

Internal deformation of the Dolomites Indenter, eastern Southern Alps: Orthogonal to oblique basin inversion investigated in crustal scale analogue models

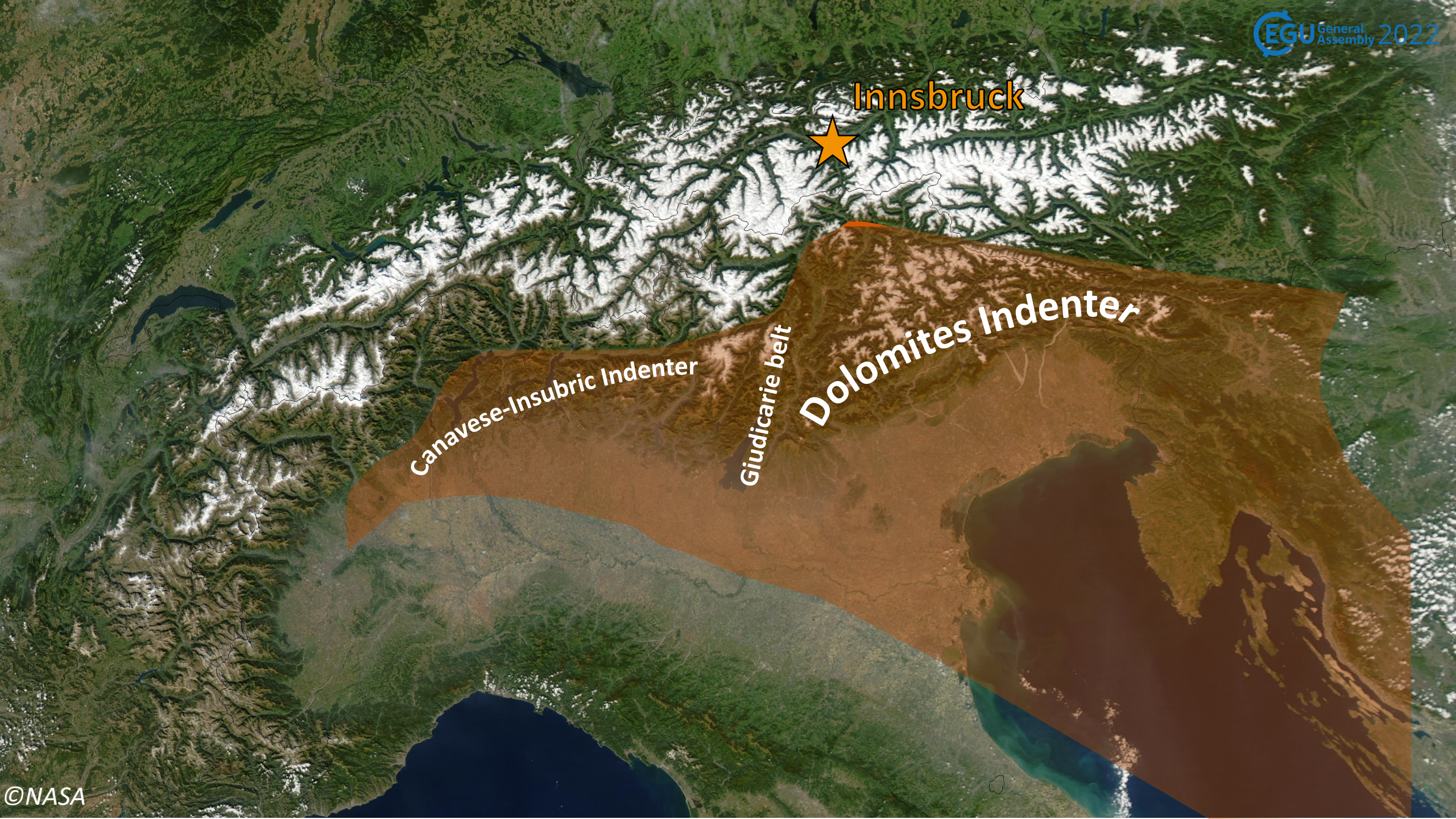
Anna-Katharina Sieberer^{1*}, Ernst Willingshofer², Thomas Klotz¹, Hugo Ortner¹, and Hannah Pomella¹

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Innsbruck



Canavese-Insubric Indenter

Giudicarie belt

Dolomites Indenter

why?

Innsbruck

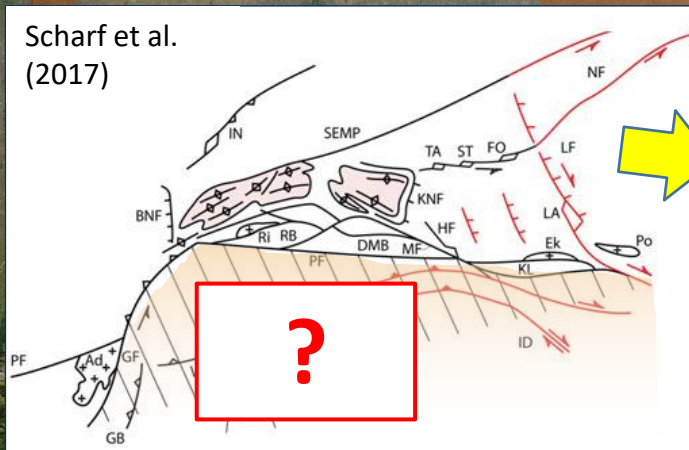


Canavese-Insubric Indenter

Giudicarie belt

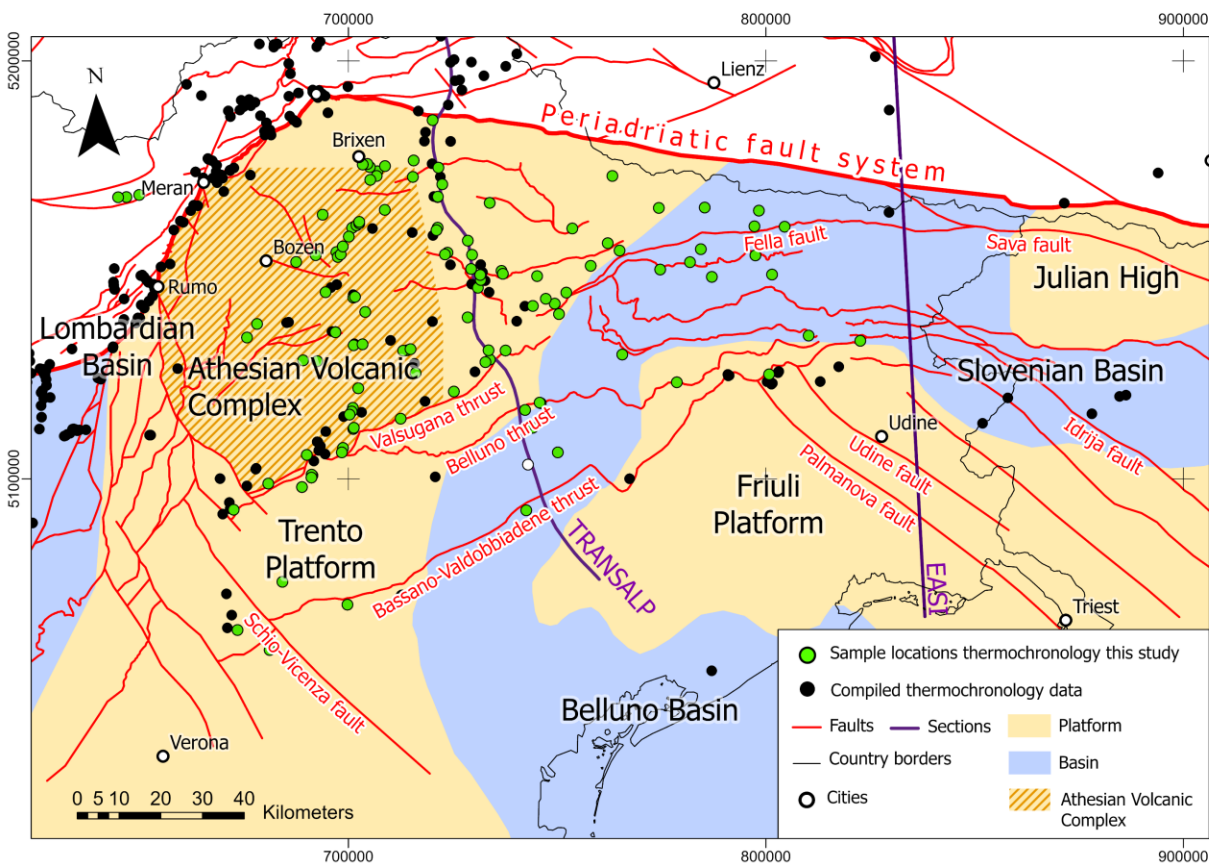
Dolomites Indenter

Scharf et al.
(2017)



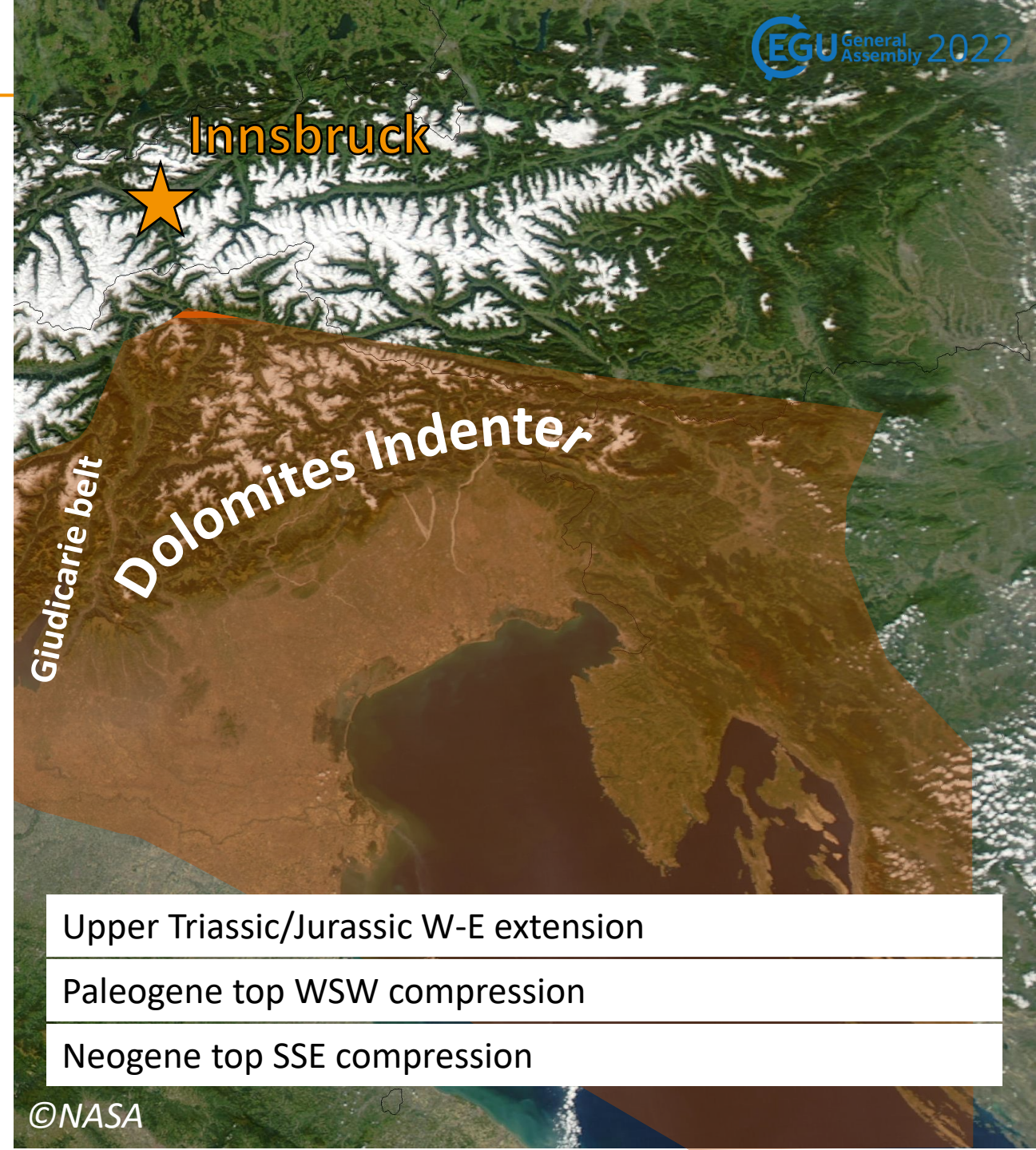
Indenter: "... a relatively rigid, less deformed piece of continental crust, which has been pushed into weaker parts of the orogen." (Reiter et al., 2018)

what? Test the effect of Mesozoic extension on Neogene shortening using crustal scale analogue models



For more infos on thermochronology data check out [Klotz et al.](#), session GD8.4

Platform/basin configuration modified from Busetti et al. (2010), Masetti et al. (2012), Picotti & Cobiainchi (2017), Martinelli et al. (2017).



Upper Triassic/Jurassic W-E extension

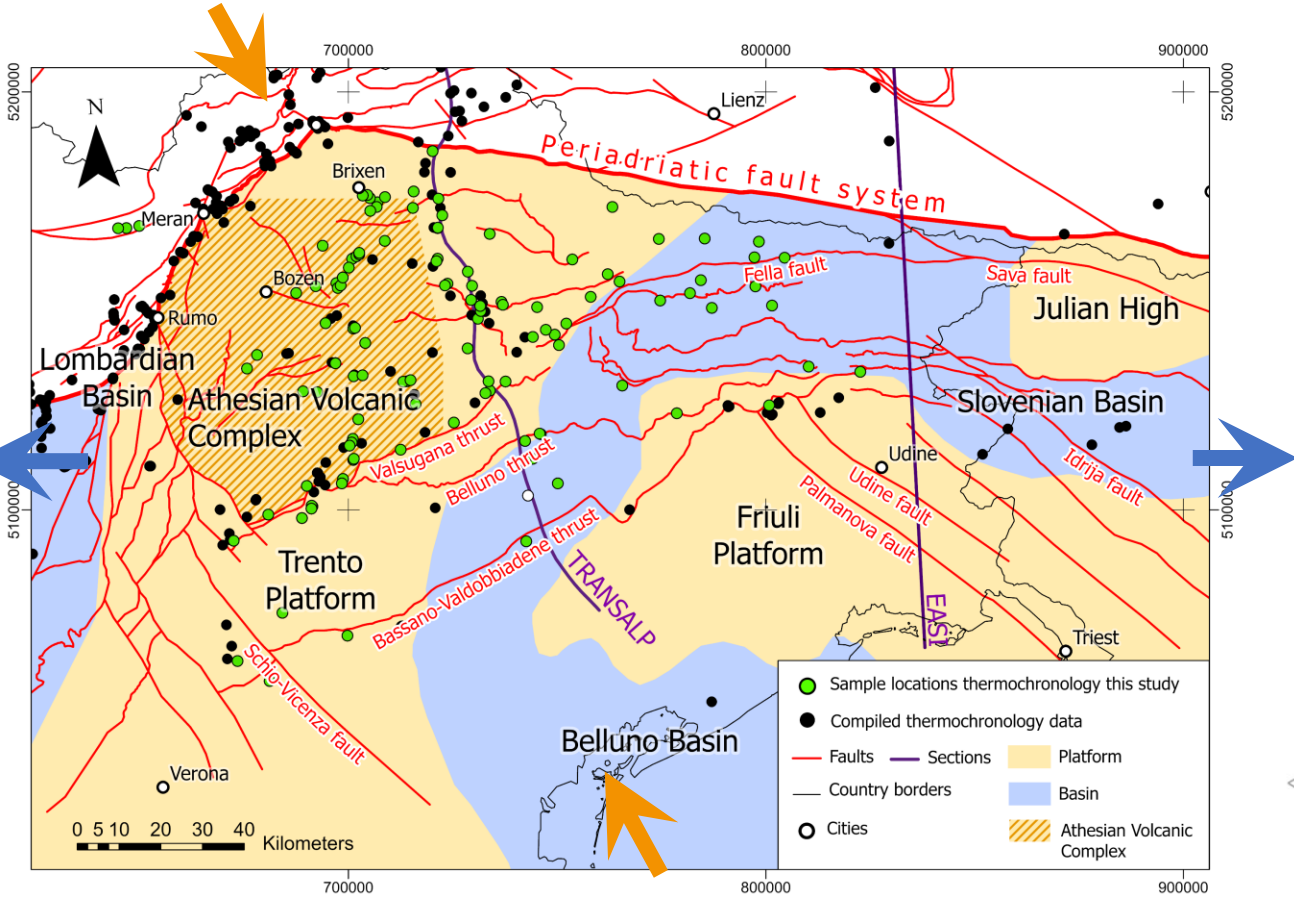
Paleogene top WSW compression

Neogene top SSE compression

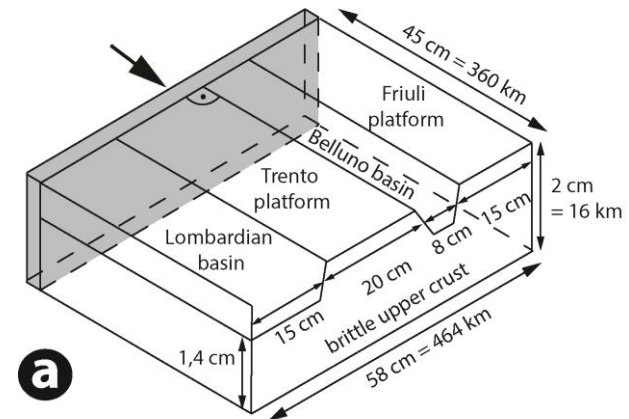


how?

Upper Triassic/Jurassic **E-W extension**
Neogene **NNW-SSE** directed **shortening**

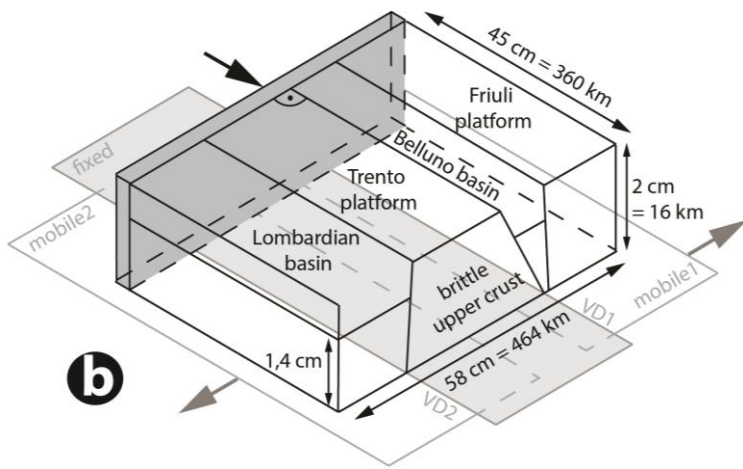


Platform/basin configuration modified from Busetti et al. (2010), Masetti et al. (2012), Picotti & Cobiانchi (2017), Martinelli et al. (2017).



a

1 cm model
= 8 km nature



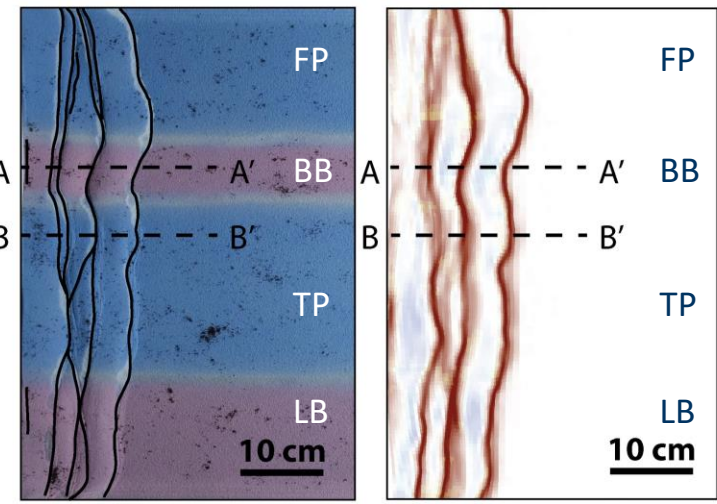
b

Pre-scribed strength contrast between platforms and basins, followed by one stage of **indentation** (black arrow).

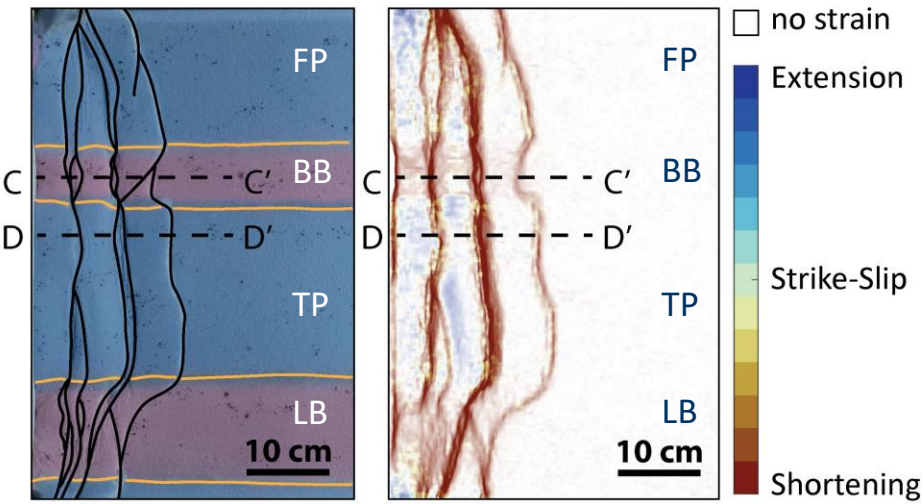
Graben structures were developed through an initial **extensional phase** (grey arrow), followed by **indentation** (black arrow).



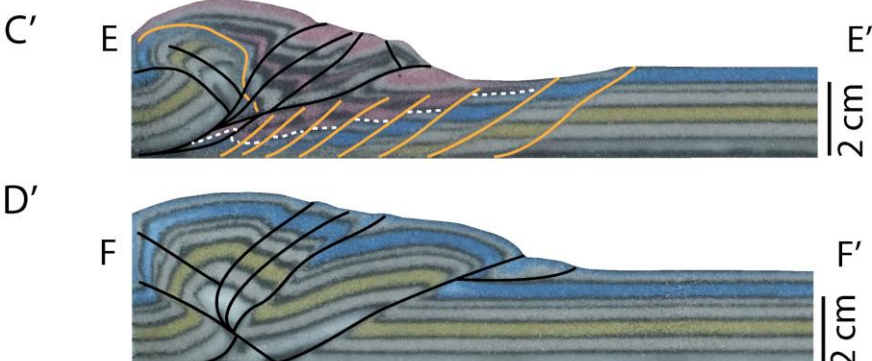
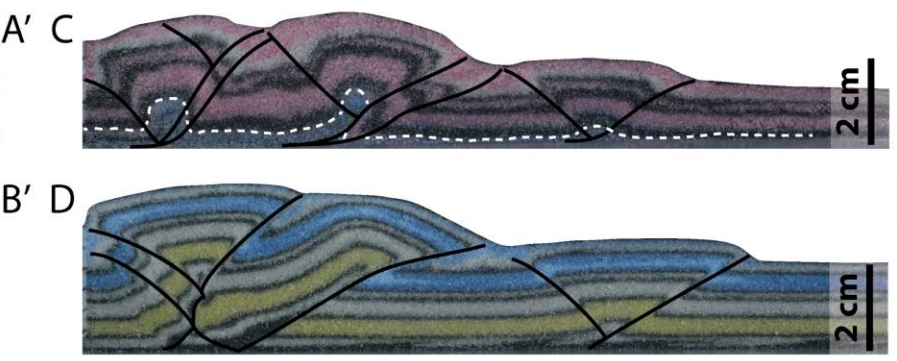
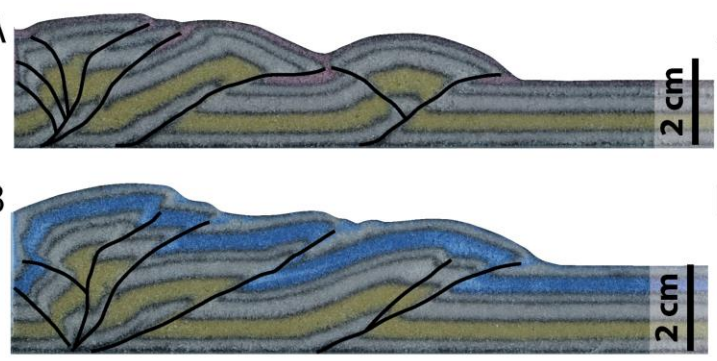
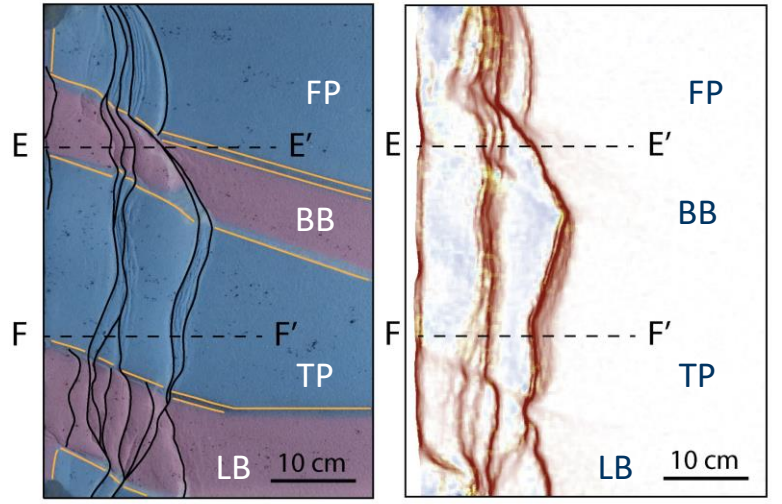
sub-series A



sub-series B



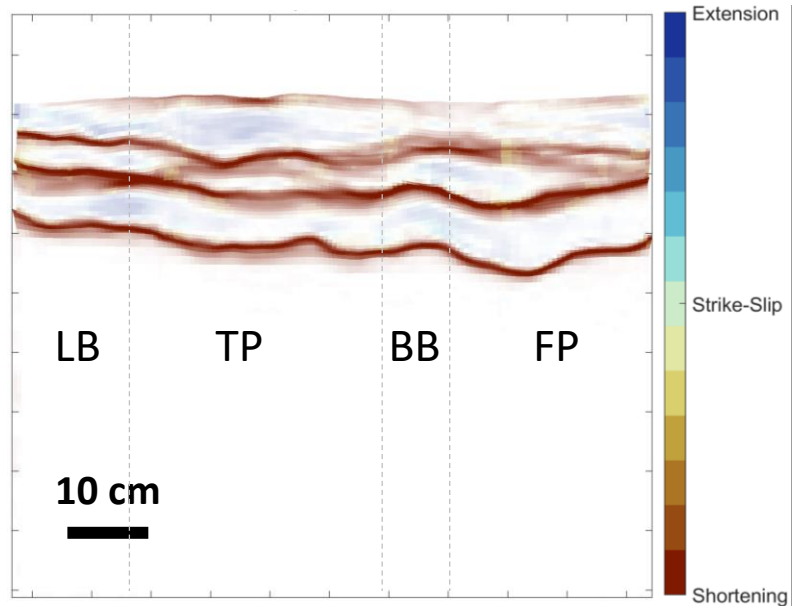
sub-series B



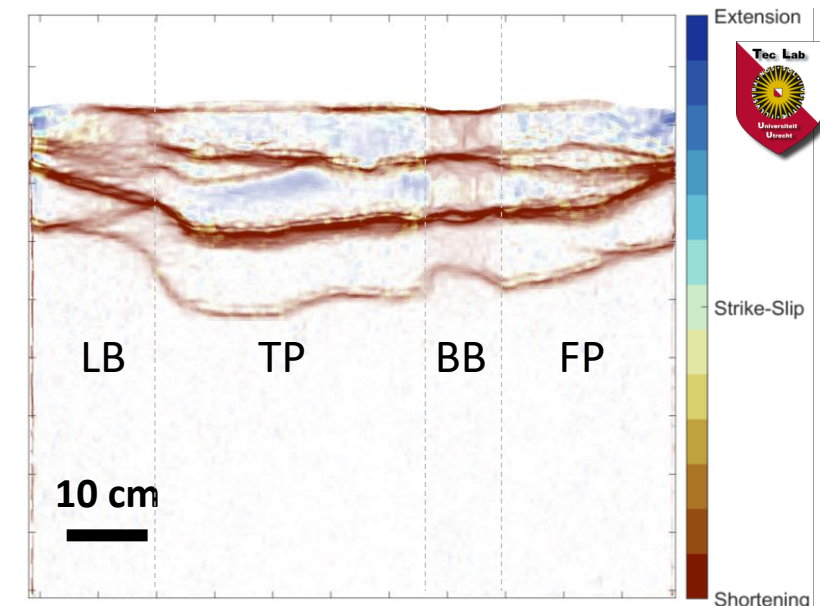
--- section — thrust fault — normal fault - - - - boundary between pre- and synrift sediments

LB...Lombardian basin BB...Belluno basin
TP...Trento platform FP...Friuli platform

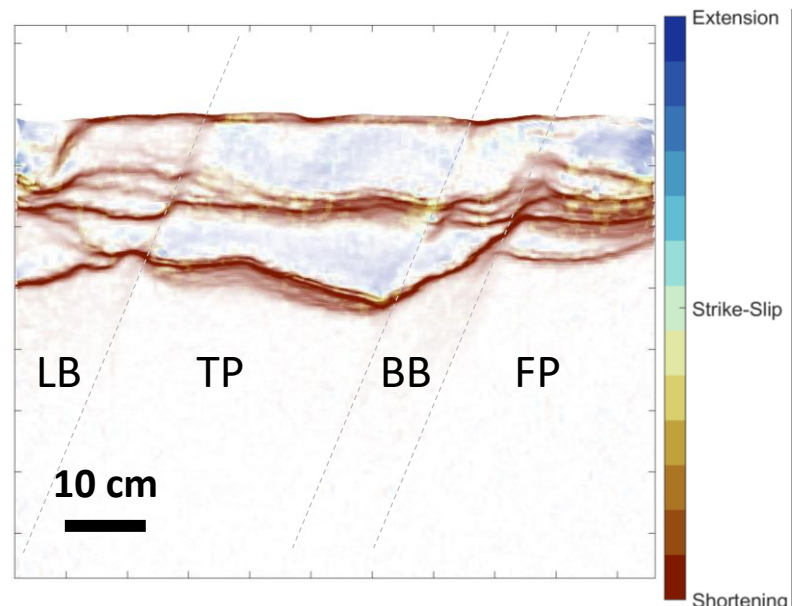
Pre-scribed lateral strength difference, *orthogonal* inversion, quartz sand only



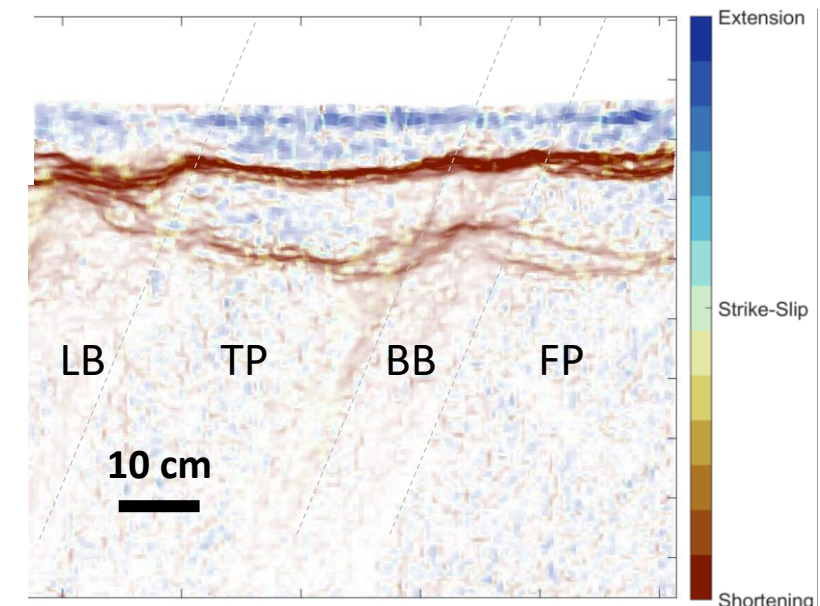
Extension, followed by *orthogonal* inversion, quartz sand only



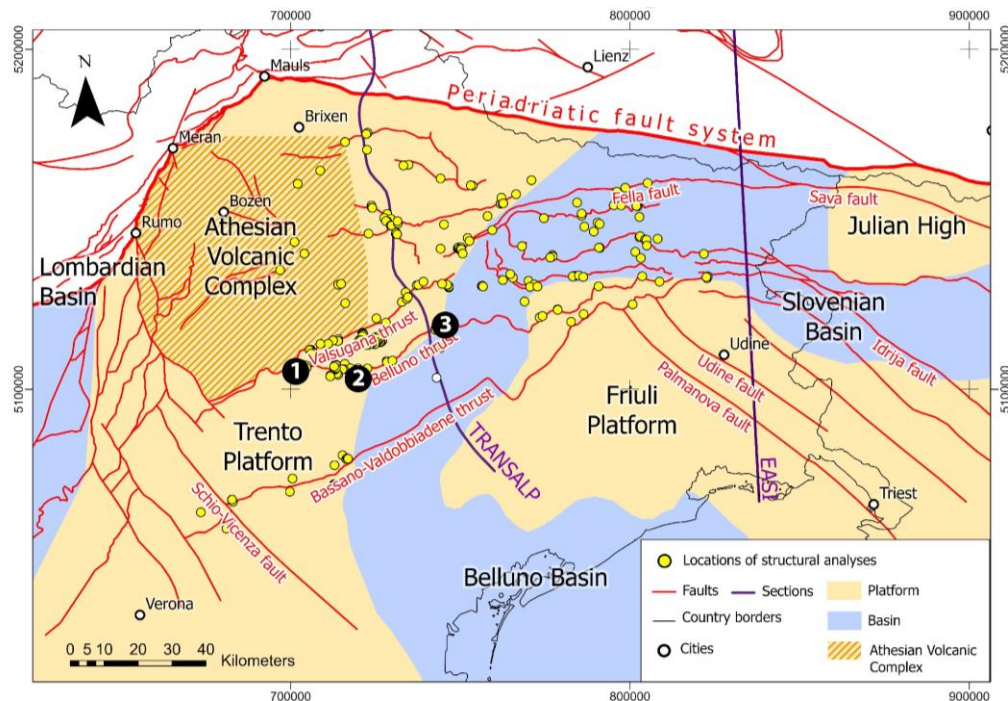
Extension, followed by *oblique* inversion, glass beads at base



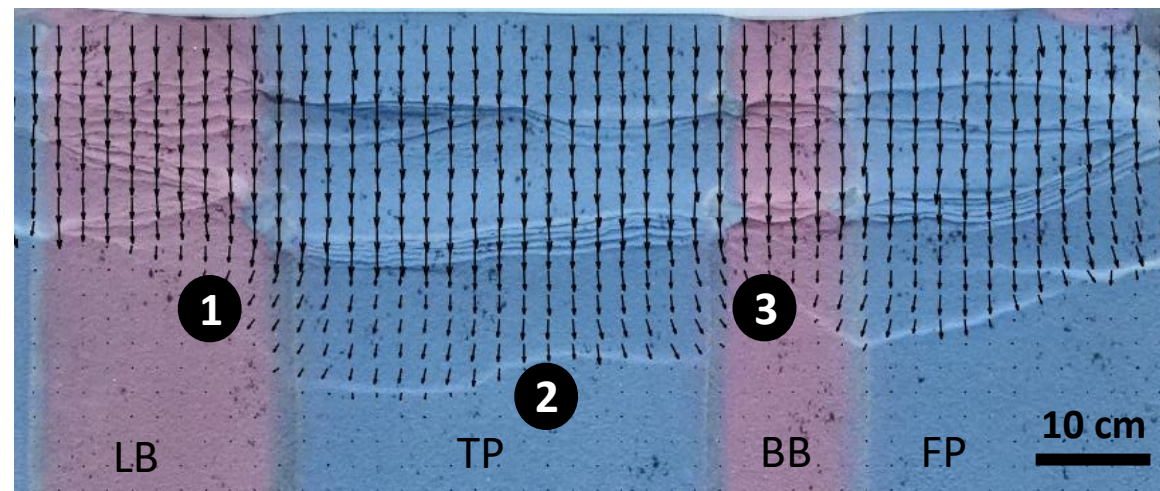
Extension, followed by *oblique* inversion, silicon putty at base



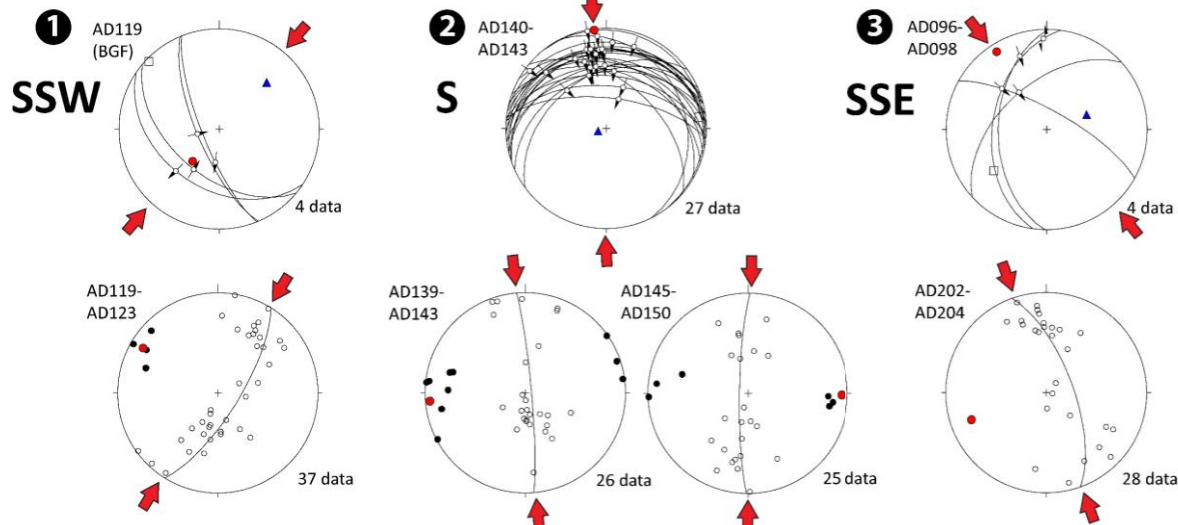
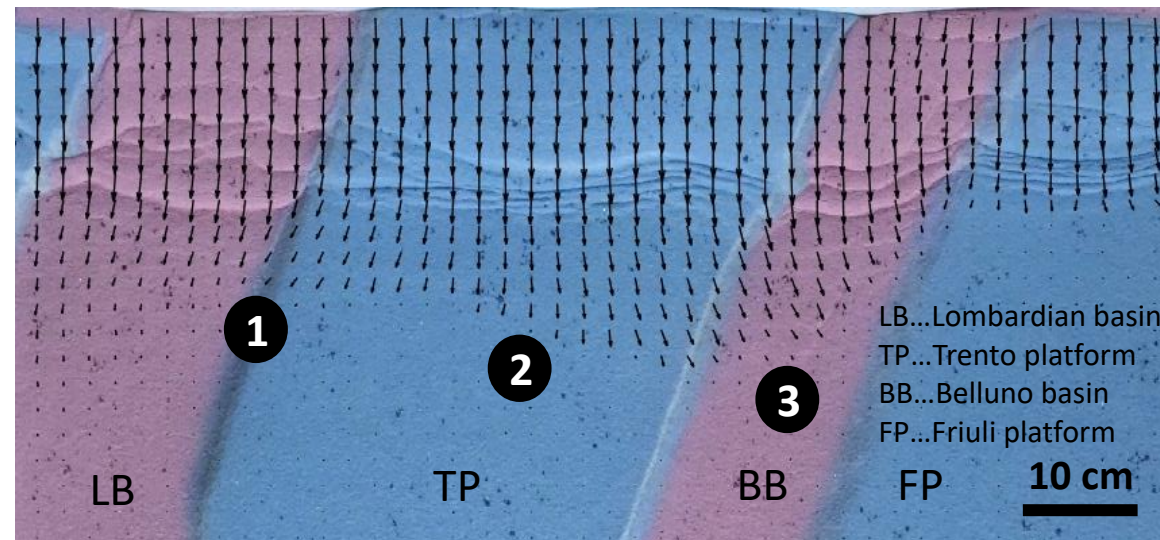
LB...Lombardian basin
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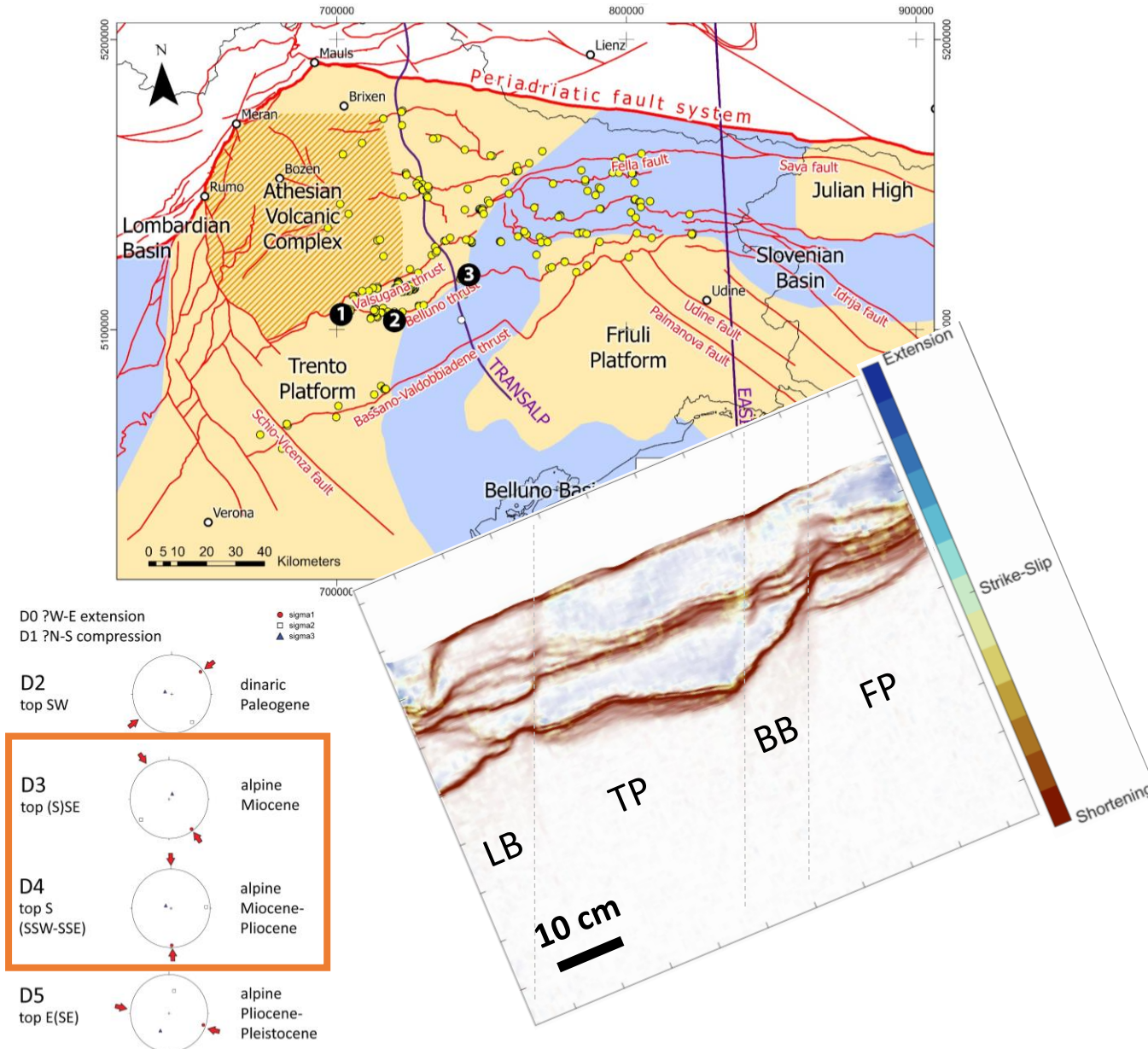


PIV analysis of sub-series B, *orthogonal* inversion, quartz sand only



PIV analysis of sub-series B, *oblique* inversion, glass beads at base





- Modelling results confirm the localisation of deformation in areas of lateral strength contrasts (Brun and Nalpas, 1996), as transitions from platforms to basins represent.
- The overall style of deformation is less dependent on the material of the basal décollement (either quartz sand, glass beads, or silicon putty).
- **The overall style of deformation is ruled by the inherited platform/basin-configuration.**
- Shortening directions of several studied faults change along strike.
- We infer that the **variability of shortening directions** along those thrust faults **depends on inherited geometries; and may not be the result of various deformational phases.**

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