Syn-tectonic sand intrusions - an added complexity to a highly deformed fold and thrust belt and implication for subsurface structural interpretation: Eastern Carpathians Bend Zone, Romania

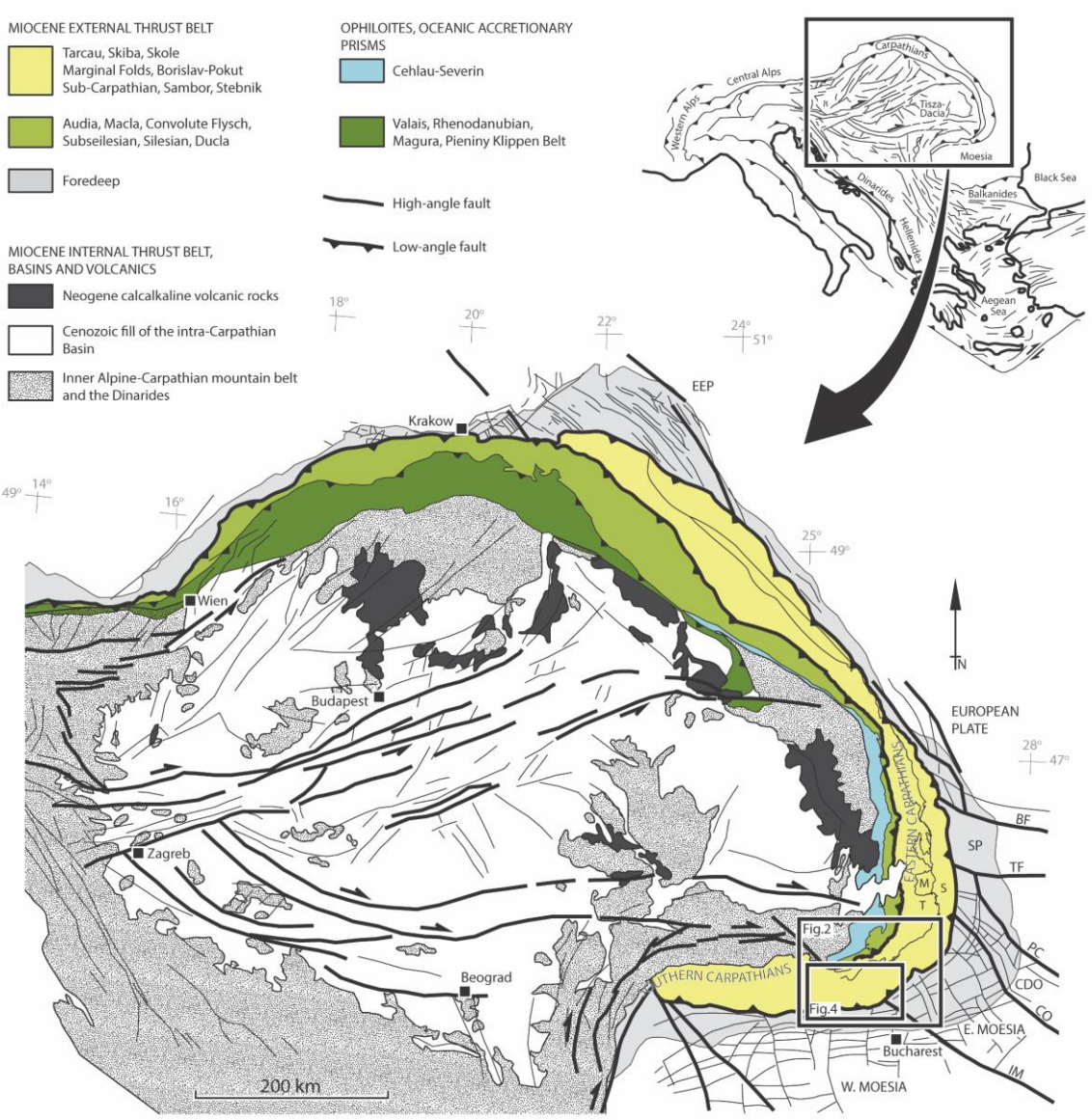
Dan M. TĂMAȘ[1]

Alexandra TĂMAȘ[2]

Zsolt SCHLÉDER[3]

Csaba KRÉZSEK[4]

Geological introduction to the area

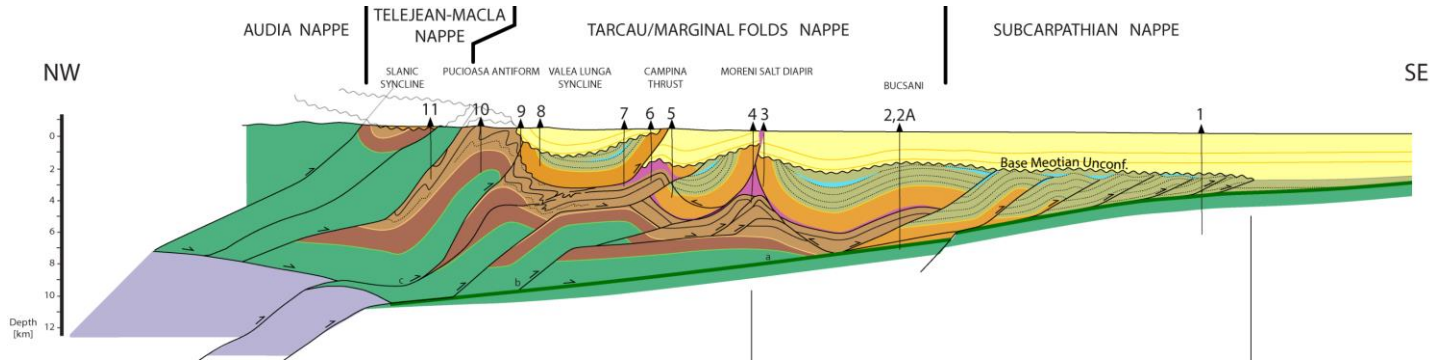


Tectonic map of the Romanian Carpathians ***(Schleder et al., 2019)***

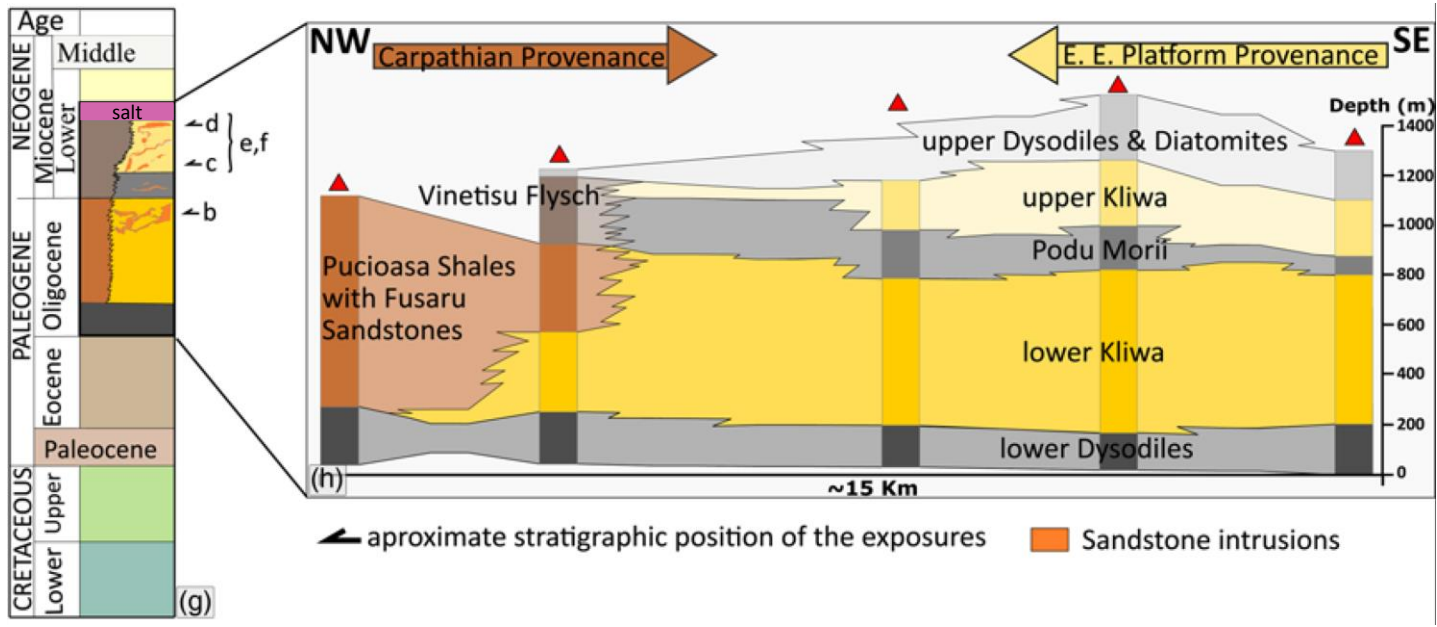
- Fold-thrust-belts represent notorious challenging environments for creating structural models of the sub-surface
- It is such the case for the Eastern Carpathian Bend Zone (ECBZ), part of the Romanian Carpathians
- The Carpathians record the closing of the Alpine Tethys between latest Jurassic and mid-Miocene
- The ECBZ hosts the largest onshore oil fields in Romania and is a highly mature hydrocarbon area

Geological introduction to the area

- ECBZ is characterised by superimposed tectonic events and multiple detachment levels
- High complexity of sub-salt reservoirs
- Difficulties arise when correlating due to scattered dip data, abrupt changes in reservoir thickness and net-to-gross ratios
- One reason for this heterogeneity is the presence of sand intrusions



Geological cross section through the AOI *(Schleder et al., 2019)*



Stratigraphic column of the studied geological units *(Tamas et al., 2020)*

Investigated outcrops

(b) Colti – alternating shales (grey) and sandstone (yellow) units

(c) Valea Rea – sandstone dominated, overturned and dipping NNW

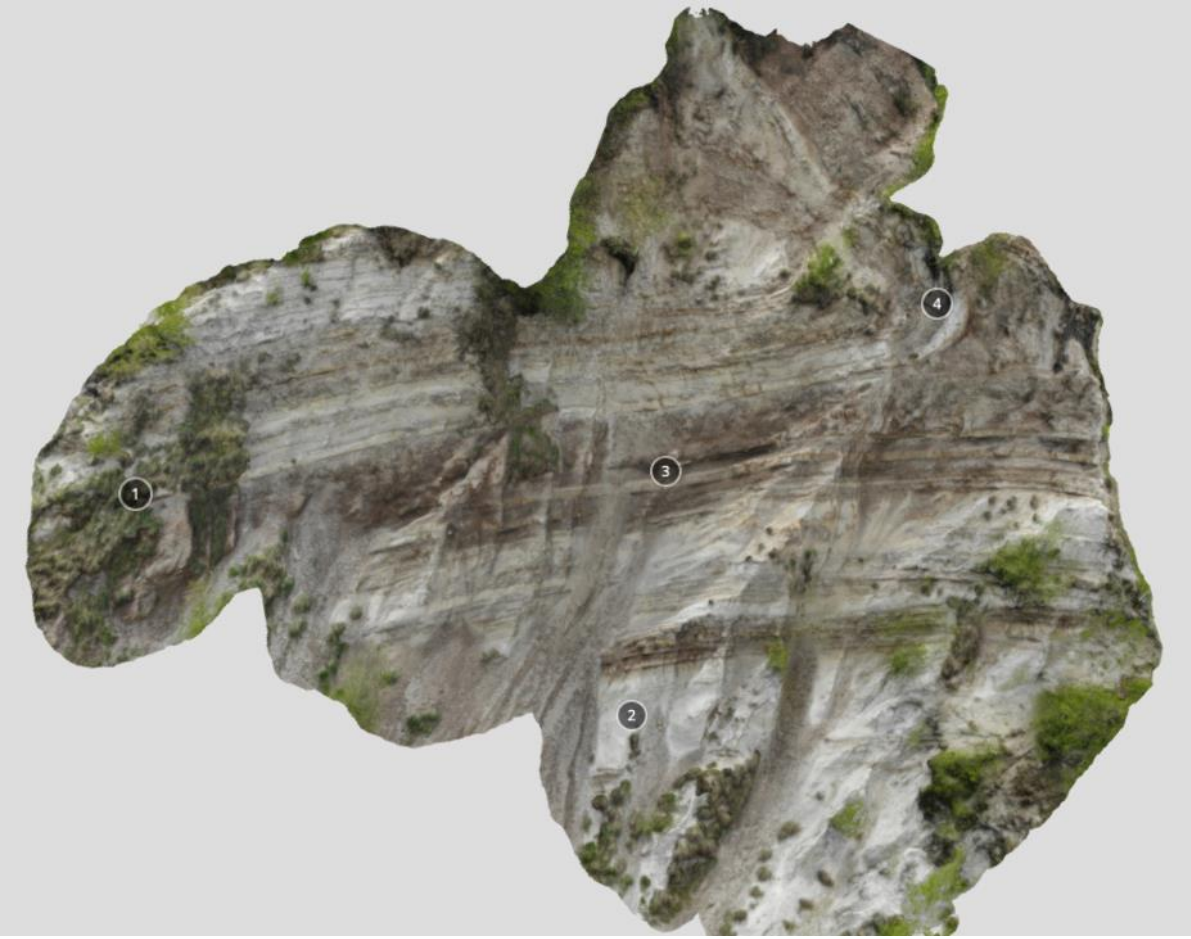
(d) Sibiciu – recumbent fold verging WNW

(e) Teleajen River – beds steeply dipping

(f) Poiana Copaceni – core of an anticline exposed due to quarrying

Overview of the studied locations *(Tamas et al., 2020)*

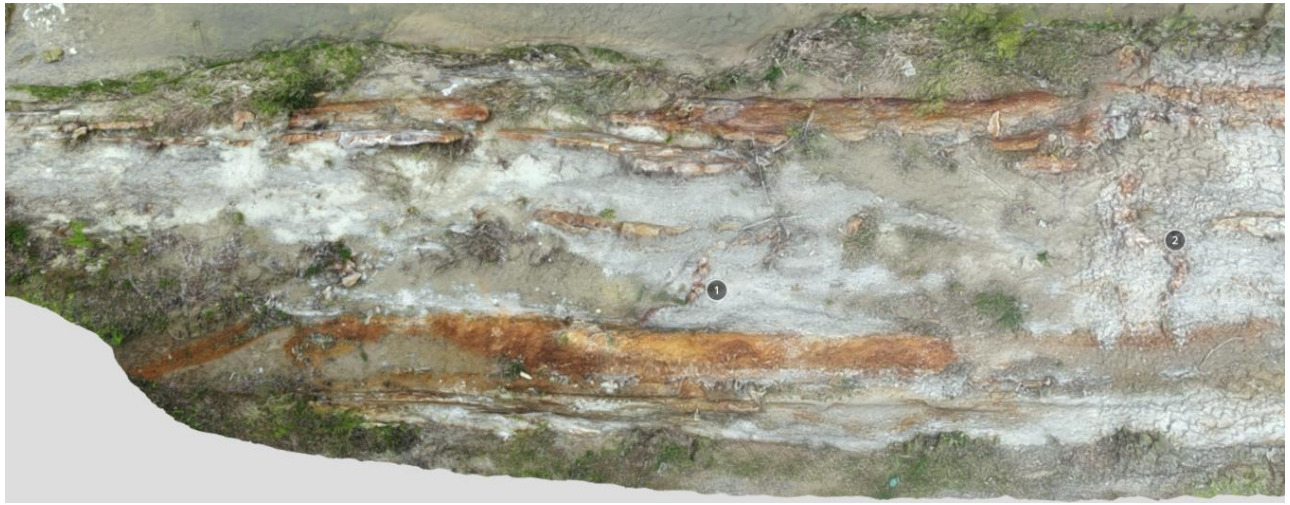
Check them out in 3D (work in progress)



Recumbent fold near Sibiciu de Sus, Buzau, Romania

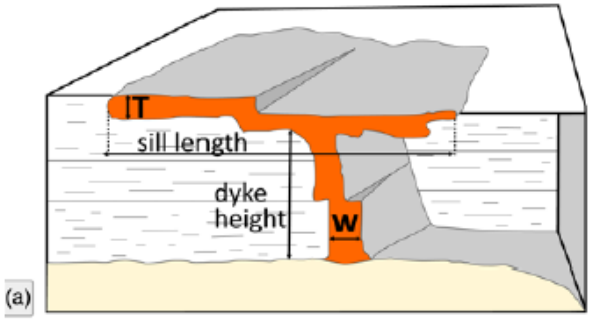
- Two of the studied 3D outcrops are now freely available on Sketchfab at:

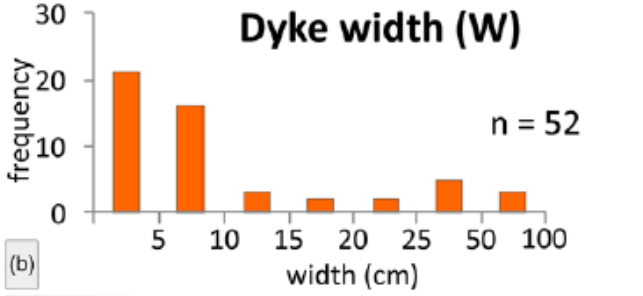
  https://sketchfab.com/danmircea.tamas

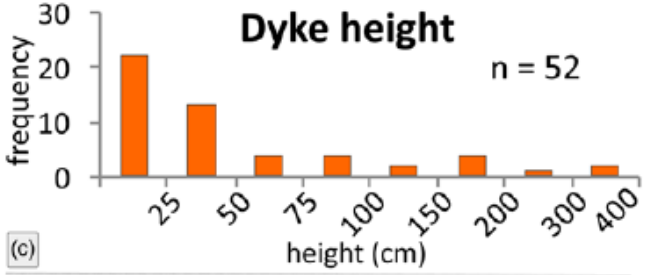


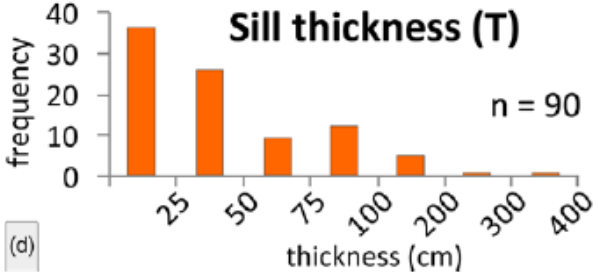
Exposure along the Teleajen River, Prahova, Romania

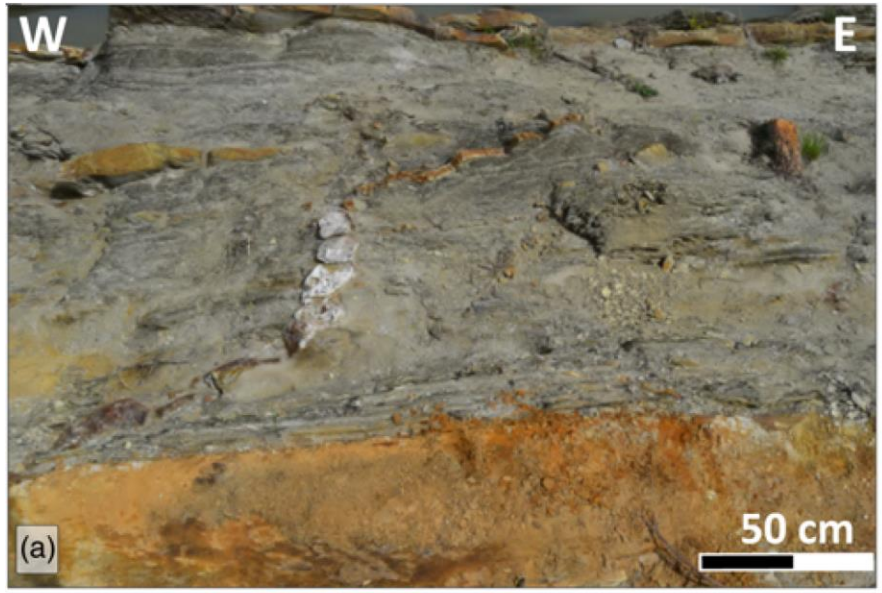
Sand intrusion statistics

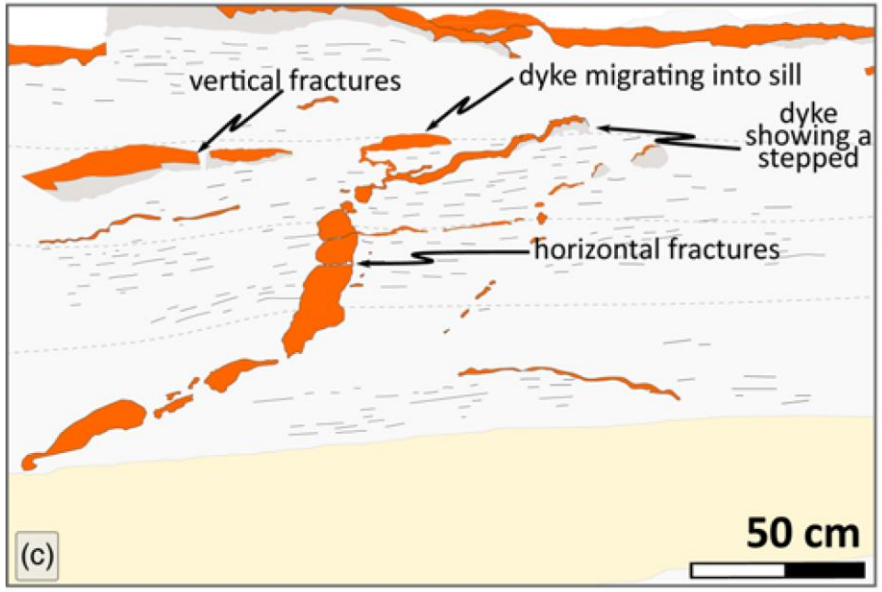


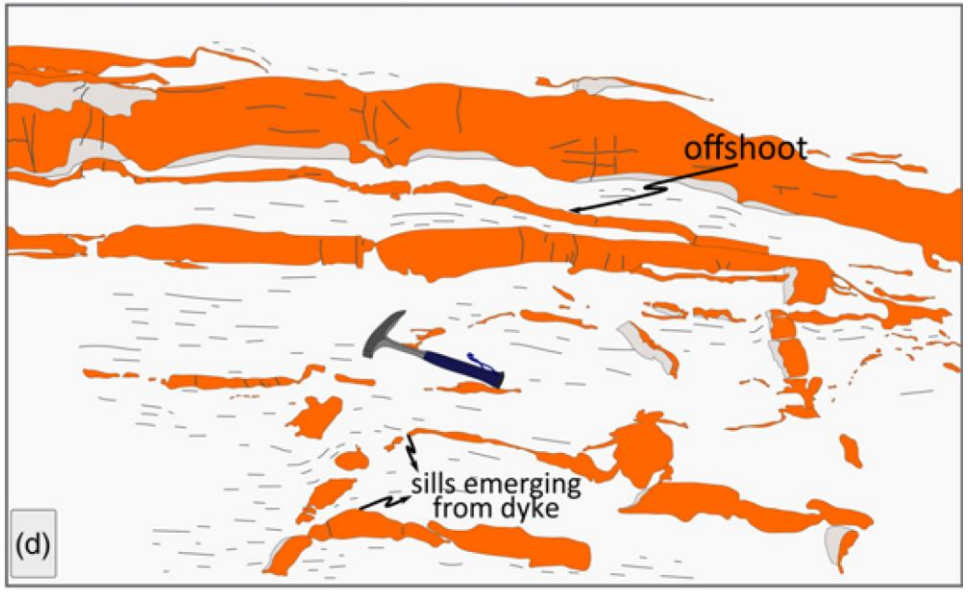








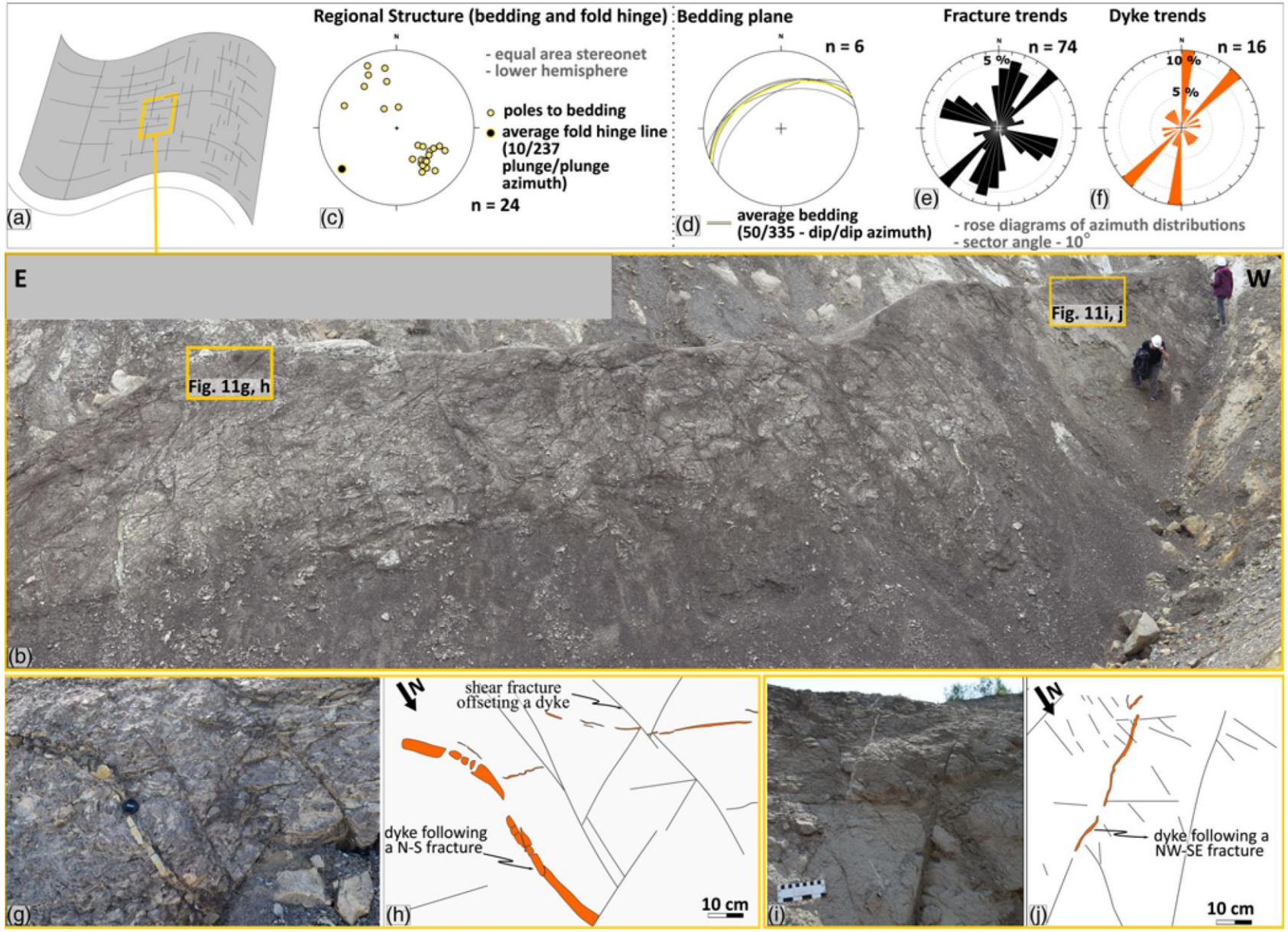




parent rock | sandstone intrusion | host rock

(Tamas et al., 2020)

Relation between dyke and tectonic structure trends

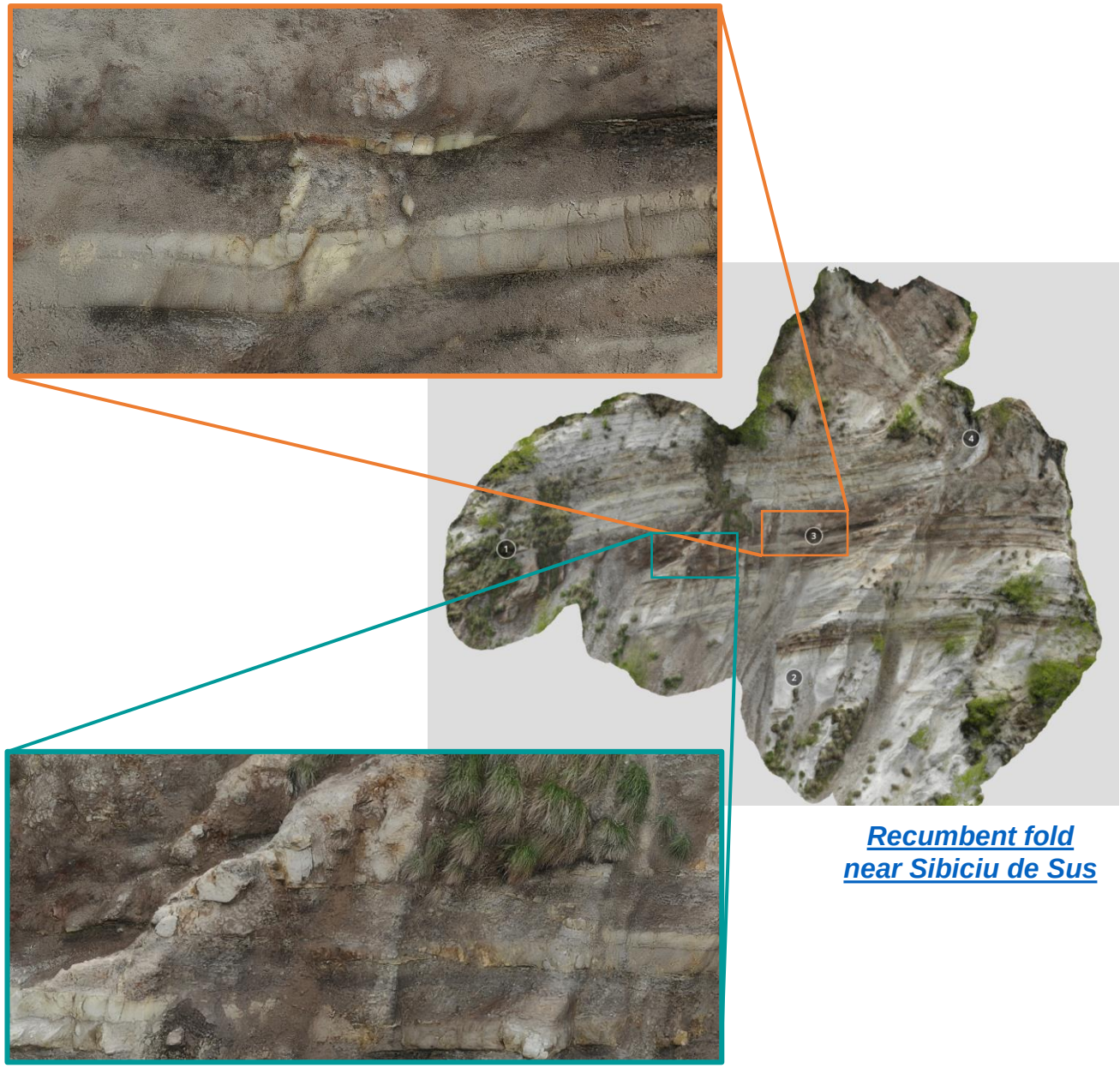


Exposure parallel to the bedding plane at Poiana Copaceni *(Tamas et al., 2020)*

- Dikes intersecting host bedding at high angles
- 74 fracture and 16 dike orientations were measured
- Three main sets of fractures have been identified
- Two dominant sets of dikes have been identified
- Injection shows good correlation with the fracture network

Conclusions

- The identified sand injections explain reservoir complexity and heterogeneity
- The dyke networks appear to follow fold-related fractures
- Injectites form interconnected networks that increase reservoir connectivity
- Injectites are part of the net-to-gross but have a much more complex architecture
- 3D outcrops provide the chance to investigate areas otherwise unreachable



Recumbent fold near Sibiciu de Sus

Thank you!

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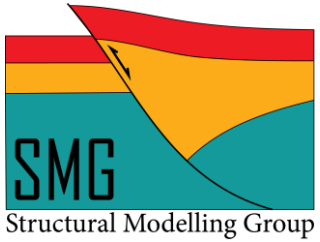

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- Tămaș A., Tămaș D.M., Krézsek C., Schléder Z., Palladino G. and Bercea R., 2020, The Nature and Significance of Sand Intrusions in a Hydrocarbon-rich Fold and Thrust Belt: Eastern Carpathians Bend Zone, Romania, Journal of the Geological Society, 177 (2), 343-356, doi: 10.1144/jgs2019-107.