

Tectonics of the Western Internal Jura Fold-and- Thrust Belt



UNIVERSITÉ DE FRIBOURG
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From the Geneva Basin to La Bienne
Valley (France)

Mapping and Forward modelling

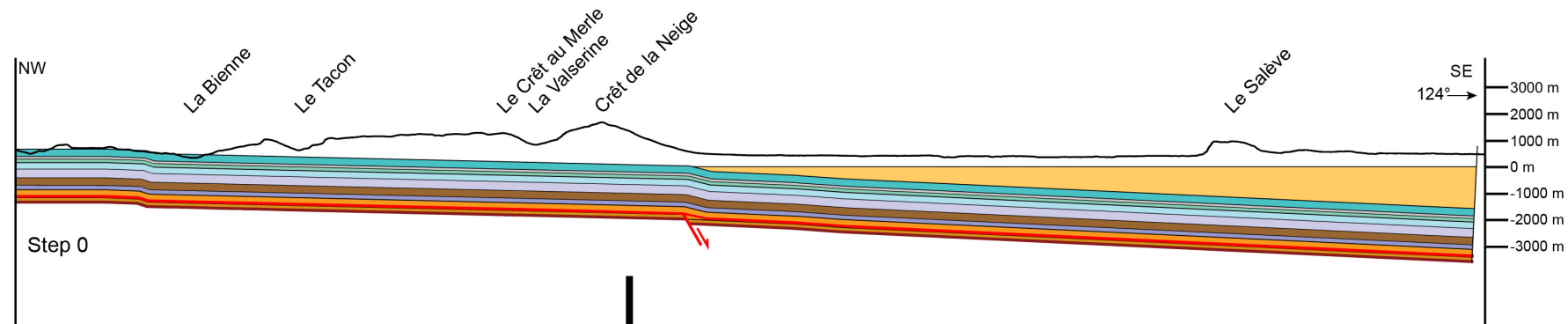
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Sandra Borderie, Jon Mosar

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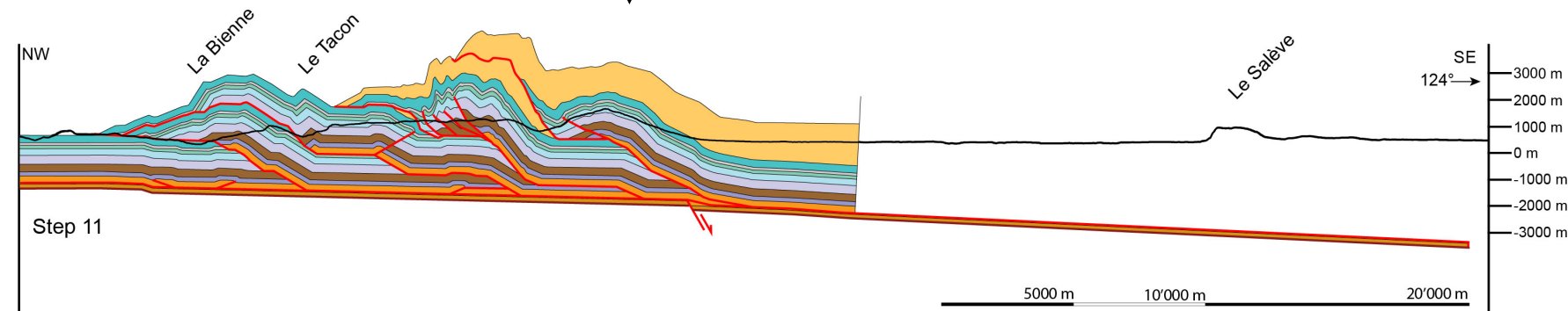
WHAT IS THE CHRONOLOGY OF THE JURA DEFORMATION?

FLAT BASIN



?

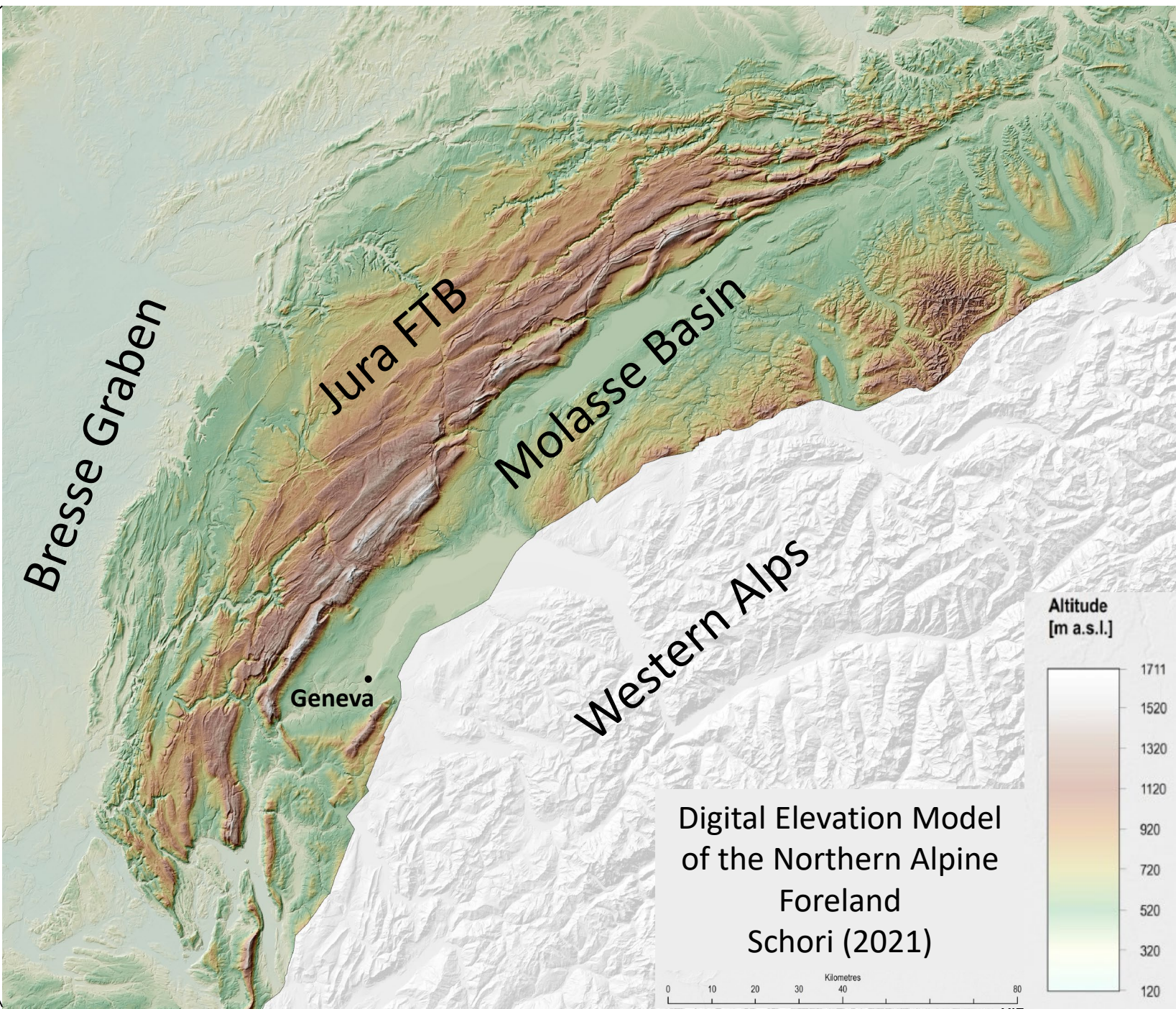
JURA FOLD-AND-THRUST BELT



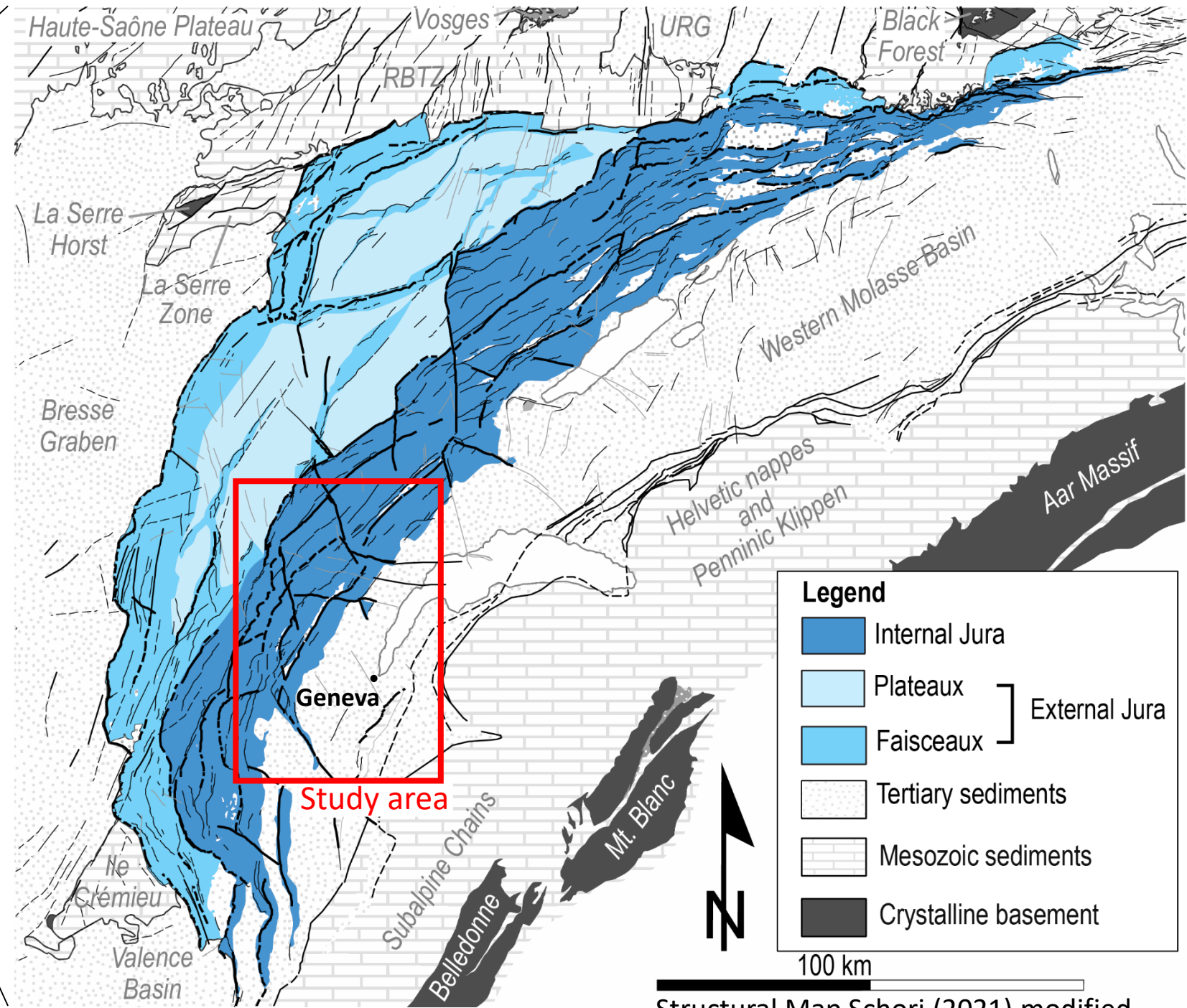
Localisation



Jura FTB =
thin-skinned style deformation



Localisation



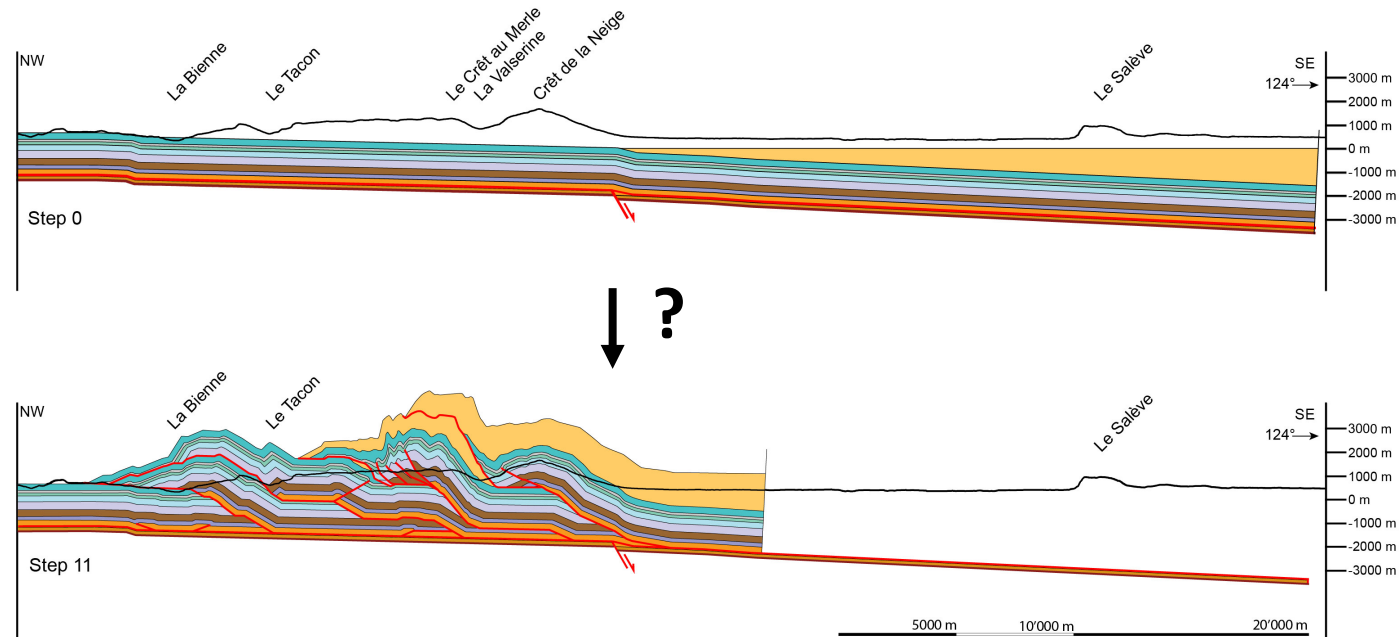
Structural Map Schori (2021) modified

1. Aims of the study

- Objective 1 : Provide a balanced cross-section with deep structures validated by forward modelling

1. Aims of the study

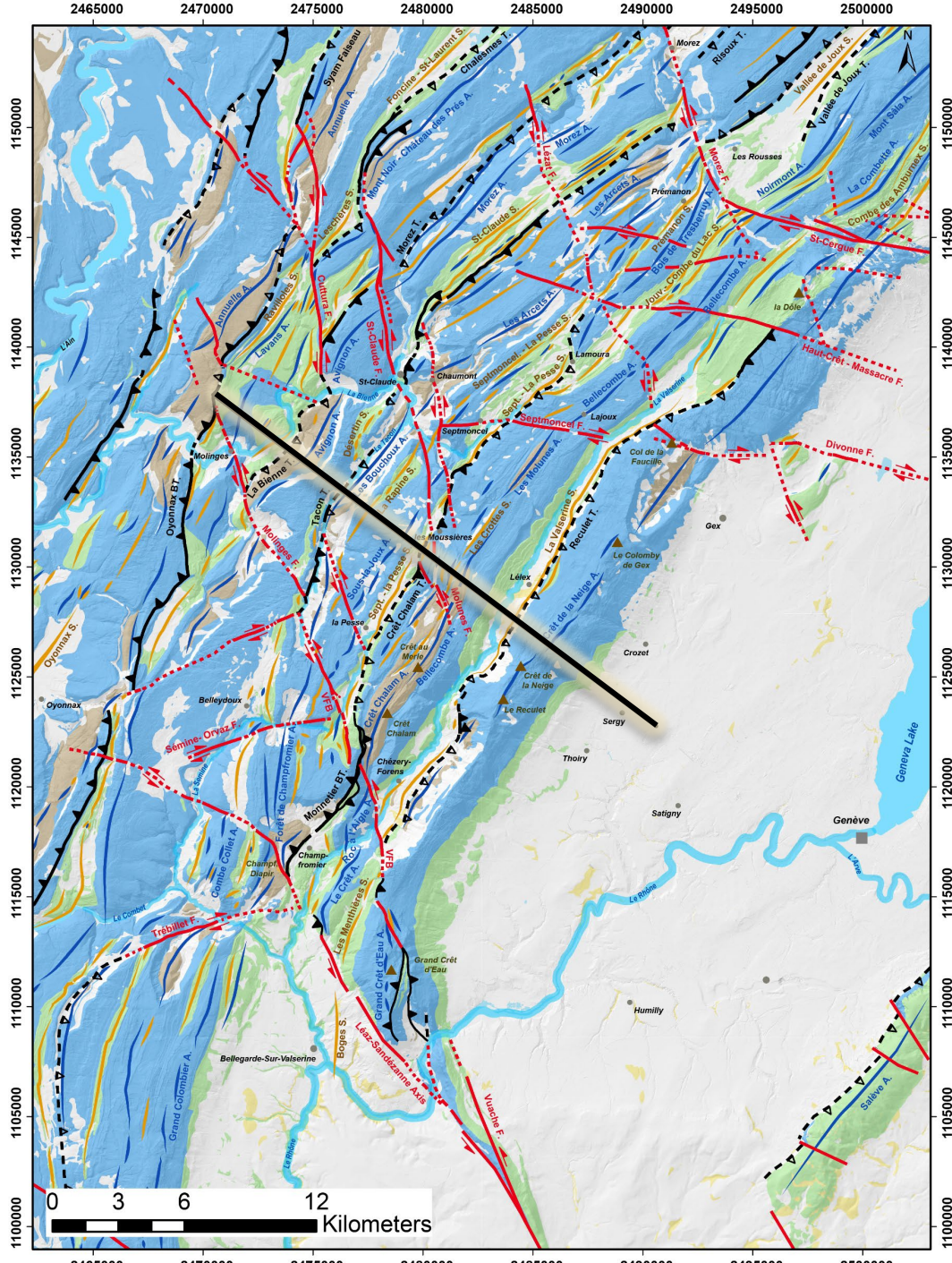
- Objective 1 : Provide a balanced cross-section with deep structures validated by forward modelling
- Objective 2 : Propose a kinematic evolution of the Western Internal Jura



2. Datasets : Mapping - Tectonic Map

Marro et al., in prep.

- Quaternary
- Tertiary
- Cretaceous
- Upper Jurassic
- Middle and Lower Jurassic



2. Datasets : Mapping - Tectonic Map

Jura Nappes (N.):

- limited by main strike-slip faults (f.)

Vuache – Forens- Les Bouchoux (VFB)

Molinges

Morez

St-Cergue

- limited by main thrusts 

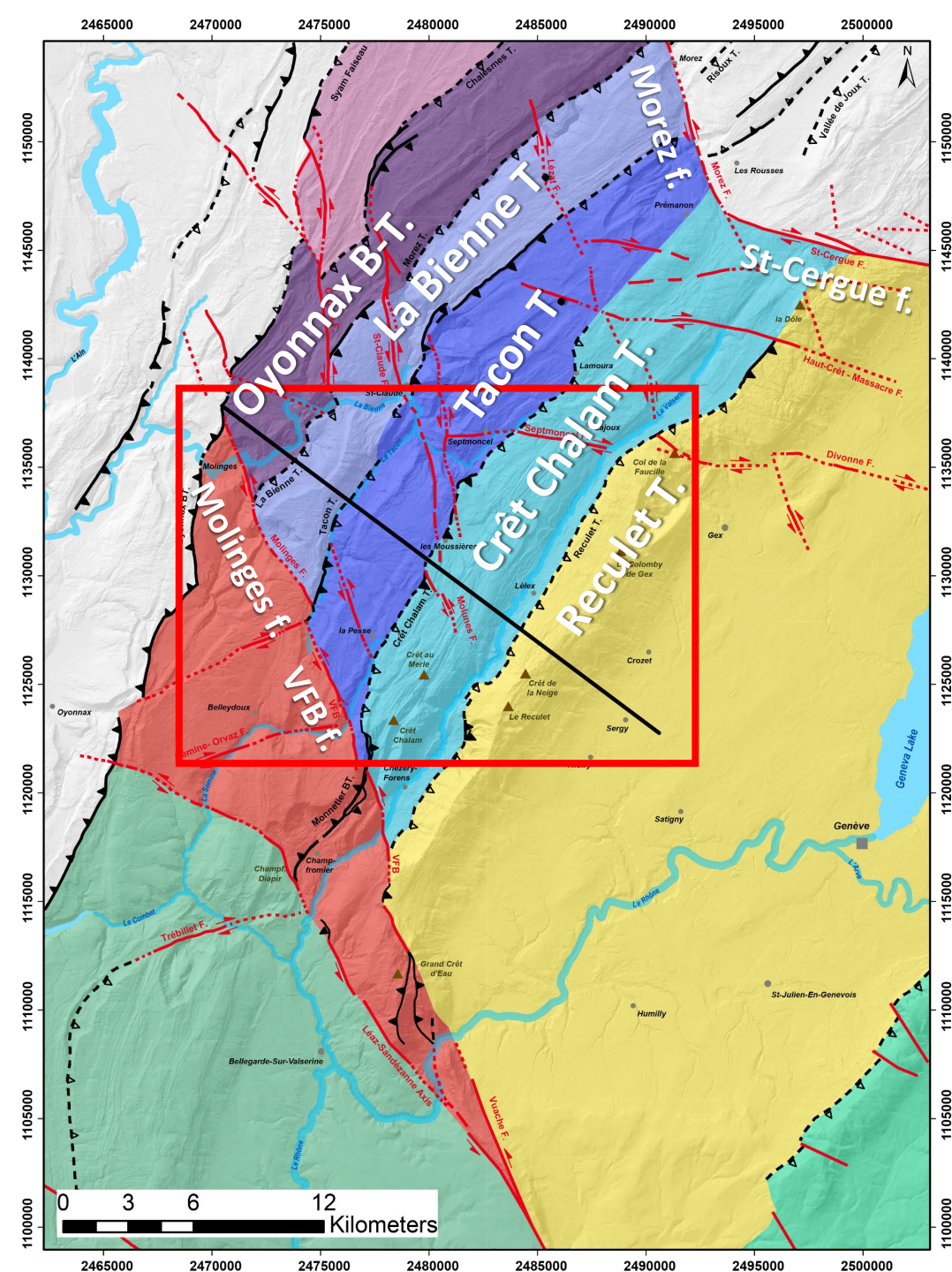
Reculet

Crêt Chalam

Tacon

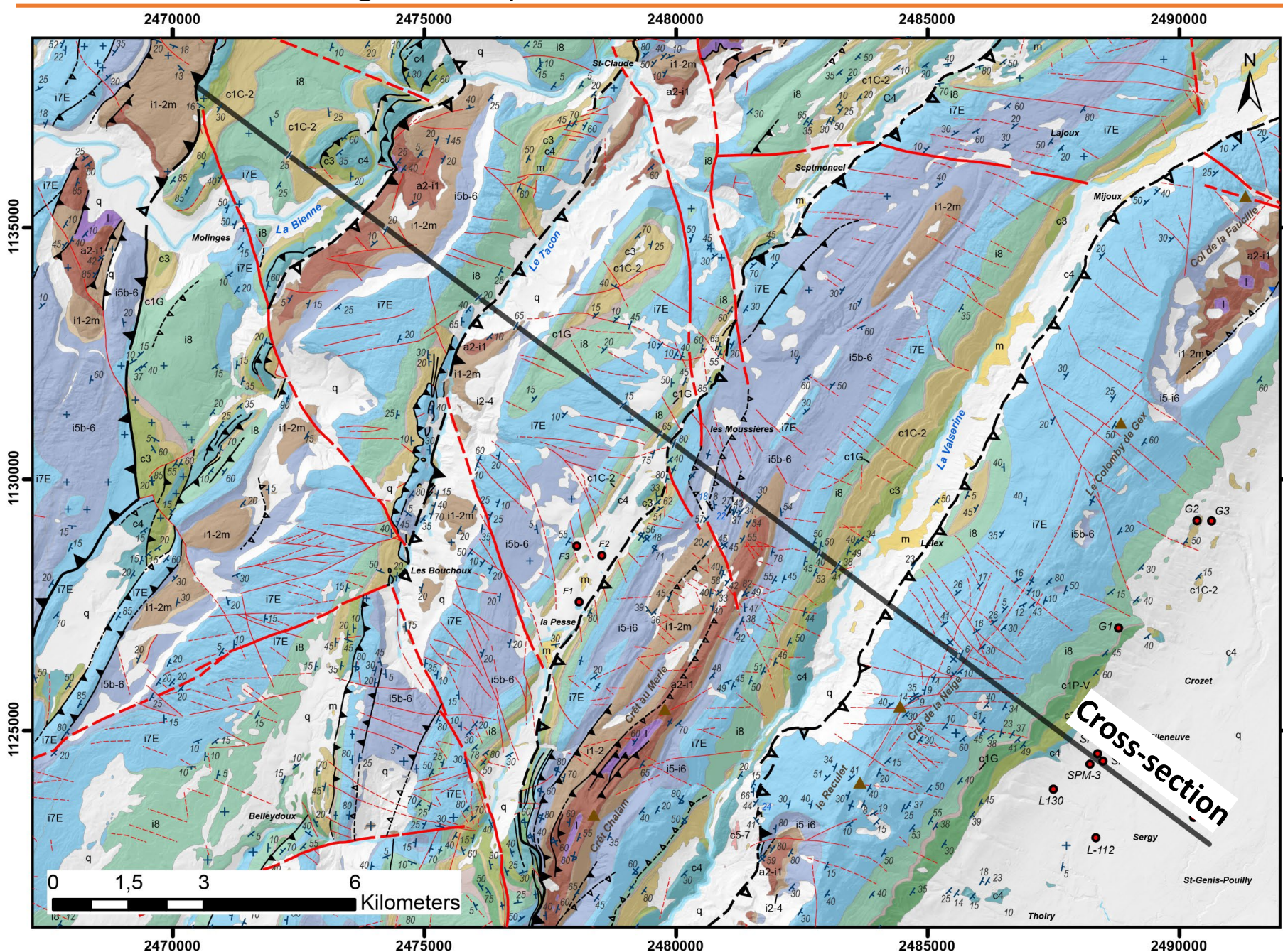
Bienne

Oyonnax



Marro et al., in prep.

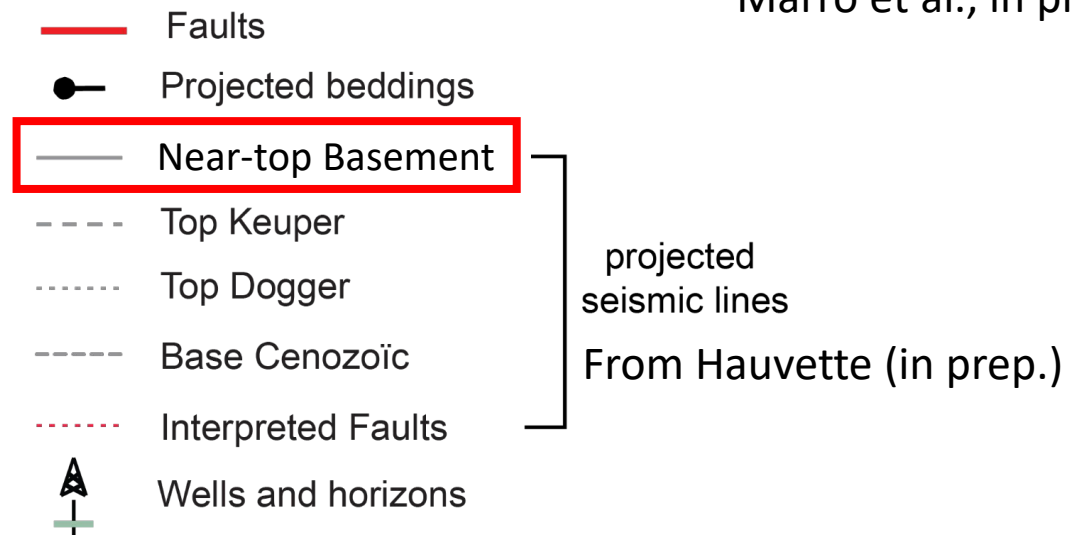
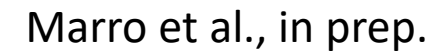
2. Datasets : Geological Map



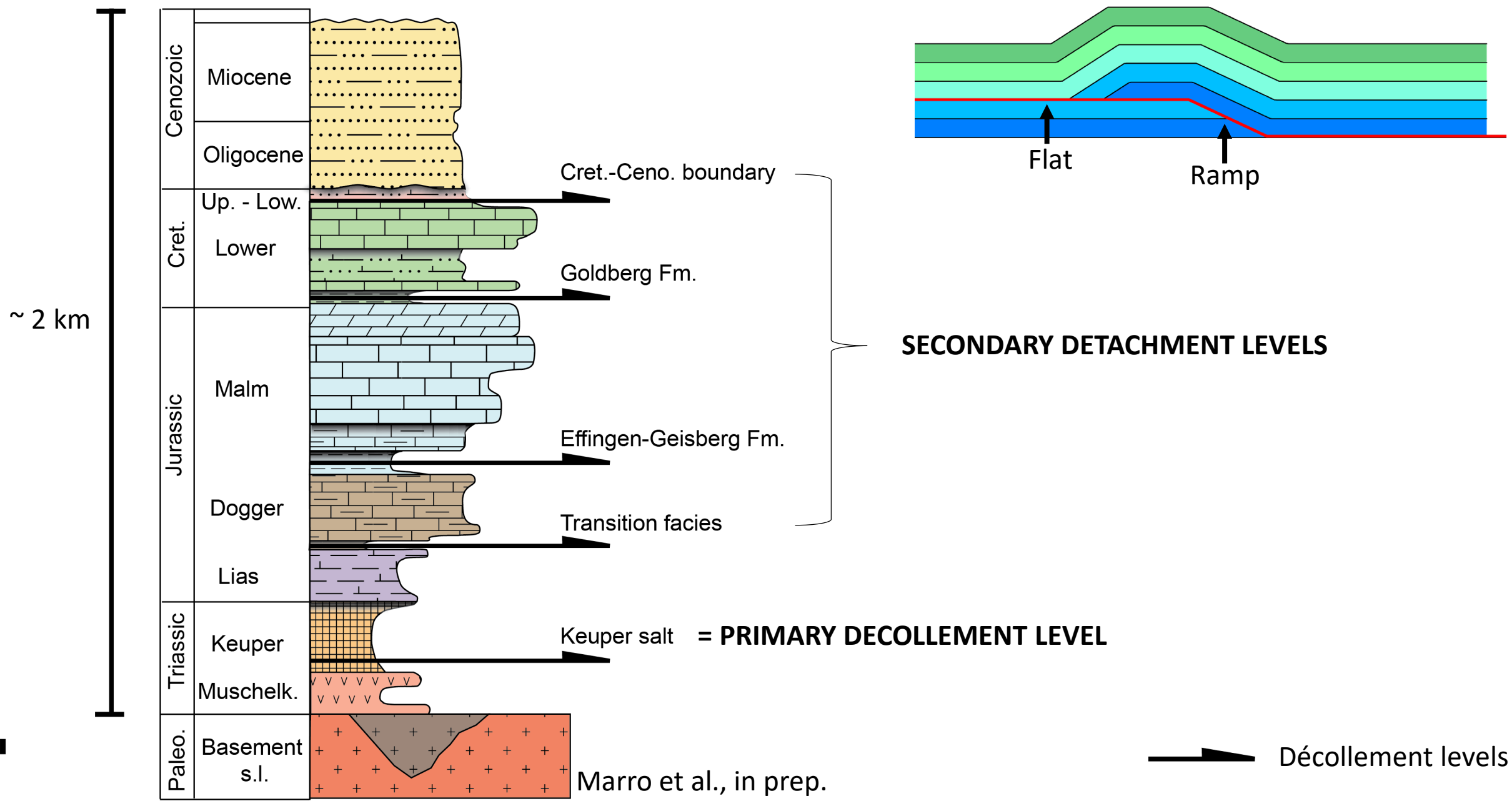
Harmonization based on
Rusillon (2017) and Brentini (2018)

Legend :
Harmonized Swiss Formations
(HARMOS, Strasky et al. 2016)

Marro et al., in prep.

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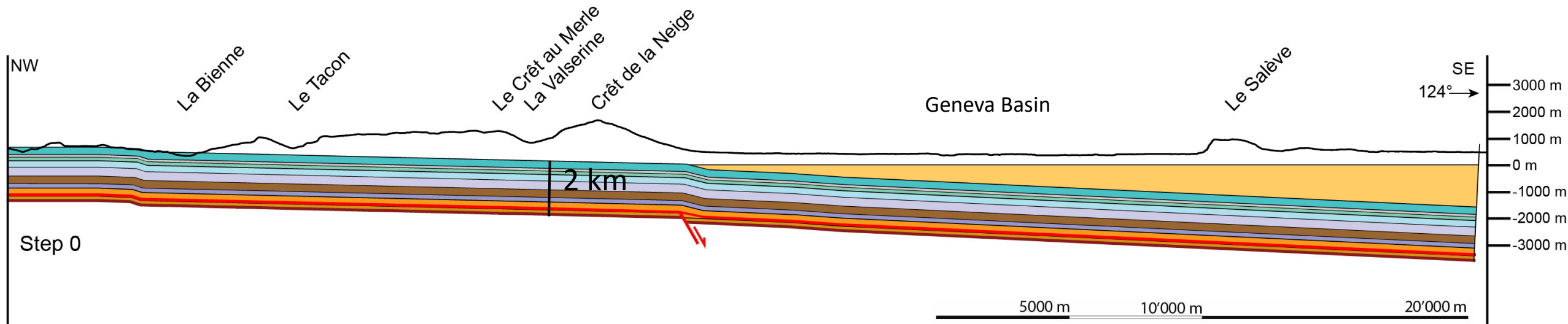
2. Datasets : simplified stratigraphy of the Western Jura



3. Results : forward Model



Petex.com (2022)



Objective -> Reconstruct the surface structures

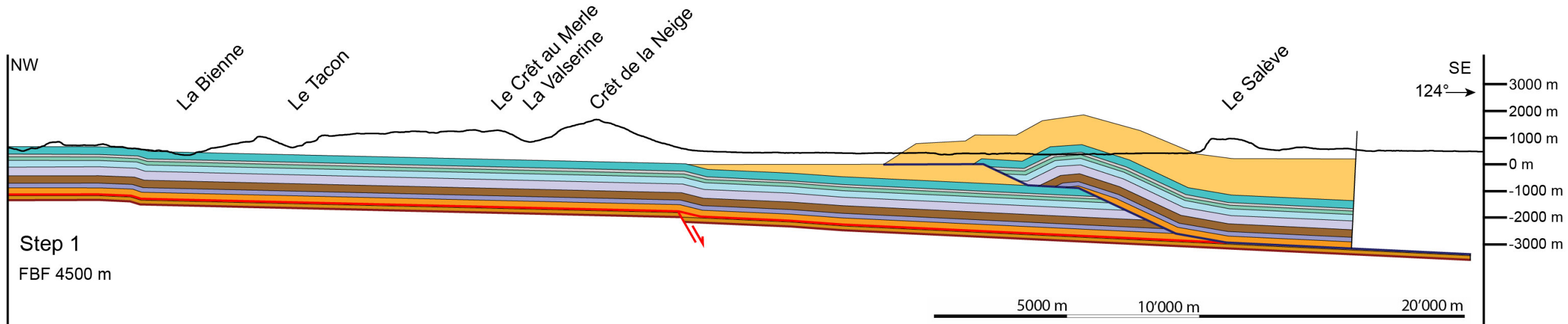
Algorithms used :

- Fault-bend fold (FBF) (Suppe, 1983)
- Trishear technique (Erslev, 1991; Allmendinger 1998)
- Fault-parallel Flow (FPF) (Egan et al., 1999)

Marro et al., in prep.

3. Results : forward Model

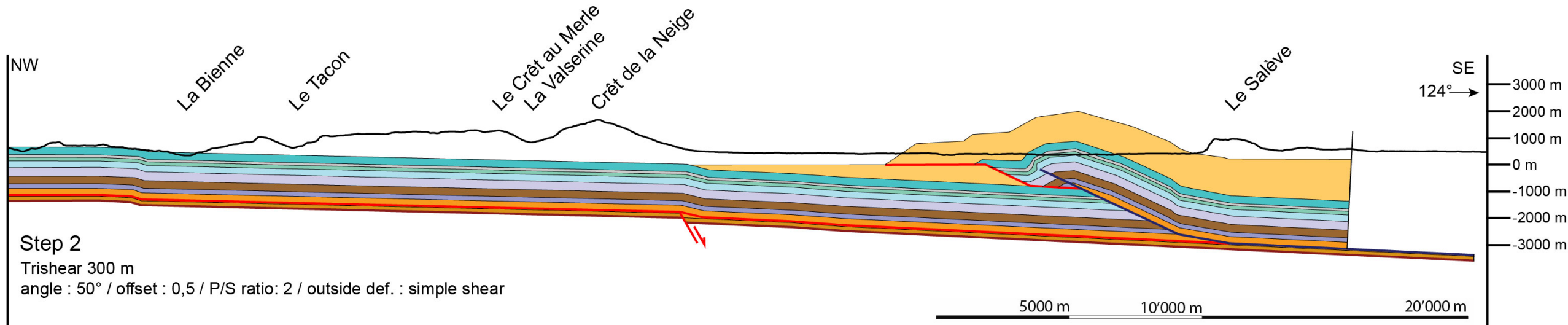
STEP 1 : Reculet Thrust



Marro et al., in prep.

3. Results : forward Model

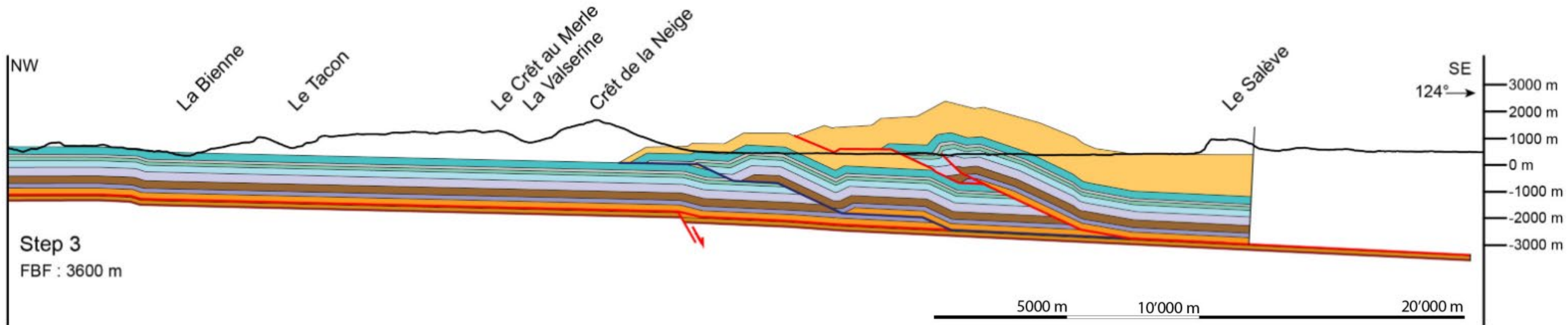
STEP 2 : Reculet Thrust, secondary branch



Marro et al., in prep.

3. Results : forward Model

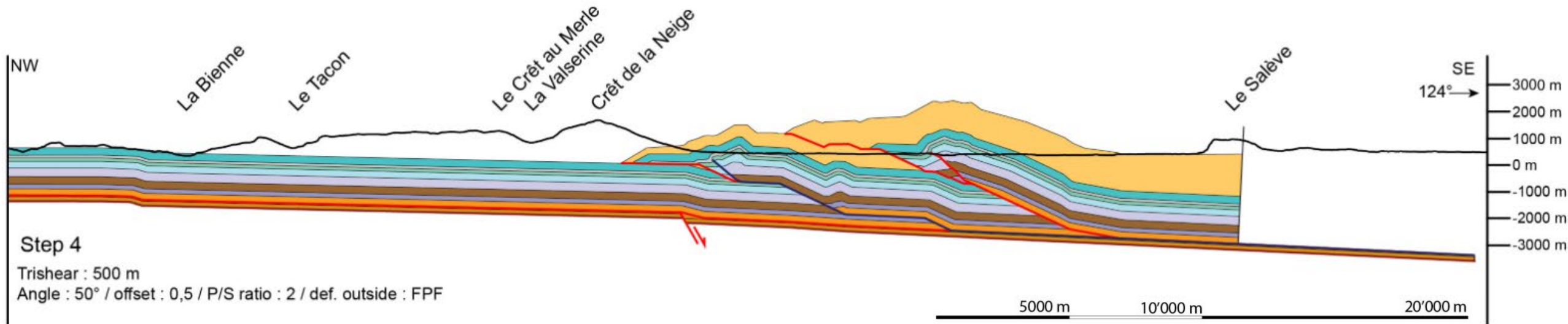
STEP 3 : Crêt Chalam Thrust



Marro et al., in prep.

3. Results : forward Model

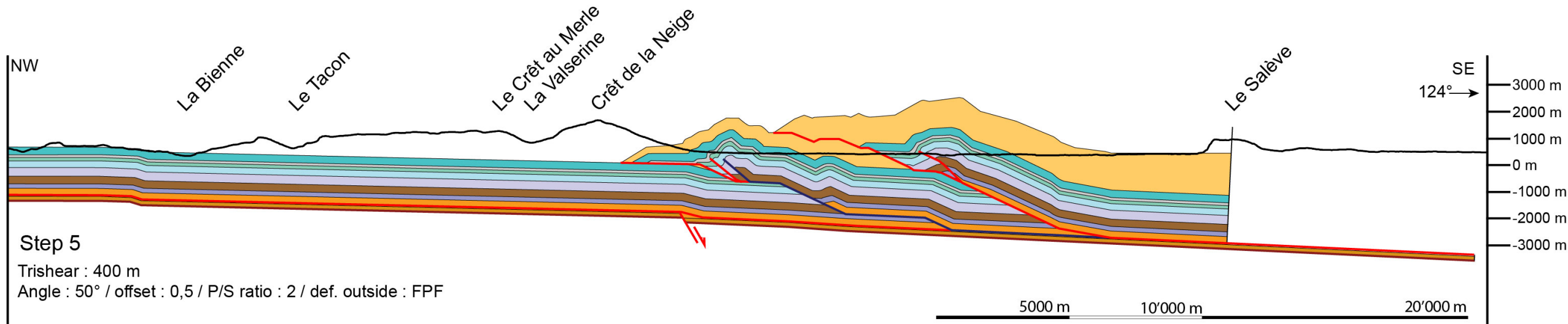
STEP 4 : Crêt Chalam imbrications



Marro et al., in prep.

3. Results : forward Model

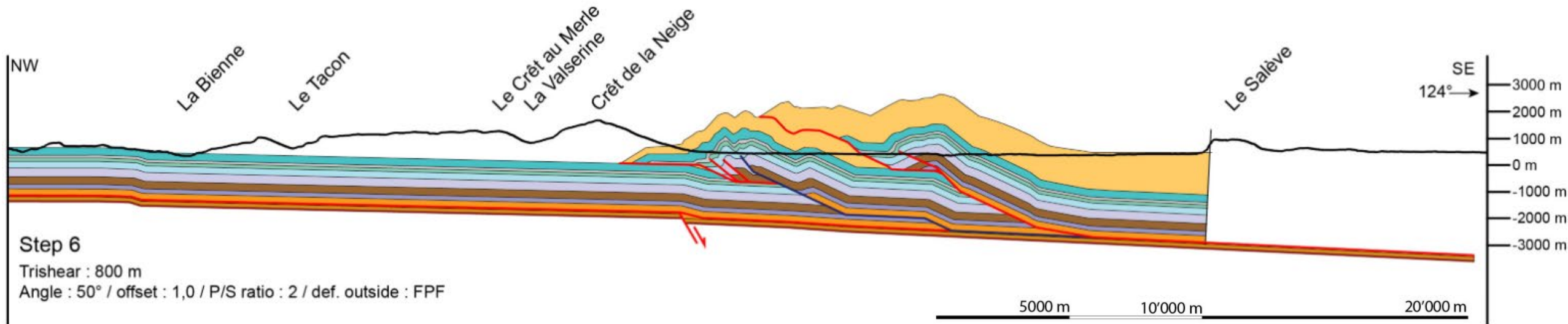
STEP 5 : Crêt Chalam imbrications



Marro et al., in prep.

3. Results : forward Model

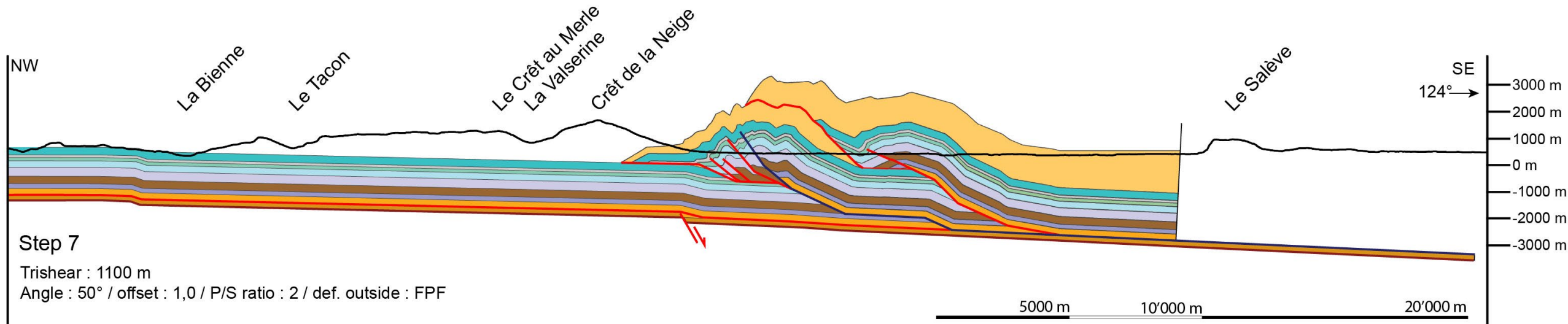
STEP 6 : Crêt Chalam imbrications



Marro et al., in prep.

3. Results : forward Model

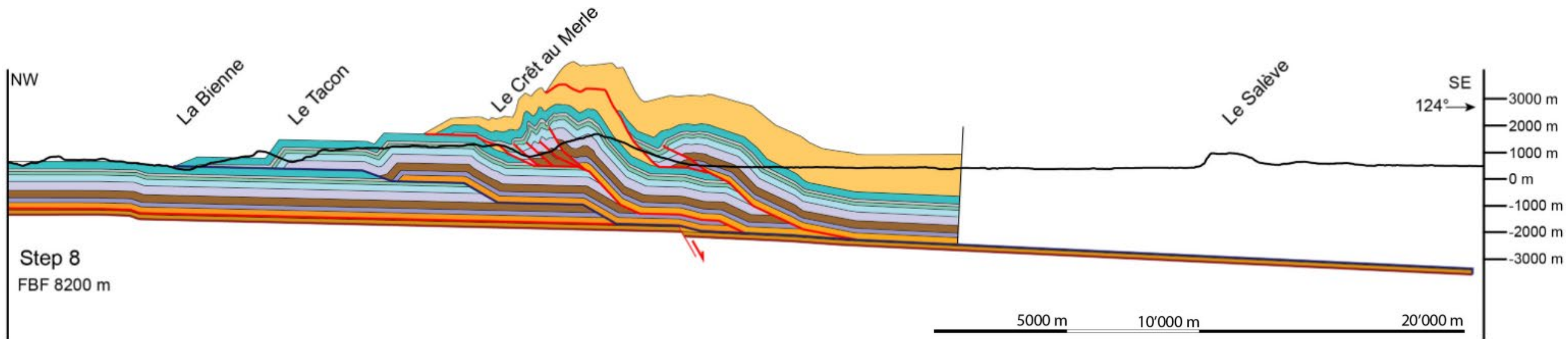
STEP 7 : Crêt Chalam imbrications



Marro et al., in prep.

3. Results : forward Model

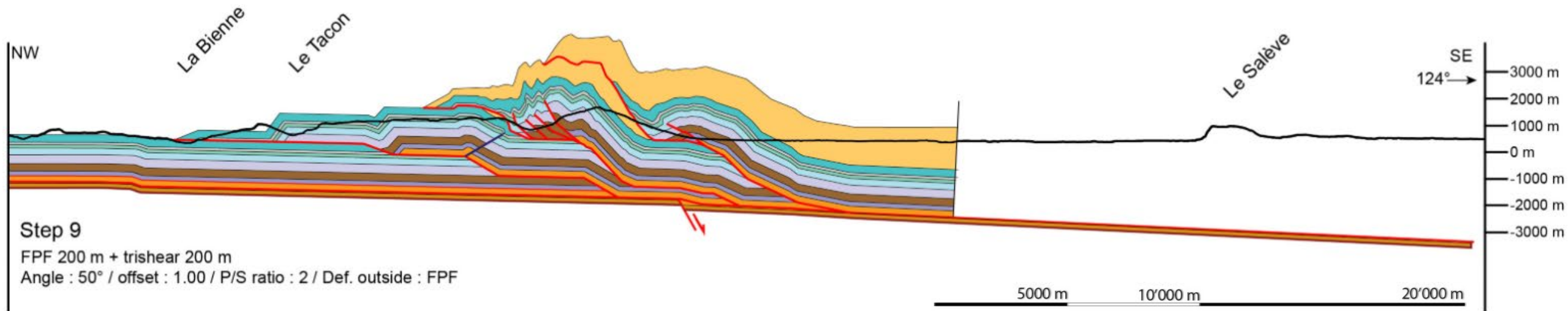
STEP 8 : Tacon Thrust



Marro et al., in prep.

3. Results : forward Model

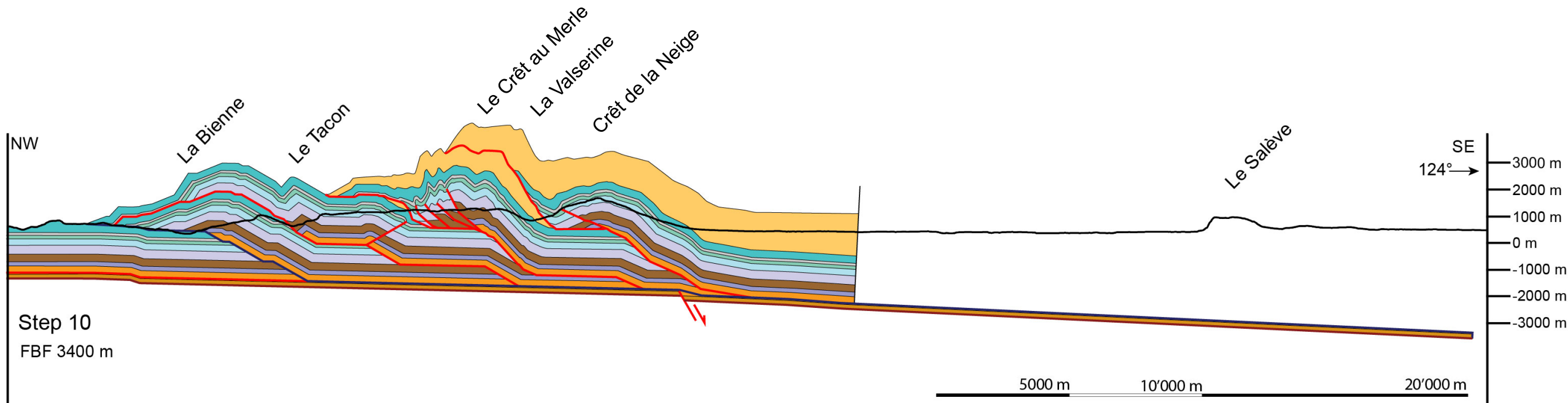
STEP 9 : Tacon backthrust



Marro et al., in prep.

3. Results : forward Model

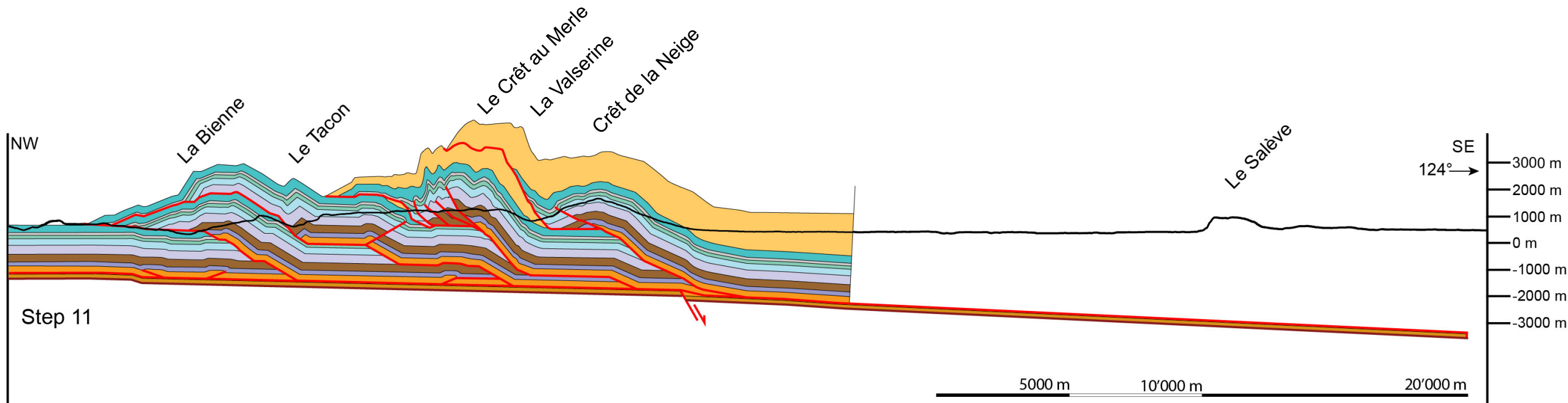
STEP 10 : La Bienne Thrust



Marro et al., in prep.

3. Results : forward Model

STEP 11 : Triassic duplexes

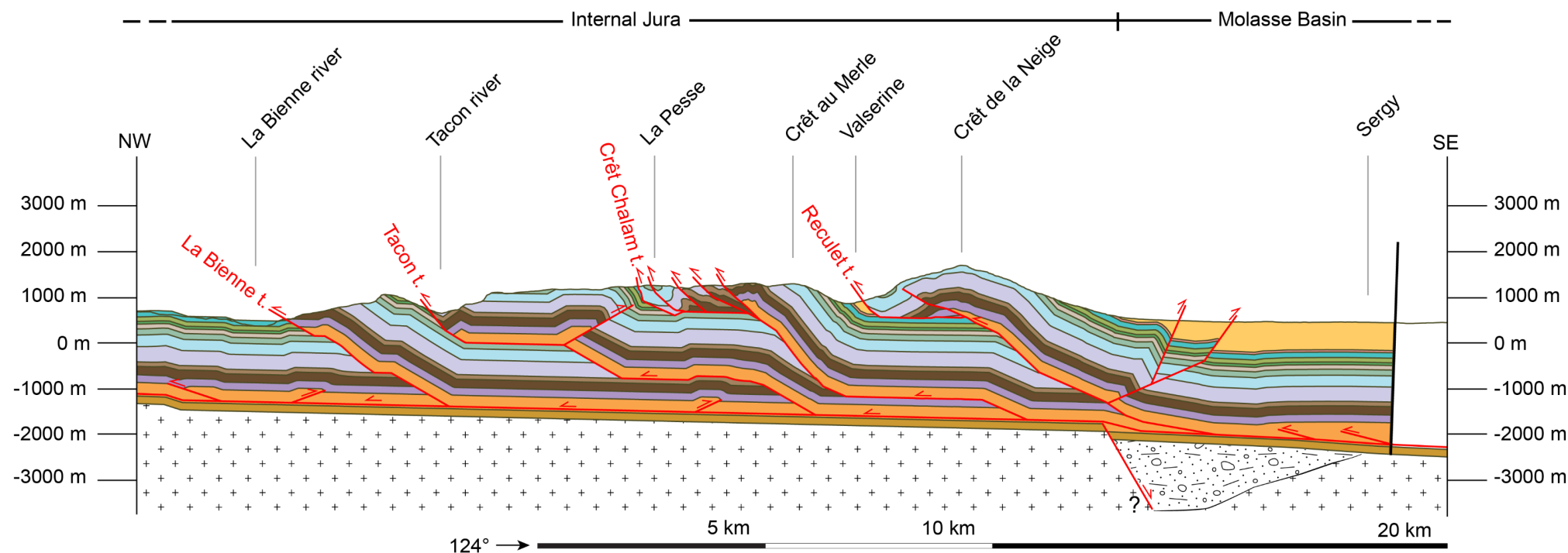


Marro et al., in prep.

TOTAL SHORTENING : 23.6 km

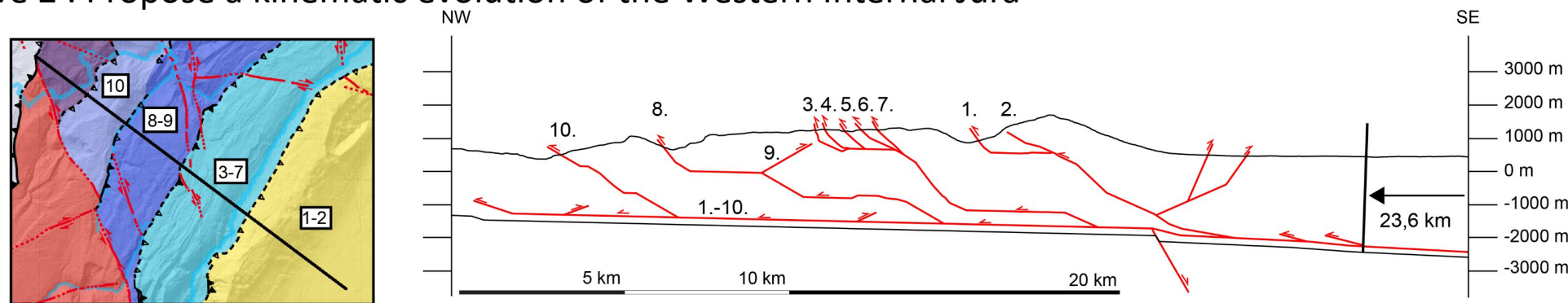
4. Results : Final cross-section + kinematics evolution

✓ Objective 1 : Provide a balanced cross-section with deep structures validated by forward modelling



Marro et al., in prep.

✓ Objective 2 : Propose a kinematic evolution of the Western Internal Jura



5. Take home message

The Western Internal Jura FTB presents a forward stepping deformation with minor back-stepping thrust sequences

What's next?

- Prolongate the cross-section
- Compare with mechanical models
- Kinematic/structural Map of the entire Jura FTB

