

Unraveling the contribution of the western margin of the Altiplano plateau in North Chile (20°S) to Andean mountain-building



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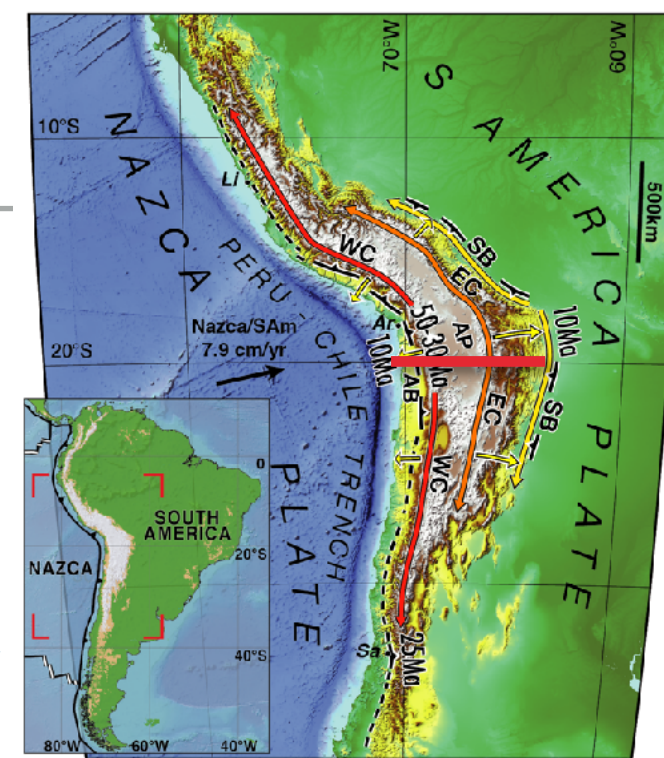
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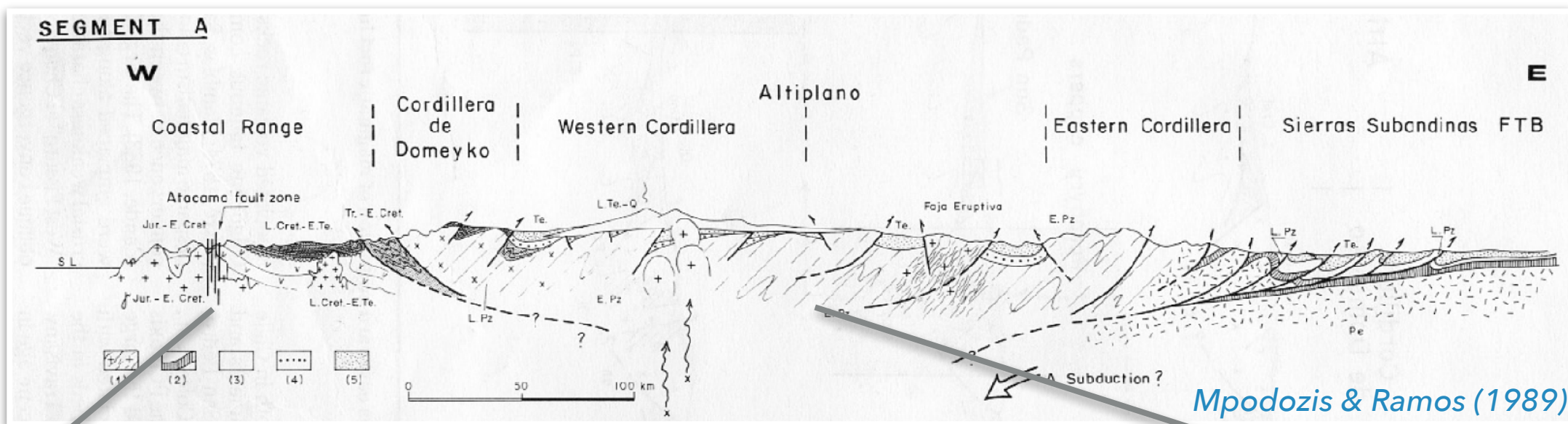
INTRODUCTION

Total E-W shortening of ~360km at ~20°S across the entire Andes, mainly accommodated by tectonic structures along the East Andean margin (e.g. McQuarrie et al., 2005).

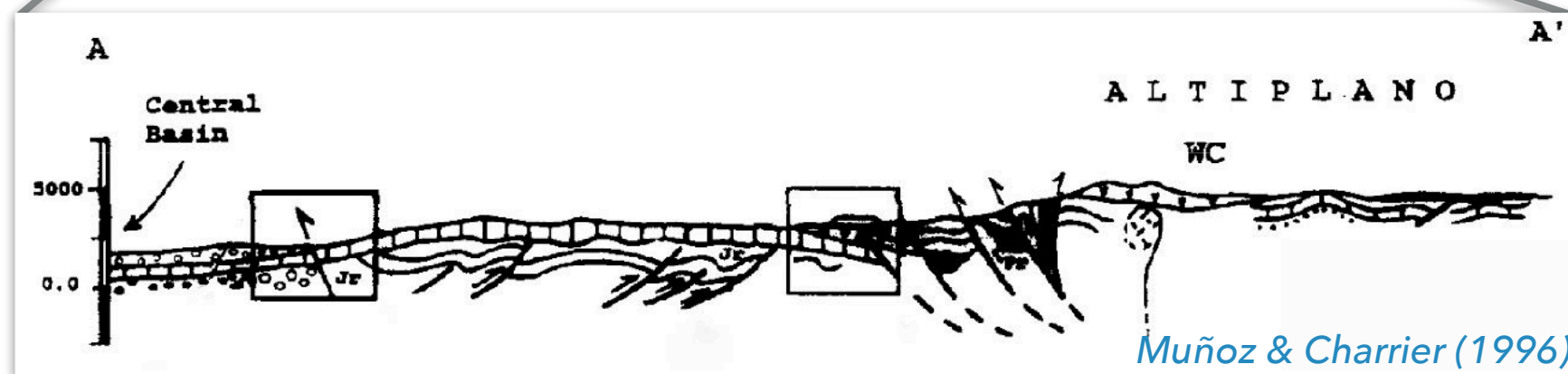
However, although west-vergent structures along the Western margin are minor in term of finite total deformation, they may have played a major role at the begining of Andean orogeny (e.g. Mpodozis & Ramos, 1989; Victor et al., 2004; Armijo et al., 2015; Riesner et al., 2017).



Armijo et al. (2015)



Mpodozis & Ramos (1989)



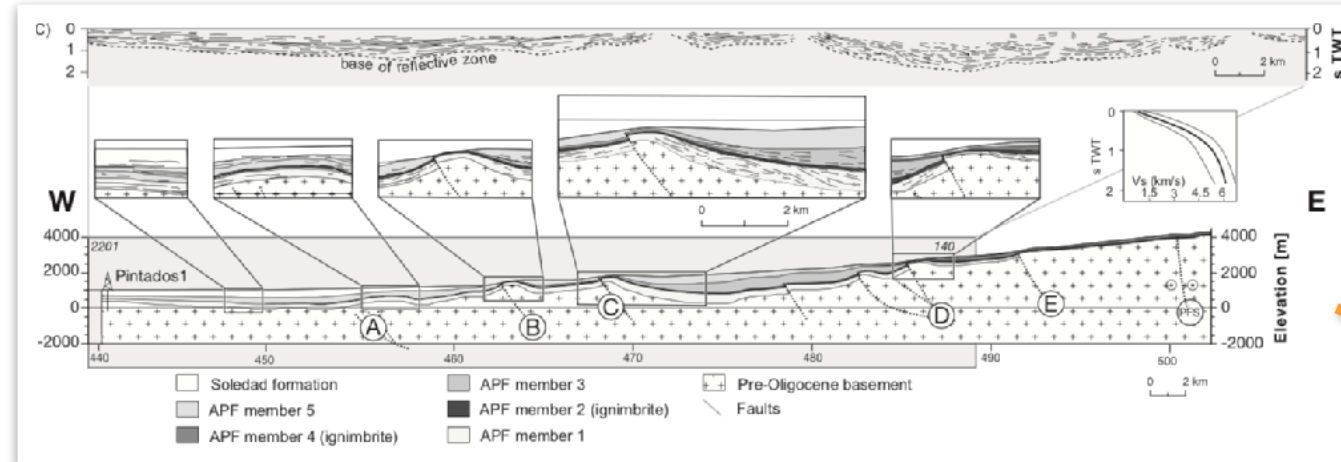
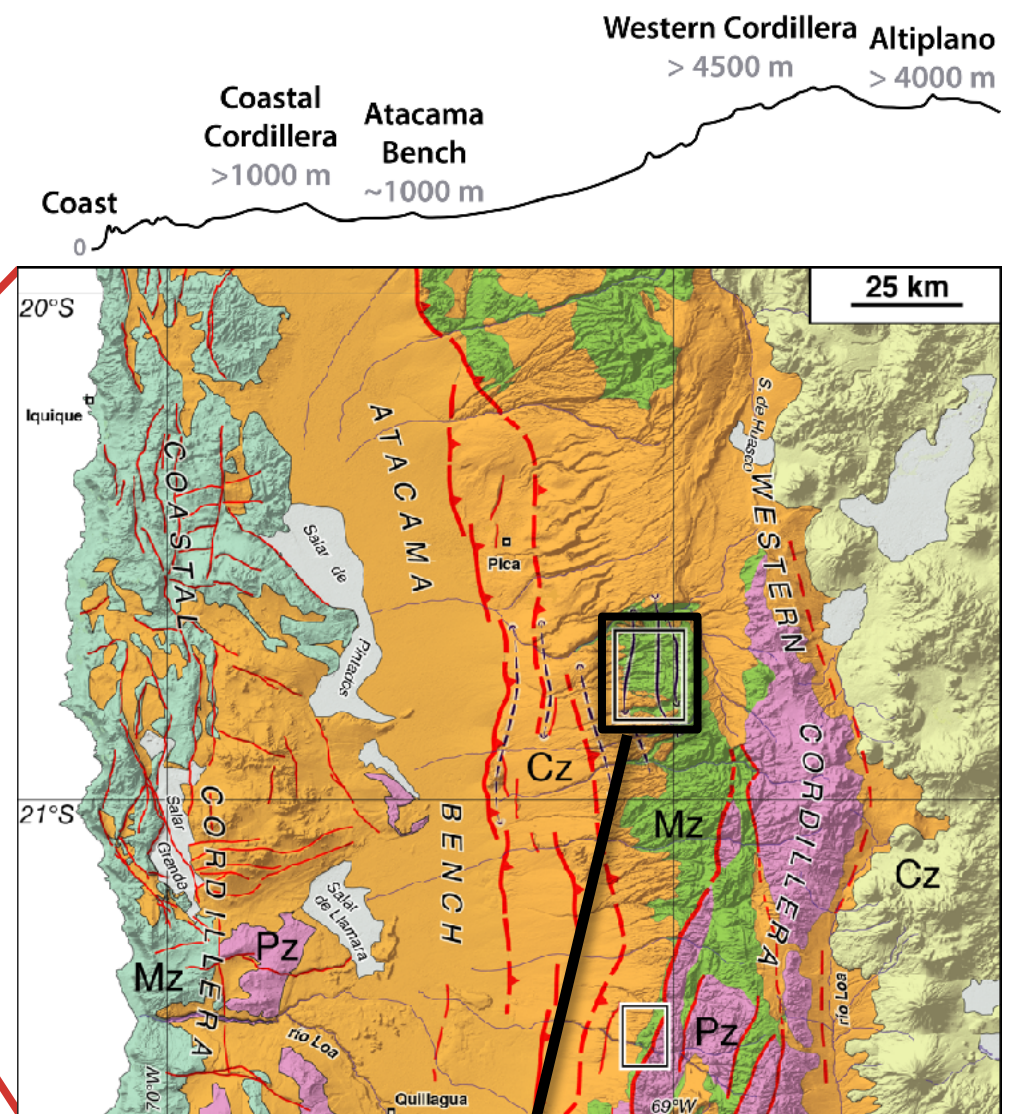
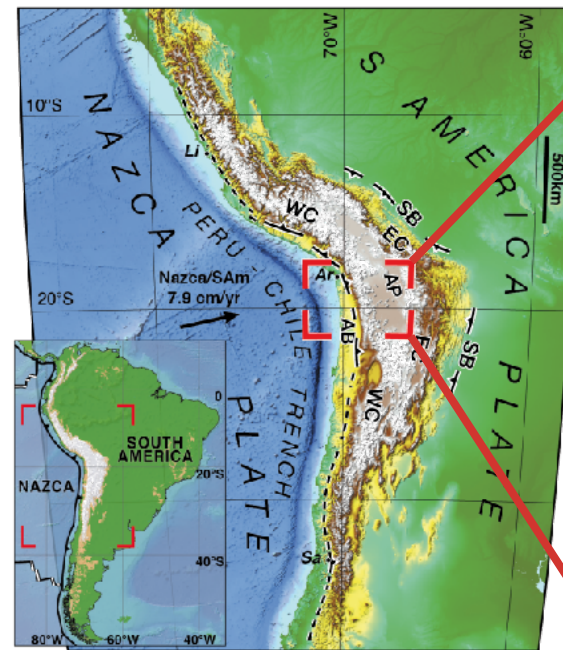
Muñoz & Charrier (1996)

Recent studies suggest that the Andean orogen may have started its formation ~50-60 Ma ago on the Western side of the Andes at ~20°S (Armijo et al., 2015).

Quantitative data needed to constrain the structure, geometry and timing of deformation of West Andean margin in the Central Andes (20°S).

WESTERN CORDILLERA CONTEXT

3 km of shortening associated to the western fault system between 30 Ma and 5-10 Ma ... but only based on slightly deformed Cenozoic deposits (Victor et al., 2004).



Victor et al. (2004) - based on ENAP seismic profiles

Under the Cenozoic cover, much more deformed **Mesozoic** layers form a fold-and-thrust-belt ... but difficult to quantify its deformation, kinematics and timing (Armijo et al., 2015).



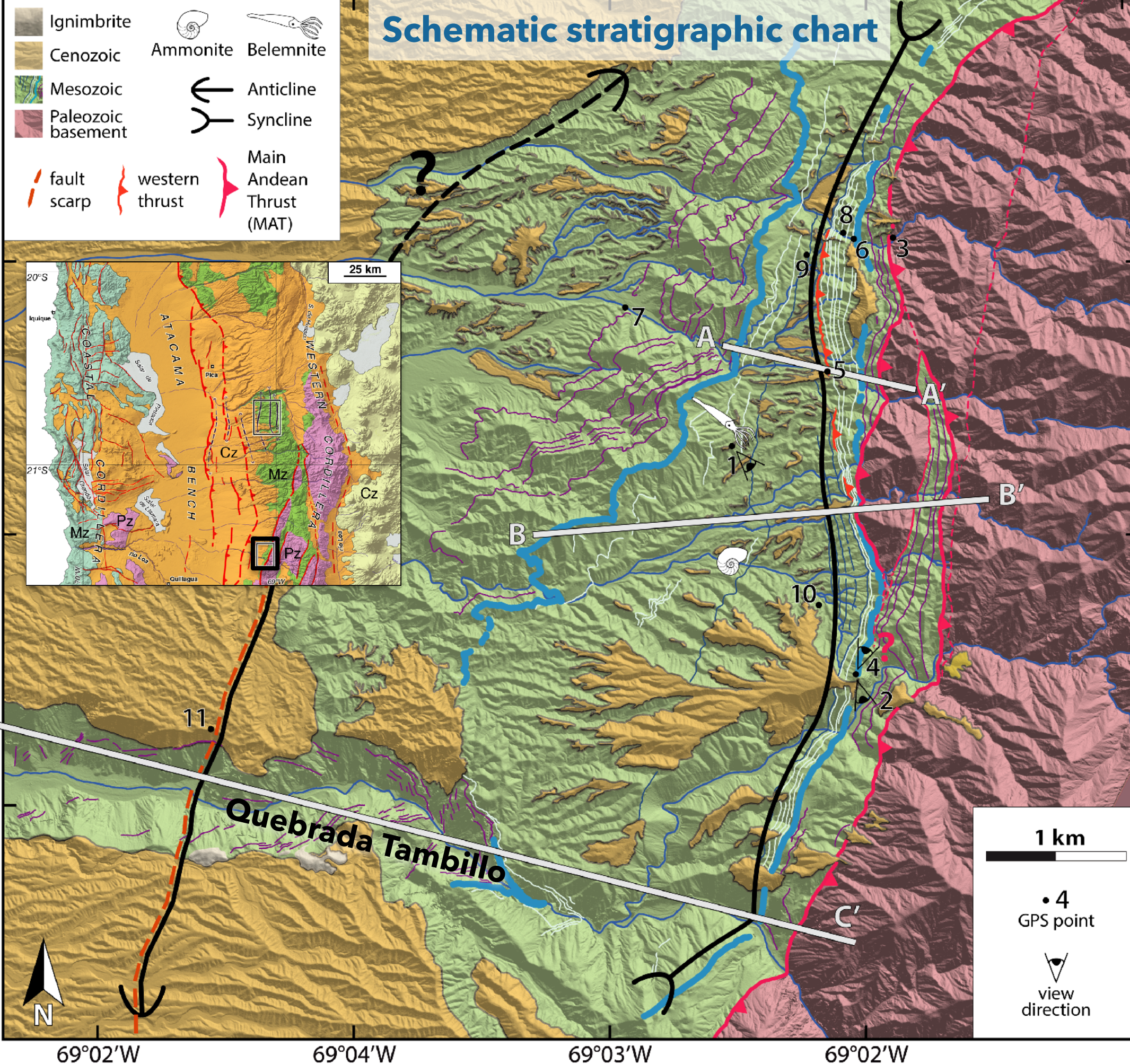
Armijo et al. (2015)

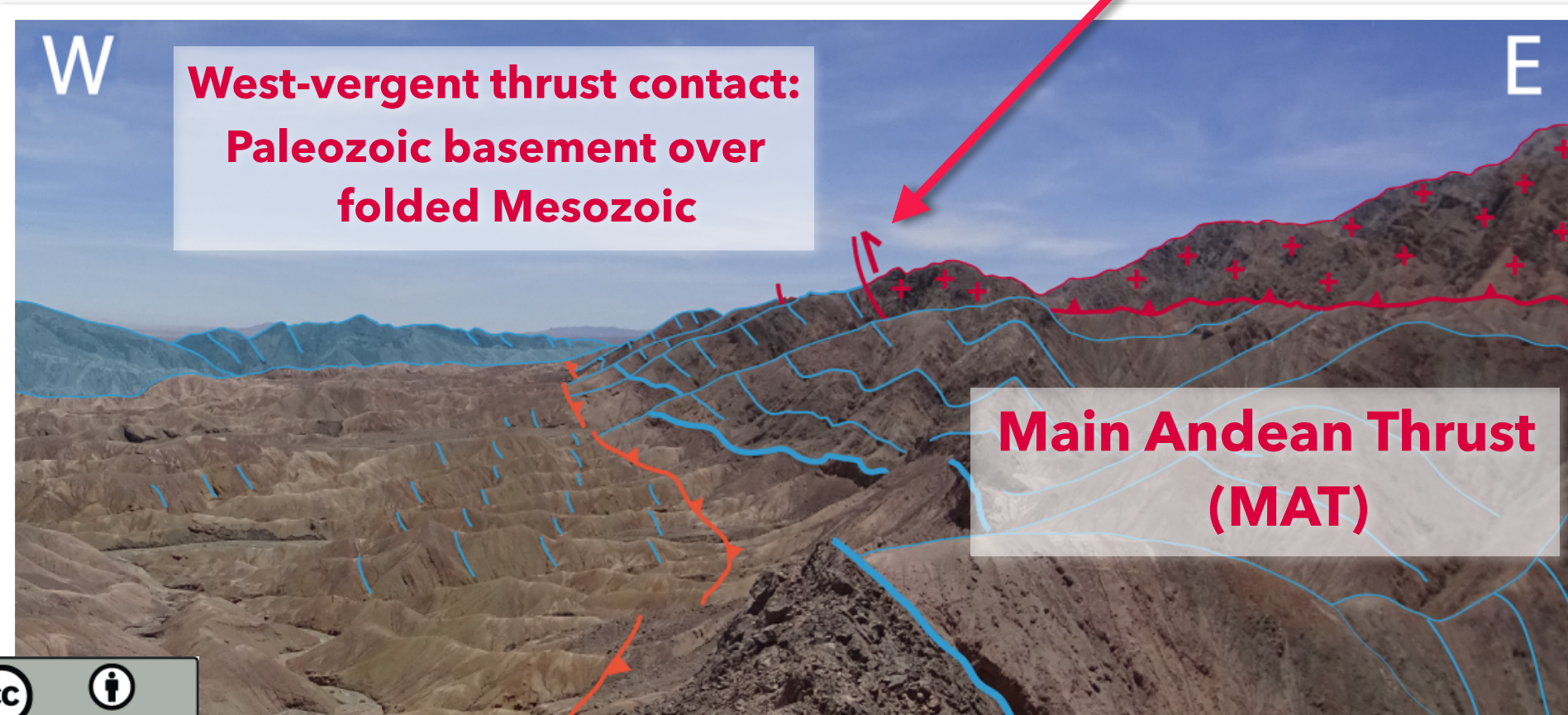
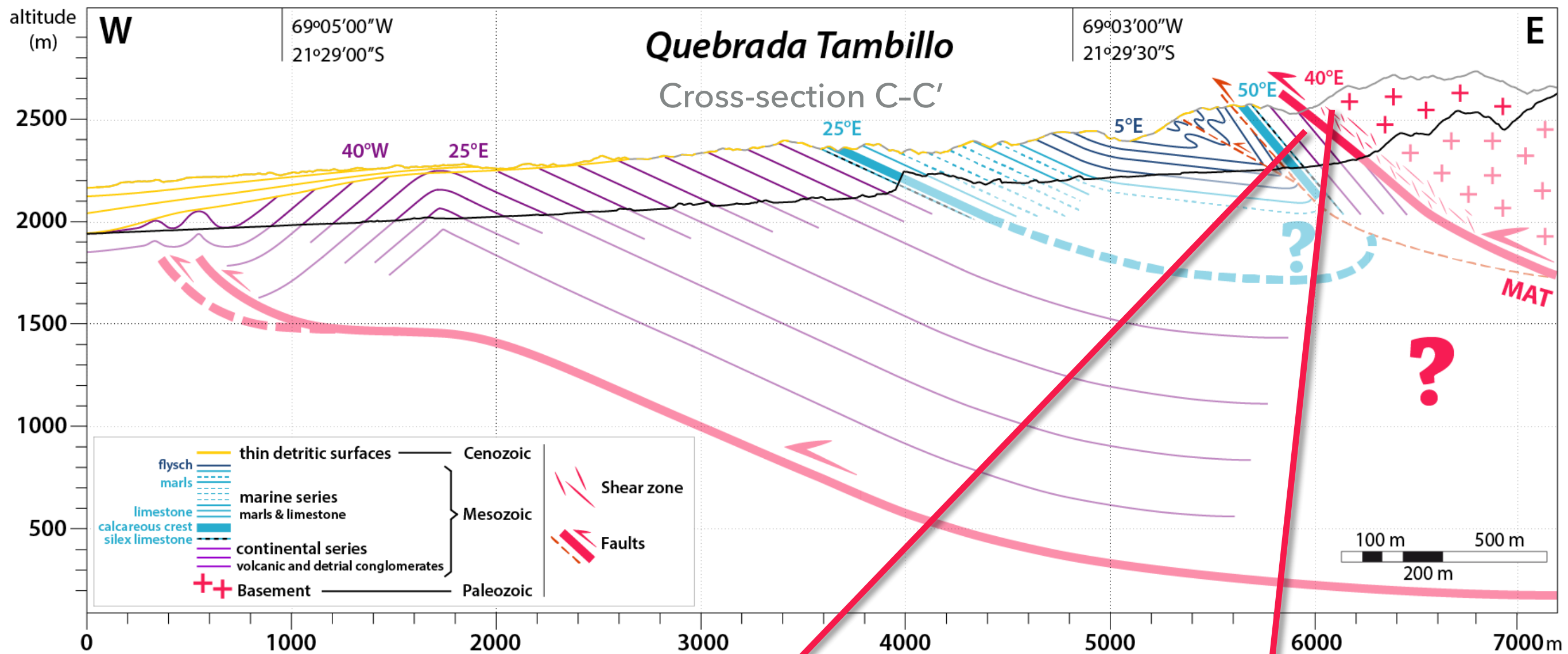
DATA & METHOD

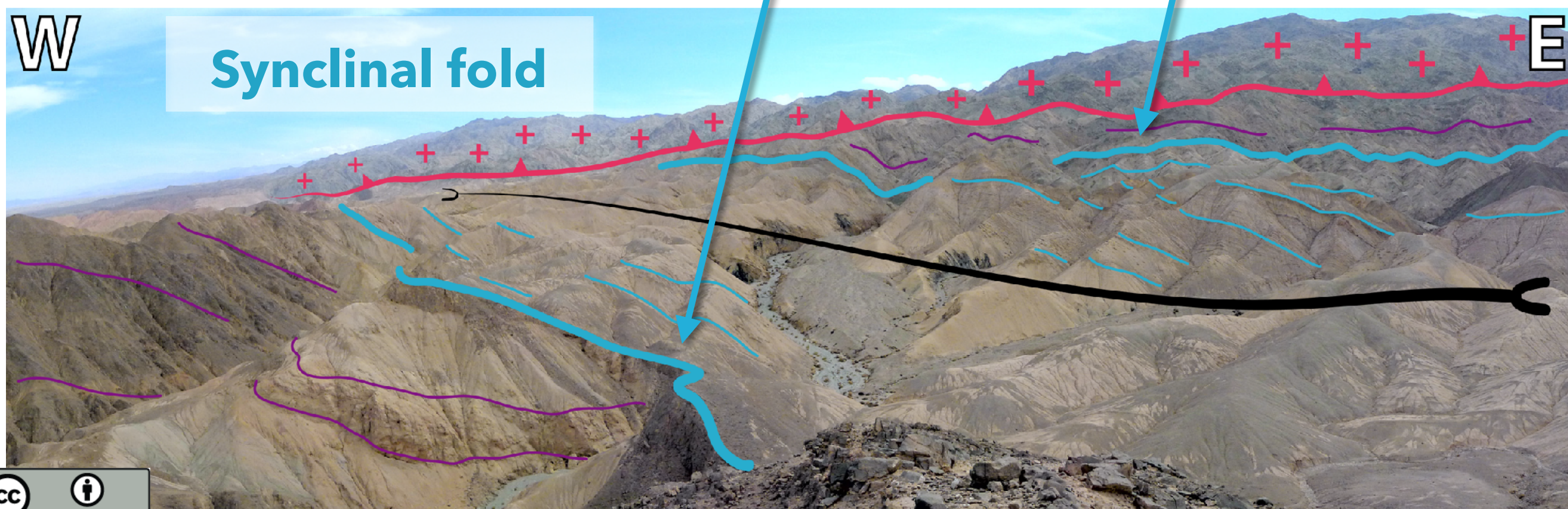
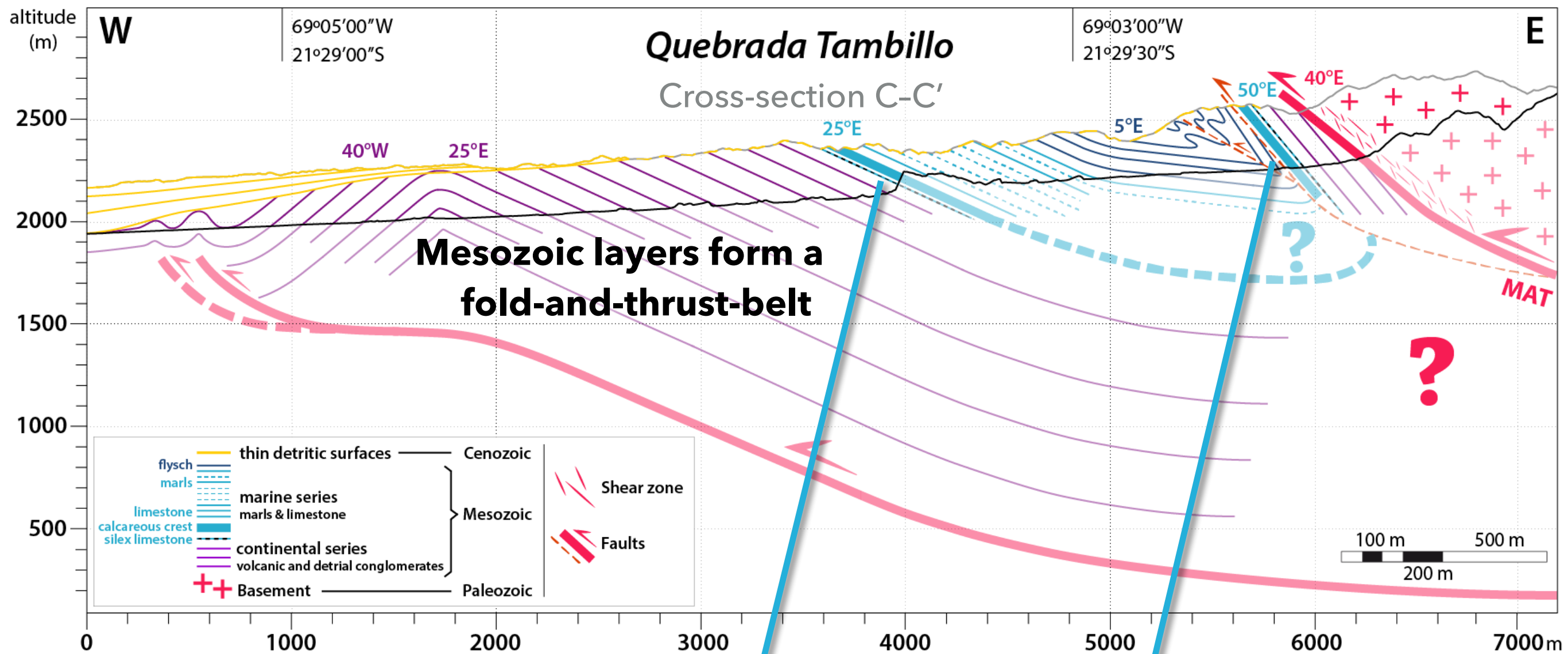
- Synthesis of existing geological maps
- Field work
- Structural and geomorphological mapping
- Seismic profiles
- Establishment of structural maps and quantitative cross-sections

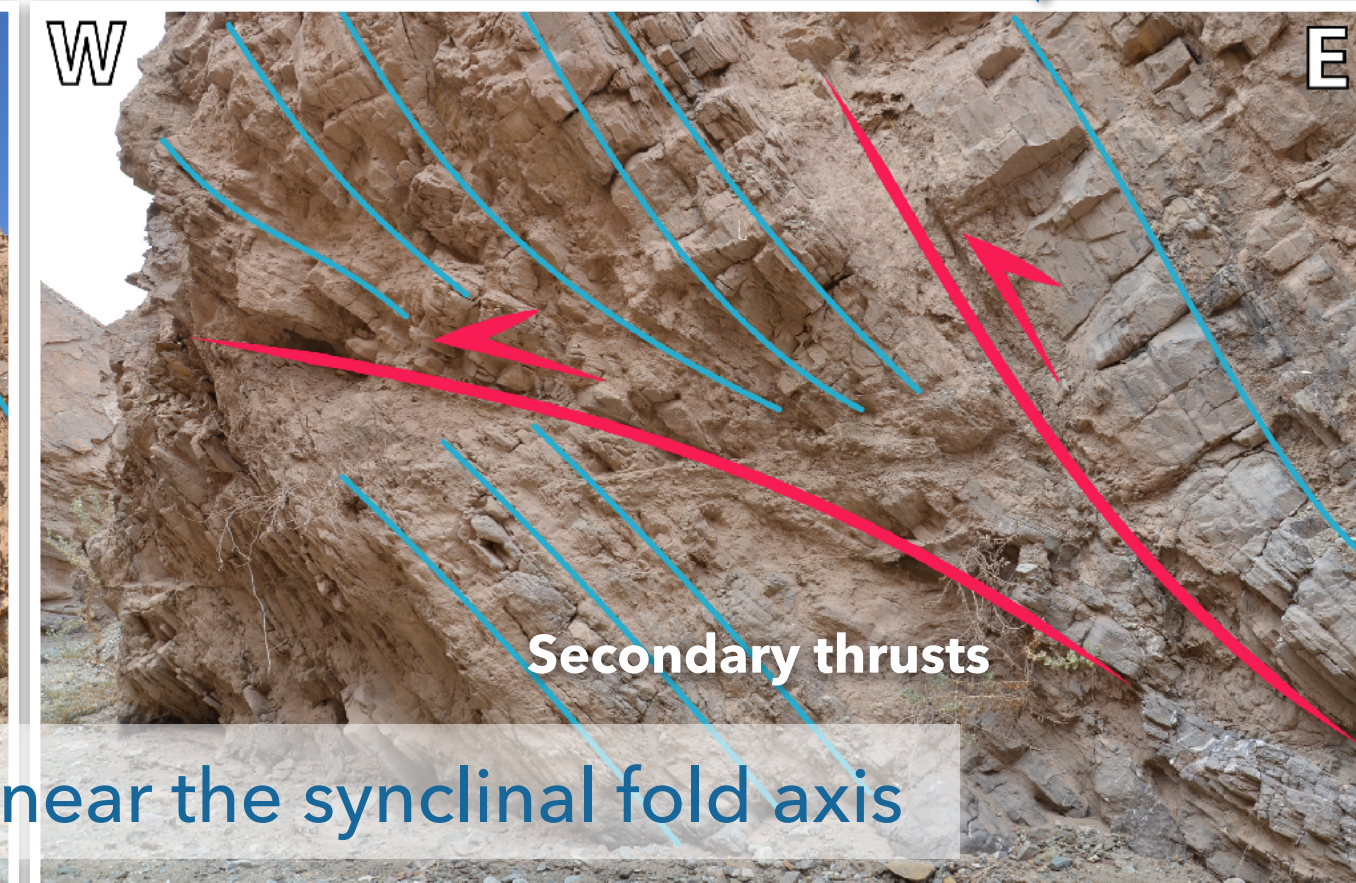
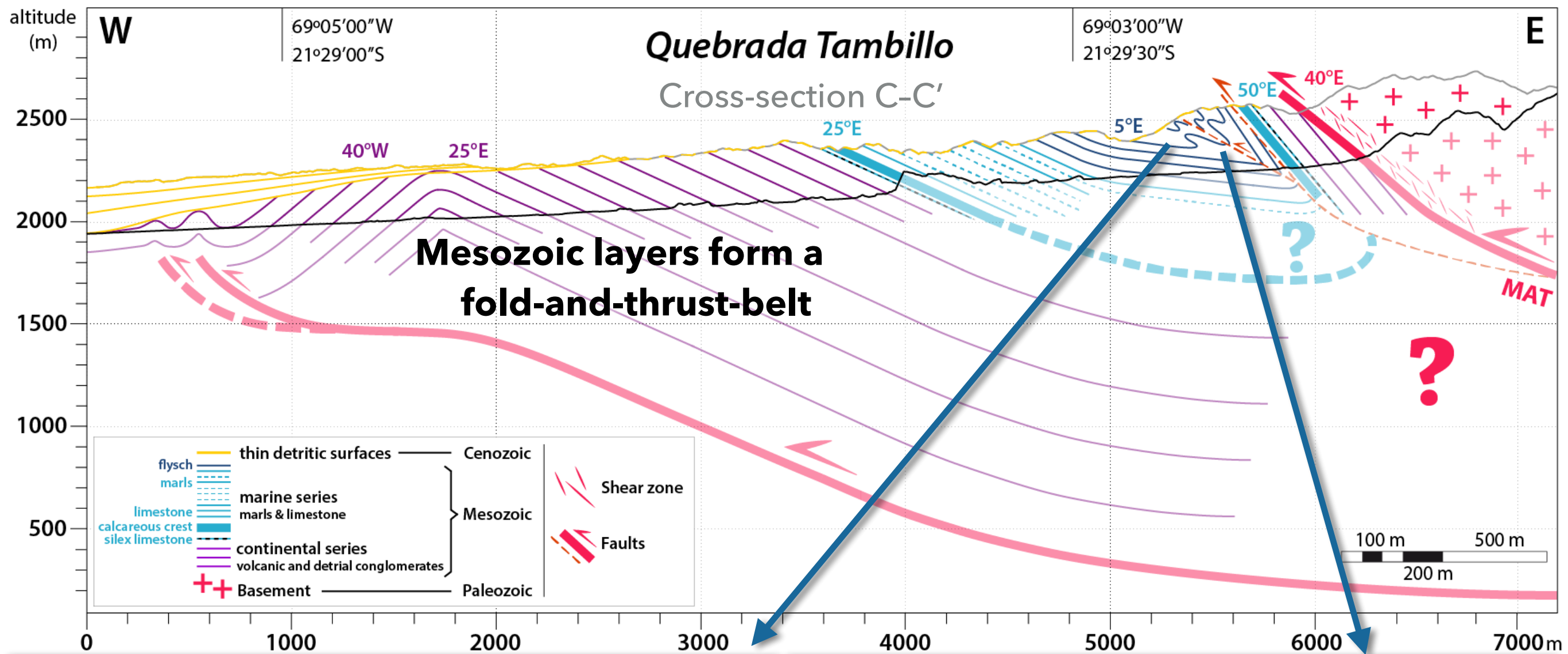
Google Earth satellite imagery & very high resolution DEM's from 0.5m Pléiades images

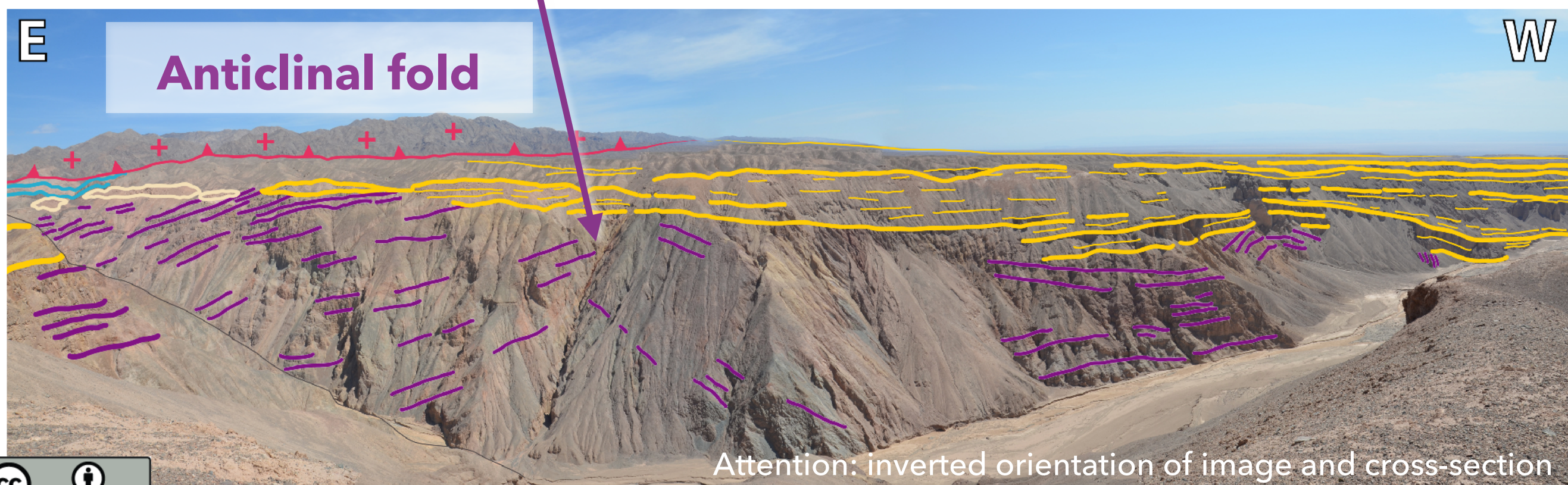
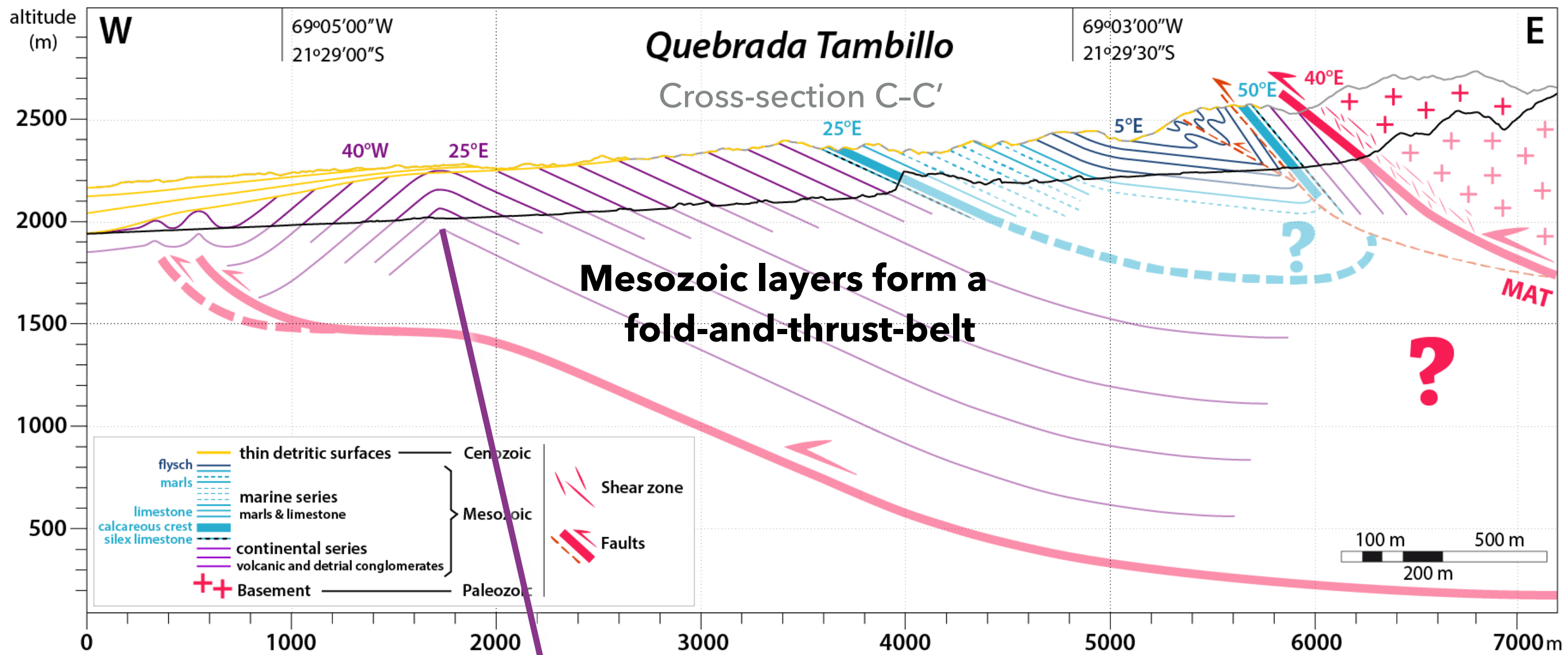
Empresa Nacional del Petroleo (ENAP)
(after interpretations from Victor et al., 2004 ; Jordan et al., 2012 ; Labbé et al., 2018)









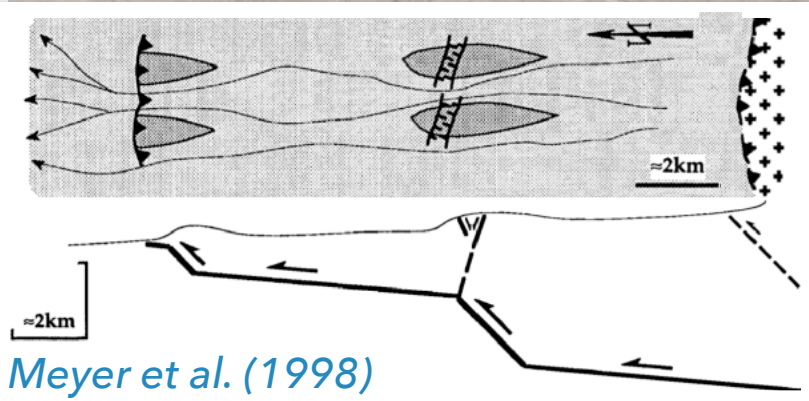


Considerable deformation documented on a few kilometer-wide outcrop...

... but at the larger scale of the whole western flank, supplementary information are needed:

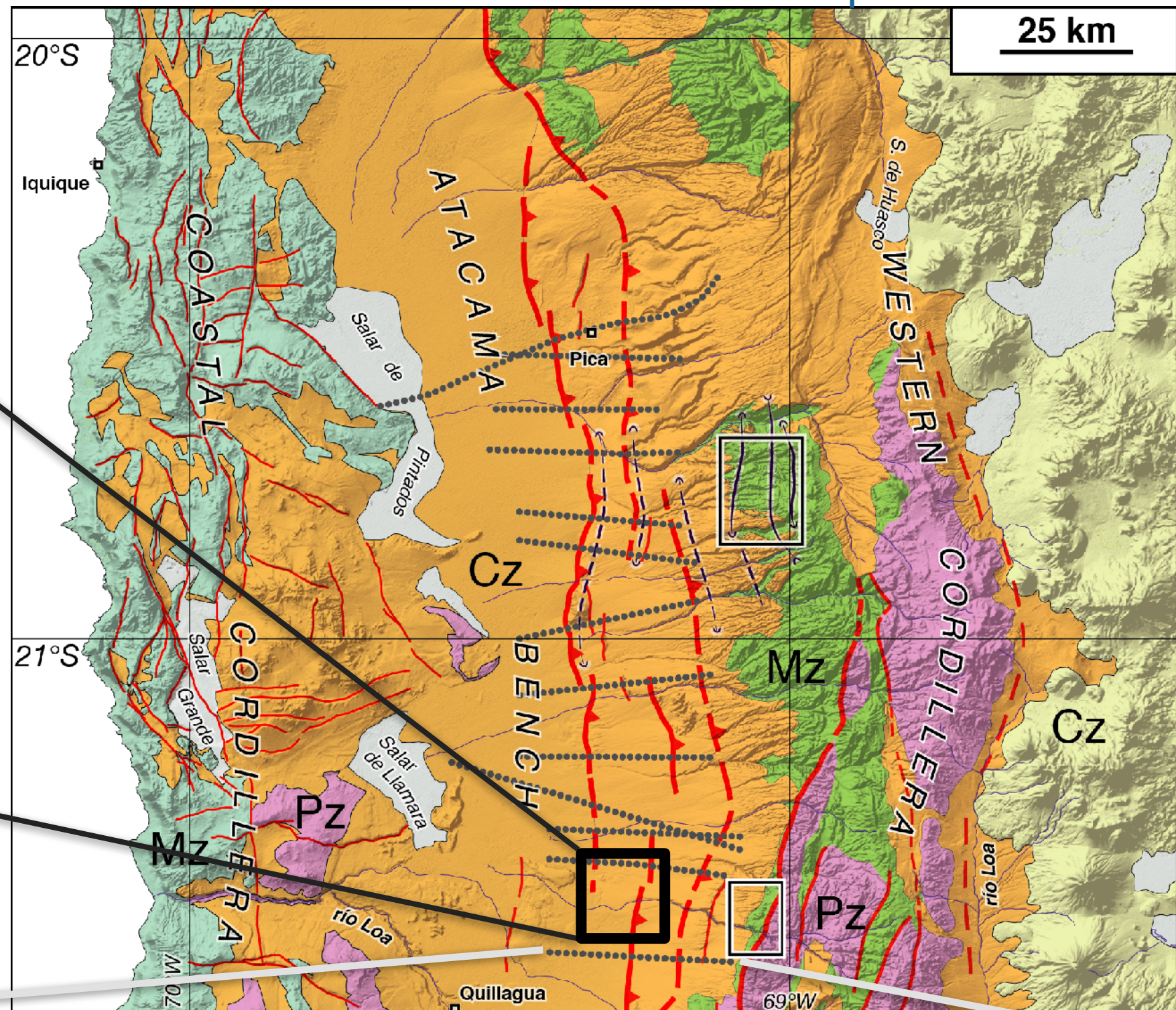
Geomorphological studies

Kilometric almond-shaped surfaces with normal faults near the hinge...



Meyer et al. (1998)

... related to fault-bend folding above a blind ramp linking 2 active décollement levels.



Seismic profile studies e.g. ENAP (Empresa Nacional del Petroleo) seismic profile 99-12

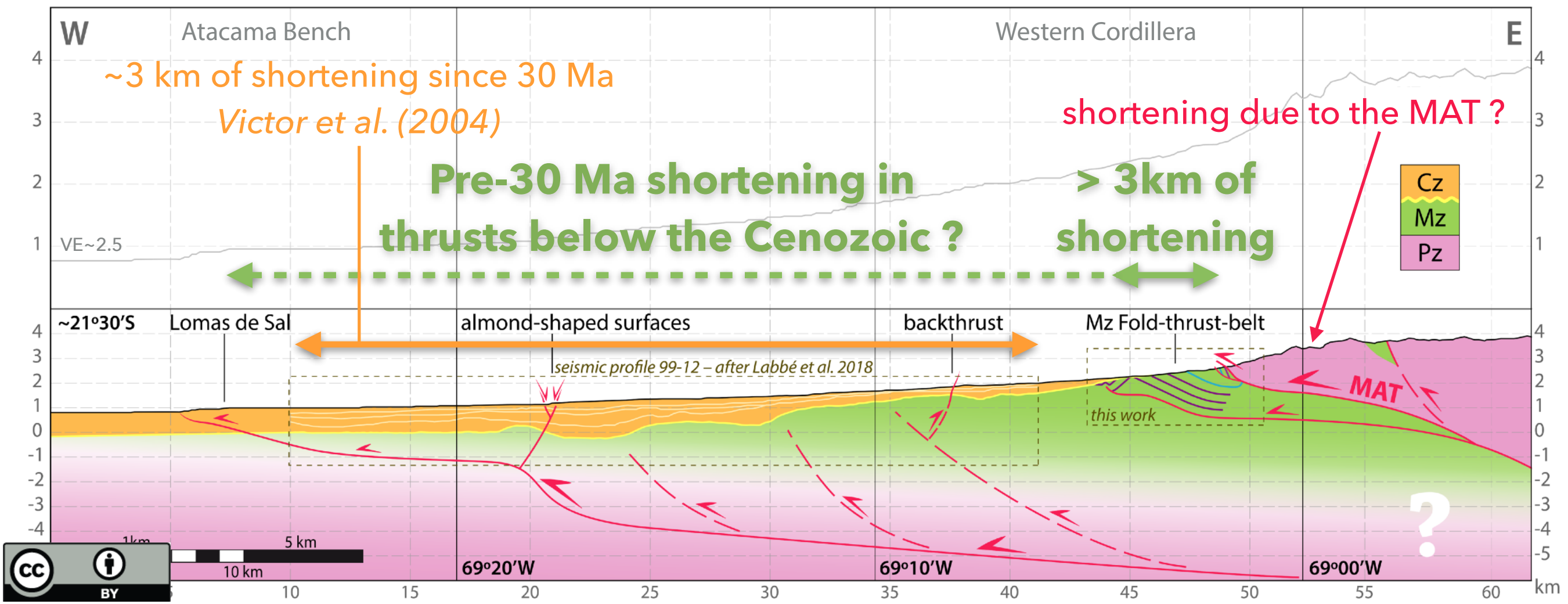
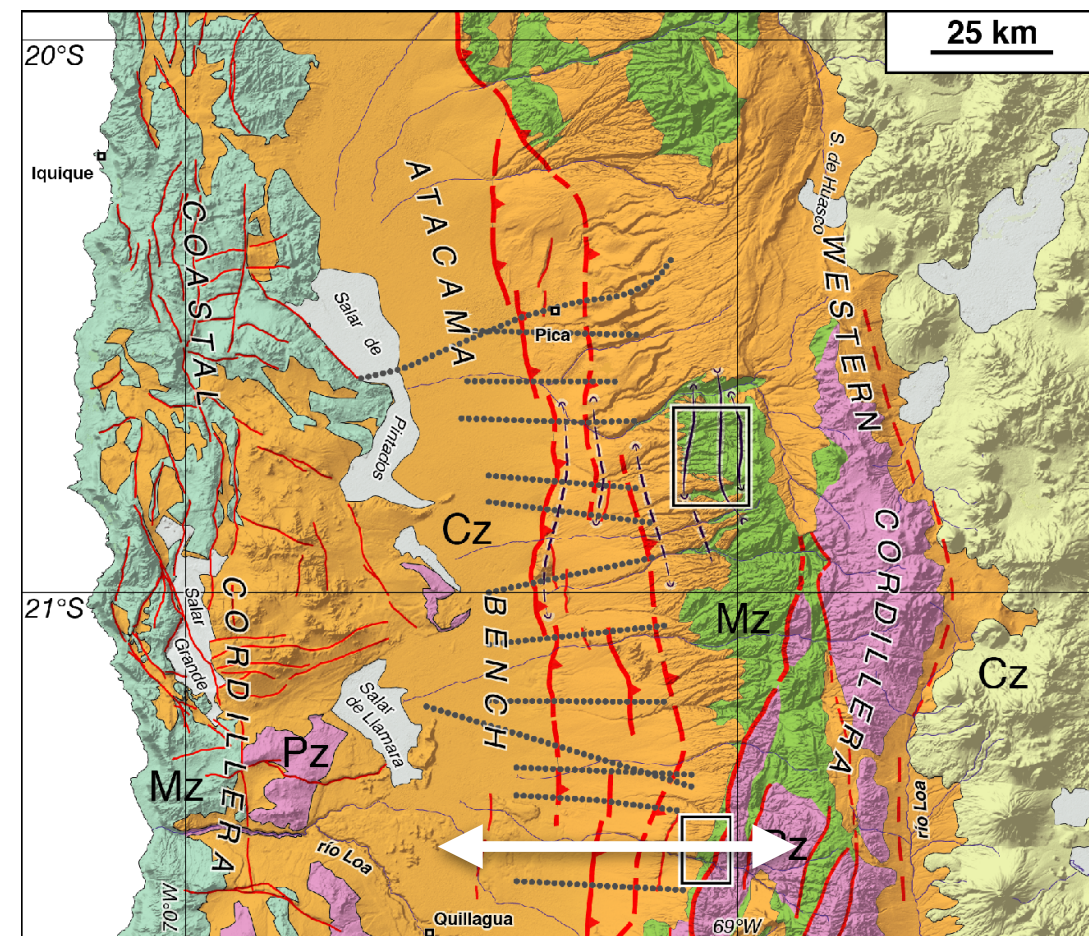


Several thrusts documented further west under the Cenozoic top cover.

Labbé et al. (2018)

Conclusion & Open Questions

- ▶ Major W vergent thrusting affecting Pz basement and fold-and-thrust-belt in Mesozoic. Less deformed, unconformable Cenozoic series.
- ▶ Shortening due to the MAT and to thrusts buried under the Cenozoic remains to be determined.
- ▶ Regional geological data and very preliminary thermochronological (U-Th)/AHe results suggest initiation of deformation at ~60 Ma. More work and modelling needed to better constrain timing.



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