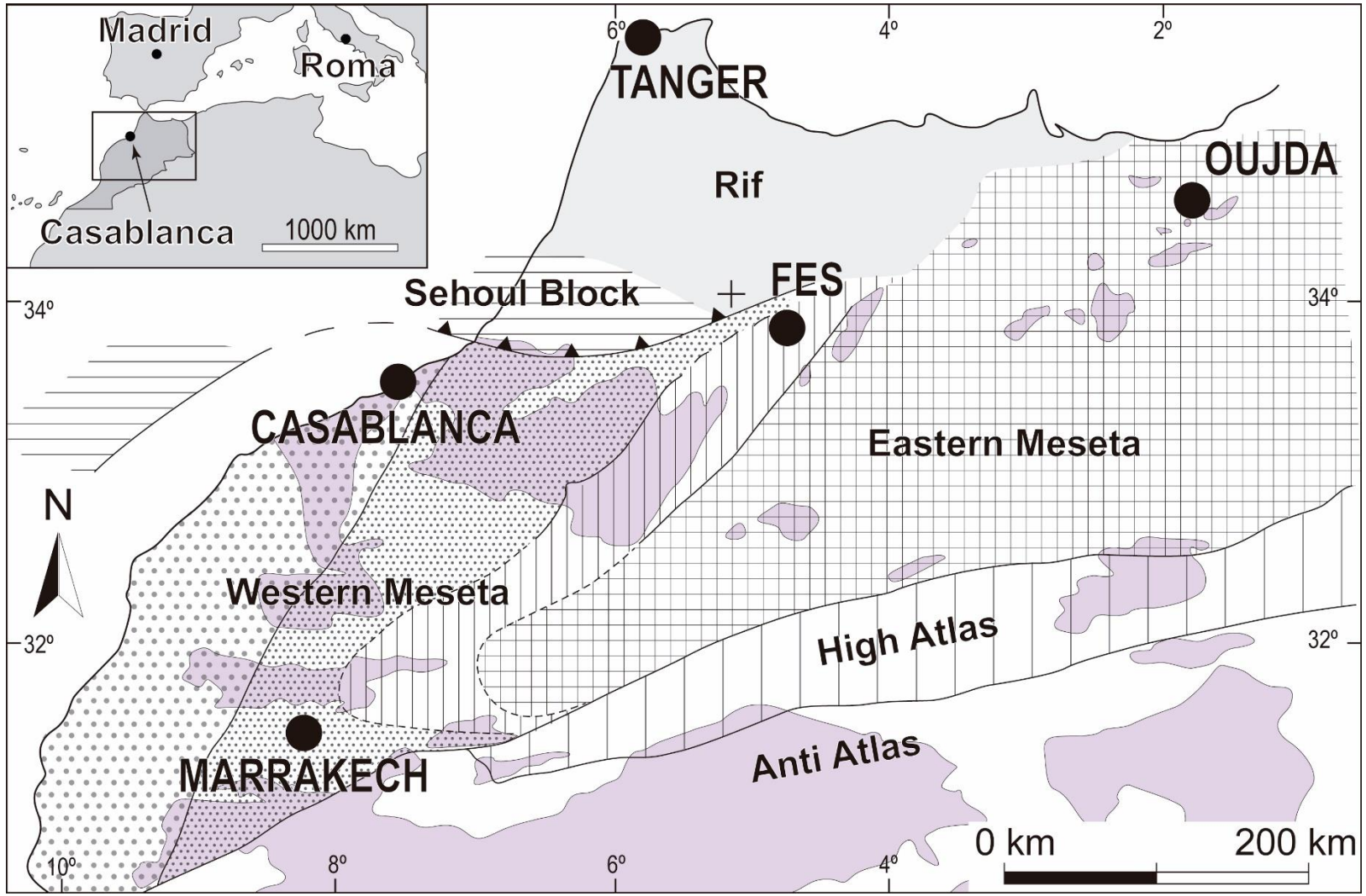
- Geological setting:
  - ✓ Moroccan Variscides
  - ✓ Eastern Moroccan Meseta
  - ✓ Debdou-Mekkam inliers
- Methodology and results:
  - ✓ Geochronology on detrital zircons
  - ✓ Structural analysis
- Tectonic evolution



After Martínez Catalán et al., 2002; Michard et al., 2010; Simancas et al., 2009

Geological Setting

- **Anti Atlas**: N-Gondwanan foreland of the Variscan Belt
- **High Atlas**: autochthonous West African rocks
- **Western Moroccan Meseta (WMM)**: several tectonic blocks, deformed mainly by upright folds
- **Eastern Moroccan Meseta (EMM)**: poorly defined yet, deformed mainly by upright folds
- **Sehoul Block**: Caledonian-Avalonian, overthrust on the WMM
- **Rif**: alpine belt

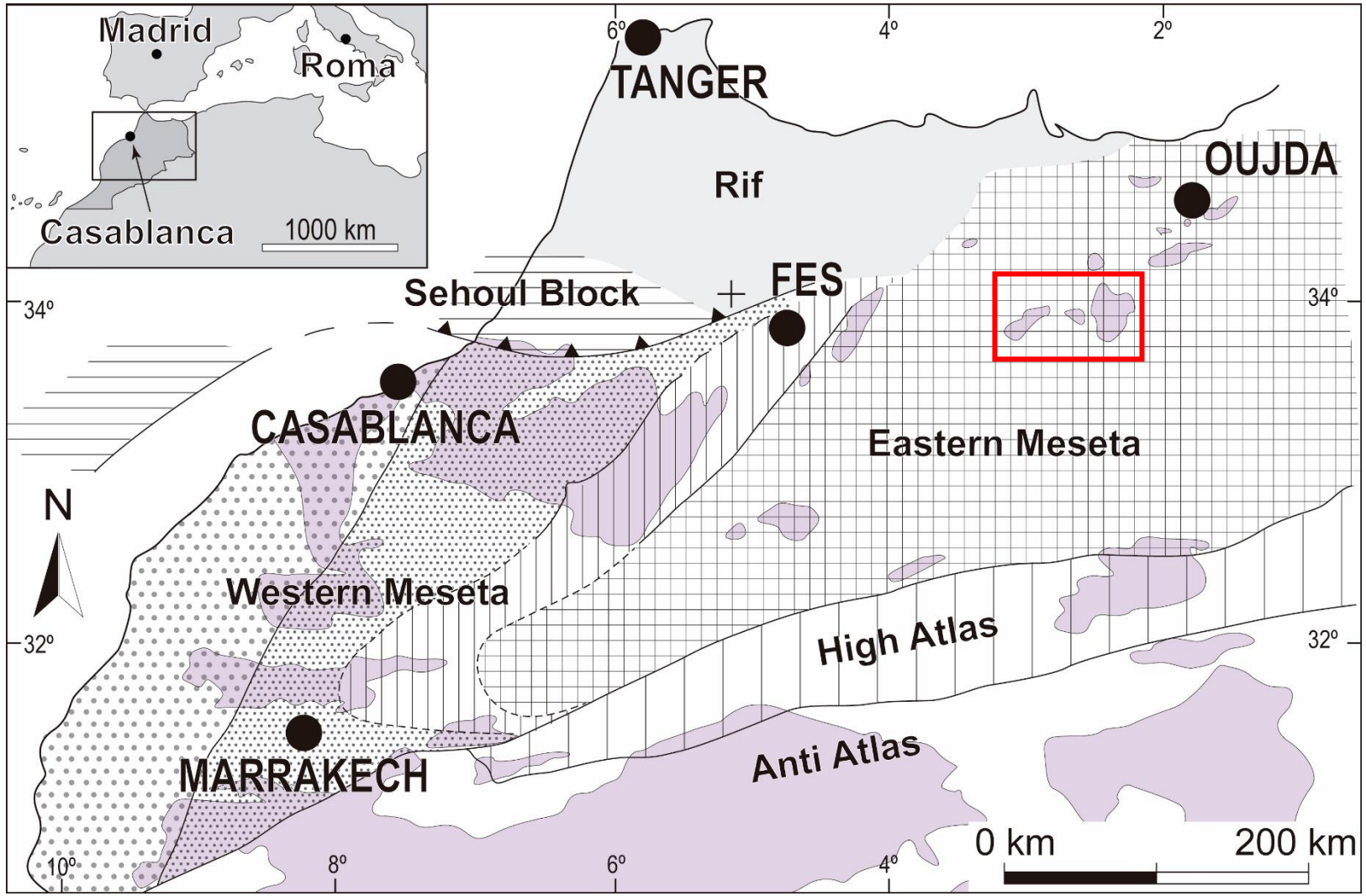


After Hoepffner et al. (2006)

Geological Setting

Eastern Moroccan Meseta
(Hoepffner et al. 2006 and references therein):

- Paleozoic mainly terrigenous sequence of the siliciclastic passive margin of Gondwana, more or less continuous from Cambrian to Late Devonian-Early Carboniferous
- Volcanoclastic Upper Visean sediments (Variscan flysch)
- Low- to very low-grade metamorphism
- Main tectonic events:
  - ✓ Eovariscan event (Late Devonian-Early Carboniferous) - poorly defined
  - ✓ Intra-Visean (Early Carboniferous) extensional phase
  - ✓ Variscan event (≈Alleghanian, Late Carboniferous-Permian) - upright folds

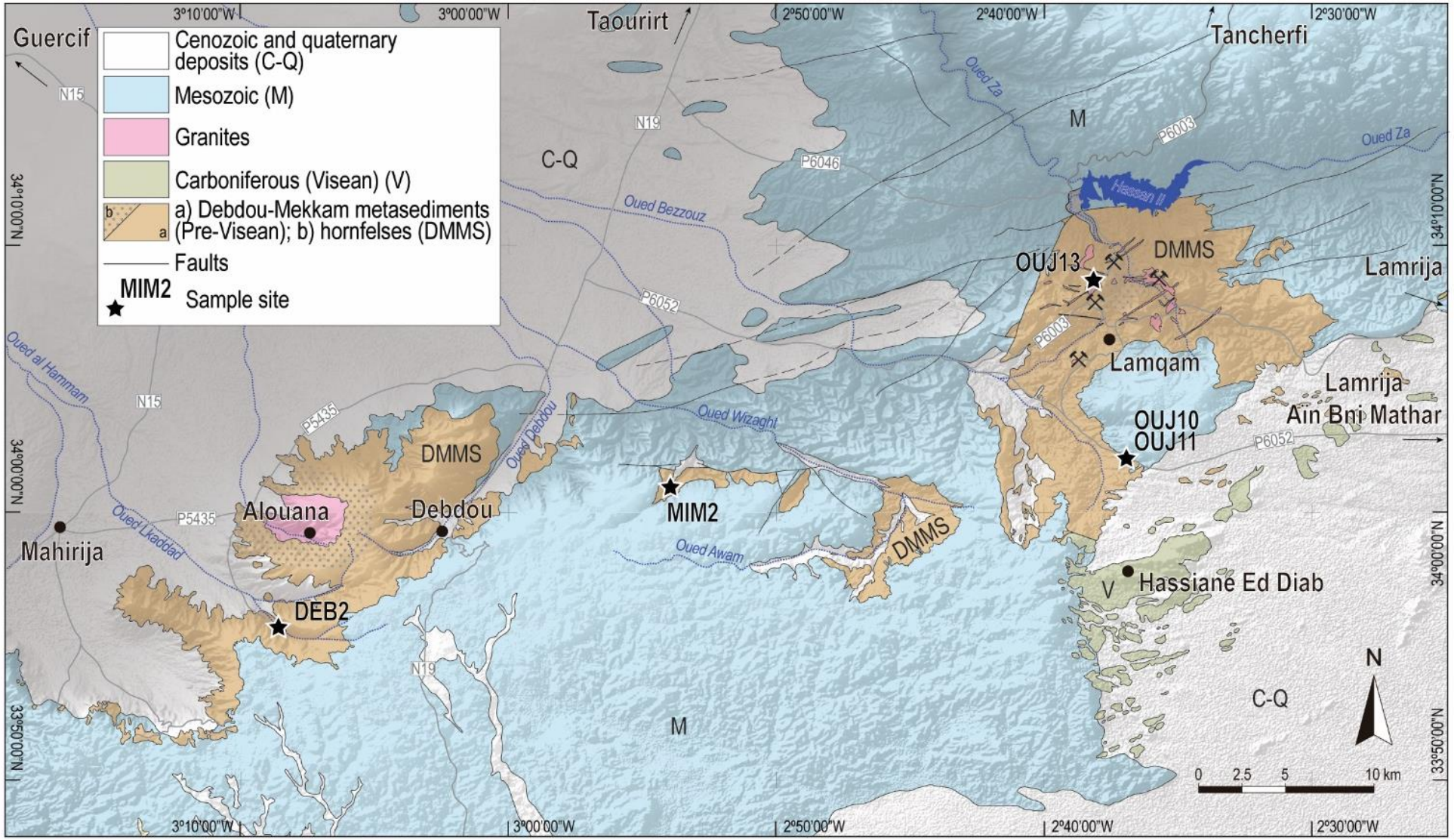


After Hoepffner et al. (2006)

GEOLOGICAL SETTING

Debdou-Mekkam metasediments (DMMS):

- Monotonous sequence of shales and greywackes
- Poorly dated at the Early Carboniferous (Medioni, 1980) or Middle-Late Devonian (Marhoumi, 1984; Marhoumi et al., 1983)



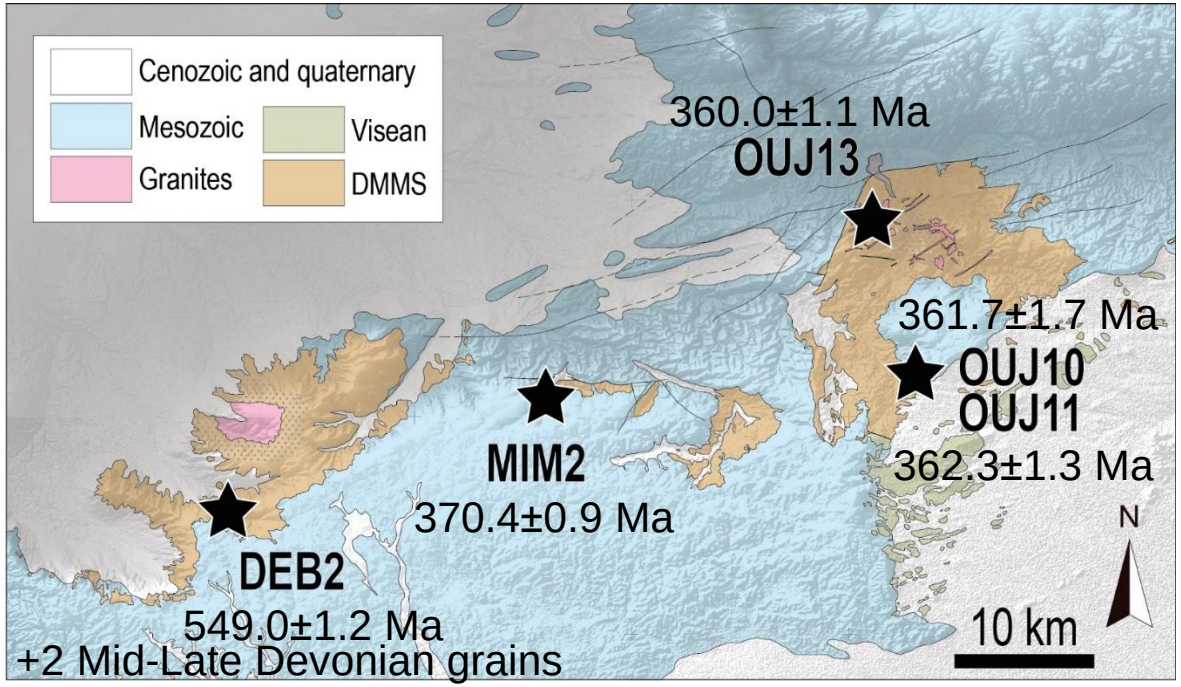
DMMS overlaid in **unconformity** by the Late Visean volcano-sedimentary sequence (Médioni, 1979 and references therein)

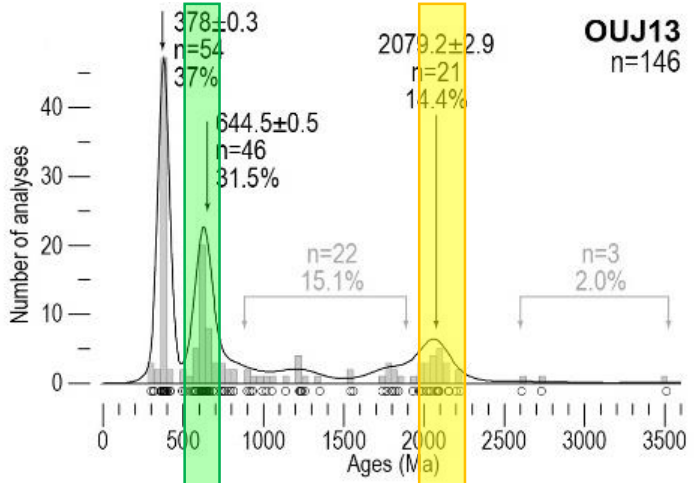
Eovariscan event (Hoepffner, 1987): NW-SE trending structures with W- to SW-vergences, associated with slaty (phase 1) and crenulation (phase 2) cleavages

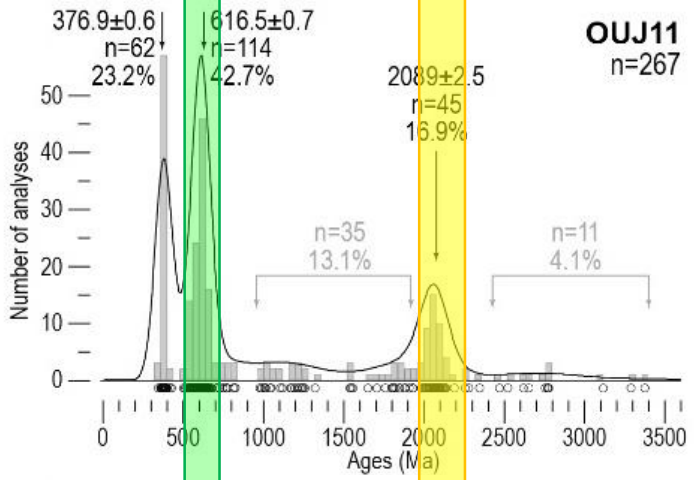
U-Pb GEOCHRONOLOGY

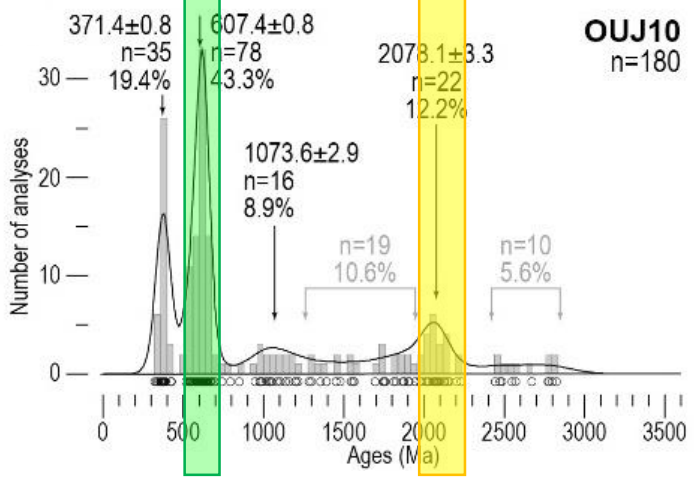
~620 Ma
Cadomian +
Pan-African
orogenies

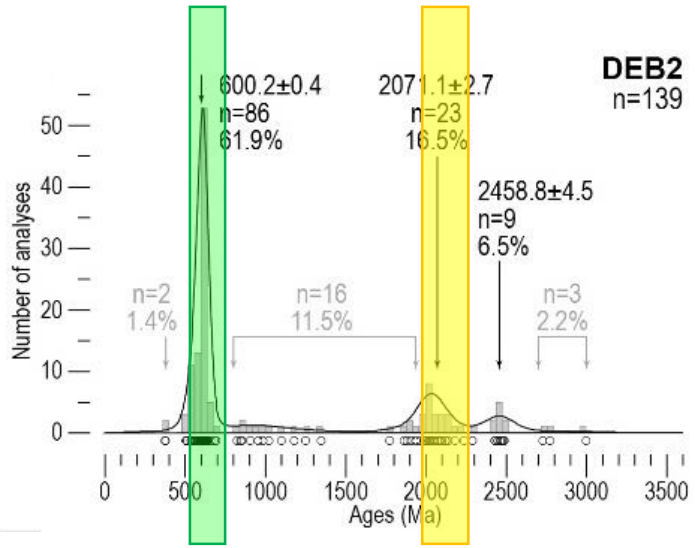
~2.1 Ga
Eburnean
orogeny

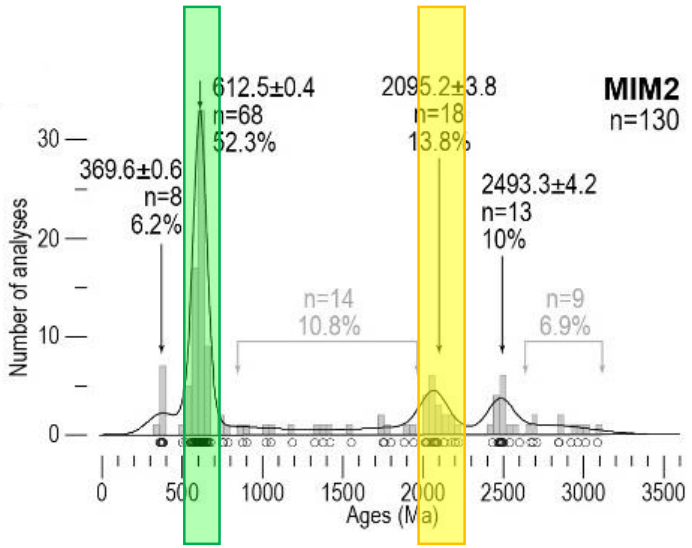








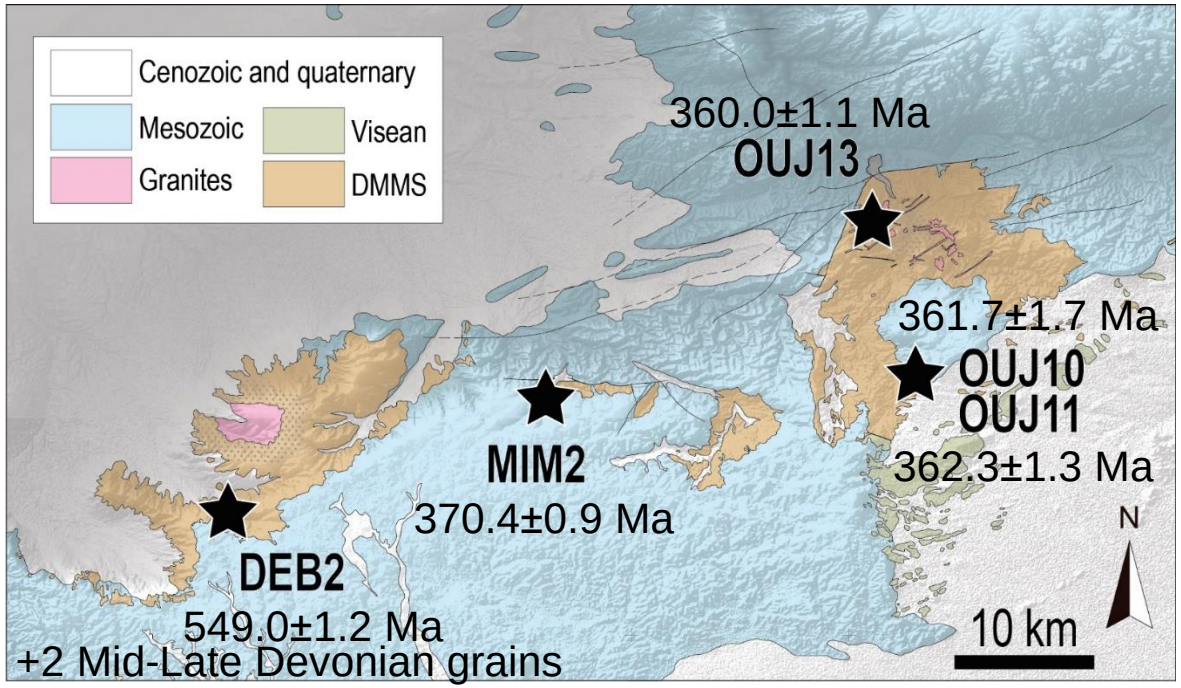


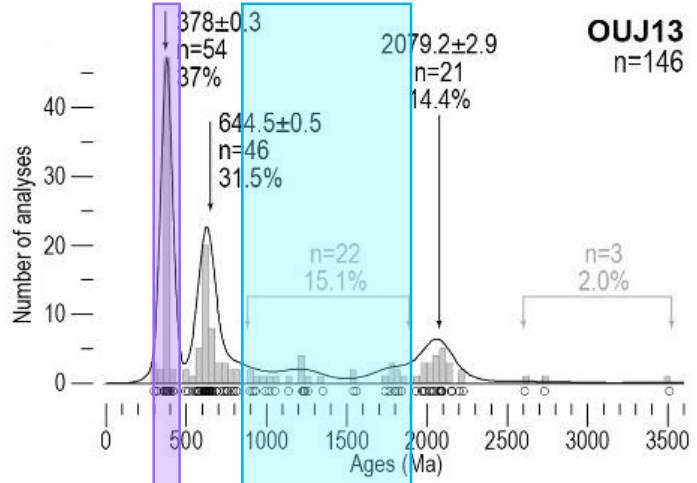


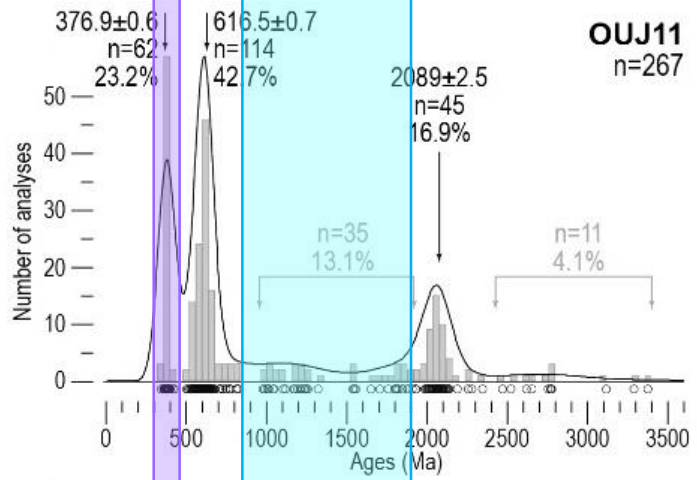
U-Pb GEOCHRONOLOGY

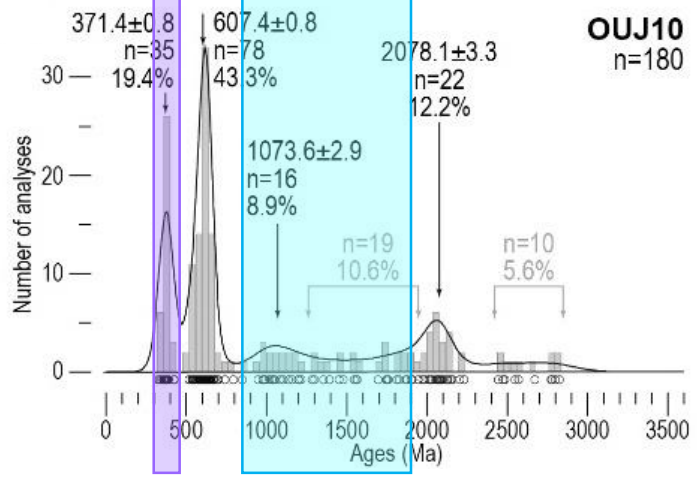
~375 Ma

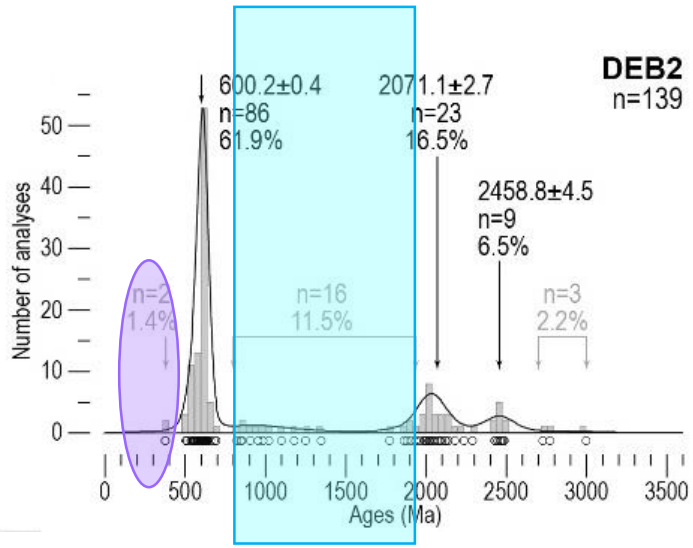
~900-1950 Ma

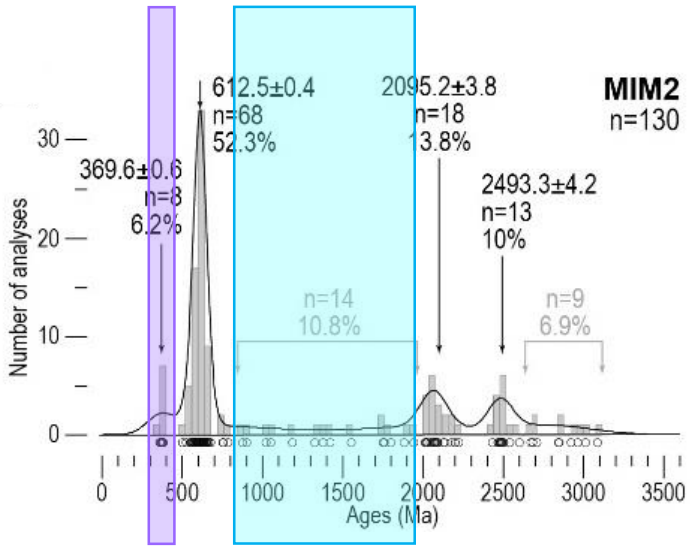




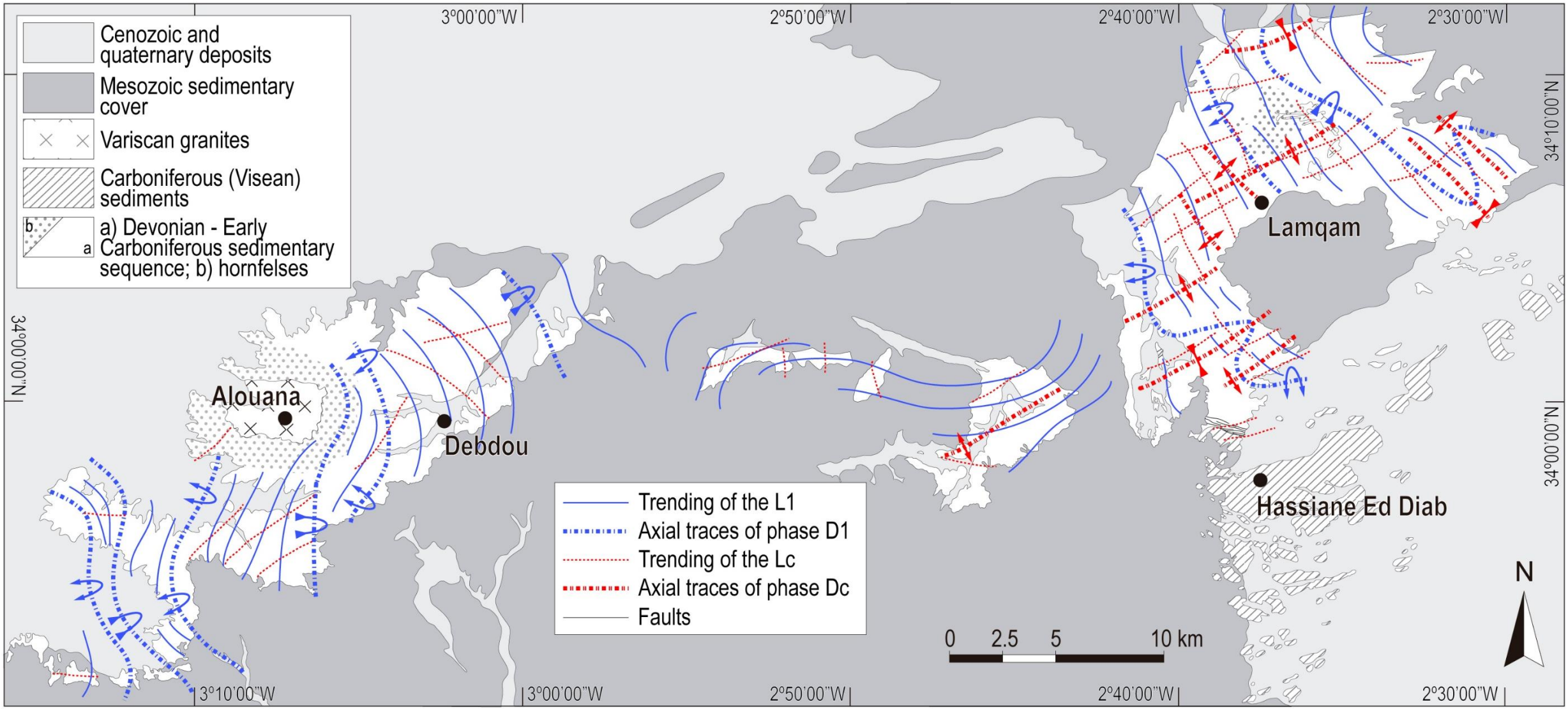




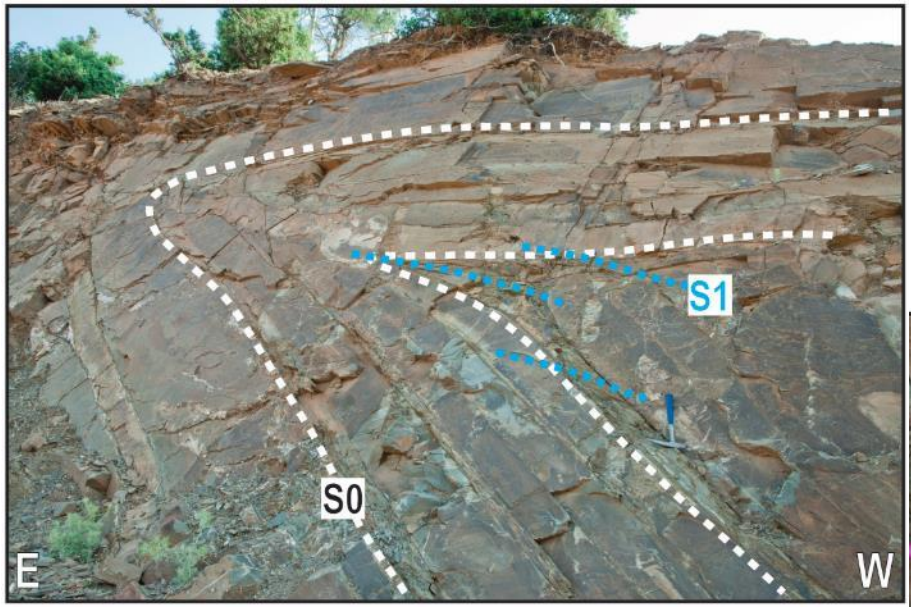


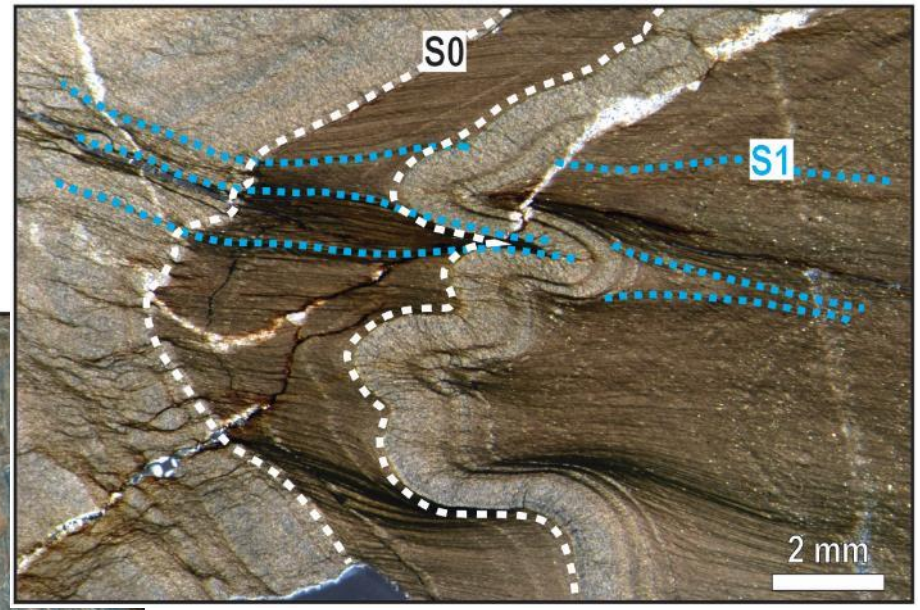


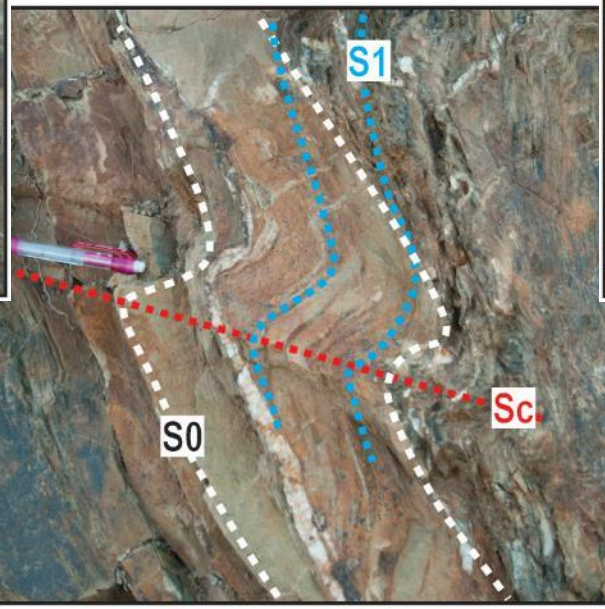
STRUCTURAL ANALYSIS

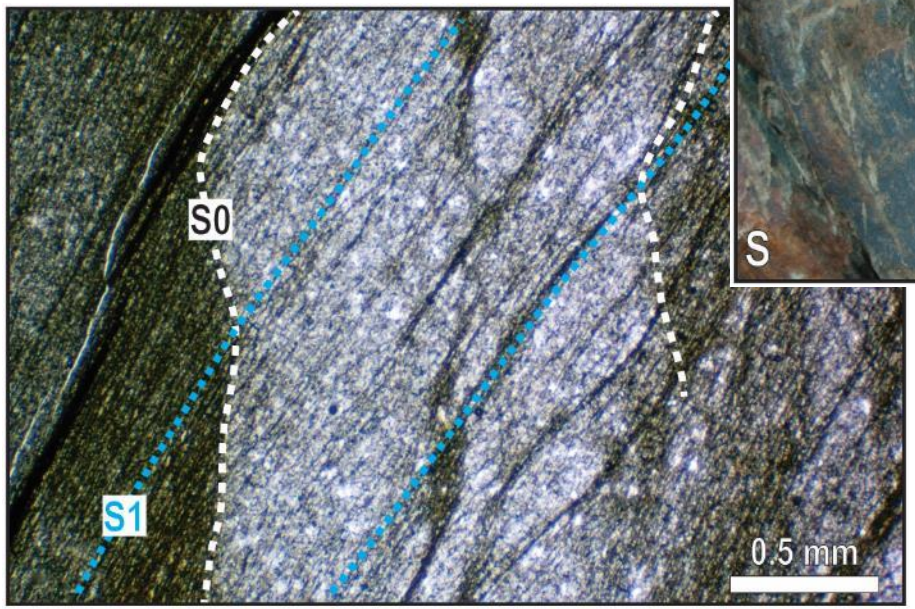


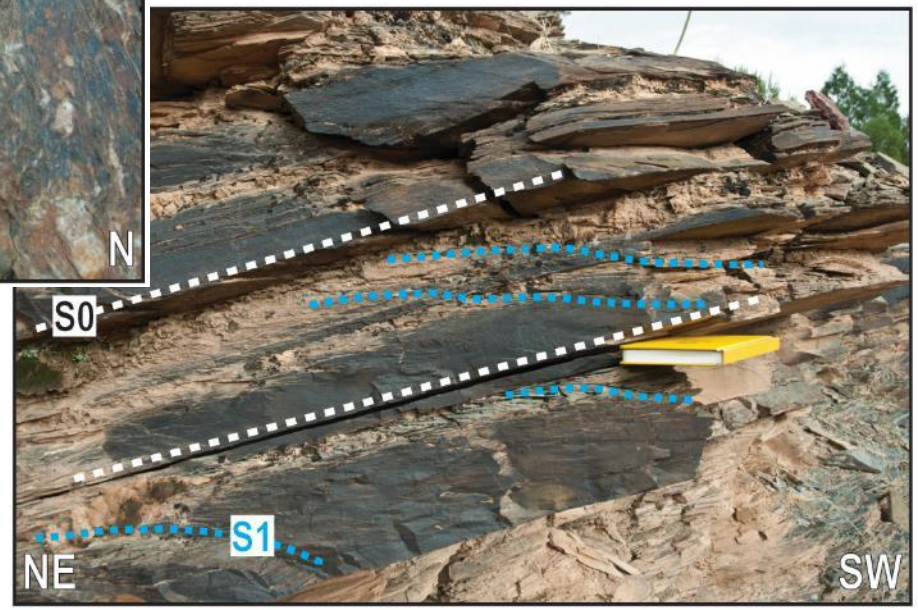
STRUCTURAL ANALYSIS – D1 EVENT



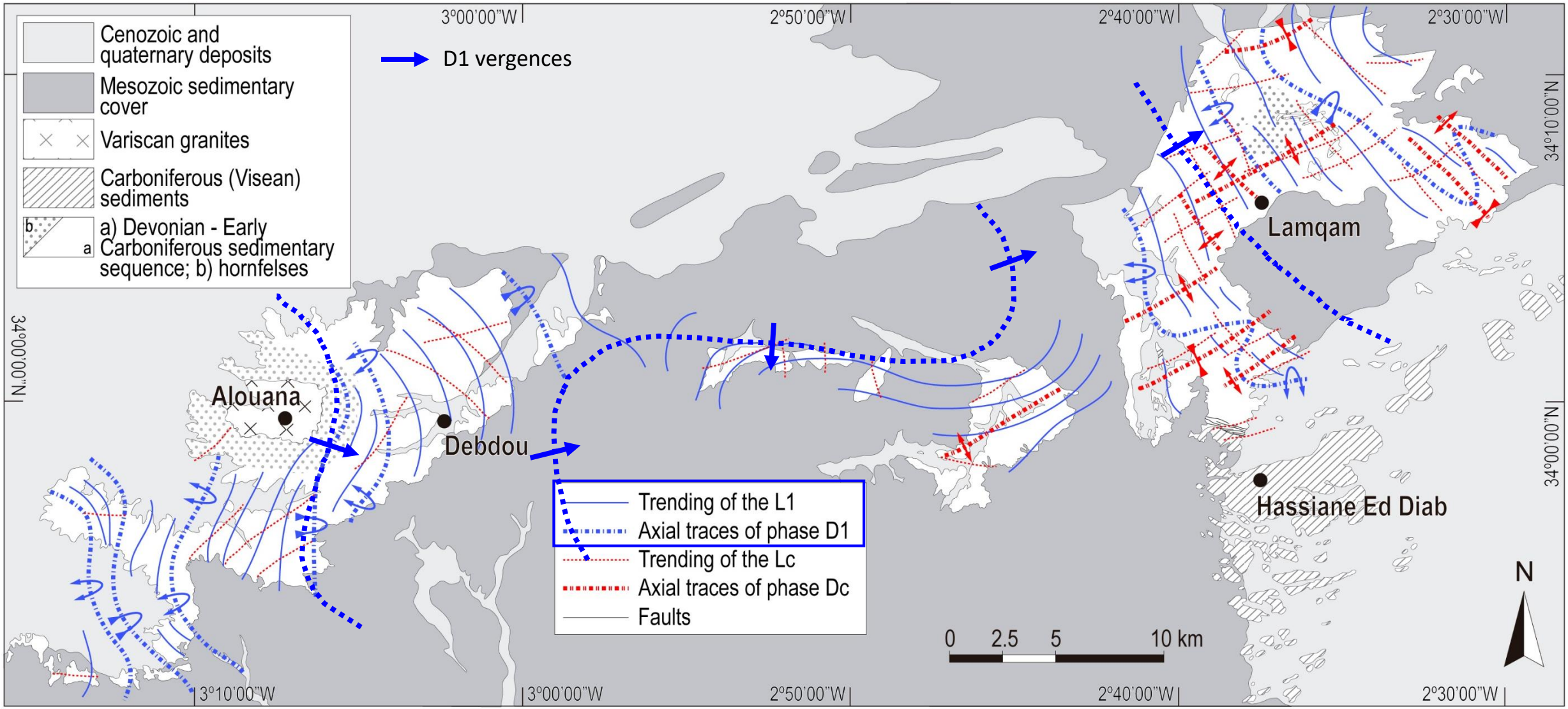








STRUCTURAL ANALYSIS – D1 EVENT



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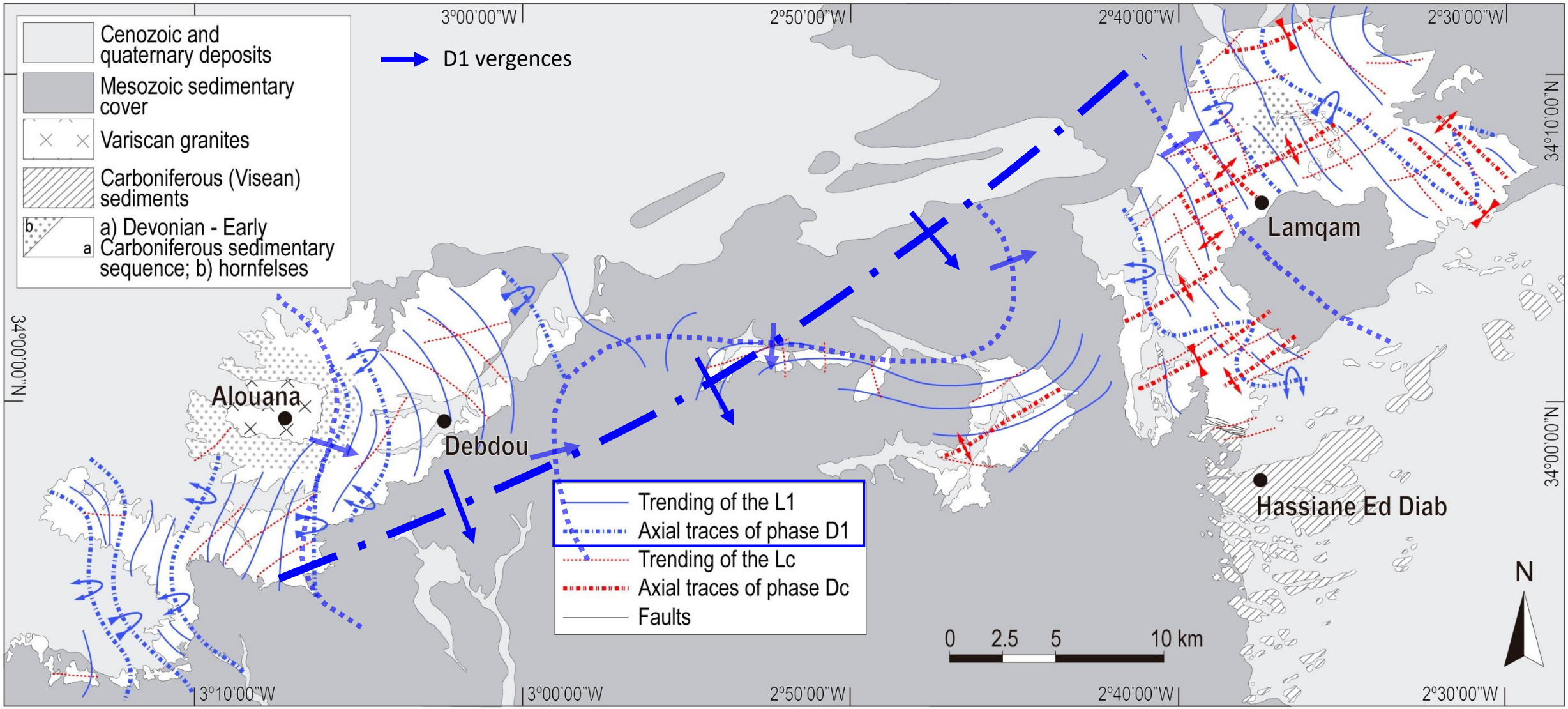
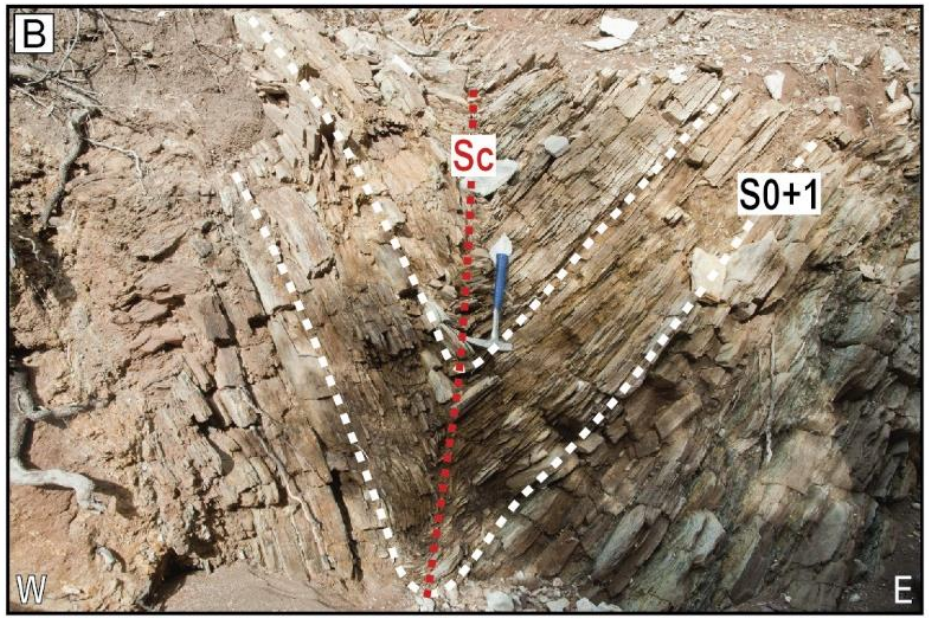
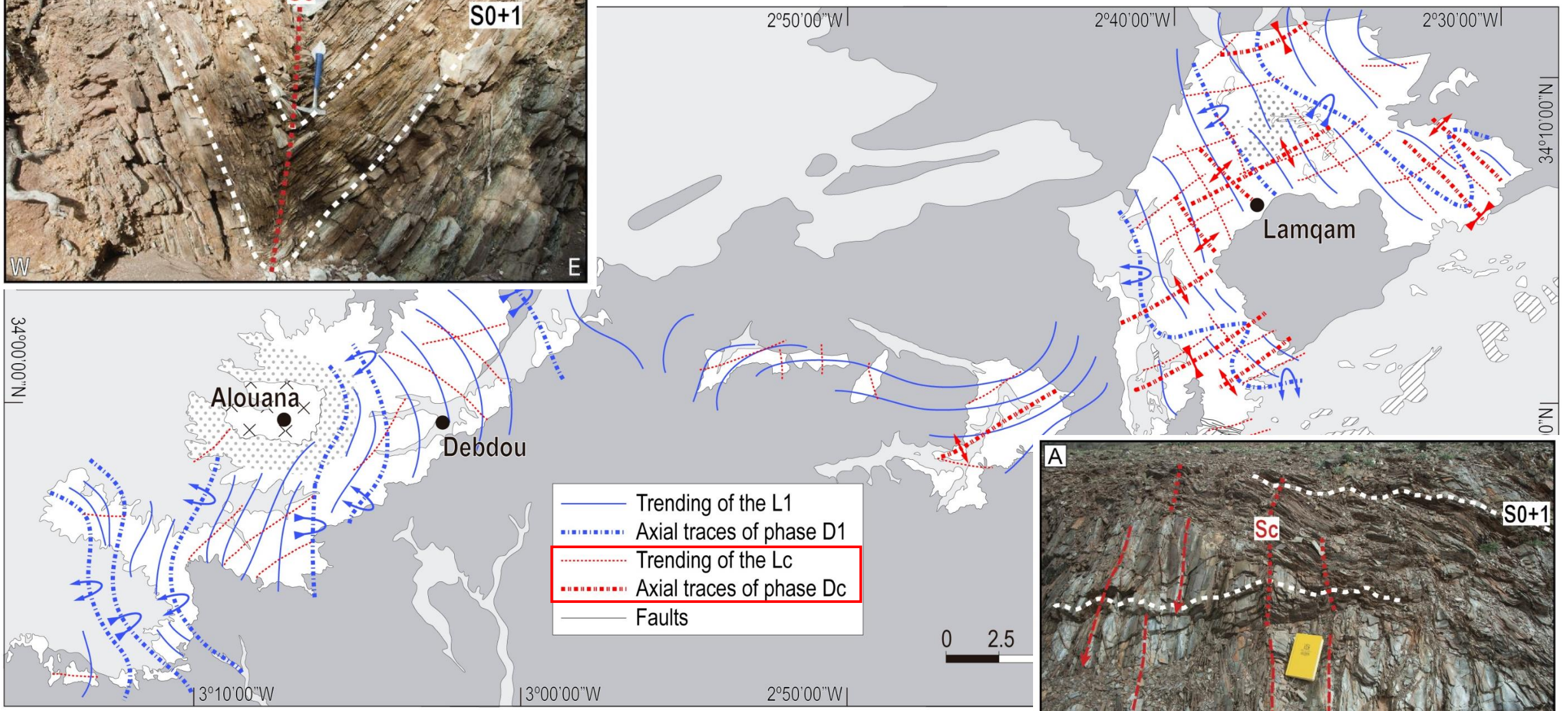
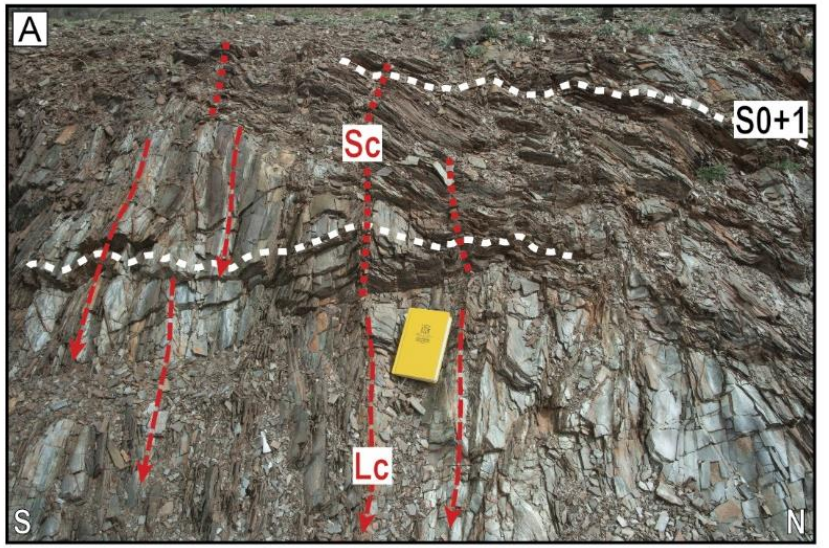


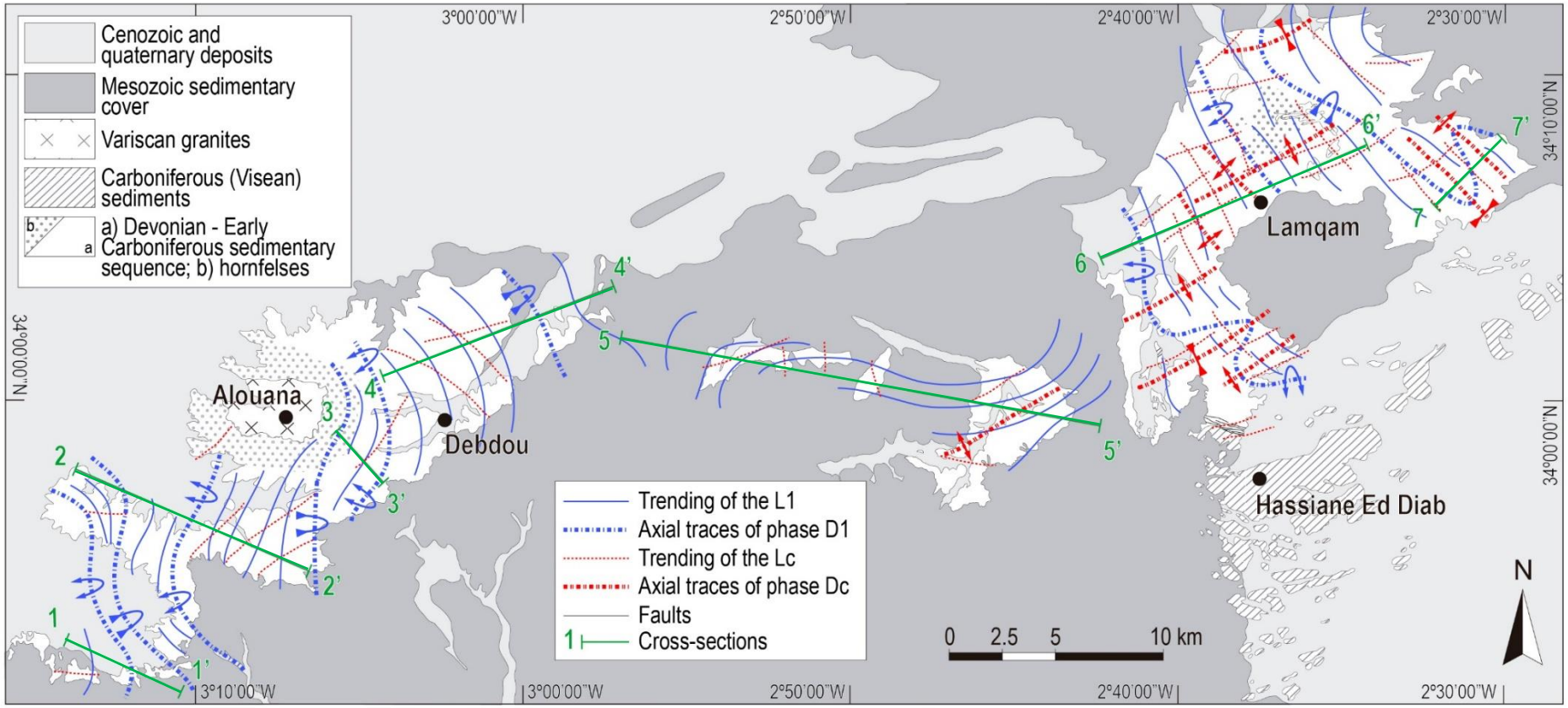
STRUCTURAL ANALYSIS – DC EVENT

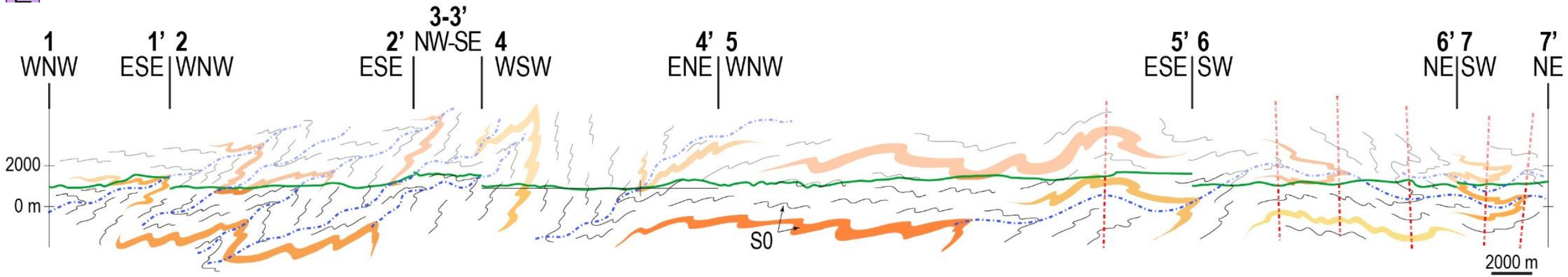




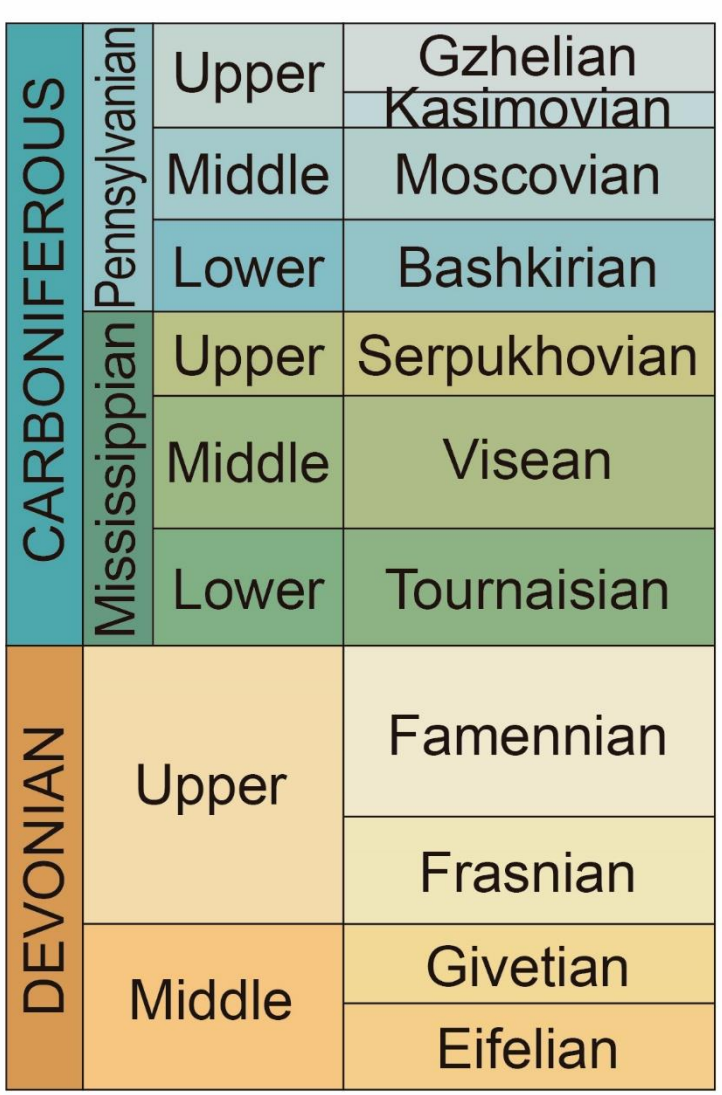


STRUCTURAL ANALYSIS





TECTONIC EVOLUTION



? Dc (both in the DMMS and Visean sequence): NE-SW to NW-SE trending, upright folds, crenulation cleavage ?

Unconformity

D1 (only in the DMMS): NE-SW trending, SE-verging fold belt, main foliation

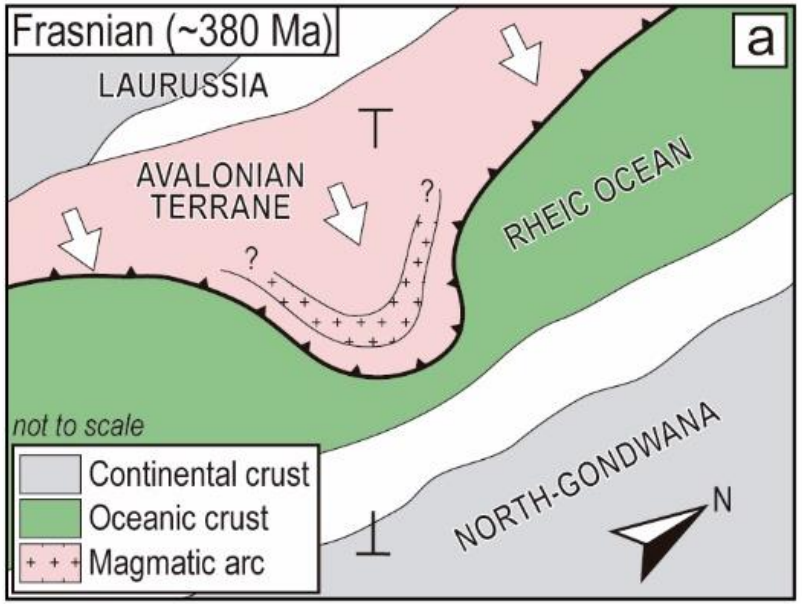
← Max. depositional age of OUJ10, OUJ11, OUJ13 (362-360 Ma)

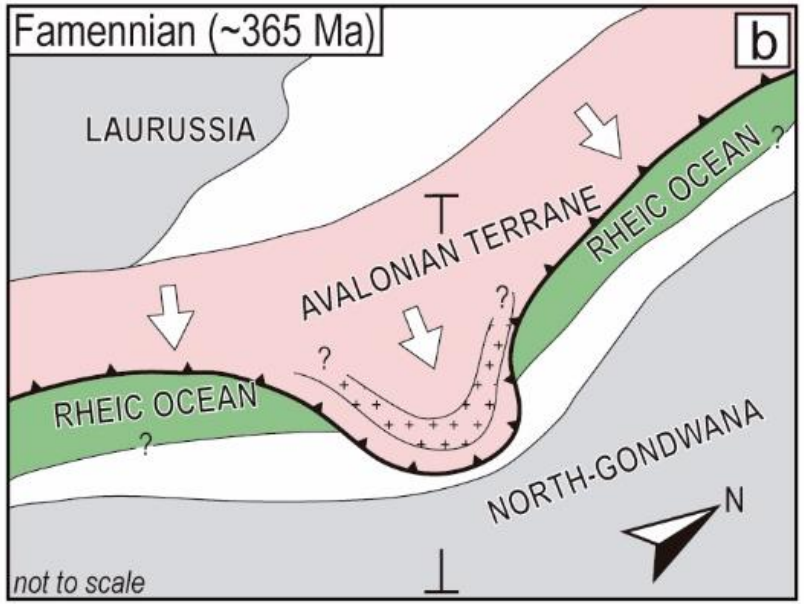
← Max. depositional age of MIM2 (370 Ma)

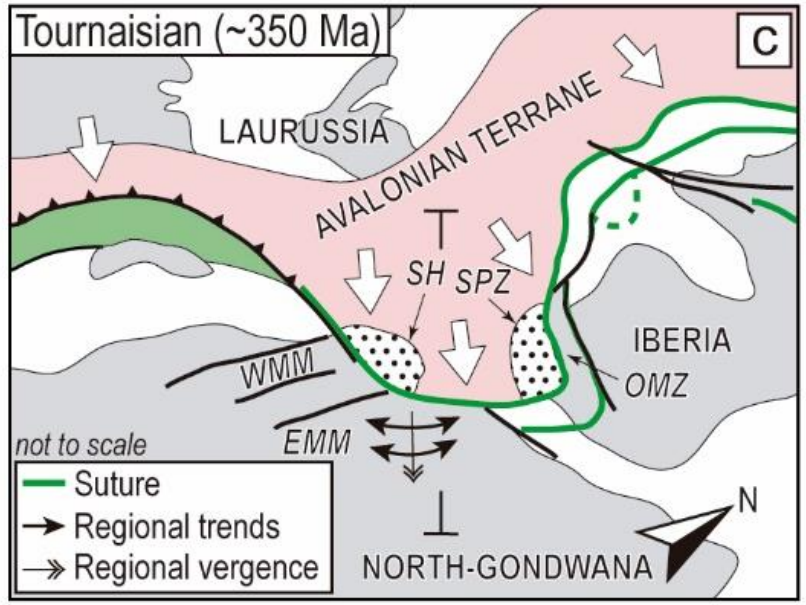
← Two grains in DEB2 (375-374 Ma)

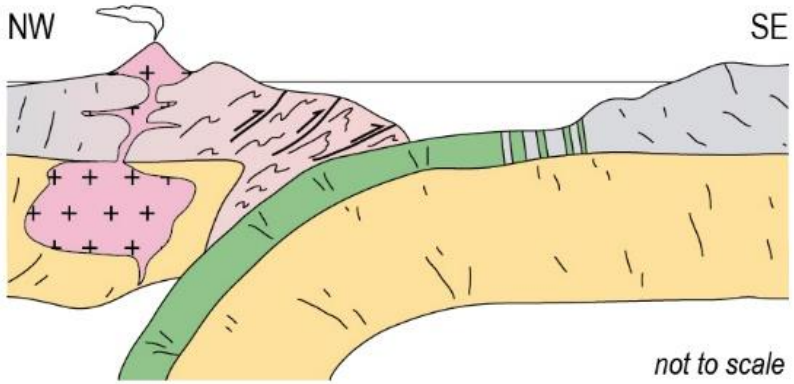
Maximum depositional ages compatible with the eastward migration of the DMMS depocenter

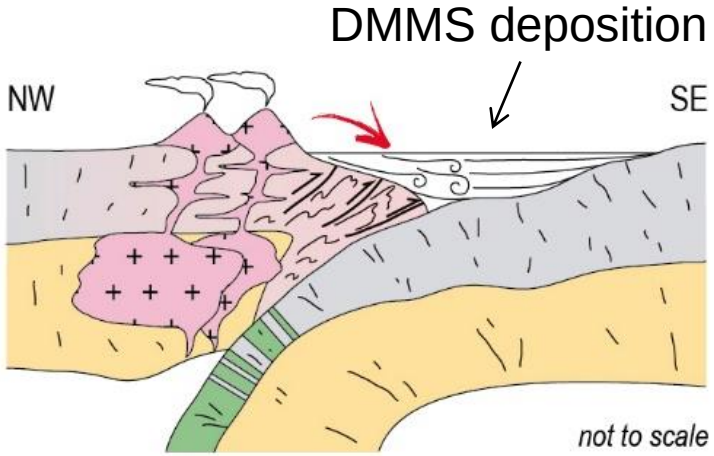
Tectonic Evolution

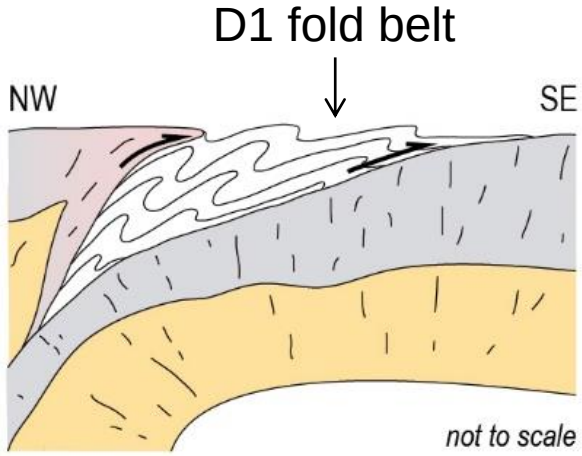












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