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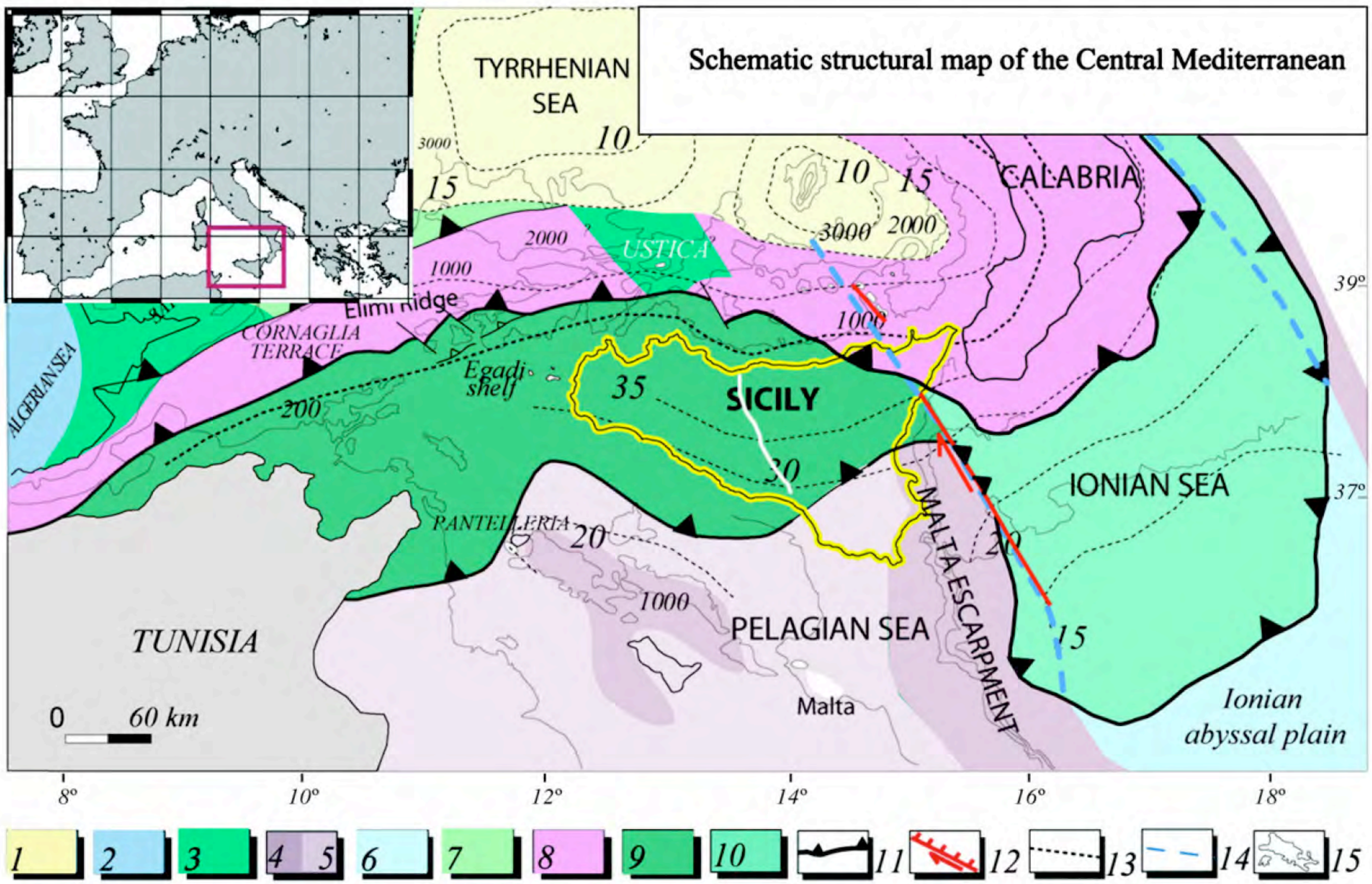

Fig. 1. Map illustrating different crustal sectors of central Mediterranean region (modified from Catalano et al., 1996). 1) Tyrrhenian oceanic crust; 2) Algerian Basin oceanic crust; 3) thinned Sardinia and Kabilian continental crust; 4, 5) African thinned continental crust; 6) Ionian oceanic crust; 7) Sardinia units; 8) Kabylian–Calabrian units; 9) Maghrebian–Sicilian units; 10) Ionian accretionary wedge; 11) thrust fronts; 12) fault with strike-slip component; 13) Moho isobaths (km); 14) hypothetic continental–oceanic boundary; 15) bathymetry. Inset shows the location map of the investigated area.

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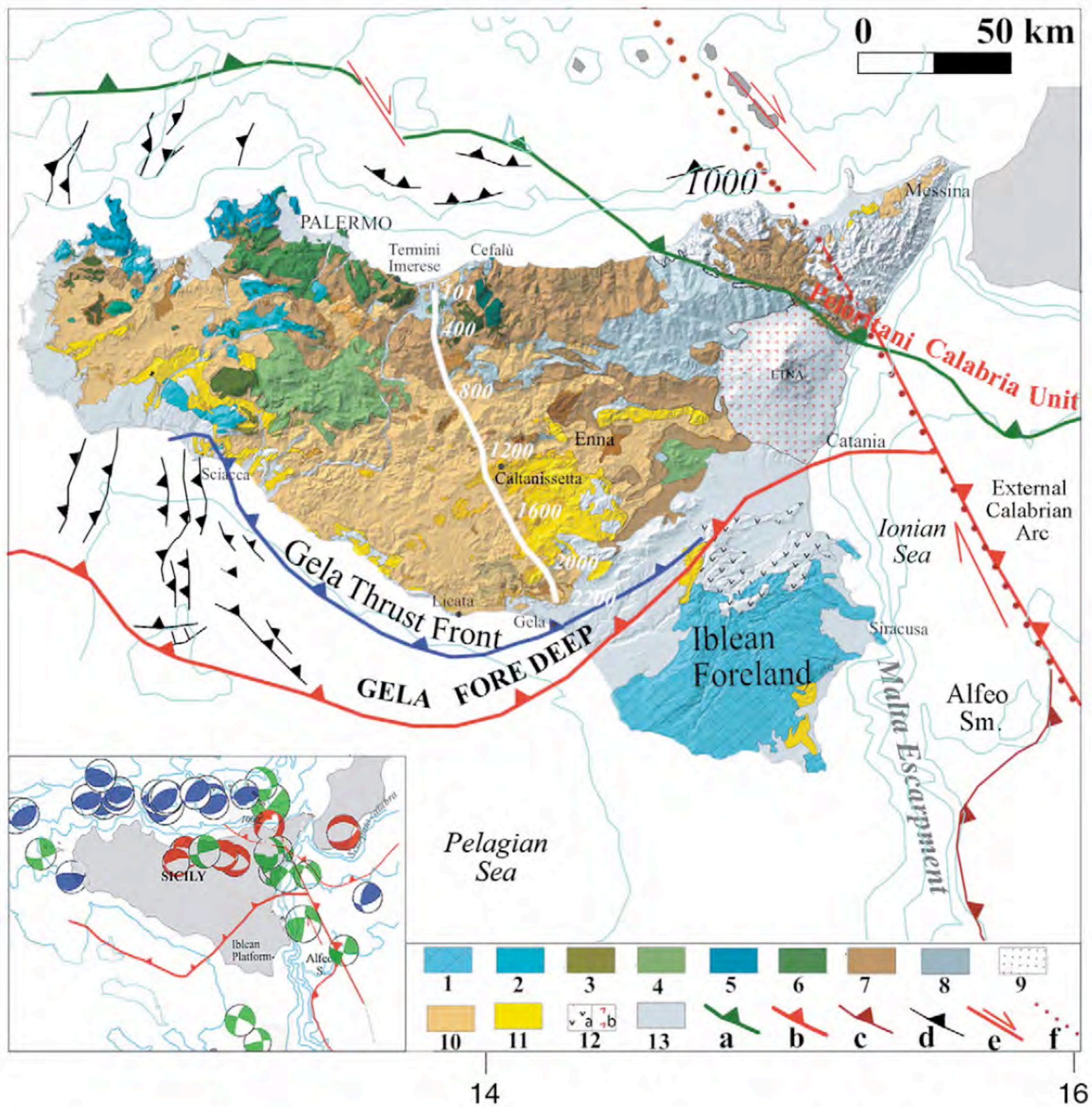

Fig. 2. Structural map of Sicily (modified from Catalano et al., 2000a,b). 1) Iblean units; 2) shelf to pelagic carbonate (Trapanese–Saccense) units; 3) shelf to deep-water carbonate (Monte Genuardo) units; 4) deep-water carbonate (Sicanian) units; 5) shelf carbonate (Panormide) units; 6) slope to deep-water (Imerese–Panormide) units; 7) Miocene Flyschs; 8) Sicilide units; 9) Calabrian–Peloritani units; 10) Miocene–Pliocene syntectonic deposits; 11) Plio-Pleistocene syntectonic deposits; 12) Plio-Quaternary volcanic rocks; 13) Pleistocene deposits; a) Kabylian–Calabrian thrust front; b) Maghrebian–Sicilian thrust front; c) Ionian accretionary wedge thrust front; d) thrusts; e) faults with strike-slip component; f) hypothetic continental oceanic boundary (modified by Catalano et al., 2000a,b; Chamot-Rooke et al., 2005). In white bold line the location of SIRIPRO profile. In the left-hand corner CMT (1977–2003) focal solutions from the area (after Pondrelli et al., 2004) are also shown. Hypocentral depth: <50 km; Magnitudo>4. Blue: focal mechanisms with compressional regime; green: focal mechanisms with strike-slip regime; red: focal mechanisms with extensional regime.

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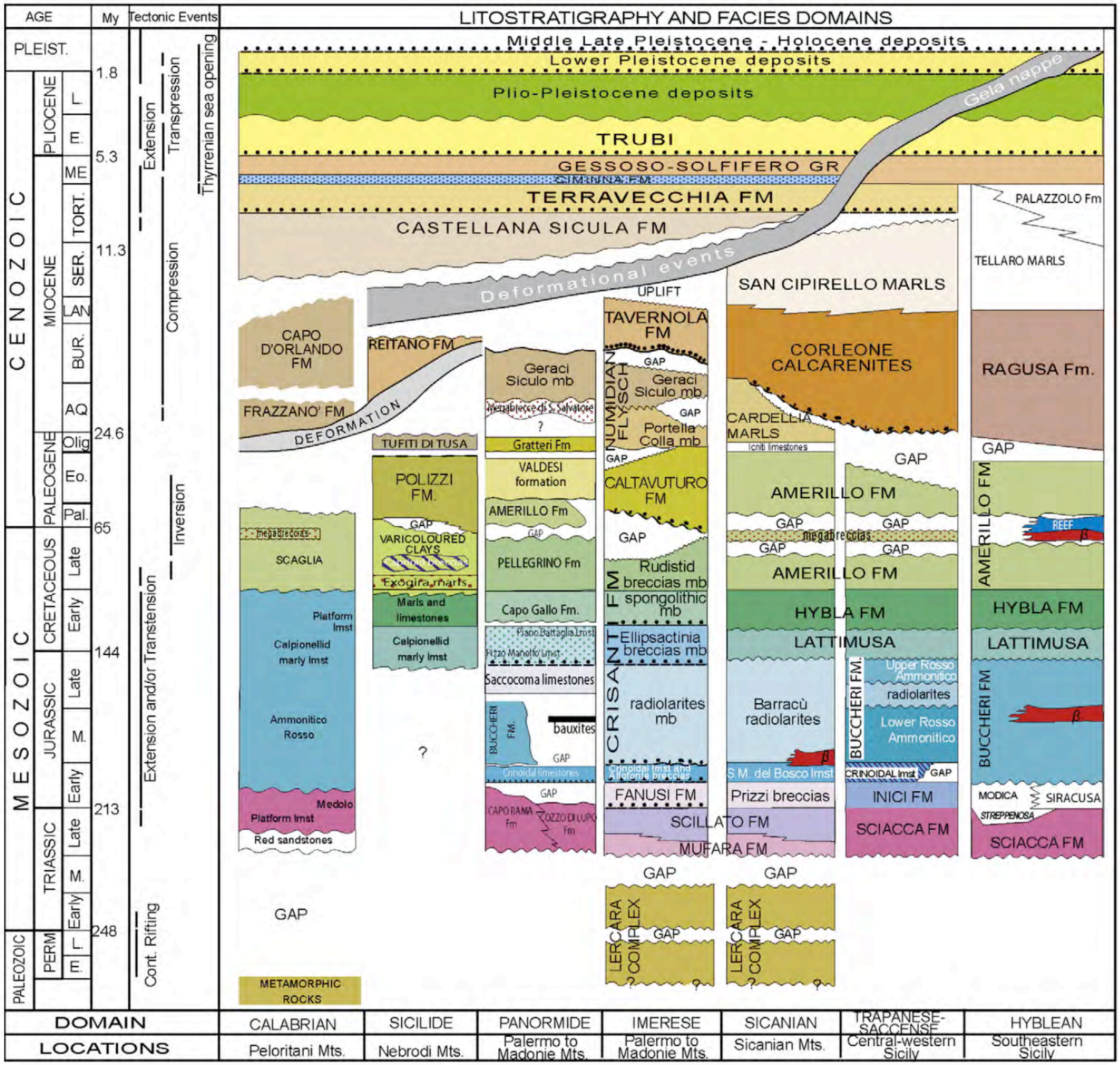

Fig. 3. Stratigraphy and facies domains of the investigated area.

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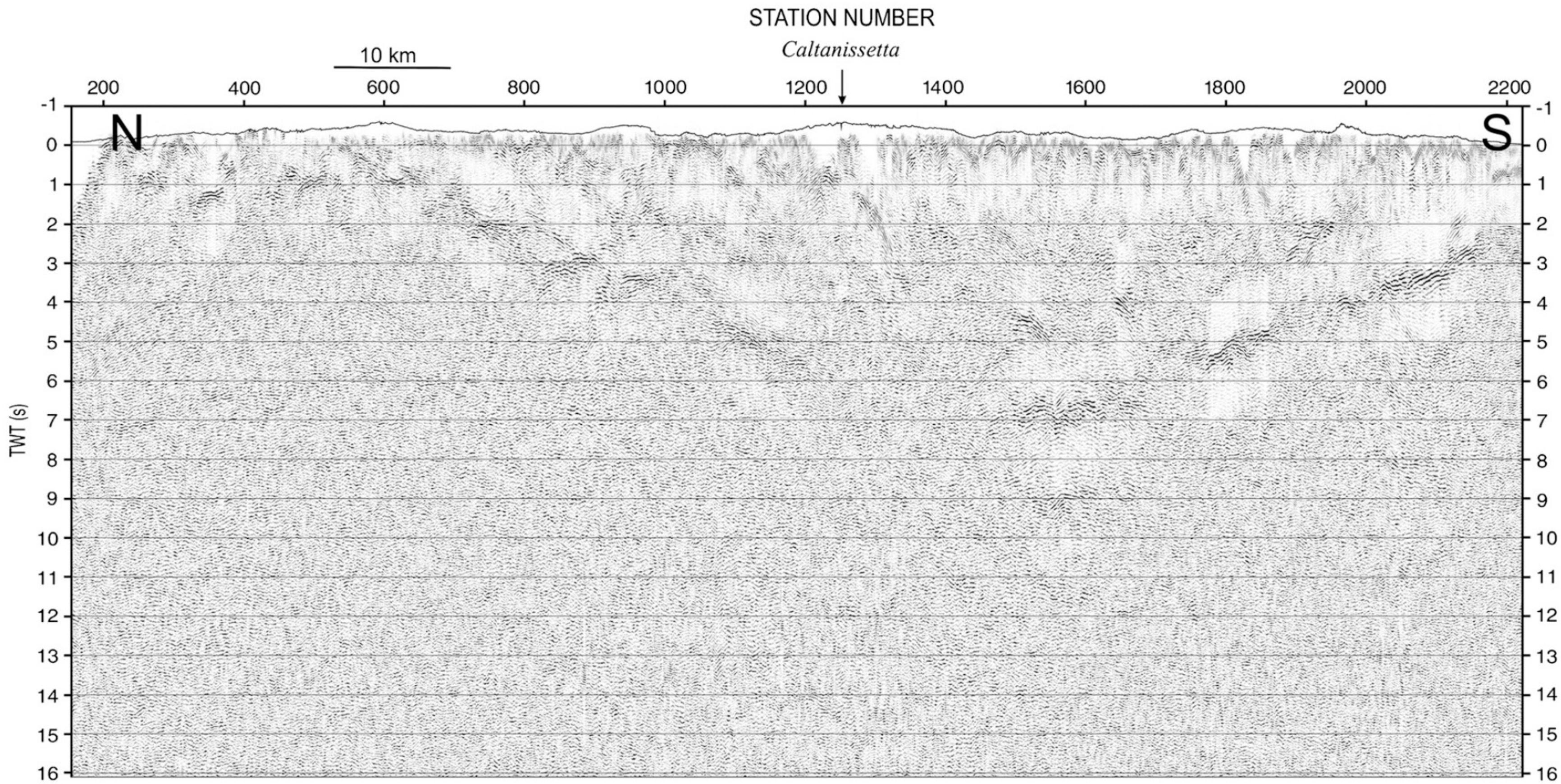

Fig. 5. Stacked section of the SIRIPRO profile.

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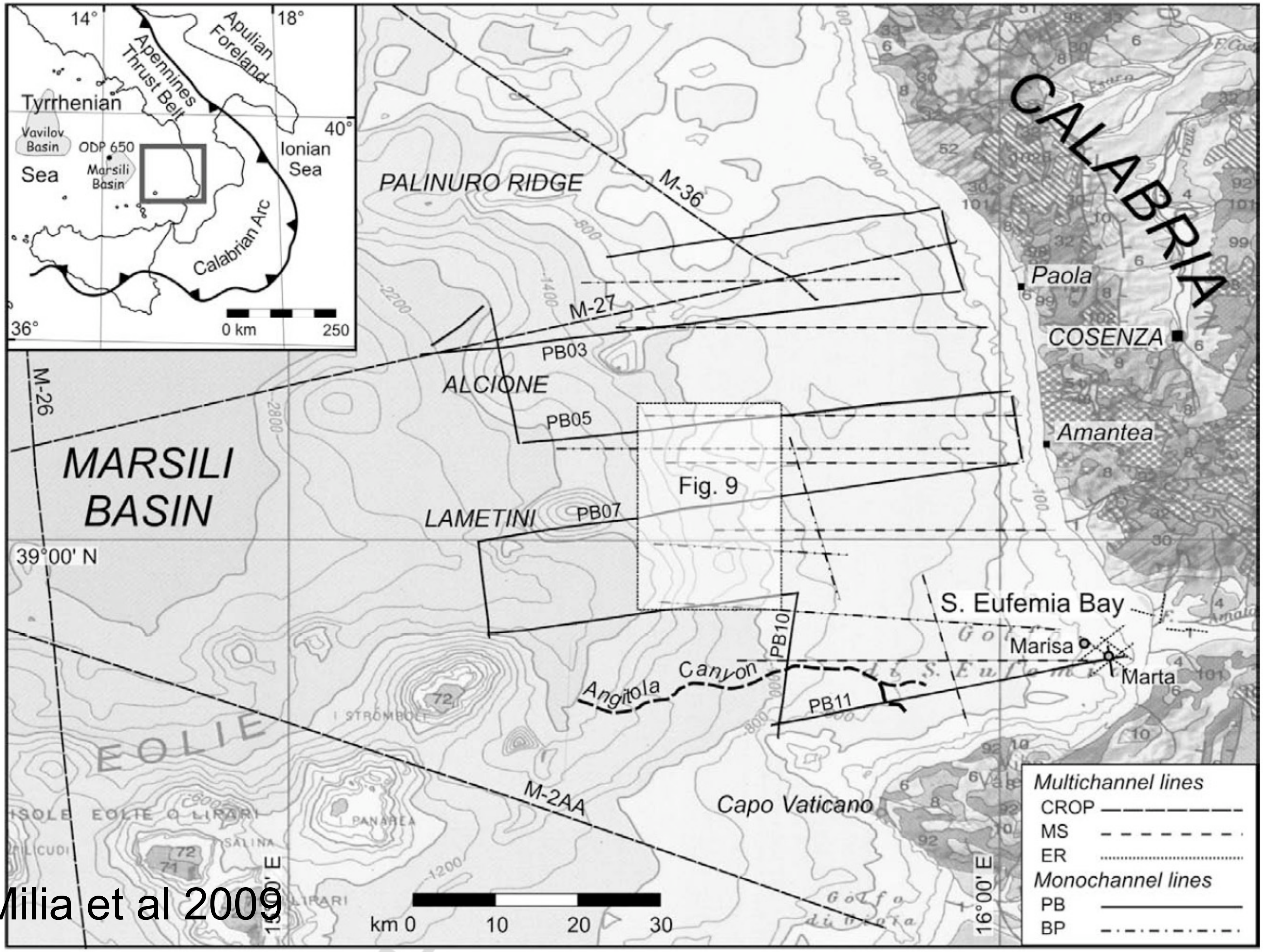
Fig. 1


14°
18°
Apulian Foreland
Apennines Thrust Belt
Tyrrhenian
Sea
Vavilov Basin
ODP 650
Marsili Basin
40°
Ionian Sea
Calabrian Arc
36°
0 km
250
PALINURO RIDGE
M-36
M-27
PB03
ALCIONE
PB05
M-26
MARSILI BASIN
Fig. 9
LAMETINI
PB07
39°00' N
CALABRIA
Paola
COSENZA
Amantea
S. Eufemia Bay
Marisa
Marta
PB10
Angitola Canyon
PB11
EOLIE
M-2AA
Capo Vaticano
16°00' E
km 0
10
20
30
Multichannel lines
CROP
MS
ER
Monochannel lines
PB
BP
Milia et al 2009

Milia et al 2009

Fig. 2

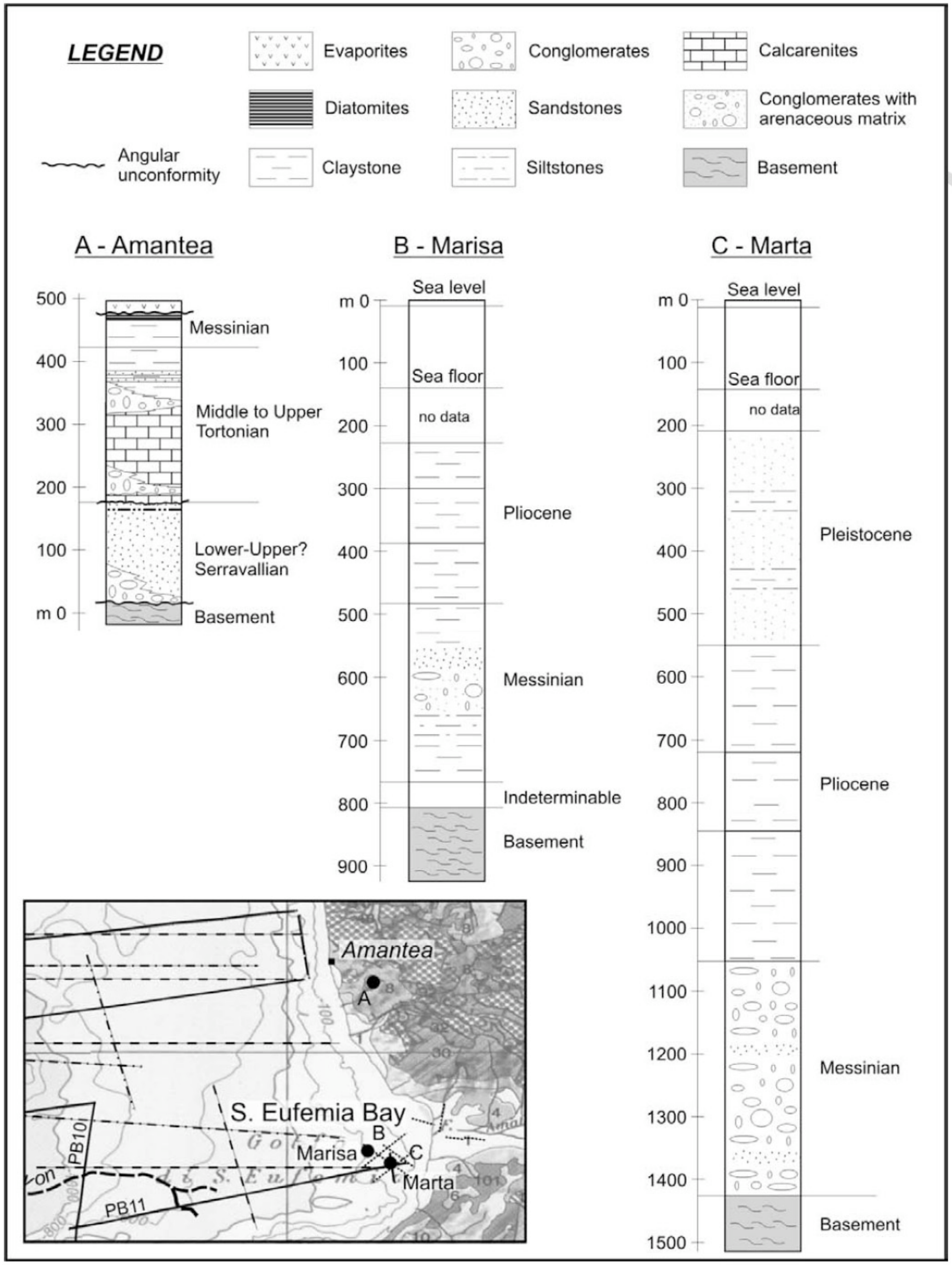


Fig. 3

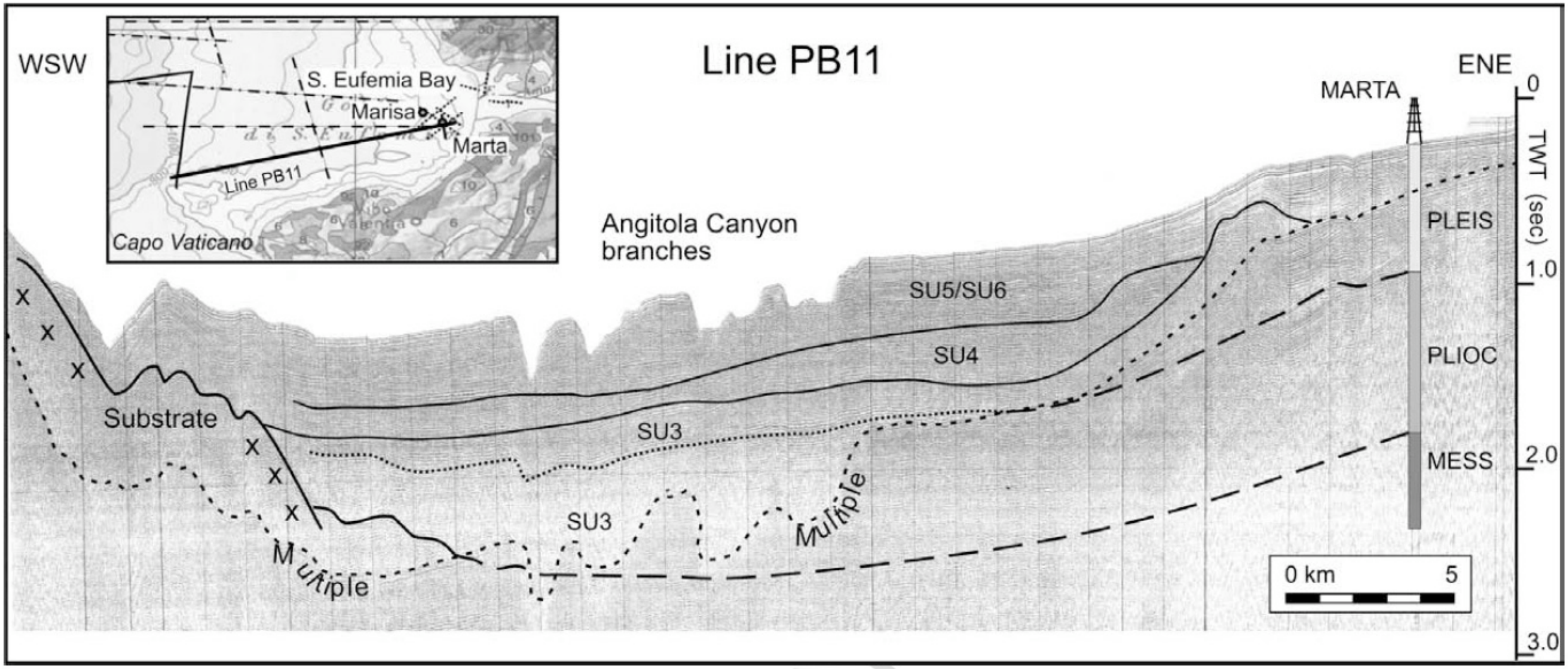


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Fig. 4

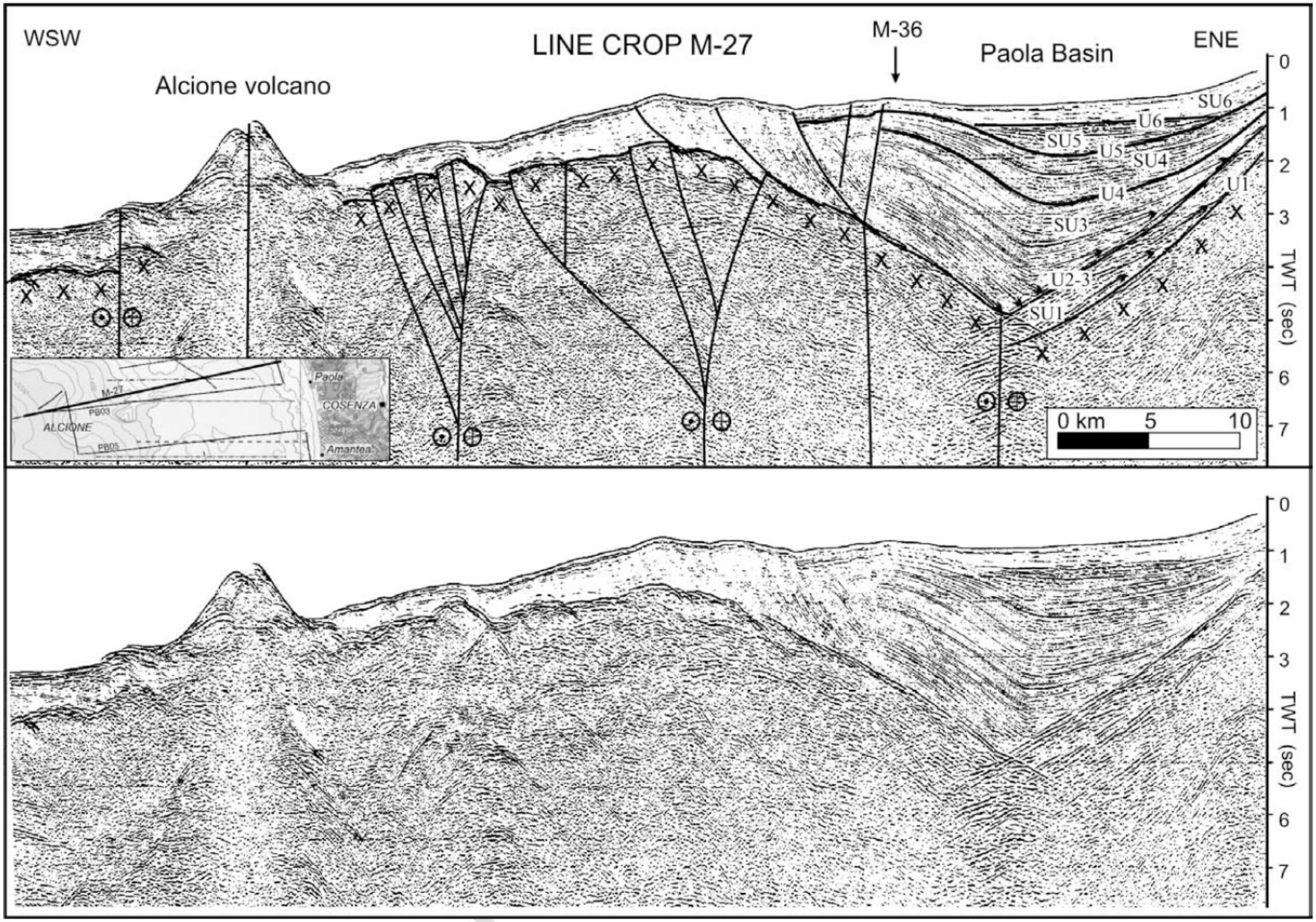

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Fig. 5

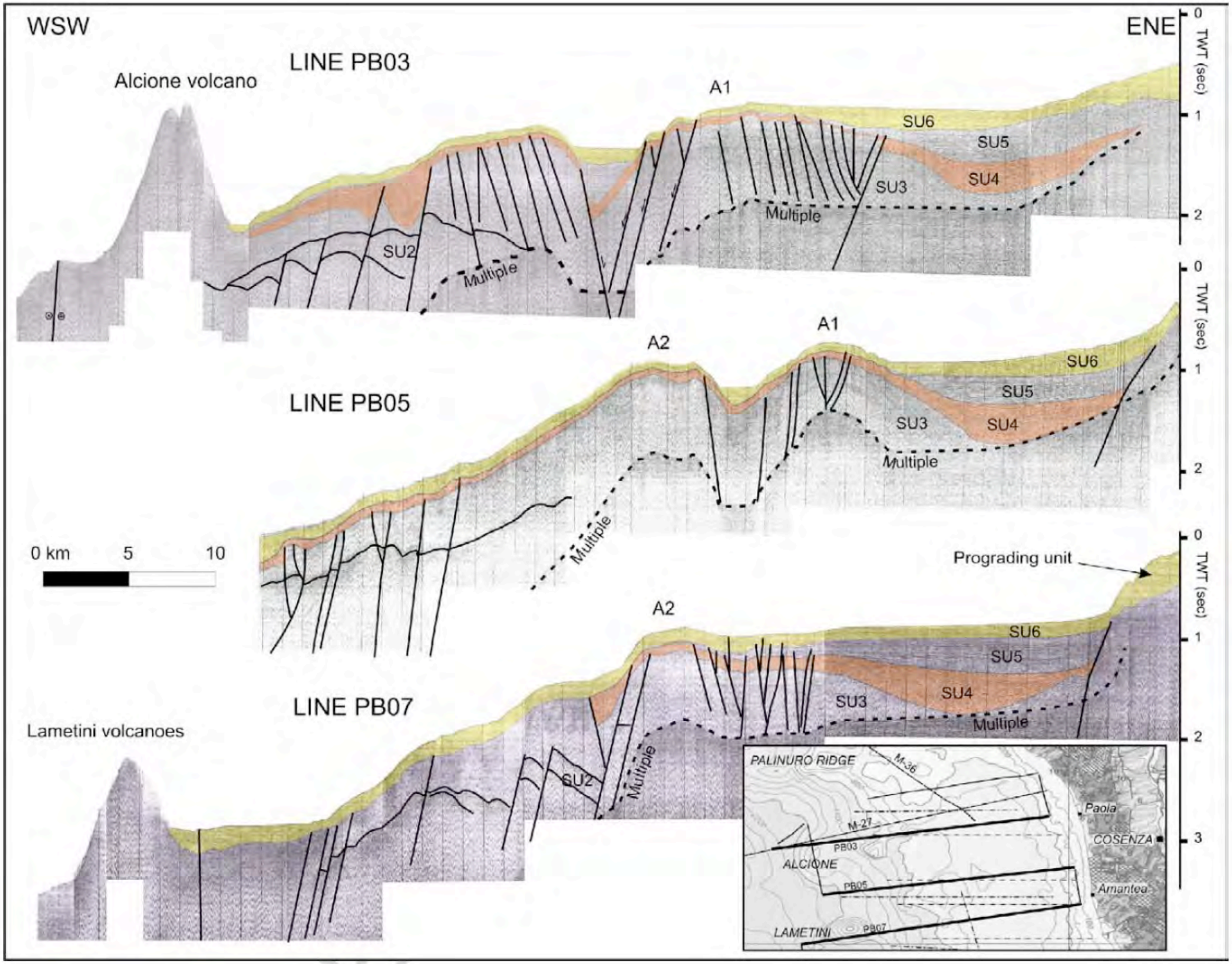

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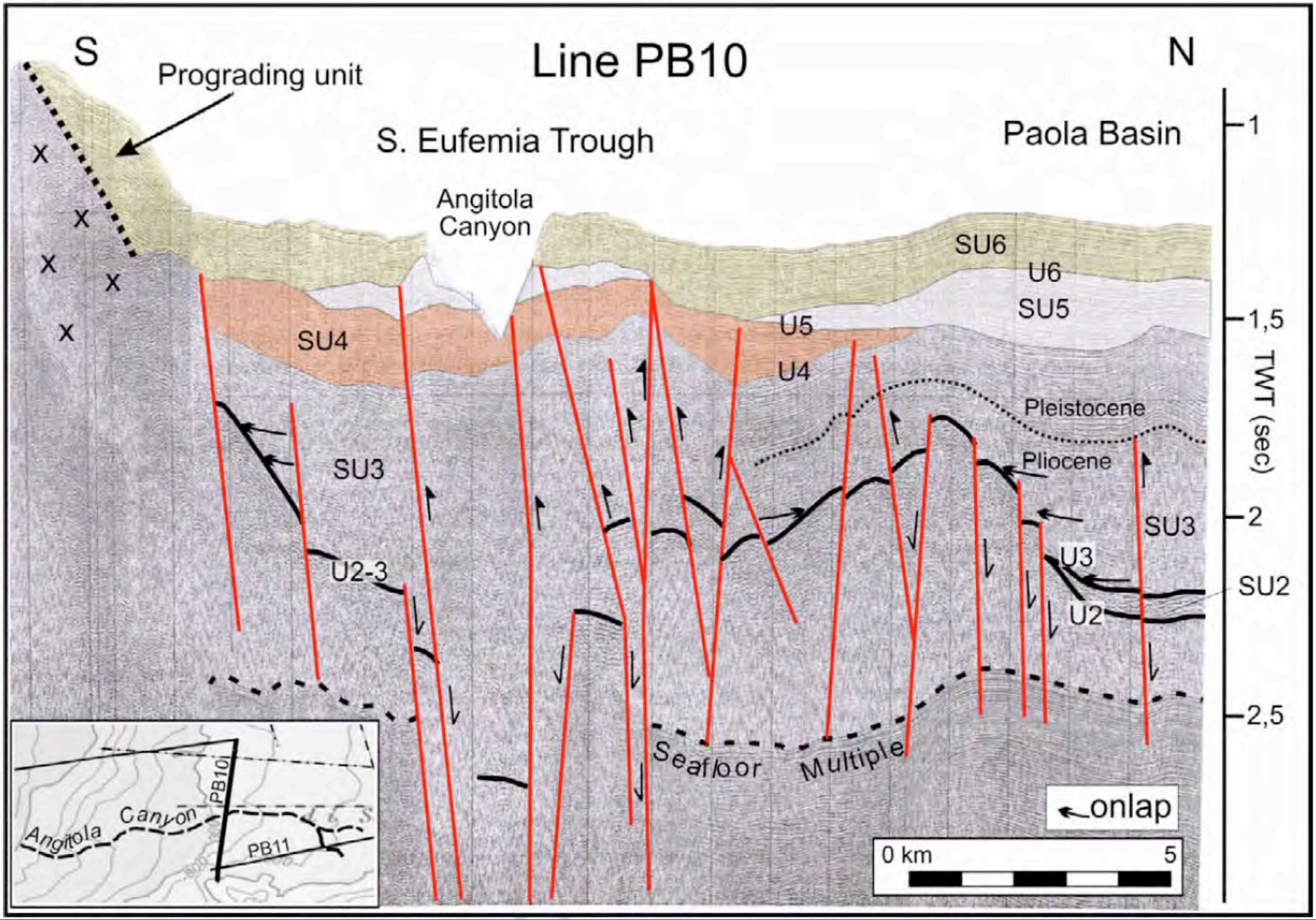
Fig. 6



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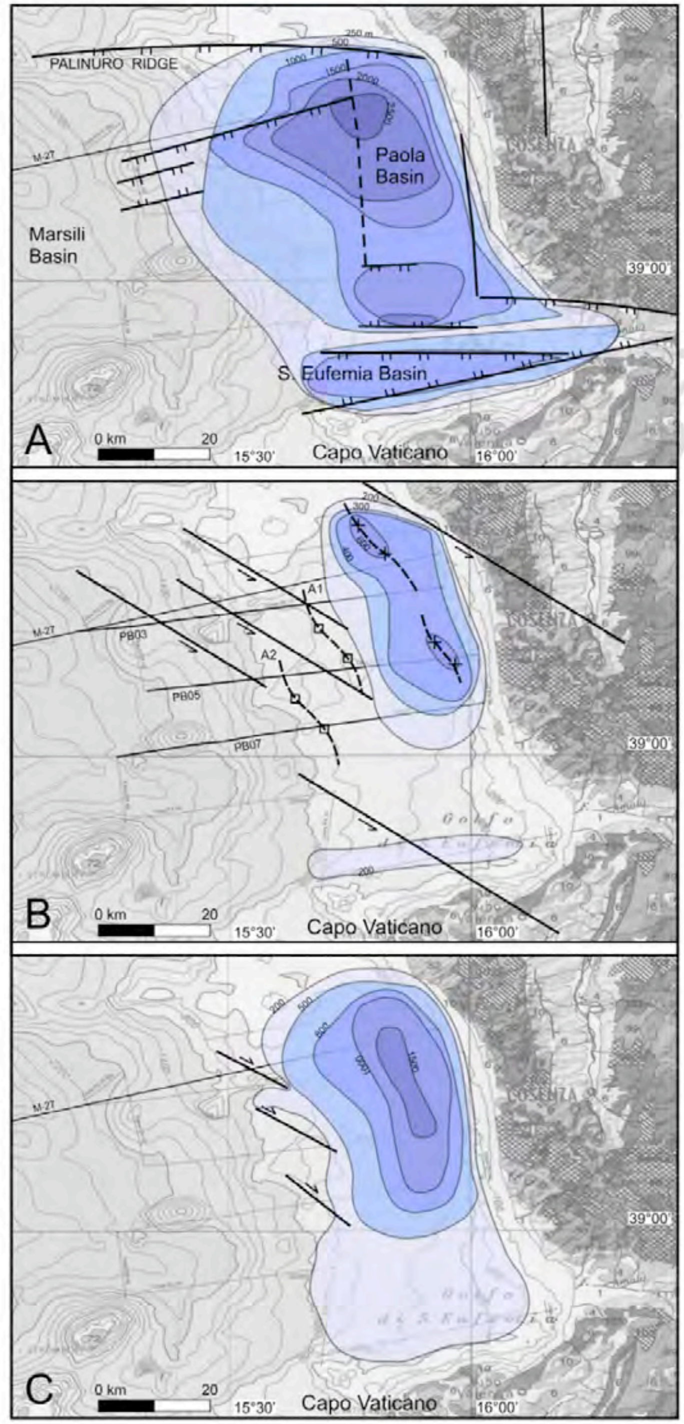
Pliocene-Lower Pleistocene Isopach

Lower Pleistocene Faults and folds

Middle Pleistocene To Recent Isopach



Milia et al 2009

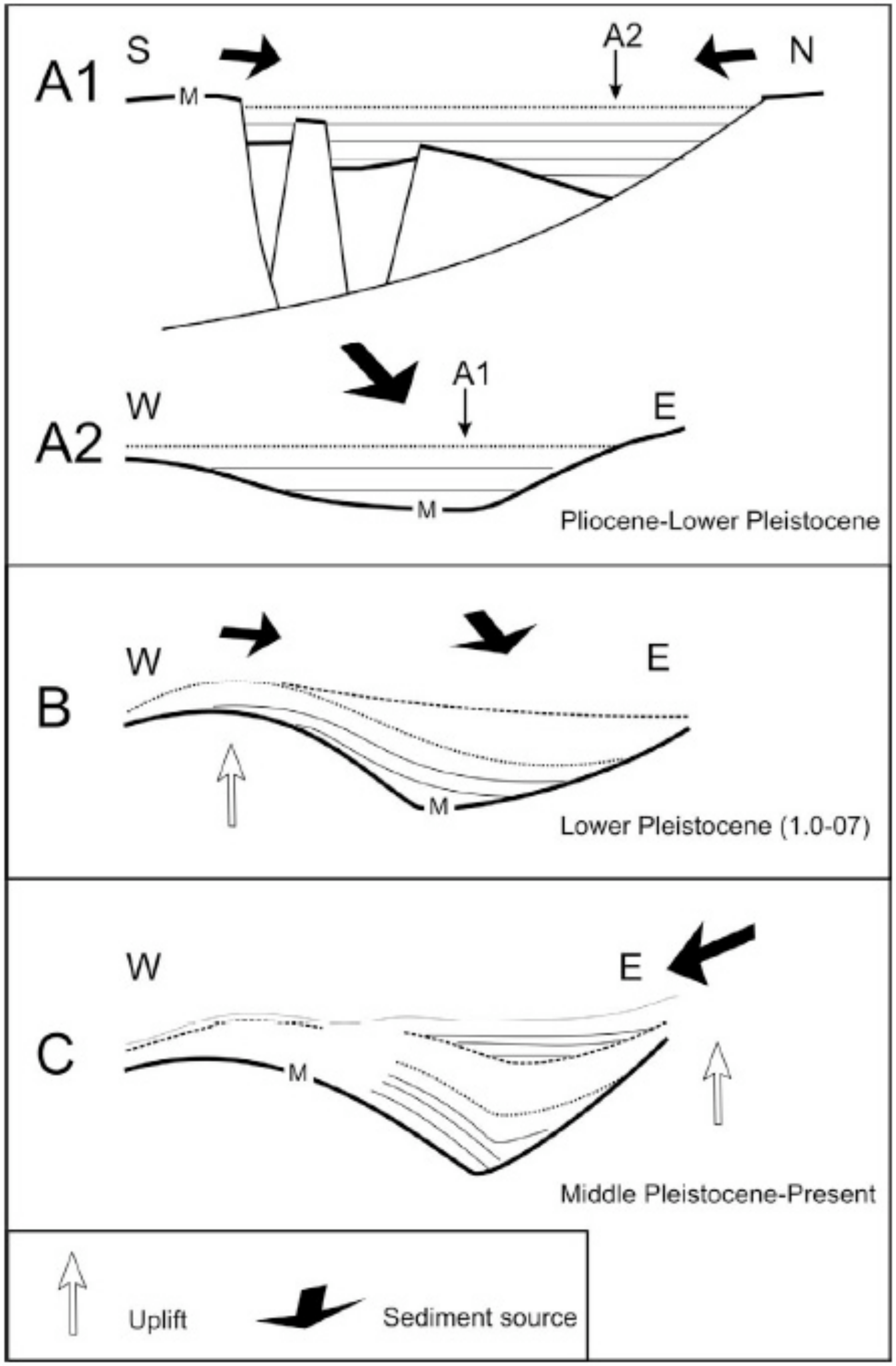


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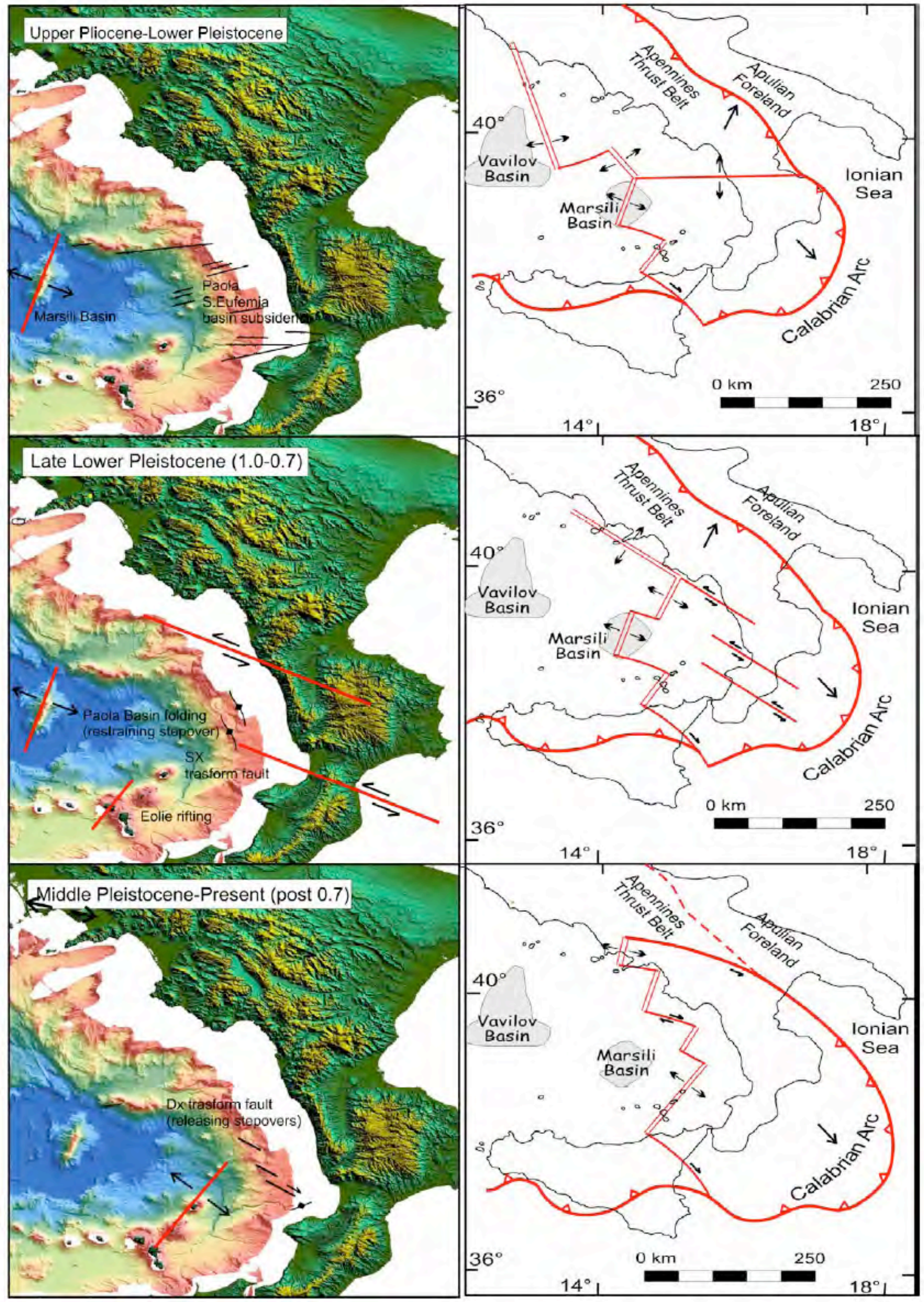
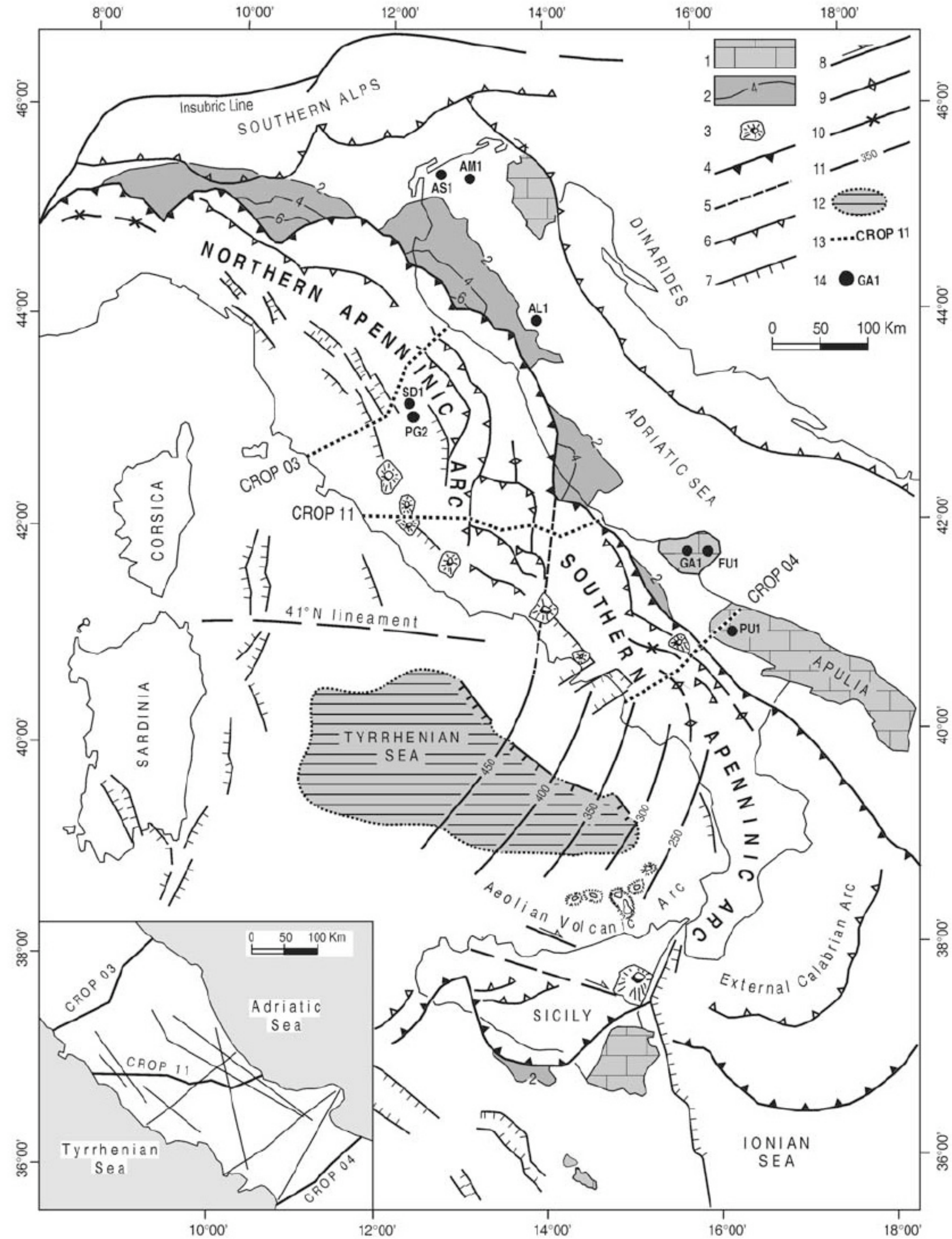
Fig. 11



Milia et al 2009



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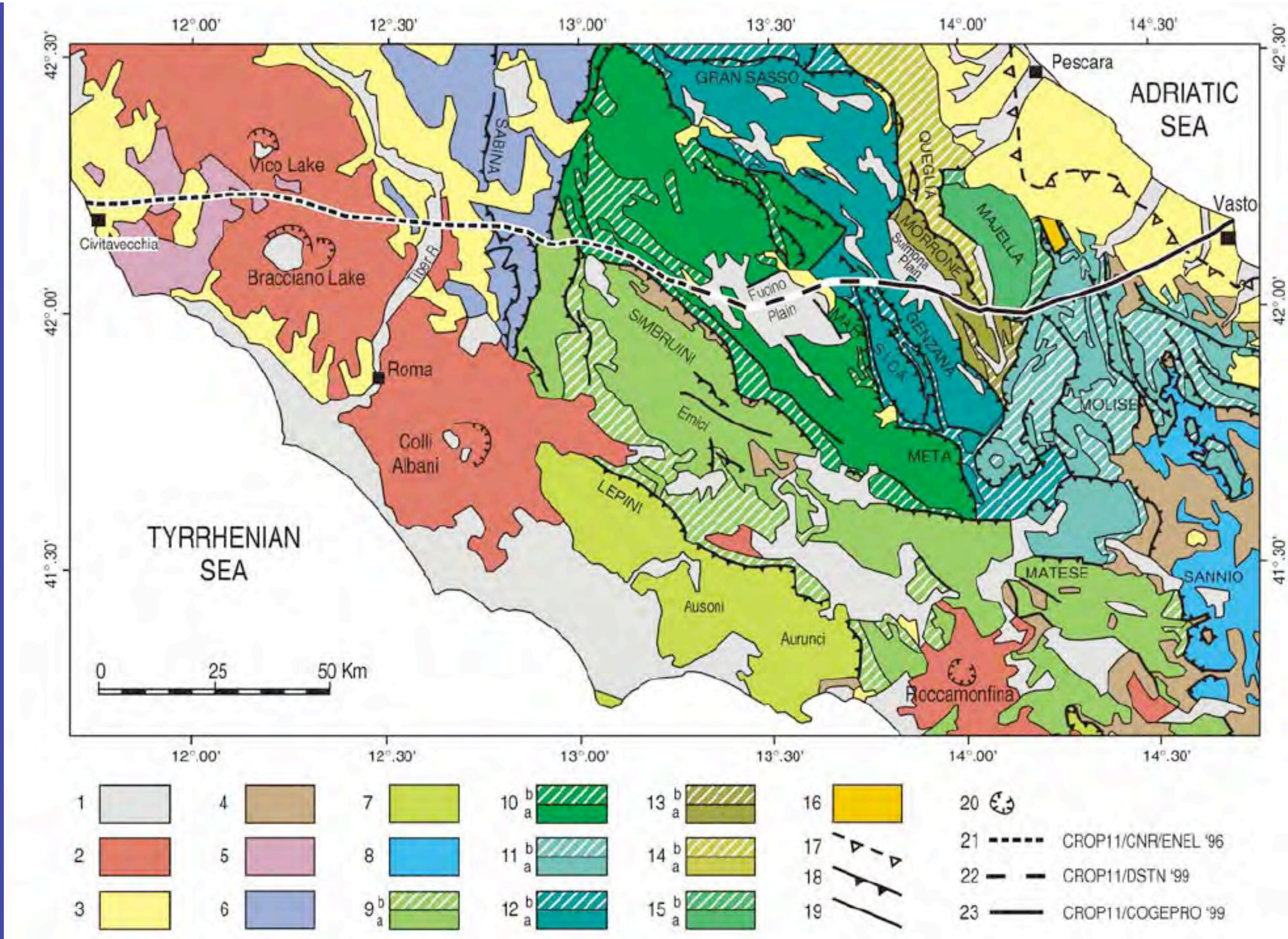

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Figure 2. Structural map of the central Apennines and trace of the CROP 11 seismic line. Key: 1, middle Pleistocene to Holocene continental and subordinate shallow-marine deposits; 2, upper Pliocene–Quaternary volcanites and volcaniclastic deposits; 3, Pliocene–lower Pleistocene continental and marine deposits; 4, undifferentiated Tortonian to uppermost Messinian/lowermost Pliocene thrust-top deposits, uppermost Tortonian–Messinian terrigenous deposits unconformably overlying the Simbruini-Matese Unit grading laterally, north of Matese, into siliciclastic flysch deposits of the Molise sequence; 5, external Ligurian Units: Cretaceous-Paleogene deep basinal deposits; 6, Sabina Units: Upper Triassic–lower Liassic shallow-water carbonates followed by middle Liassic–lower Miocene basinal carbonates; 7, Lepini Unit: Upper Triassic–Upper Cretaceous shallow-platform carbonates followed by lower-middle Miocene deeper-water carbonate deposits; 8, Sannio Unit: Lower Cretaceous–middle Miocene basinal deposits; 9, Simbruini-Matese Unit: (part a) shallow-platform dolomites and limestones (Upper Triassic–Upper Cretaceous) and slope-to-proximal-basin carbonates (Lower Jurassic–Paleogene) disconformably overlain by Miocene open-ramp carbonate deposits, and (part b) siliciclastic flysch deposits (Tortonian); 10, Western Marsica-Meta Unit: (part a) shallow-platform dolomites and limestones (Upper Triassic–Upper Cretaceous) and subordinate slope-to-proximal-basin carbonates (Lower Jurassic–Paleogene) disconformably overlain by Miocene open-ramp carbonate deposits, and (part b) siliciclastic flysch deposits (Messinian); 11, Molise Units: (part a) basinal carbonates (Jurassic/Lower Cretaceous to Tortonian), and (part b) siliciclastic flysch deposits (uppermost Tortonian–Messinian); 12, Gran Sasso-Genzana and Montagna dei Fiori Units: (part a) shallow-platform dolomites and limestones (Upper Triassic–Lower Cretaceous) and slope-to-proximal-basin carbonates (Lower Jurassic–Paleogene) overlain, locally in disconformity, by Miocene open-ramp carbonate deposits, and (part b) siliciclastic flysch deposits (Messinian); 13, Morrone-Porrara Unit: (part a) shallow-platform (Jurassic–Upper Cretaceous) and slope-to-proximal-basin carbonates (Jurassic-Paleogene) disconformably overlain by Miocene open-ramp carbonate deposits, and (part b) siliciclastic flysch deposits (Messinian); 14, Queglia Unit: (part a) Upper Cretaceous–Paleogene basinal carbonates followed by Miocene open-ramp carbonate deposits and by Messinian evaporites, and (part b) siliciclastic flysch deposits (Messinian–lower Pliocene); 15, Majella Unit: (part a) shallow-platform to proximal-basin carbonate deposits (Lower Cretaceous–Paleogene) overlain by Miocene open-ramp carbonates and by Messinian evaporites and marls, and (part b) siliciclastic flysch deposits (lower Pliocene); 16, lower Pliocene marly clays of the Casoli Unit; 17, buried front of the Apennine thrust sheets; 18, major thrusts and backthrusts; 19, faults, including normal faults and strike-slip faults; 20, crater/caldera rims; 21, 22, and 23, trace of the Crop 11 seismic line.

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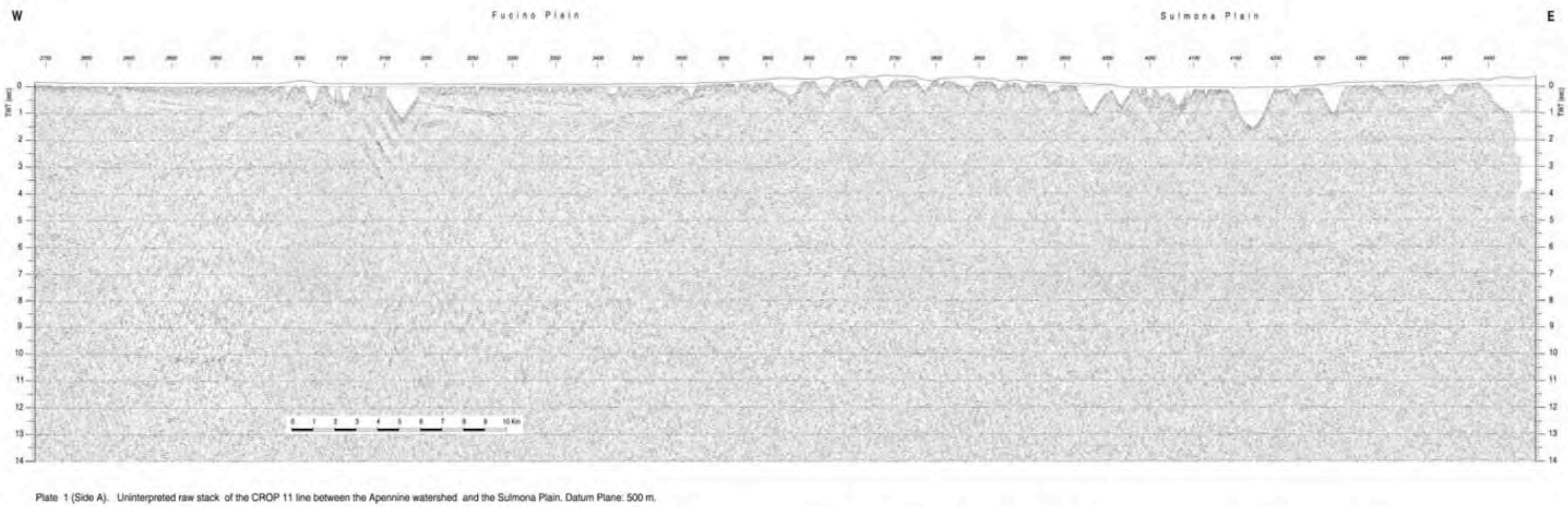

Foldout 1. Uninterpreted raw stack of the CROP 11 line between the Apennine watershed and the Sulmona Plain; datum plane is 500 m.

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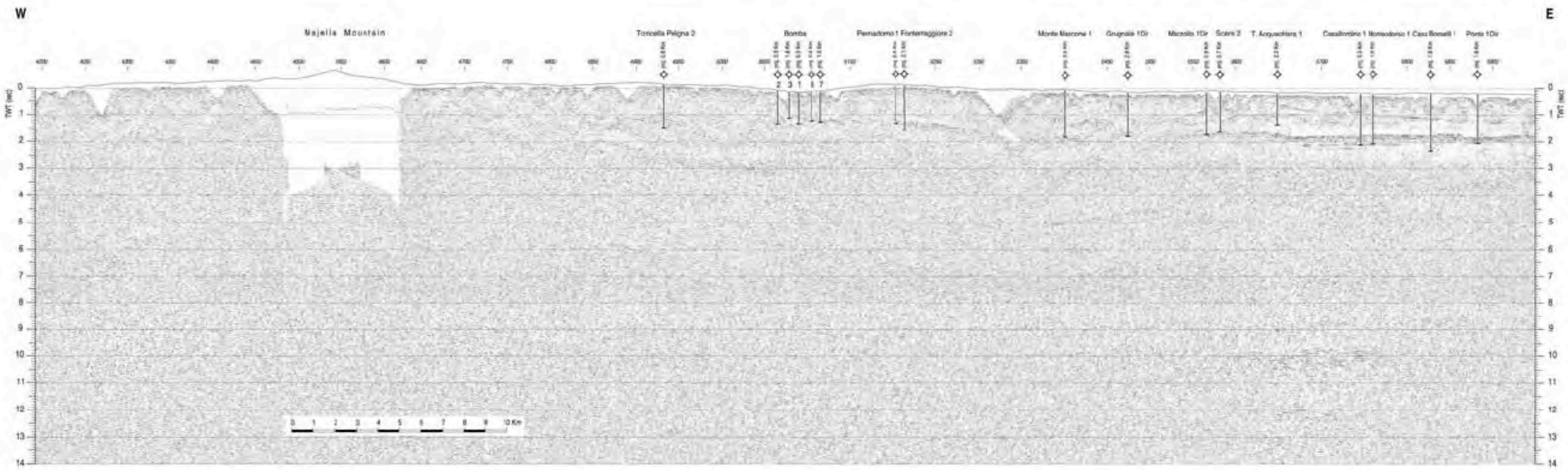

Plate 1 (Side B). Uninterpreted raw stack of the CROP 11 line between the Majella Mountain and the Adriatic coast. Datum Plane: 500 m.

Foldout 2. Uninterpreted raw stack of the CROP 11 line between the Majella Mountain and the Adriatic coast; datum plane is 500 m.

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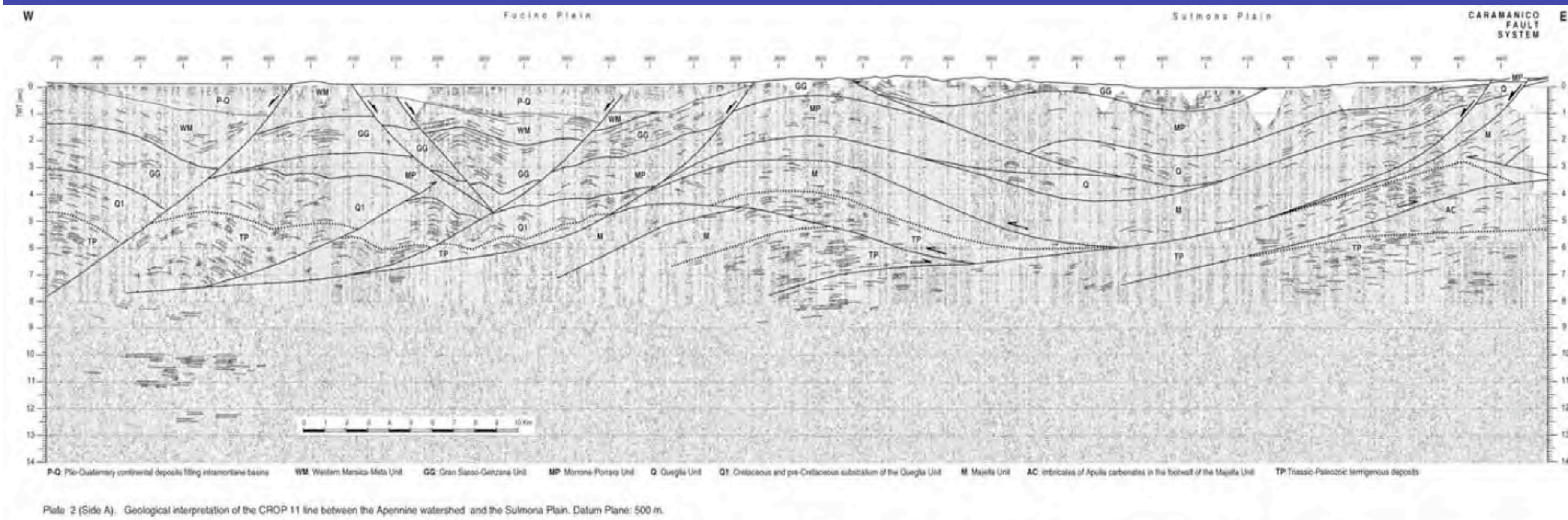

Foldout 3. Geological interpretation of the CROP 11 line between the Apennine watershed and the Sulmona Plain; datum plane is 500 m.

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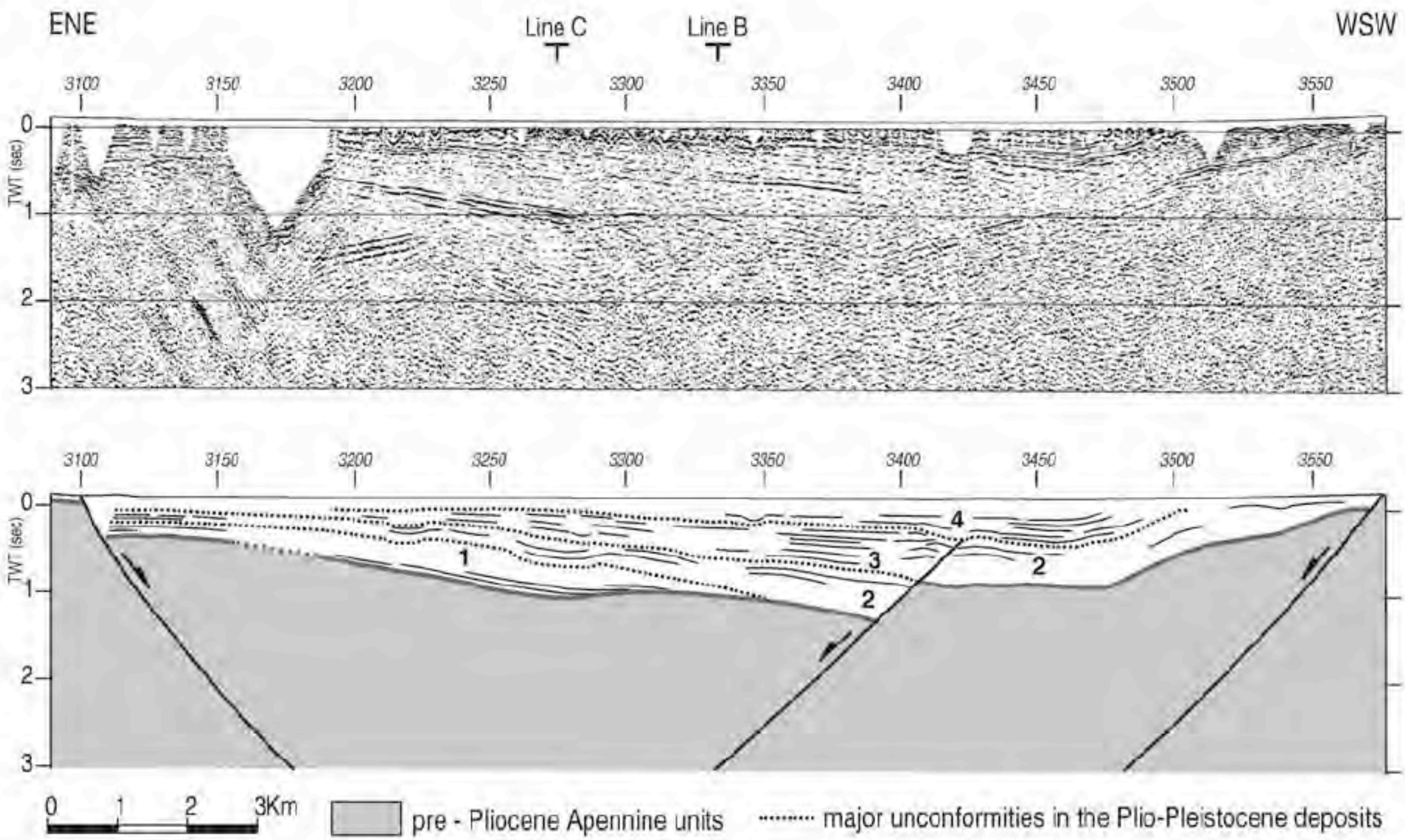

Figure 14. Interpretation of the CROP 11 profile in the Fucino area with the stratal architecture of the Plio-Pleistocene continental deposits filling the intramontane basin. Arabian numbers indicate the identified tectonically controlled seismic units (units 1–4) described in the text.

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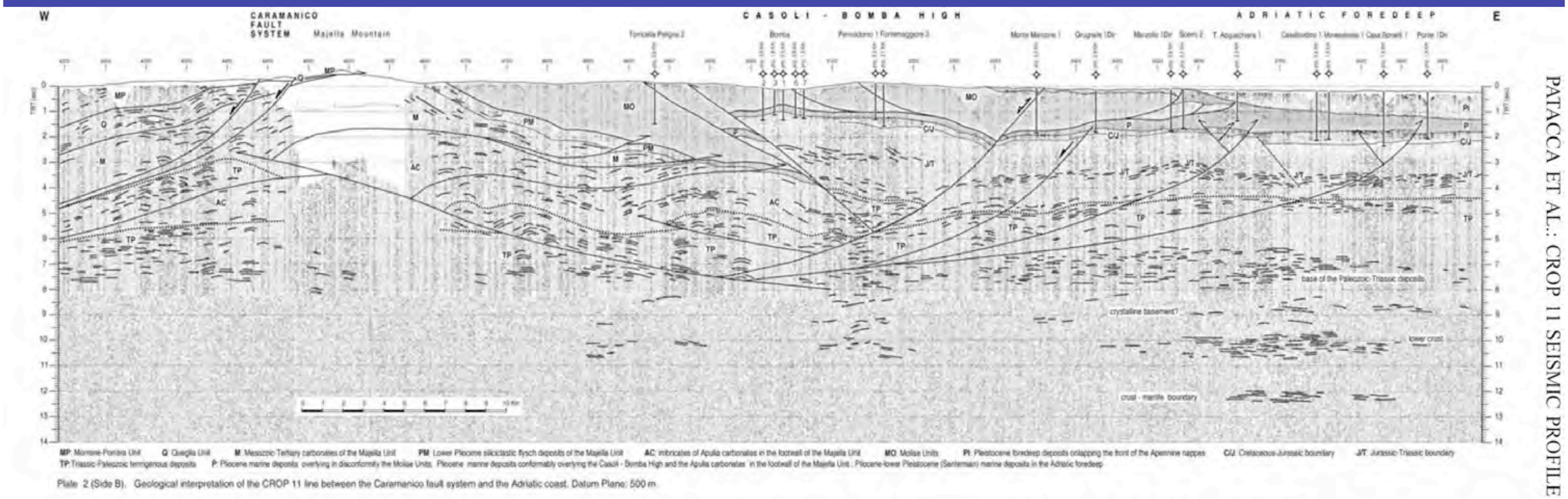

Foldout 4. Geological interpretation of the CROP 11 line between the Caramanico fault system and the Adriatic coast; datum plane is 500 m.

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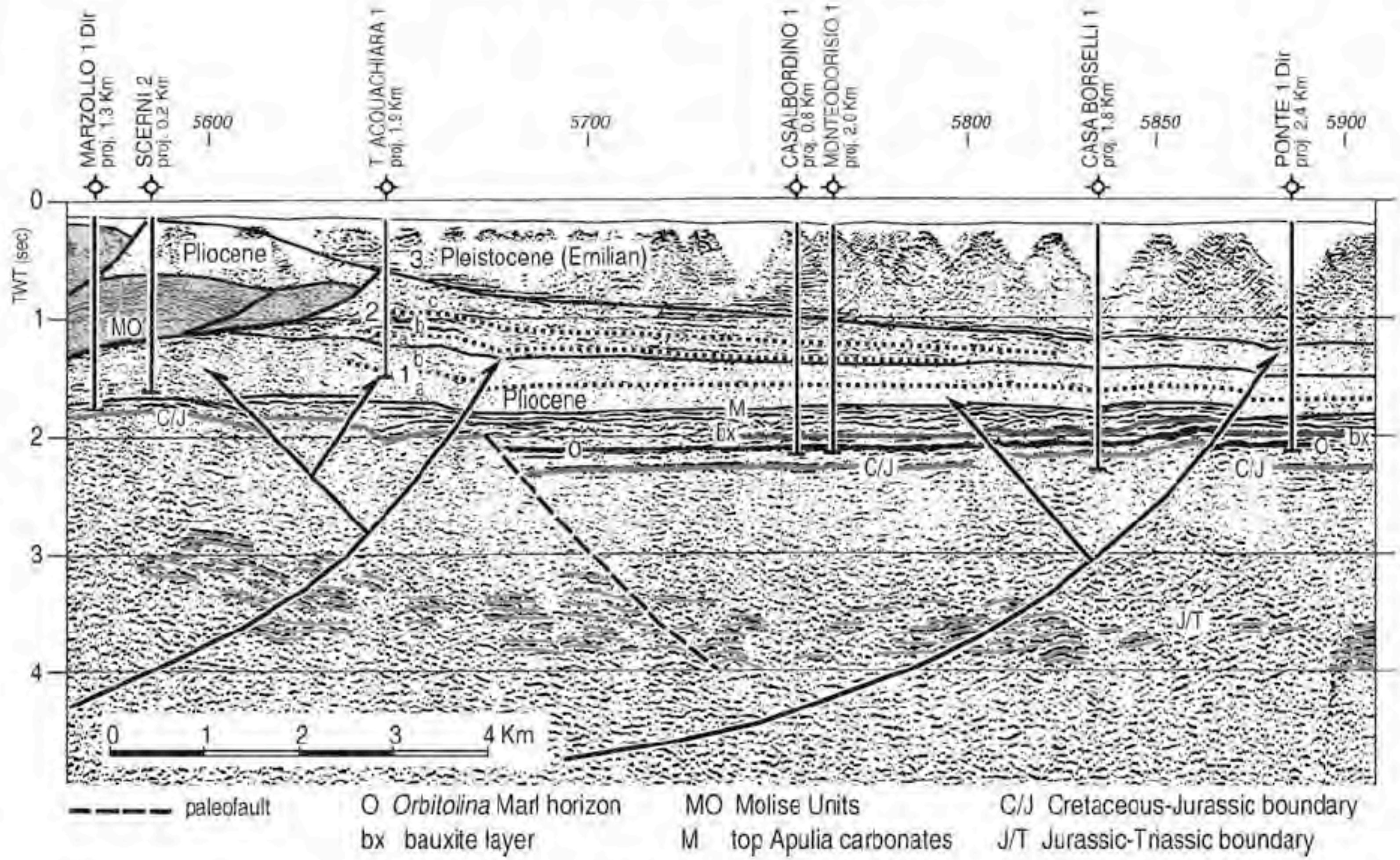

Figure 5. Easternmost portion of the CROP 11 profile showing in some details the seismic signatures in the foreland area at relatively shallow depths. The reflection data highlight the seismic facies configuration of the Apulia carbonates and overlying Plio-Pleistocene foredeep deposits. Well-log expressions of the Mesozoic-Tertiary carbonates and of the overlying Plio-Pleistocene deposits are shown in Figures 6 and 10, respectively. Arabian numbers with associated small letters a, b, and c refer to the intervals illustrated in Figure 10. The datum plane of the seismic line is 400 m above sea level. Rotary table elevations and total depths of the projected wells are indicated in Figure 10.

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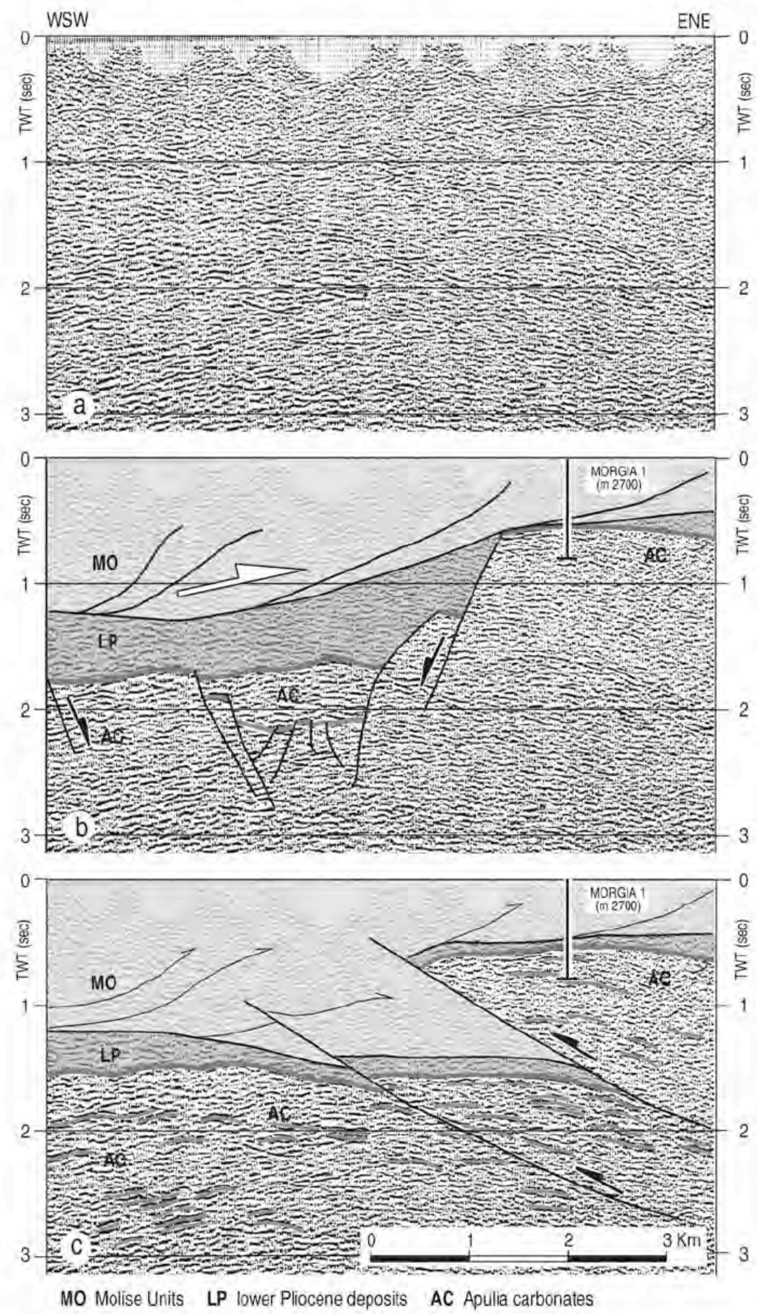

Figure 9. Different structural interpretations of the western flank of the Casoli-Bomba High. (a) Uninterpreted segment of a commercial line parallel to the CROP 11 line located a few kilometers toward the north. (b) Interpretation according to *Scisciani et al.* [2001]. (c) Alternative interpretation proposed in this paper. See in Figure 3 the location of Morgia 1.

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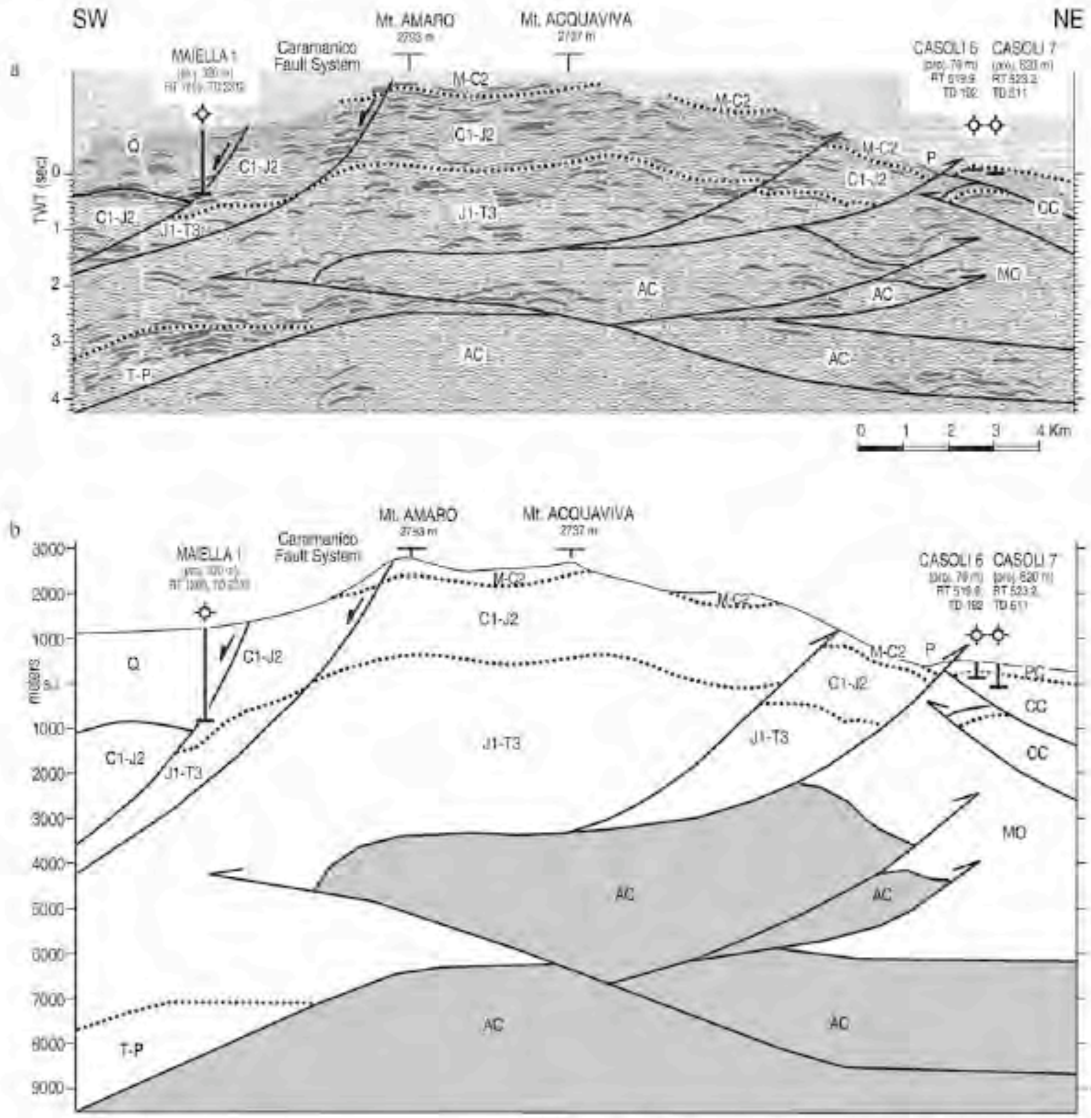

Figure 12. Interpreted commercial line crossing the Majella anticline in correspondence to the (a) axial culmination and (b) corresponding geological section. Datum plane of the seismic profile: 200 m above sea level. Abbreviations: AC, Mesozoic-Tertiary carbonates of the Apulia Platform in the footwall of Majella; CC, Mesozoic-Tertiary carbonates of the Apulia Platform in the Casoli structural high; PC, lower Pliocene marly clays of Casoli; TP, Paleozoic-Triassic deposits of Majella; J_1-T_3, Upper Triassic–Lower Jurassic carbonates of Majella; C_1–J_2, Middle Jurassic–Lower Cretaceous carbonates of Majella (Morrone di Pacentro Fm); M-C_2, Upper Cretaceous–upper Miocene carbonates and Messinian evaporites of Majella; P, lower Pliocene siliciclastic flysch deposits of Majella; Q, upper Messinian–lower Pliocene siliciclastic flysch deposits of the Queglia Unit; MO, Molise nappes.

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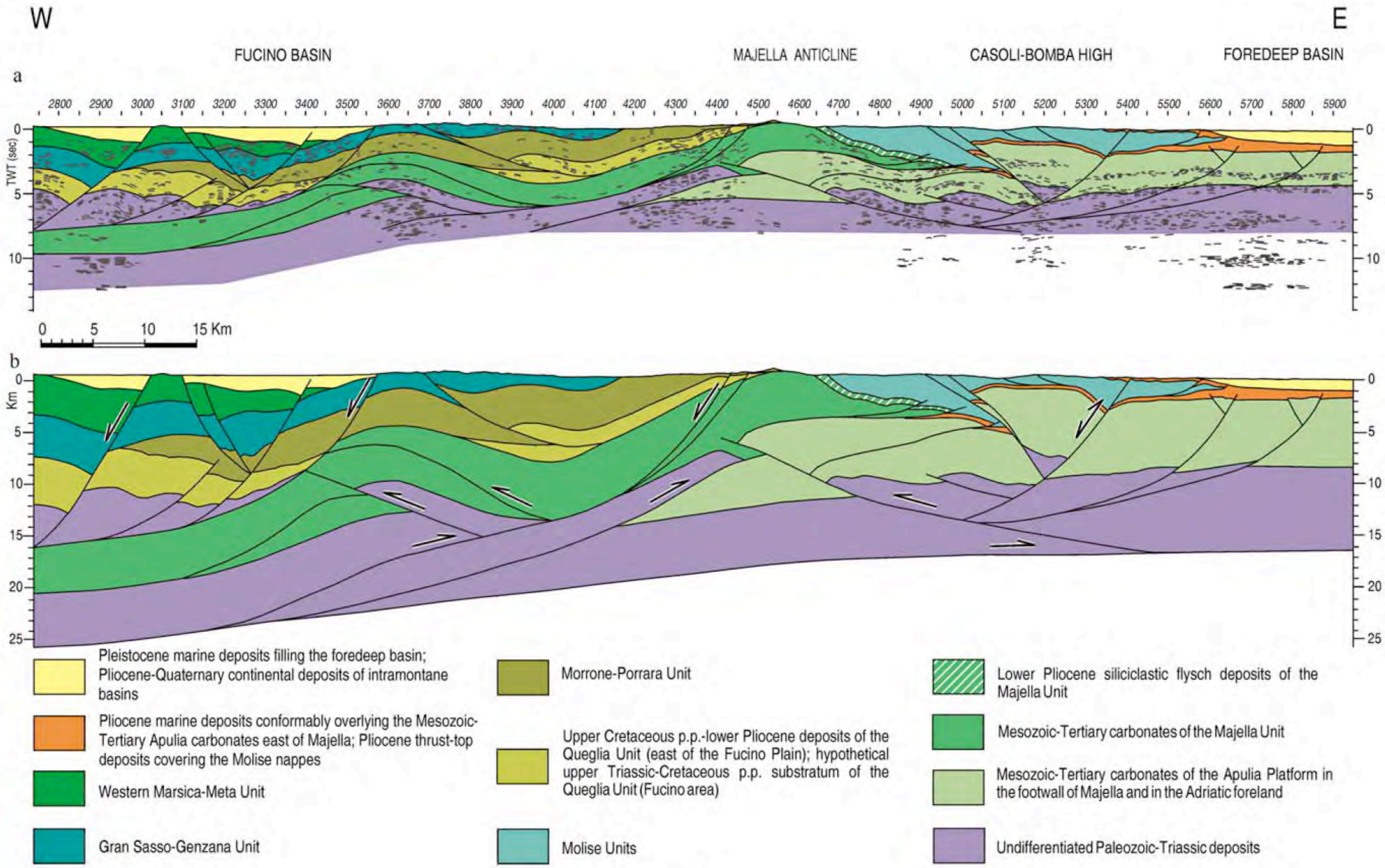

Figure 17. Simplified structural interpretation of the CROP 11 line. (a) Time section. (b) Depth-converted section. At the western termination of the seismic profile, we have reported in both sections the interpretation according which the deepest seismic reflectors are representative of the Paleozoic-Triassic sedimentary sequence underlying the Upper Triassic dolomites and evaporites of the Apulia Platform (see discussion in the text).

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Transalp Crustal Seismic Profile Location

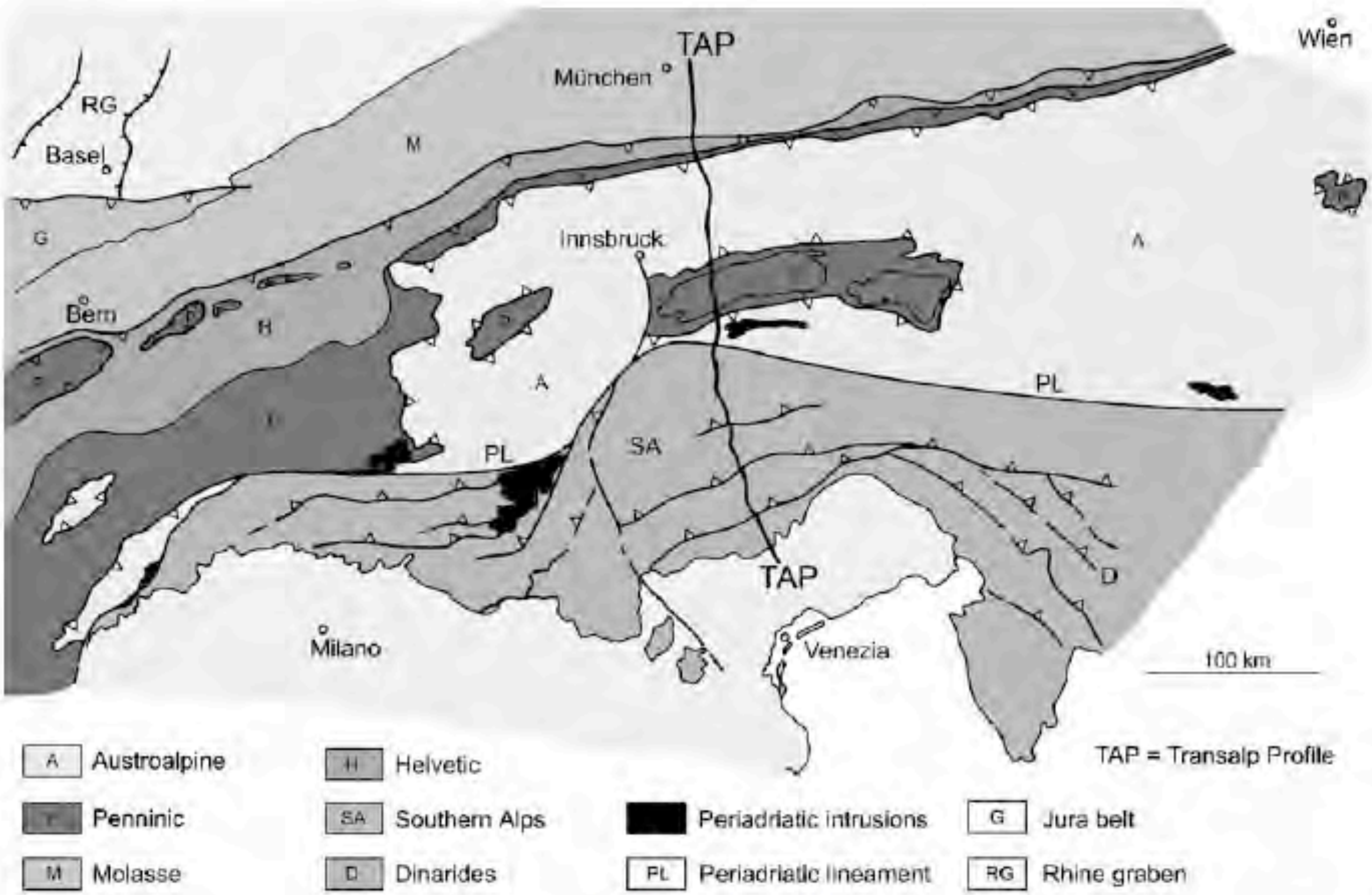

Fig. 1. Structural scheme of the Alps (simplified from Bigi et al., 1990) and location of the TRANSALP profile (TAP).

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Crustal Model before Transalp Experiment

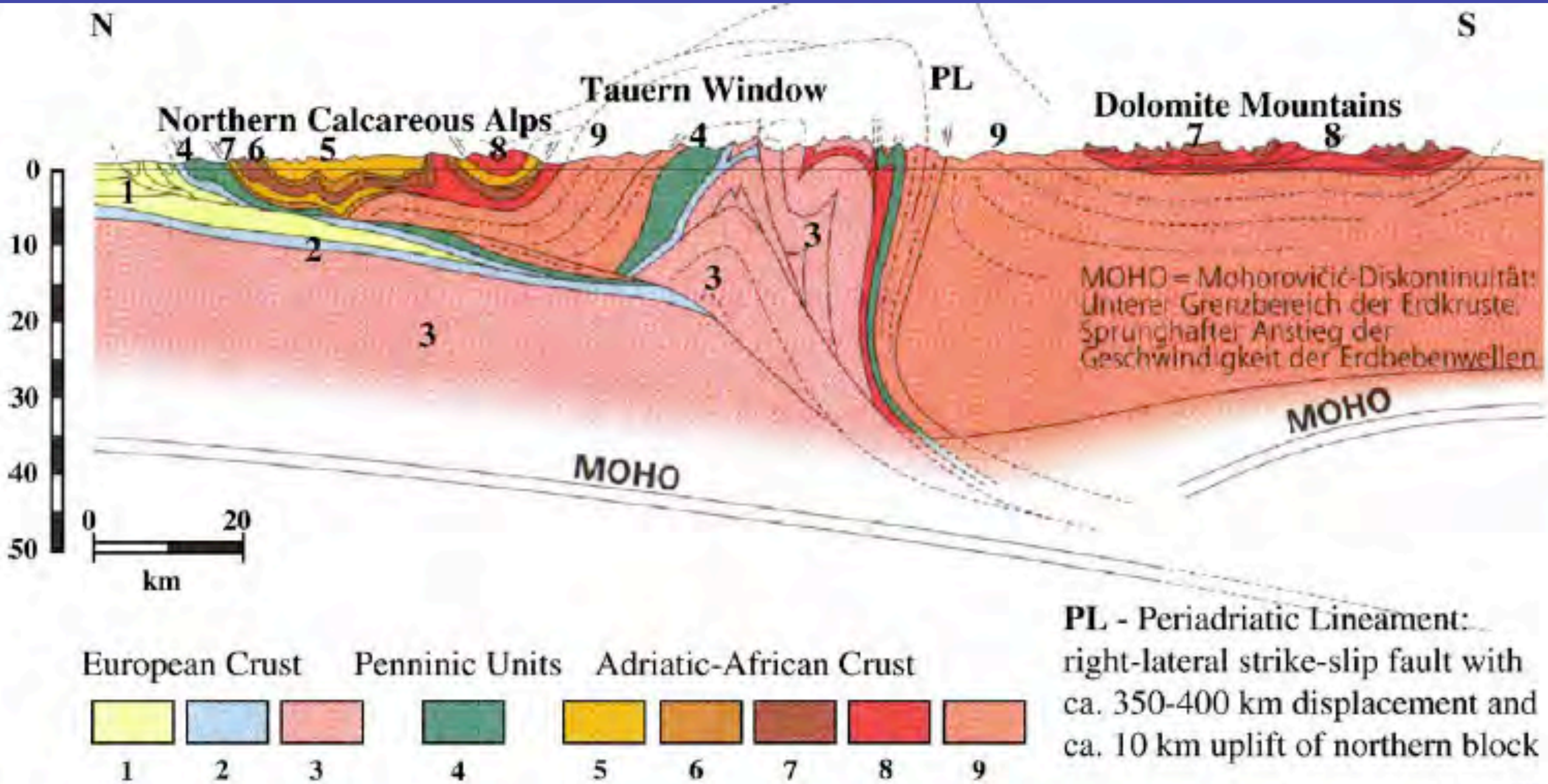

Fig. 1. Pre-experiment crustal cross-section along the TRANSALP-Traverse (modified from Lammerer and Weger, 1998). Legend: 1) Molasse sediments, folded and unfolded, 2) European Mesozoic sedimentary rocks, 3) European Variscan basement and Tauern core complex, 4) oceanic sedimentary rocks and ophiolites, 5) Upper Triassic carbonates of Adria plate, 6) Raibl beds, 7) Lower Triassic carbonates of Adriatic plate, 8) Permo-Triassic evaporates volcanics of Adria plate, porphyric granites, granodiorites, tonalities (Central Gneiss unit) in Tauern Window, 9) Austroalpine and South Alpine pre-Mesozoic metamorphic basement. Estimates of lateral and vertical displacements along the Periadriatic Lineament (PL) are in debate. Moho depths are derived from seismic refraction experiments in the 1970s (Miller et al., 1977; Scarascia and Cassinis, 1997). Adriatic crust is assumed to be more rigid than the European crust.

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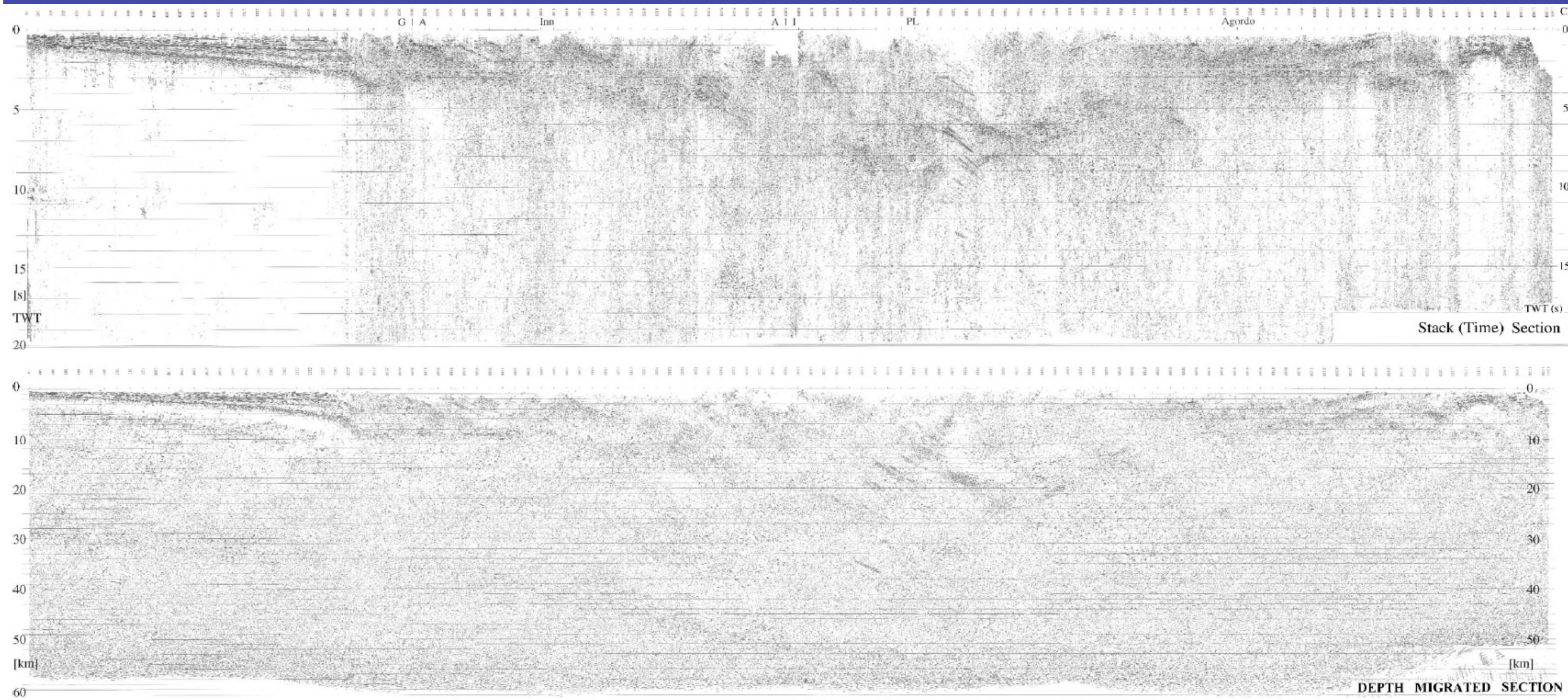

ïig. 16. Compilation of complete Vibroseis sections of the TRANSALP transect. Top: Stack section, bottom: depth-migrated section. The stack section has been produced by using a 20 s long AGC window before stacking in order to maintain relative amplitudes. A 2 s long AGC window was used for input into the migration scheme in order to make the wavefield nore coherent. Scale 1 : 1, length of sections: 300 km.

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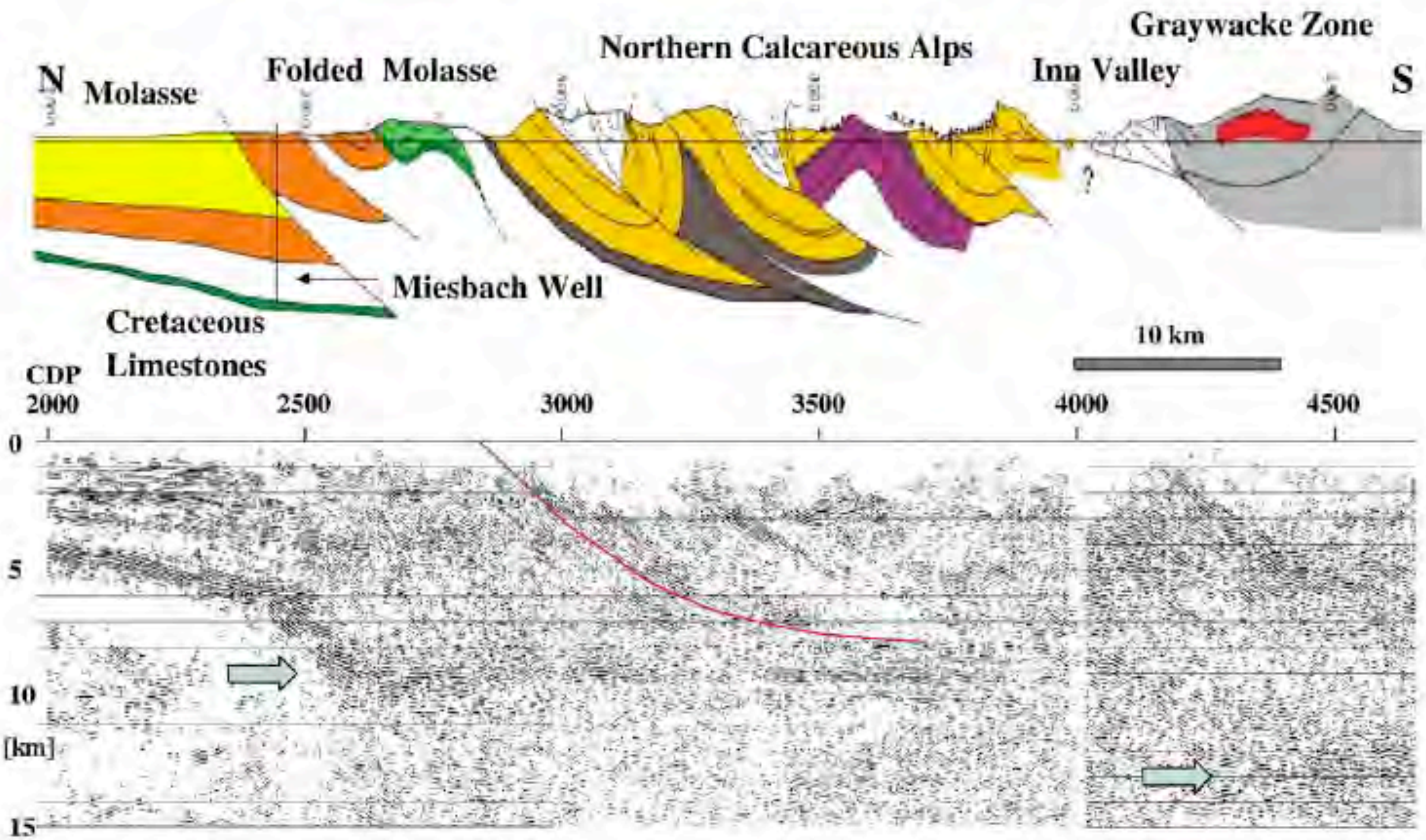

Fig. 11. Depth-migrated Vibroseis section from the Bavarian Tertiary Molasse Basin to the Northern Calcareous Alps, crossing the main Alpine front thrust system. The arrows mark displacements of the base of the Folded Molasse Basin and the Northern Calcareous Alps. The marked line denotes a transition from diffuse reflective character of the folded Molasse Basin (including Rhenodanubian Flysch and Helvetic units) to well pronounced individual southward dipping reflections of the nappes of the Northern Calcareous Alps. Velocity analysis has shown reduced velocities beneath the marked line. Well Miesbach 1 has been drilled from +709 to −5040 m (a.m.s.l.) into Lower Cretaceous limestones. Note that datum level for seismic section is 800 m a.m.s.l. Vertical scales are slightly exaggerated (ca. 1.25:1).

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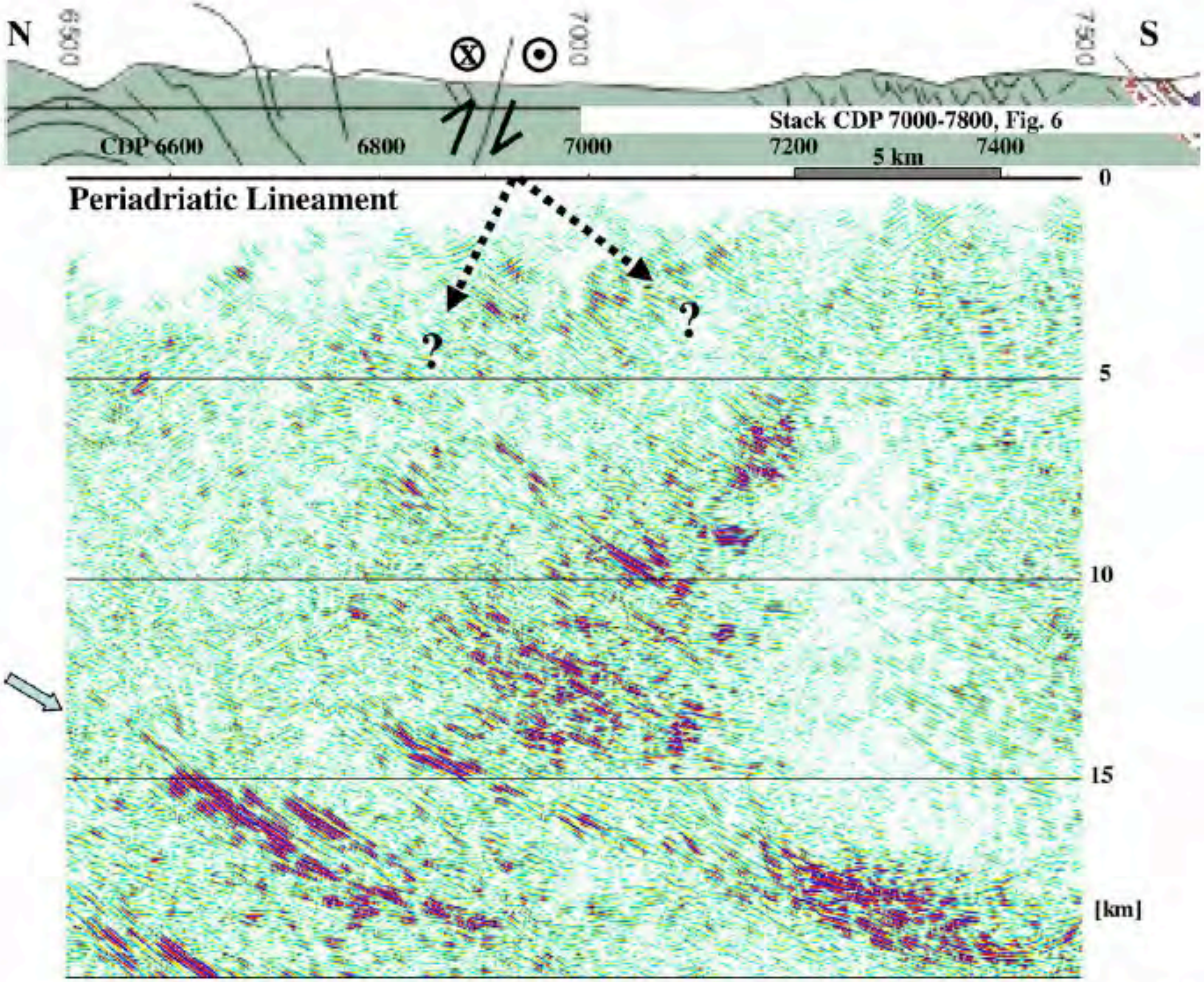

Fig. 8. Sample of the post-stack depth-migrated section, located south of the Tauern Window. The location of the stack sample (Fig. 6) is marked as a white bar for comparison. Note that the steeply southward dipping pattern in the stack section migrated about 20 km to the north. The location of the Periadriatic Lineament and its possible dip directions according to the discussion in the text is marked by arrows. The arrow on the left side marks again the reflection seen in Figs. 5 and 6.

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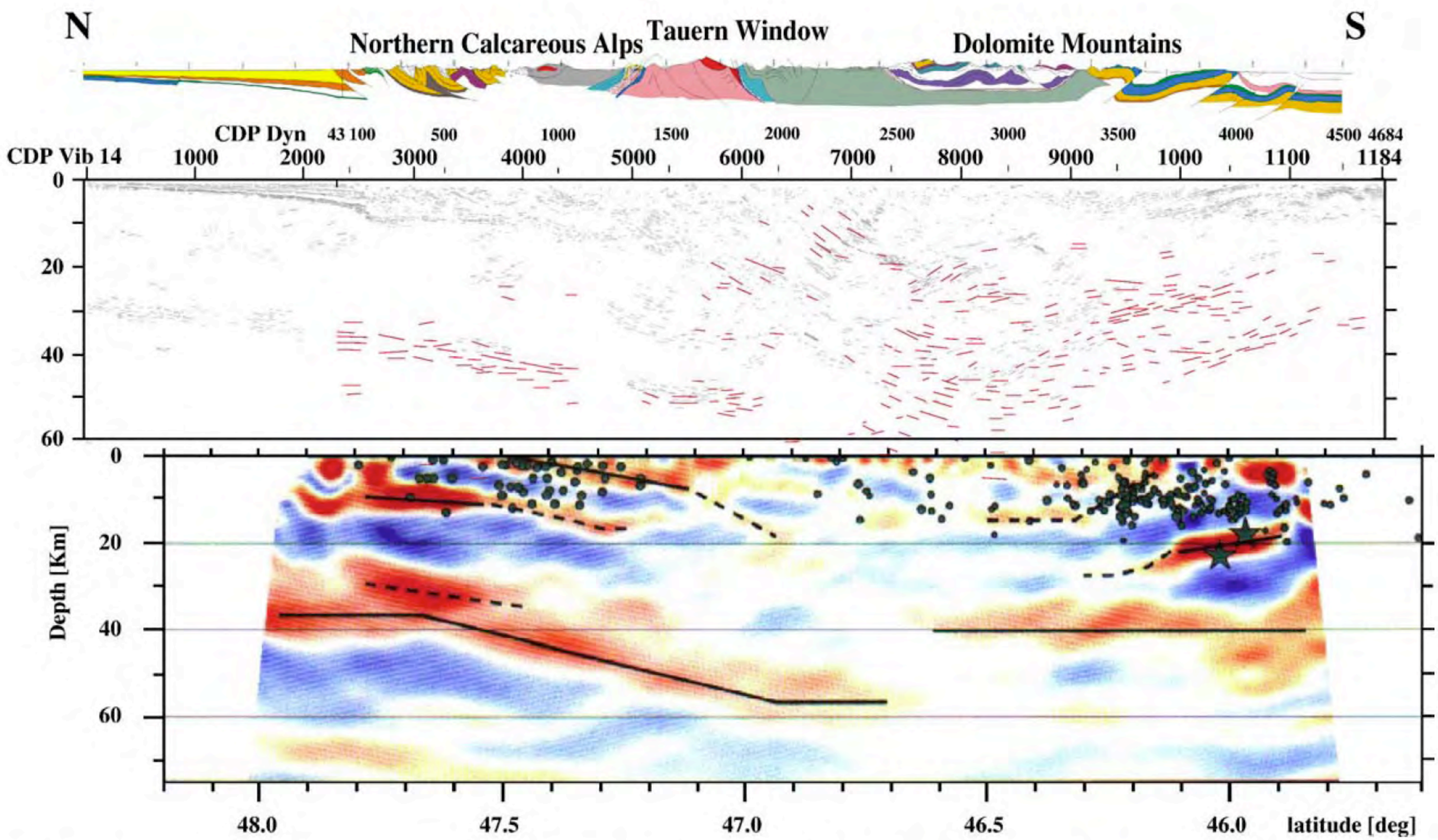

ïig. 18. Comparison of the reflection seismic section (Vibroseis reflections in black, explosive seismic reflections in red colour), represented as ine drawing (top), with a depth-migrated receiver function section (bottom, modified from Kummerow et al., 2004). The maximum within the ed-coloured receiver functions corresponds to the assumed P- to S-wave converting main discontinuities (black lines). Also shown here focal lepths of earthquakes since 1975; stars denote particularly strong earthquakes (see discussion by Kummerow et al., 2004).

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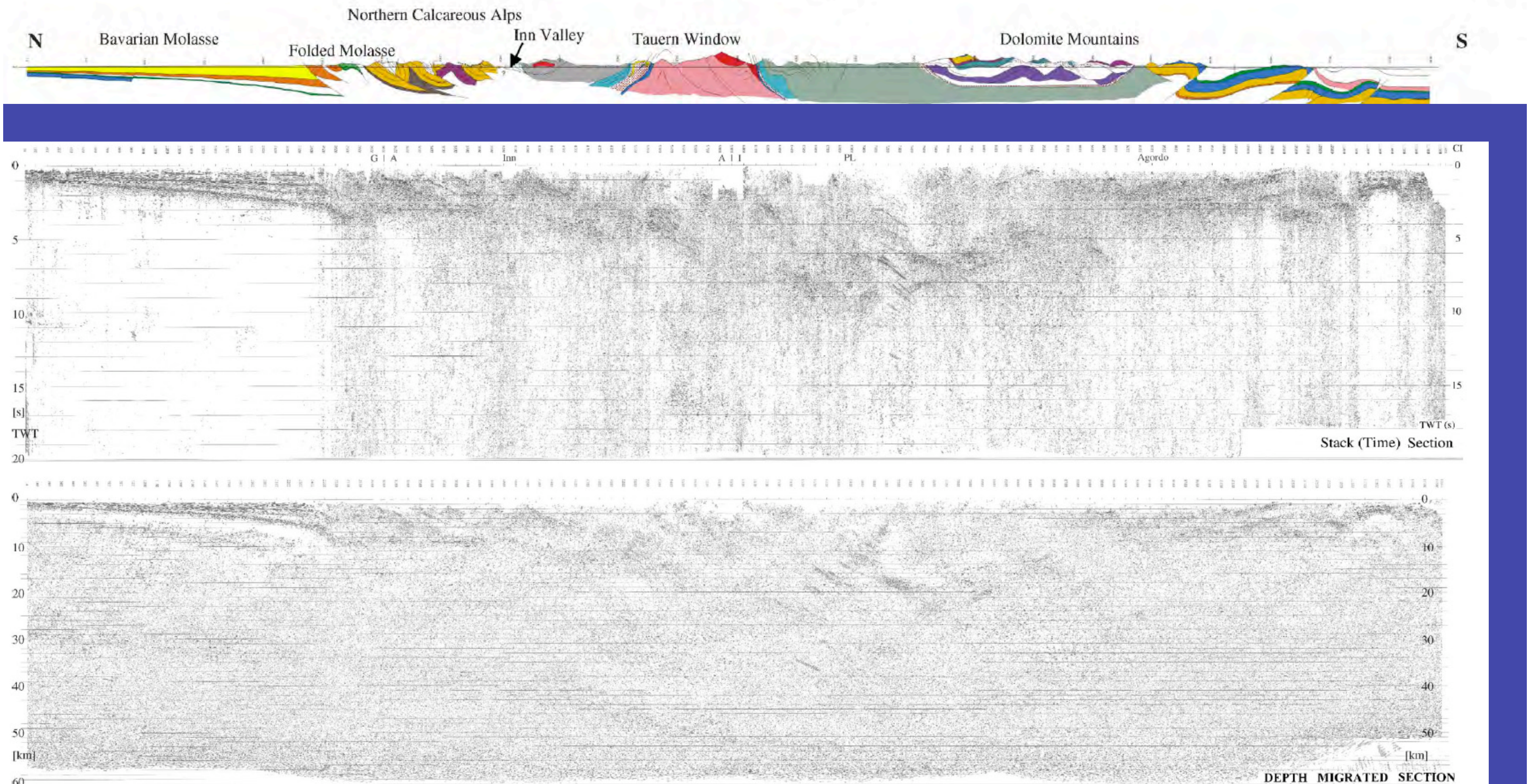

Fig. 16. Compilation of complete Vibroseis sections of the TRANSALP transect. Top: Stack section, bottom: depth-migrated section. The stack section has been produced by using a 20 s long AGC window before stacking in order to maintain relative amplitudes. A 2 s long AGC window was used for input into the migration scheme in order to make the wavefield more coherent. Scale 1 : 1, length of sections: 300 km.

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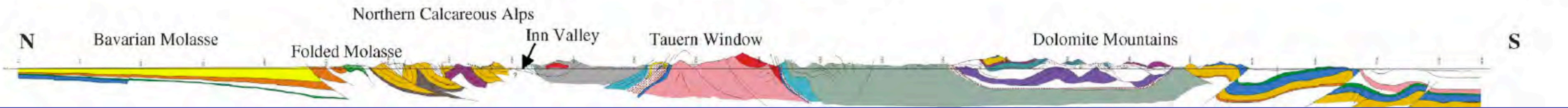

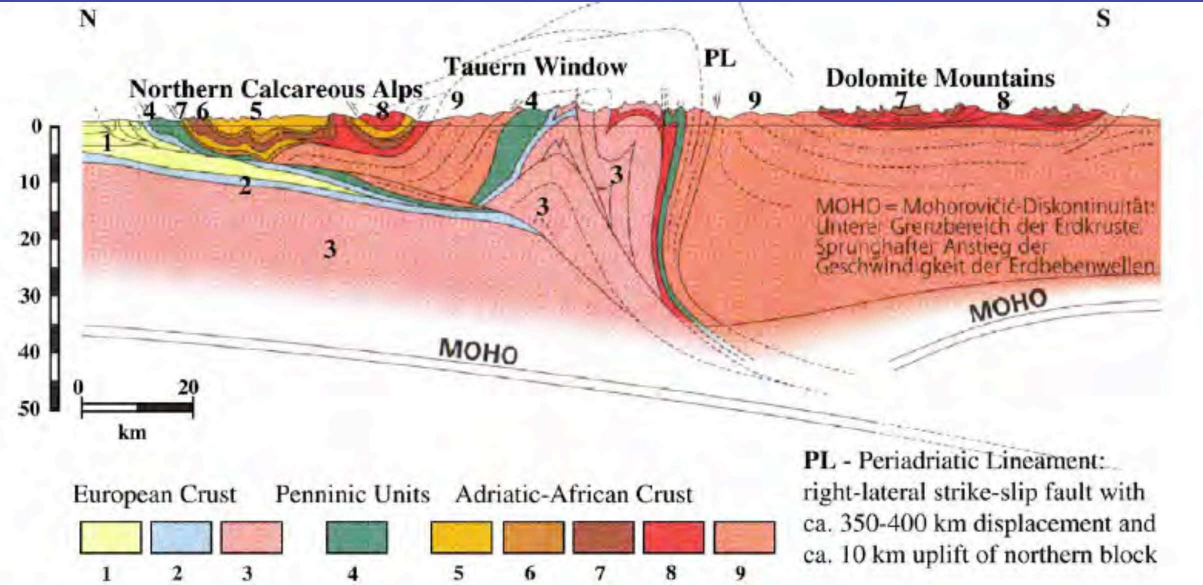

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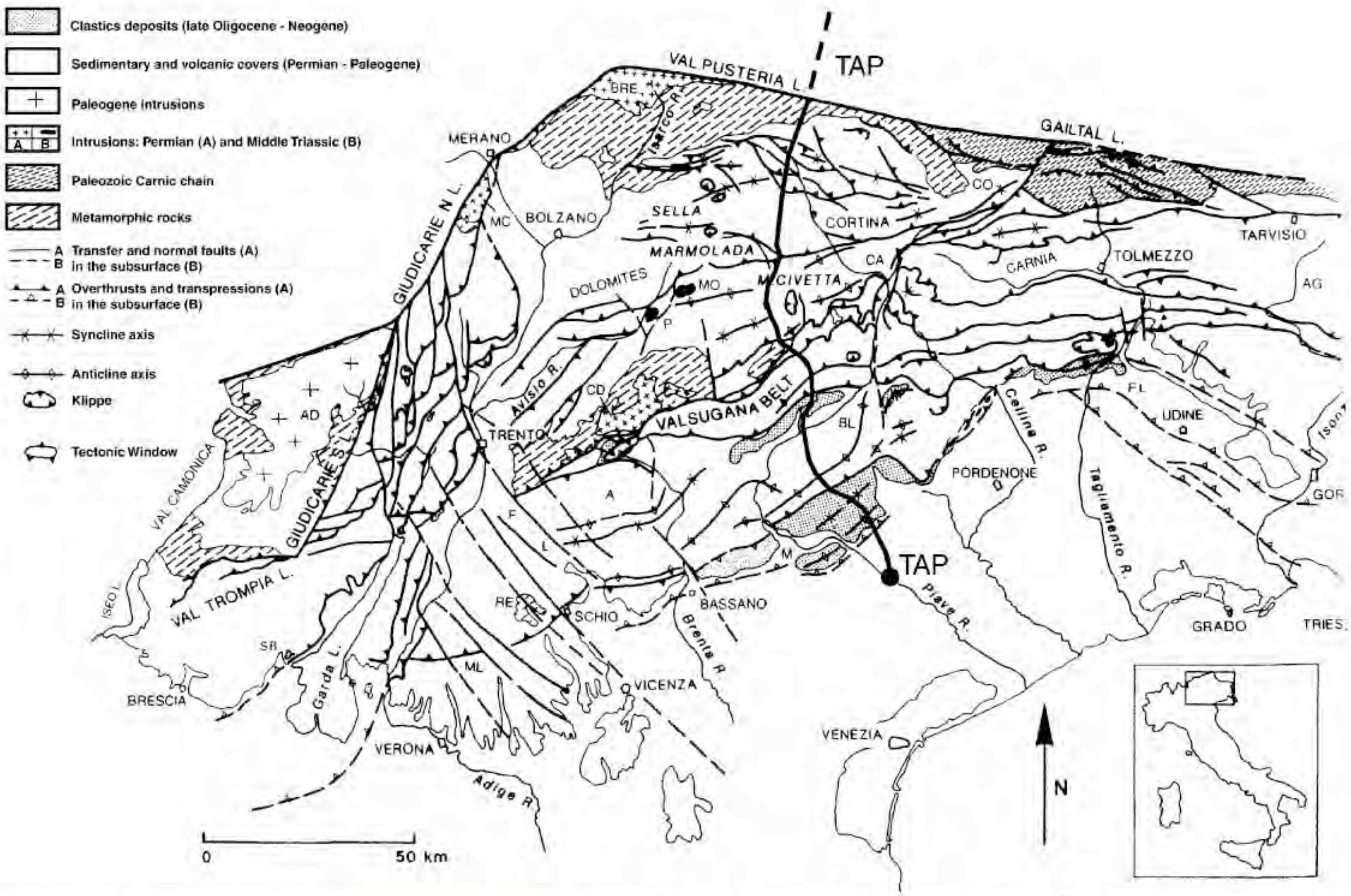

Fig. 2. Tectonic map of the eastern Southern Alps (from Castellarin et al., 1998b, modified from Bigi et al., 1990). Letters: AG = *Alpi Giulie*; FL = *Friuli*; CA = *Cadore*; CO = *Comelico*; MO = *Monzoni*; P = *Predazzo*; BL = *Belluno*; M = *Montello*; RE = *Recoaro*; ML = *Monti Lessini*; F = *Folgaria*; L = *Lavarone*; A = *Asiago zone*; SB = *S. Bartolomeo Hill* (Salò, Garda Lake); MC = *Monte Croce*; BRE = *Bressanone, Ivigna*; CD = *Cima d'Asta*; AD = *Adamello*; TAP = TRANSALP profile (southern sector).

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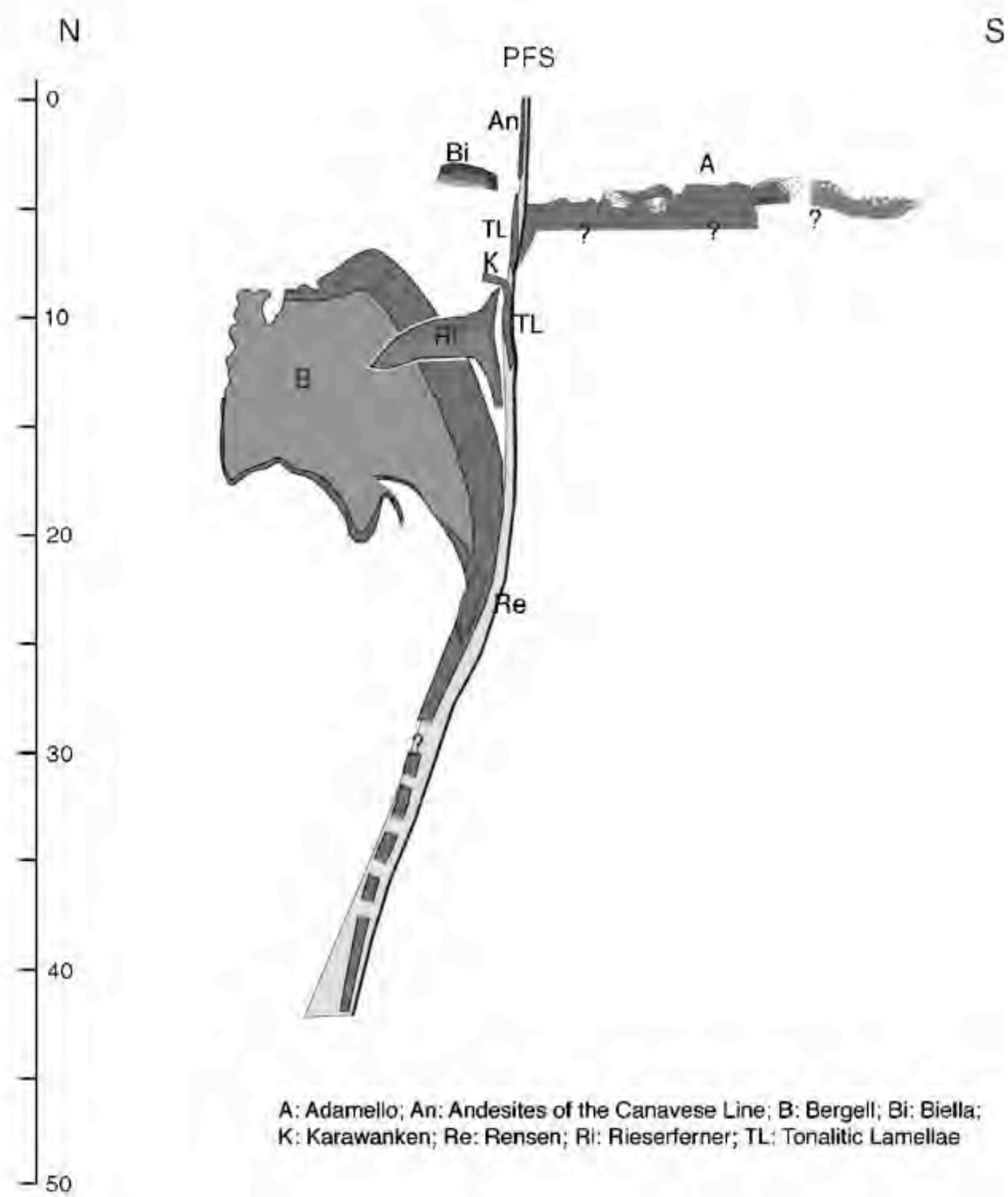

Fig. 4. Synthetic section showing depth (km) and geometry of the plutonic bodies of Oligocene age associated with the activity of the "Periadriatic Fault System" (PFS) and constructed on the base of geobarometric data and geological maps (after Rosenberg, 2003).

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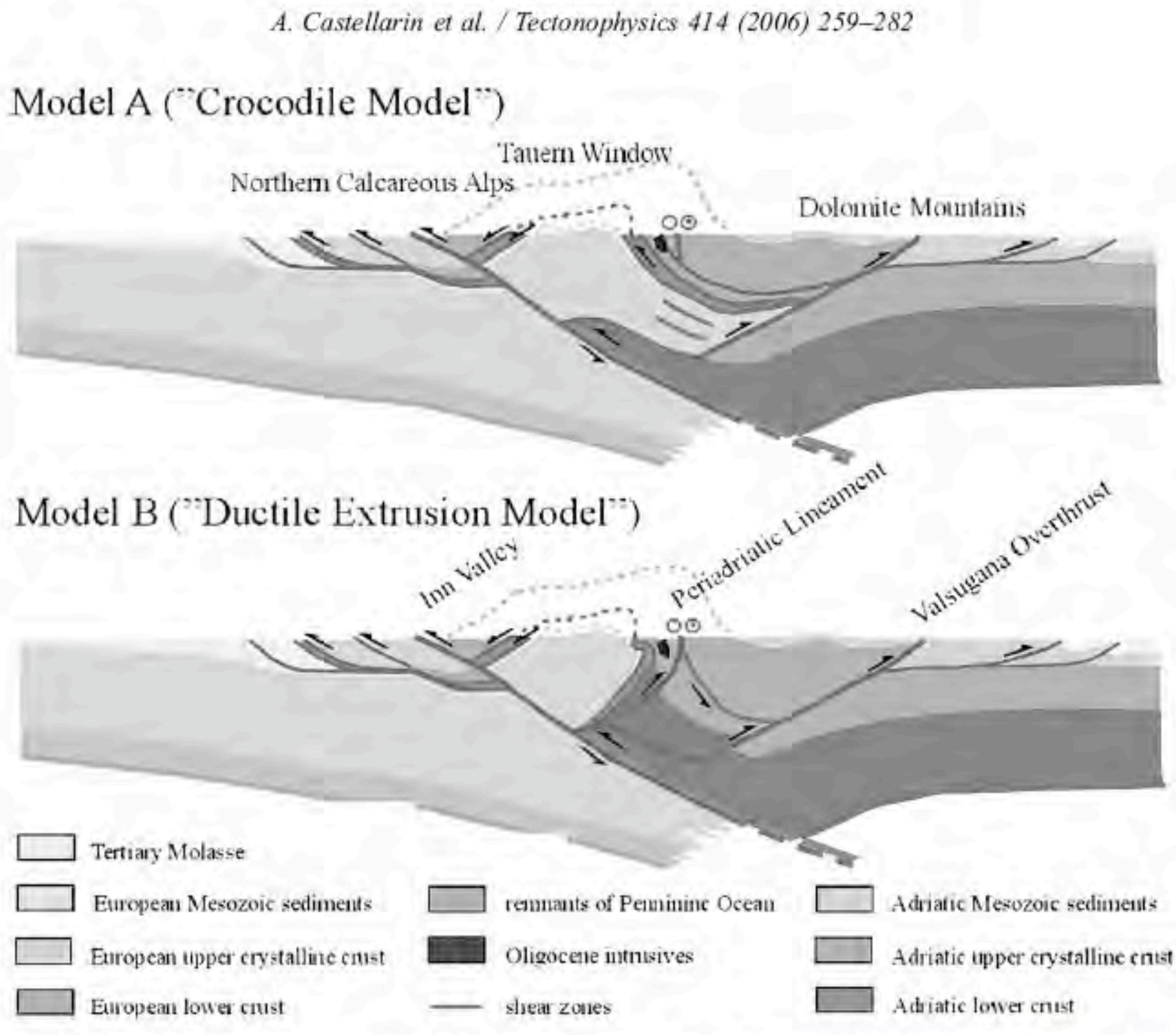

Fig. 5. The two general interpretative models of the TRANSALP profile (TRANSALP Working Group, 2002).

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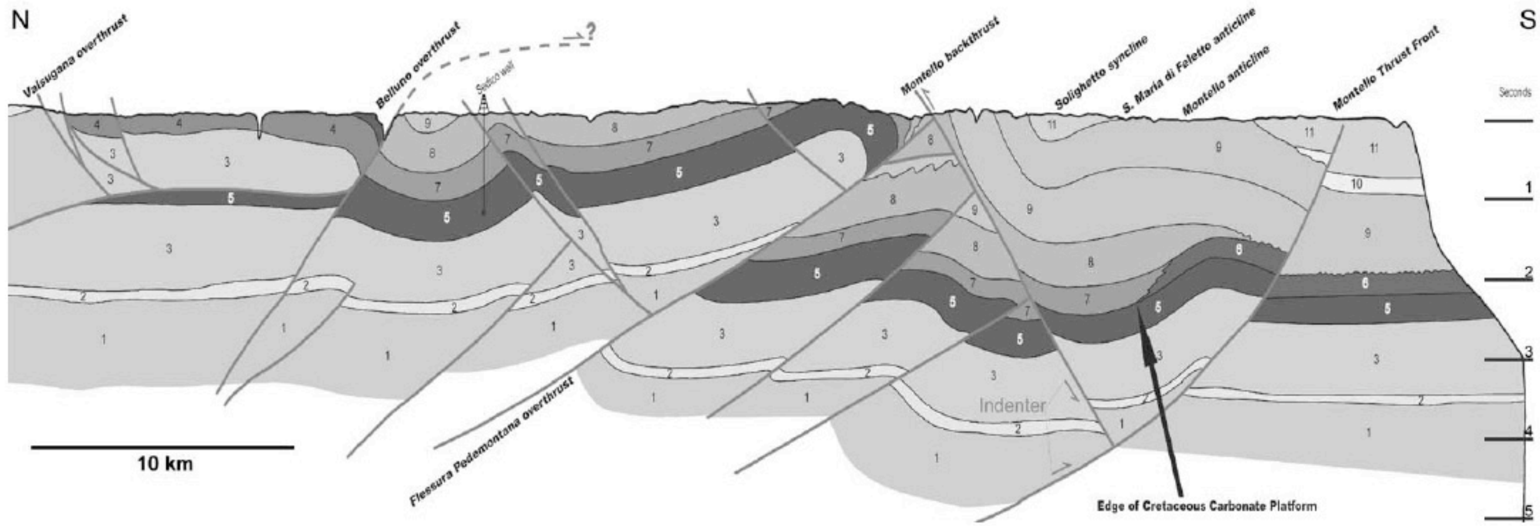

Fig. 7. Geologic section from interpreted vibroseis time-migrated data of the TRANSALP profile from Agordo (to the north) to the Venetian plane (to the south). Subsurface data from AGIP (Sedico, Volpago, Nervesa wells). Surface information from geological maps and unpublished data of the authors. Keys for the numbers: 1 = metamorphic basement in the non-metamorphic covers; 2 = Permian; 3 = Triassic (undifferentiated); 4 = Upper Triassic; 5 = Jurassic; 6 = Cretaceous (carbonate platforms); 7 = Cretaceous (basinal deposits); 8 = Eocene Flysch; 9 = Neogene molasse; 10 = marine Pliocene (Cornuda); 11 = Plio–Pleistocene–Holocene.

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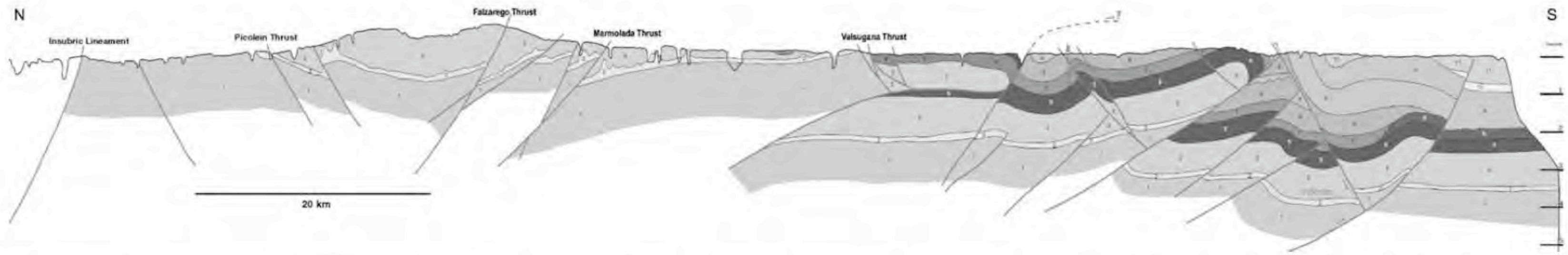

Fig. 8. Geologic section from interpreted seimic time-section of the TRANSALP profile from the Periadriatic Lineament (Pustertal) (to the north) to the Venetian plane (to the south). Key numbers of the seismic and geological units as in Fig. 7.

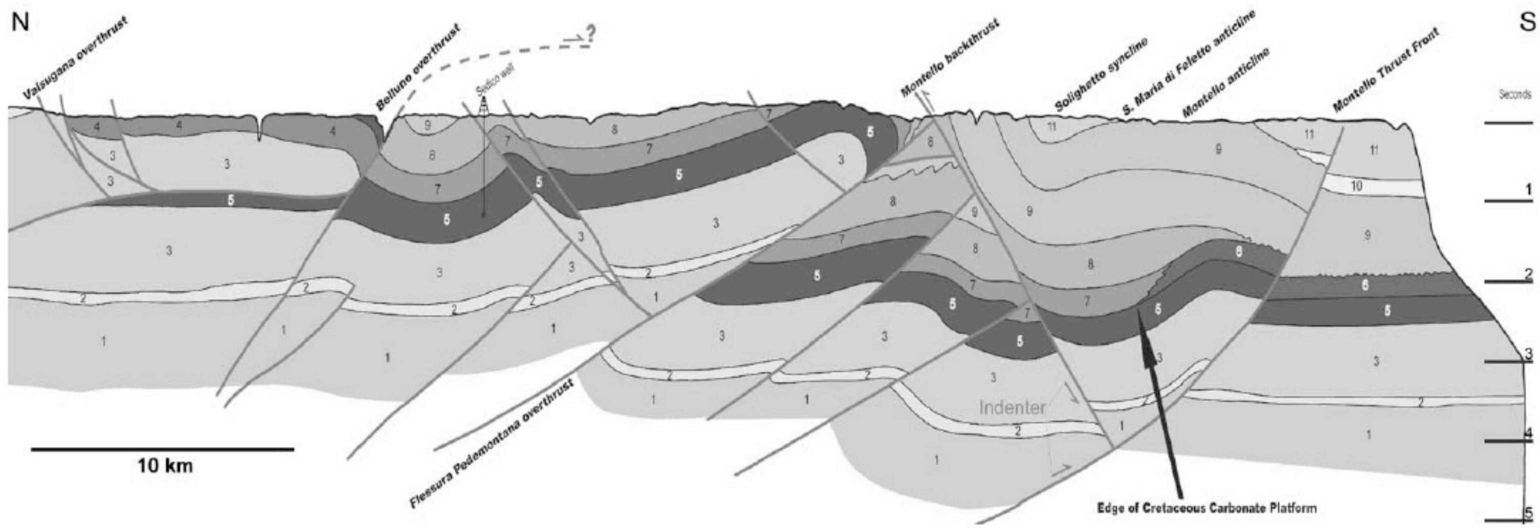

Fig. 7. Geologic section from interpreted vibroseis time-migrated data of the TRANSALP profile from Agordo (to the north) to the Venetian plane (to the south). Subsurface data from AGIP (Sedico, Volpago, Nervesa wells). Surface information from geological maps and unpublished data of the authors. Keys for the numbers: 1 = metamorphic basement in the non-metamorphic covers; 2 = Permian; 3 = Triassic (undifferentiated); 4 = Upper Triassic; 5 = Jurassic; 6 = Cretaceous (carbonate platforms); 7 = Cretaceous (basinal deposits); 8 = Eocene Flysch; 9 = Neogene molasse; 10 = marine Pliocene (Cornuda); 11 = Plio–Pleistocene–Holocene.

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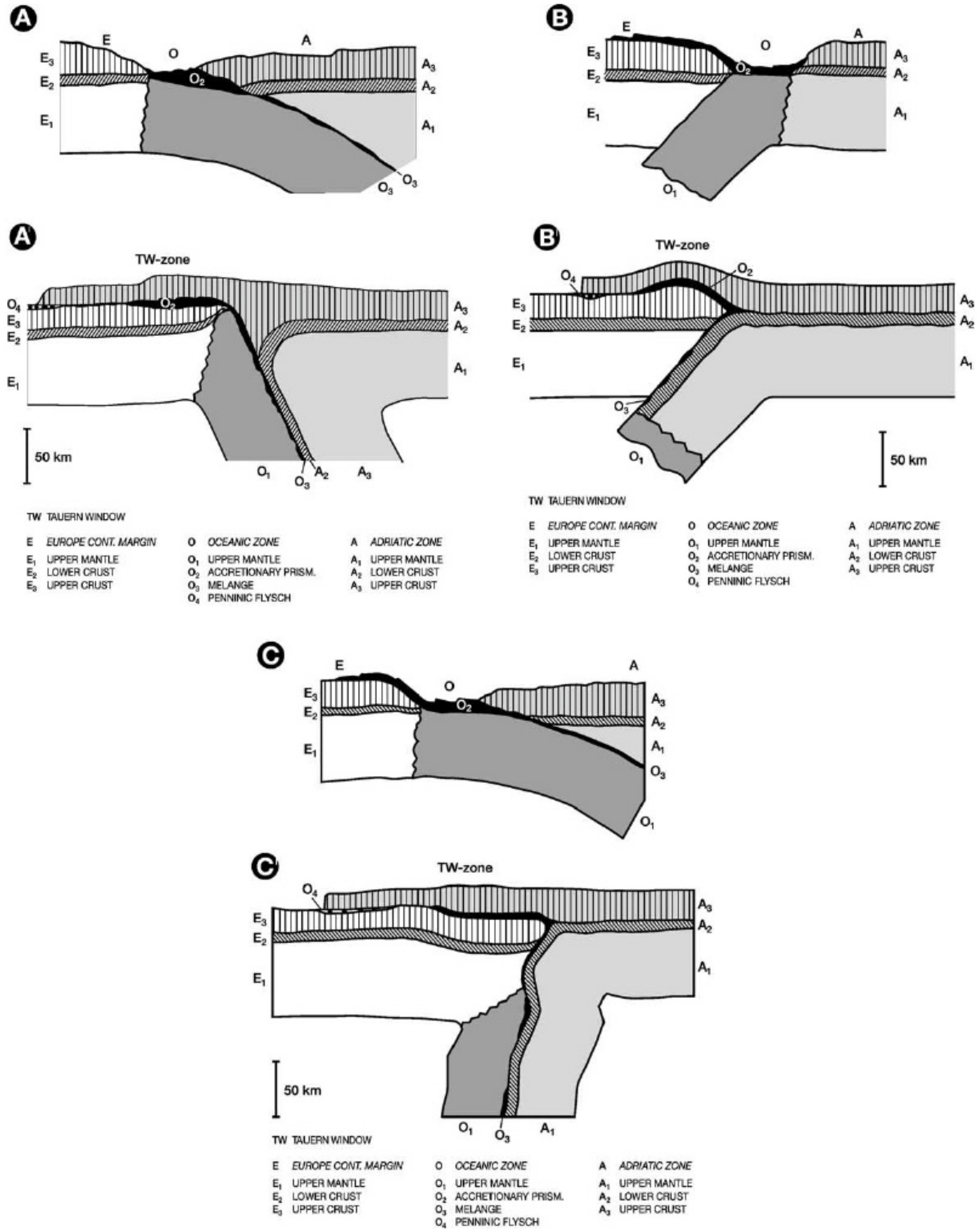

Fig. 13. A–A′, B–B′, C–C′. Schemes of different subduction models of the Alpine collided lithosphere. A′, B′, C′ represent the situation after the Austroalpine nappes emplacement (explanations are given in the text).

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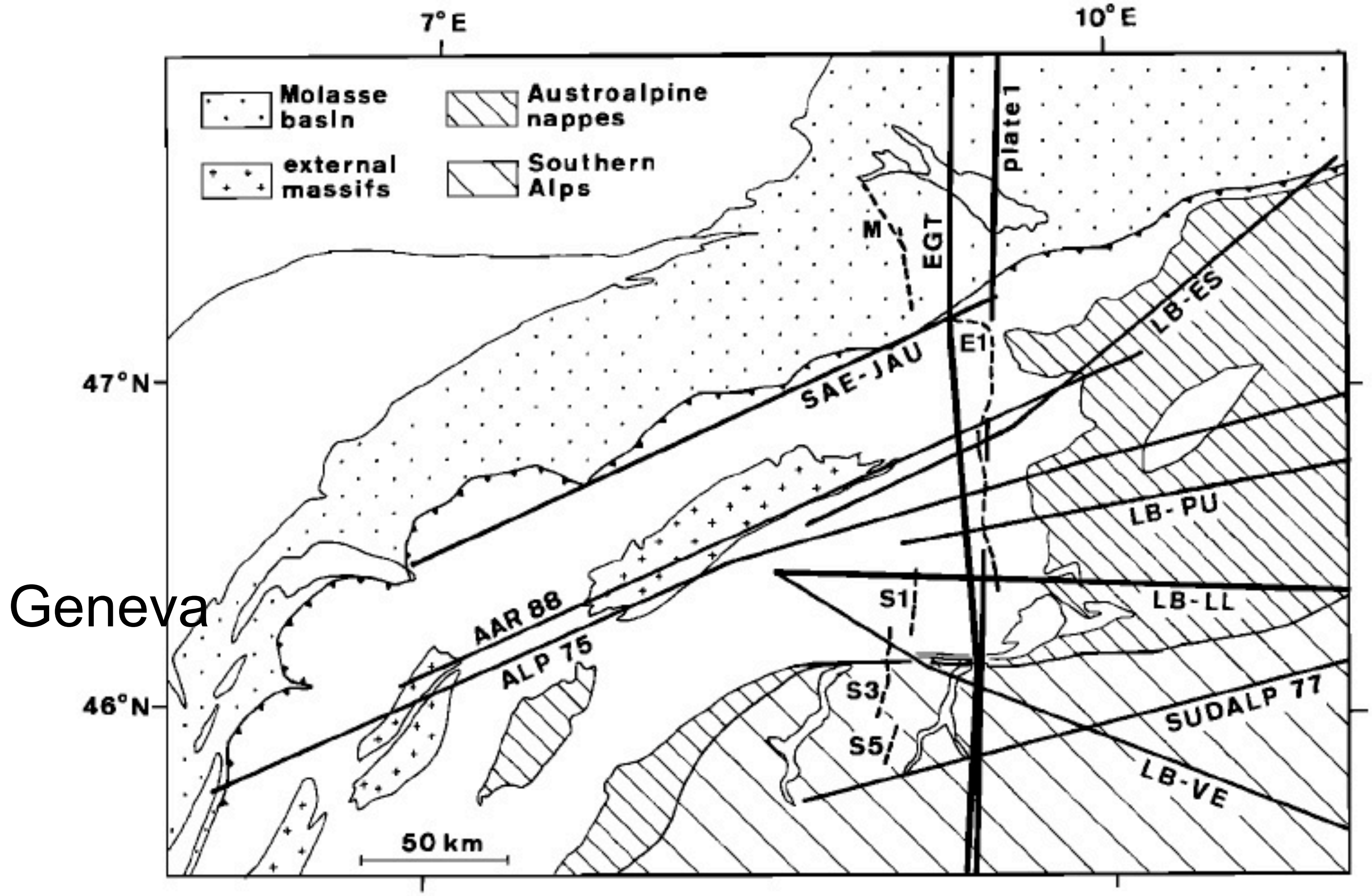


Figure 1. Network of seismic lines used for constraining the profile of Plate 1. Solid lines are refraction profiles; broken lines are reflection profiles.

Schmidt et al 1996

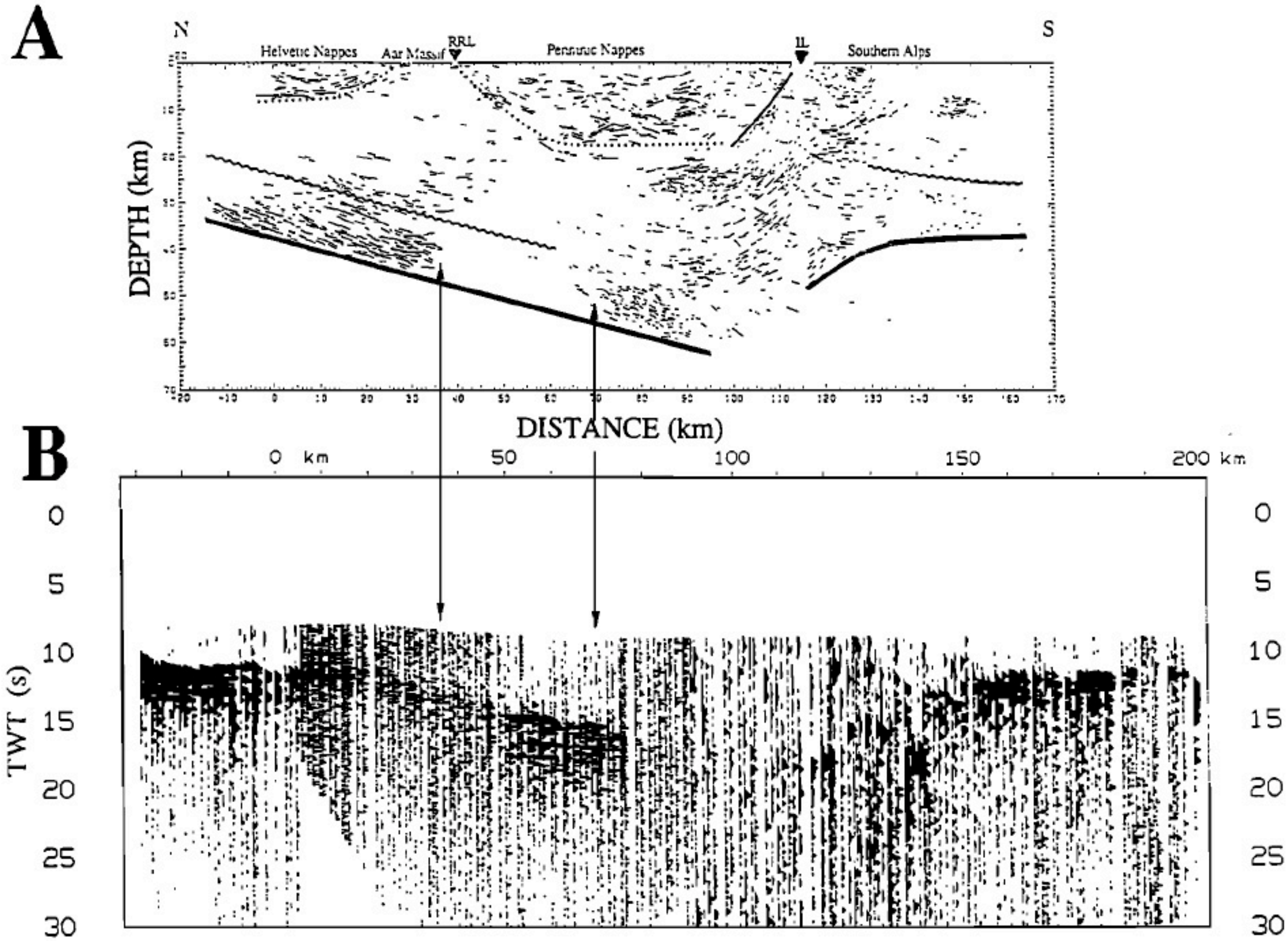


Figure 2. Summary of seismically determined crustal structure and Moho depth along the transect of Plate 1. Horizontal and vertical scale are the same in both panels. (a) Migrated near-vertical reflections along the eastern traverse and generalized seismic crustal structure derived from orogen-parallel refraction profiles [*Holliger and Kissling*, 1992]. Solid line indicates position of Moho, derived from orogen-parallel refraction profiles; wiggly line indicates top lower crust; dotted line indicates base of Penninic and Helvetic nappes; thin solid line is the Insubric line; RRL is the Rhine-Rhone line. (b) Normal-incidence representation of the wide-angle Moho reflections in the EGT (European Geotraverse) refraction profile perpendicular to the orogen and across the eastern Swiss Alps [*Valasek et al.*, 1991].

Schmidt et al

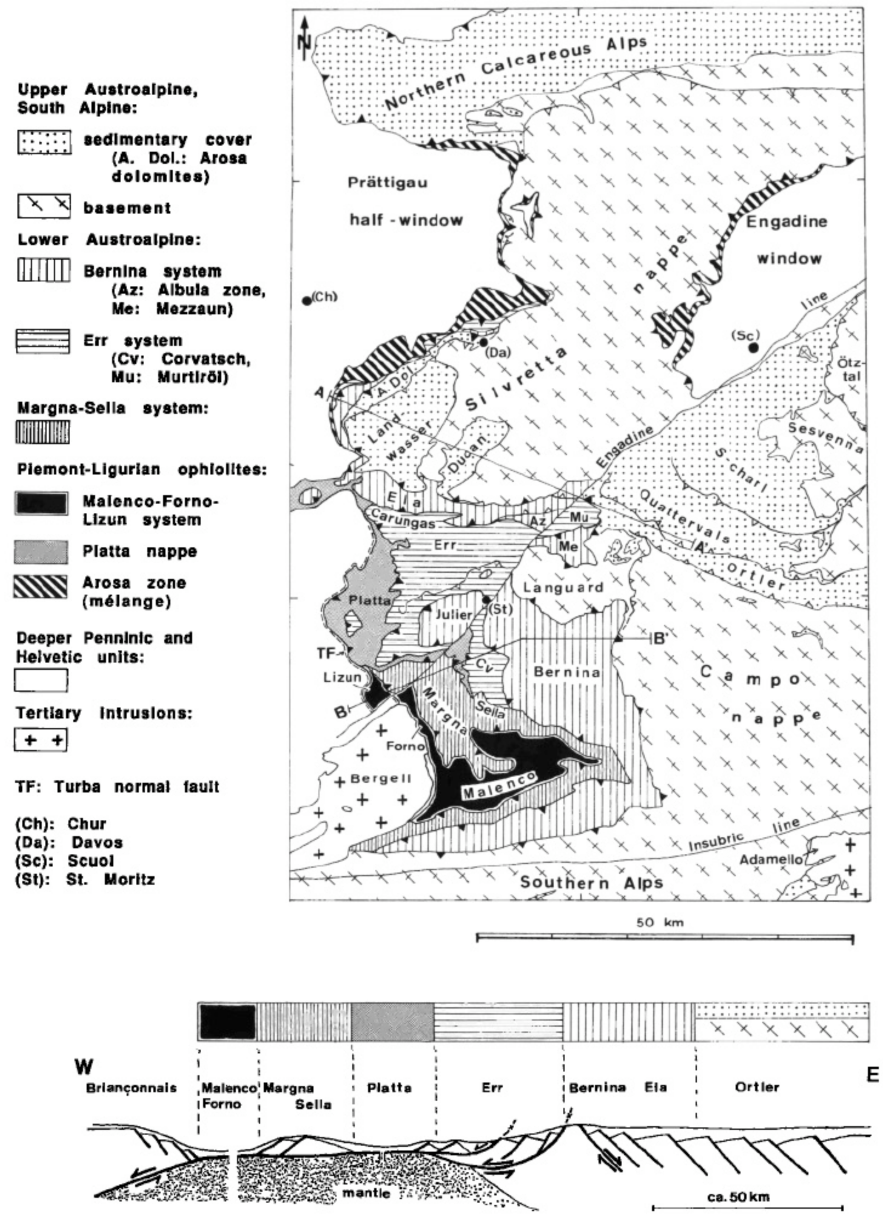


Figure 3. Tectonic map of eastern Switzerland, modified after *Schmid et al.* [1990]. Circled numbers in inset refer to ophiolite-bearing units (solid areas) derived from the South Penninic or Piemont-Liguria Ocean (units labeled "1") and from the North Penninic or Valais Ocean (units labeled "2"). Numbers indicate the following: 1a, Arosa; 1b, Platta; 1c, Lizun and Avers; 1d, Malenco; 2a, Chiavenna; 2b, Misox zone; 2c, ophiolites within North Penninic Bündnerschiefer; 2d, Areue-Bruschghorn; 2e, Martegnas. Profile trace refers to the the profile of Plate 1.

Schmidt et al 1996

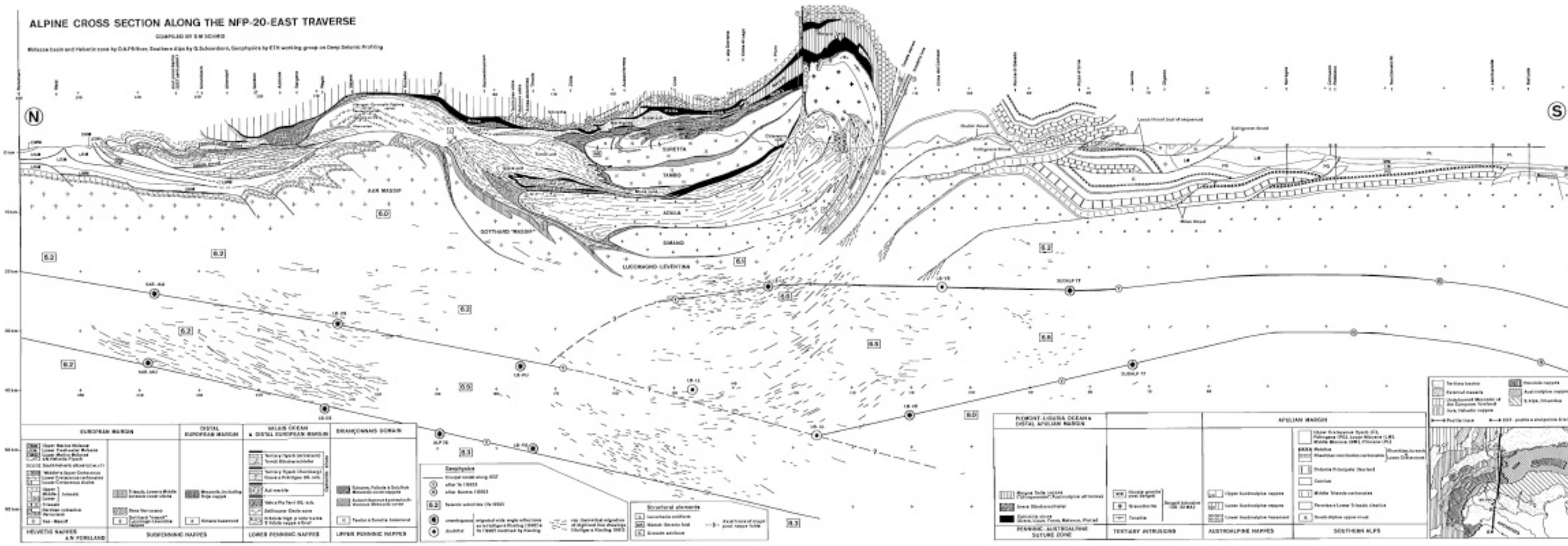


Plate 1. Integrated cross section along an Alpine transect in Eastern Switzerland (see inset for location).

Schmidt et al 1996

Schmidt et al 1996

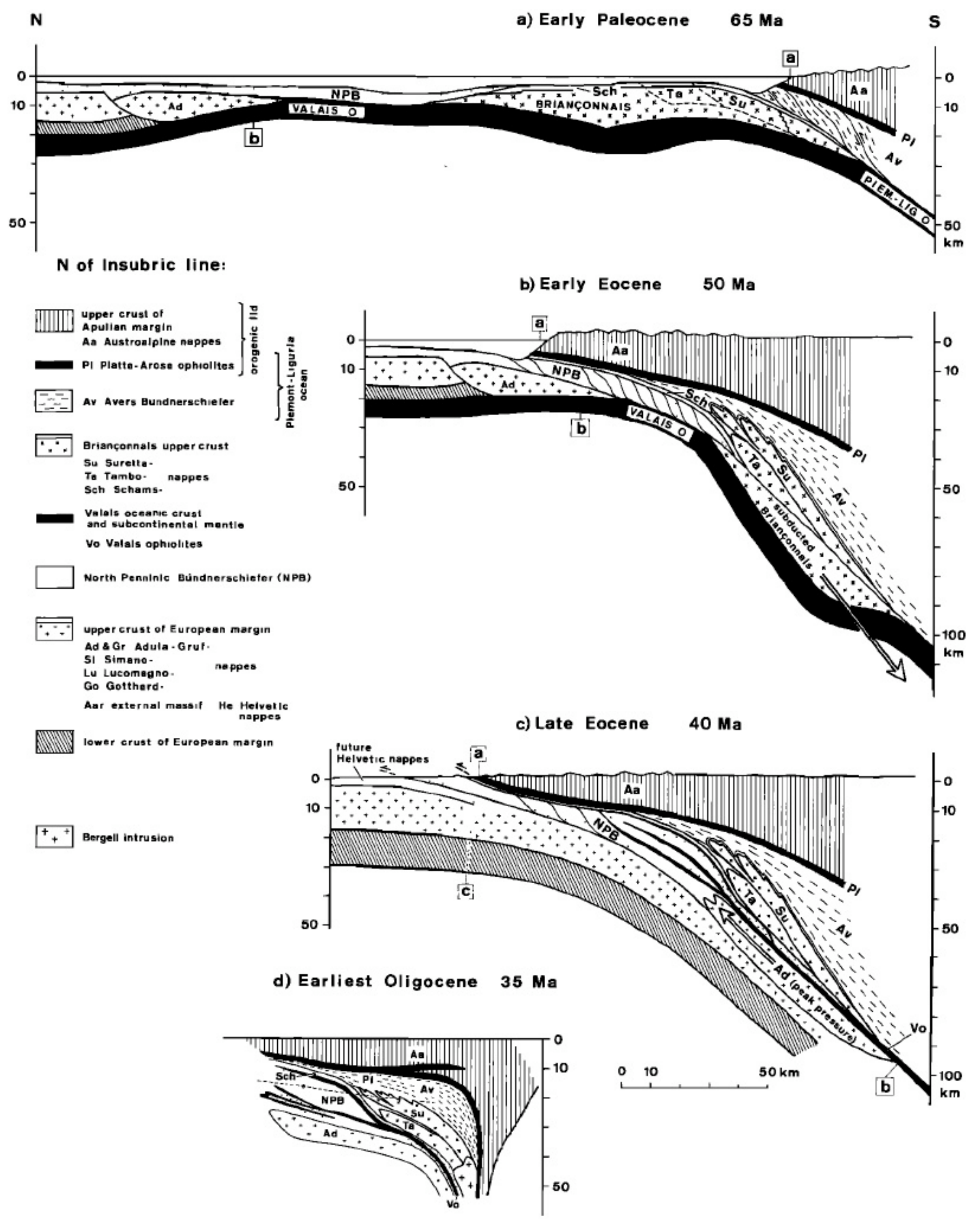


Figure 8. Scaled and area-balanced sketches of the kinematic evolution of the eastern Central Alps from (a-b) early Tertiary convergence and subduction to (c) collision and (d-g) postcollisional shortening.

Schmidt et al 1996

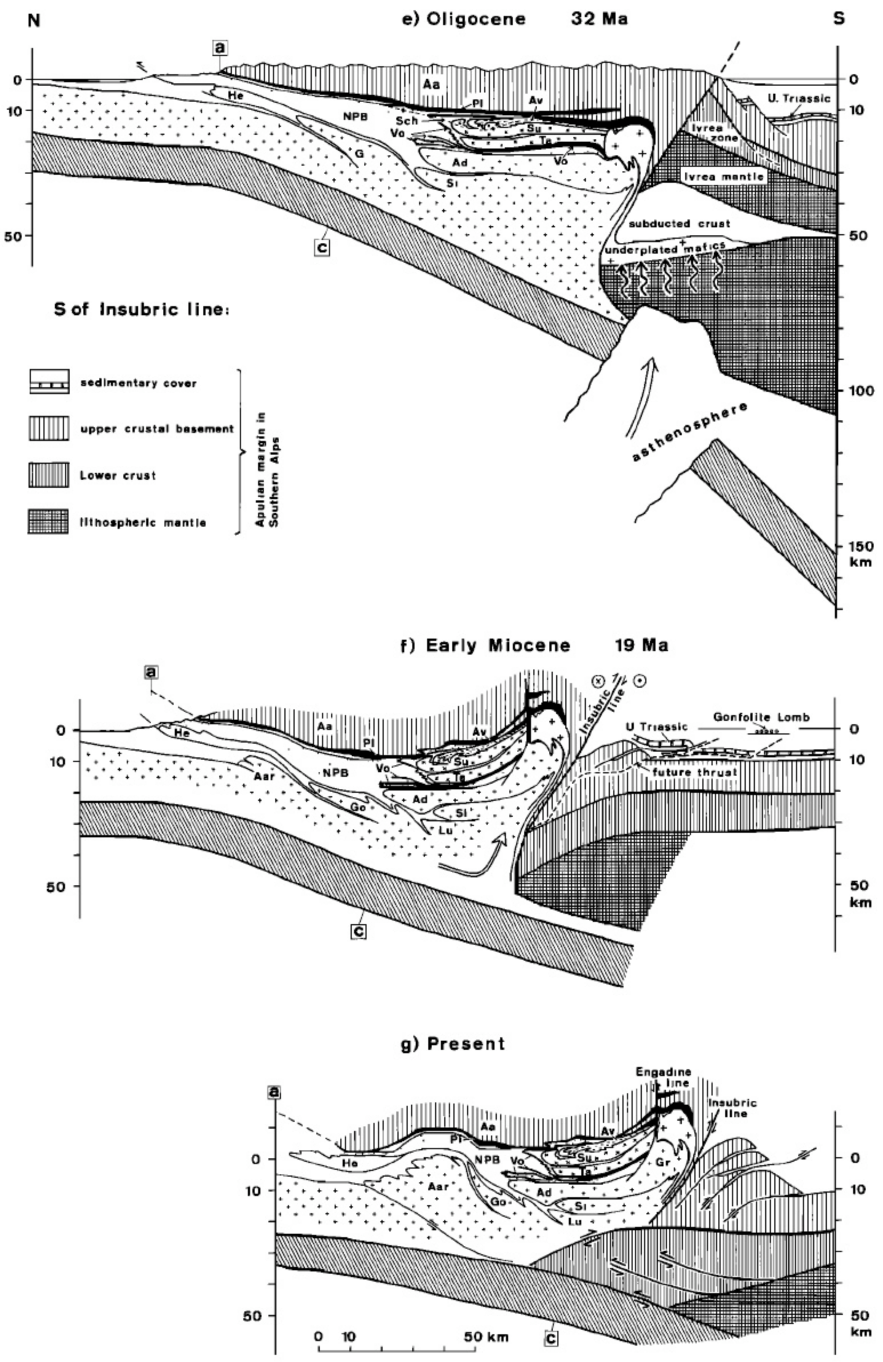


Figure 8. (continued)

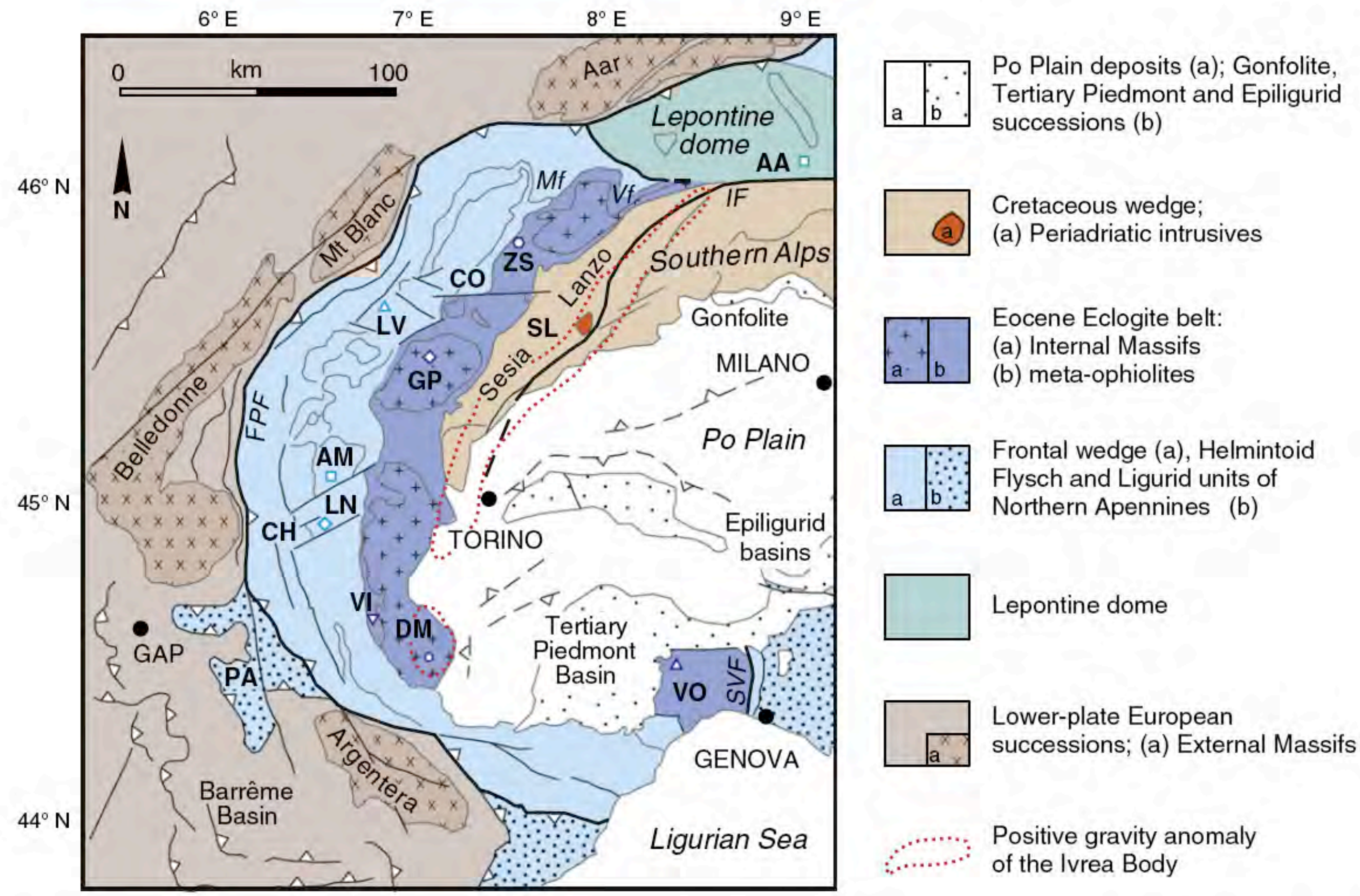
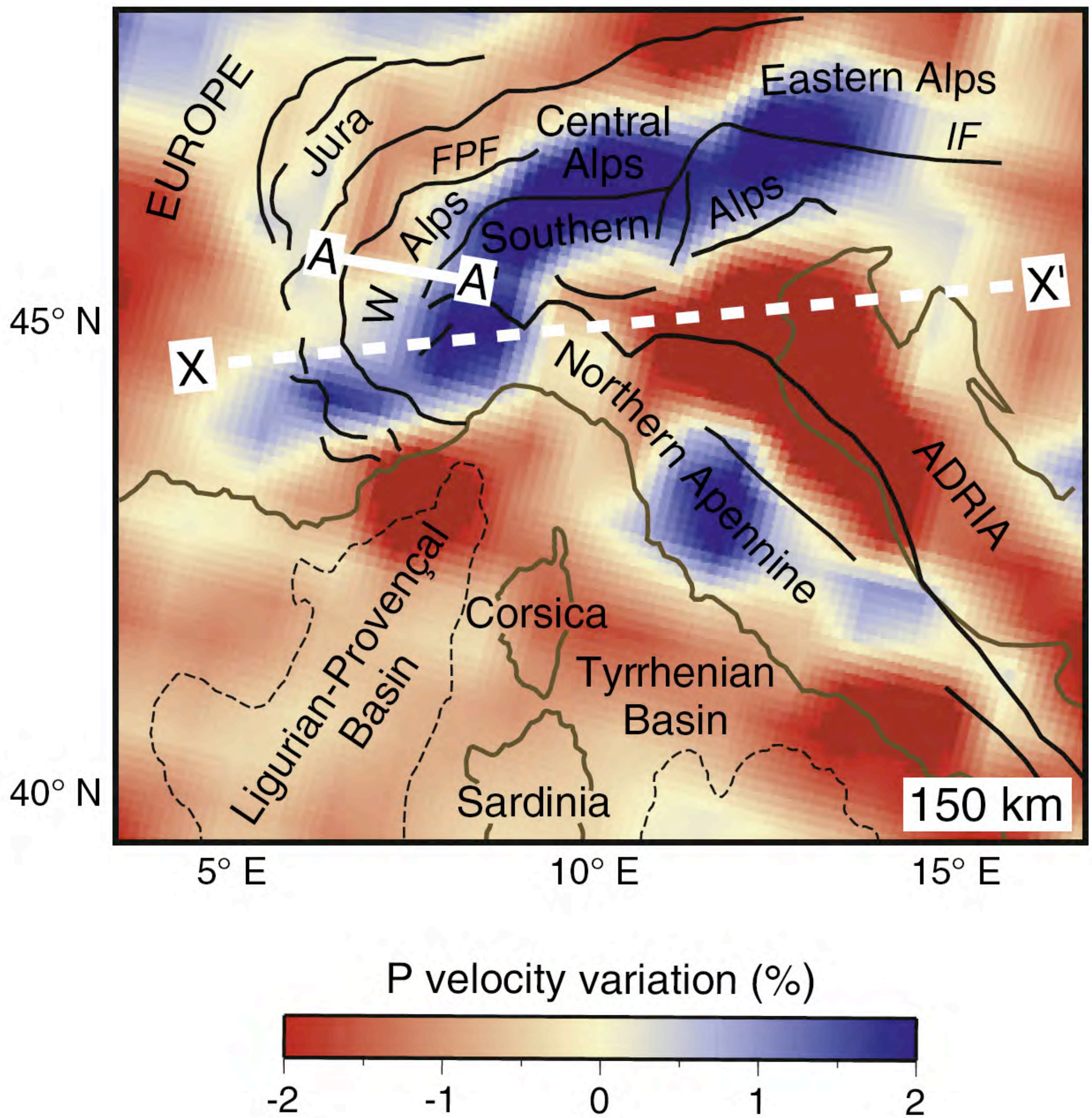


Fig. 1. Tectonic sketch of the Western Alps. The Eocene Eclogite belt (blue) is exposed on the upper-plate side of the orogen, between the Frontal wedge (light blue) and the remnants of a Late Cretaceous doubly-vergent wedge including the Sesia-Lanzo unit (brown). Major faults (acronyms in italics): FPF, Frontal Pennine; IF, Insubric; SVF, Sestri-Voltaggio. Tectonic units (acronyms in bold): AA, Alpe Arami; AM, Ambin; CH, Chenaillet; CO, Combin; DM, Dora-Maira; GP, Gran Paradiso; LN, Lago Nero; LV, Leverogne; PA, Parpaillon; SL, Sesia-Lanzo; VI, Viso; VO, Voltri; ZS, Zermatt-Saas. Mf, Mischabel backfold; Vf, Vanzone backfold. Open symbols indicate location of samples shown in Figs. 3 and 4.

Malusa et al 2011



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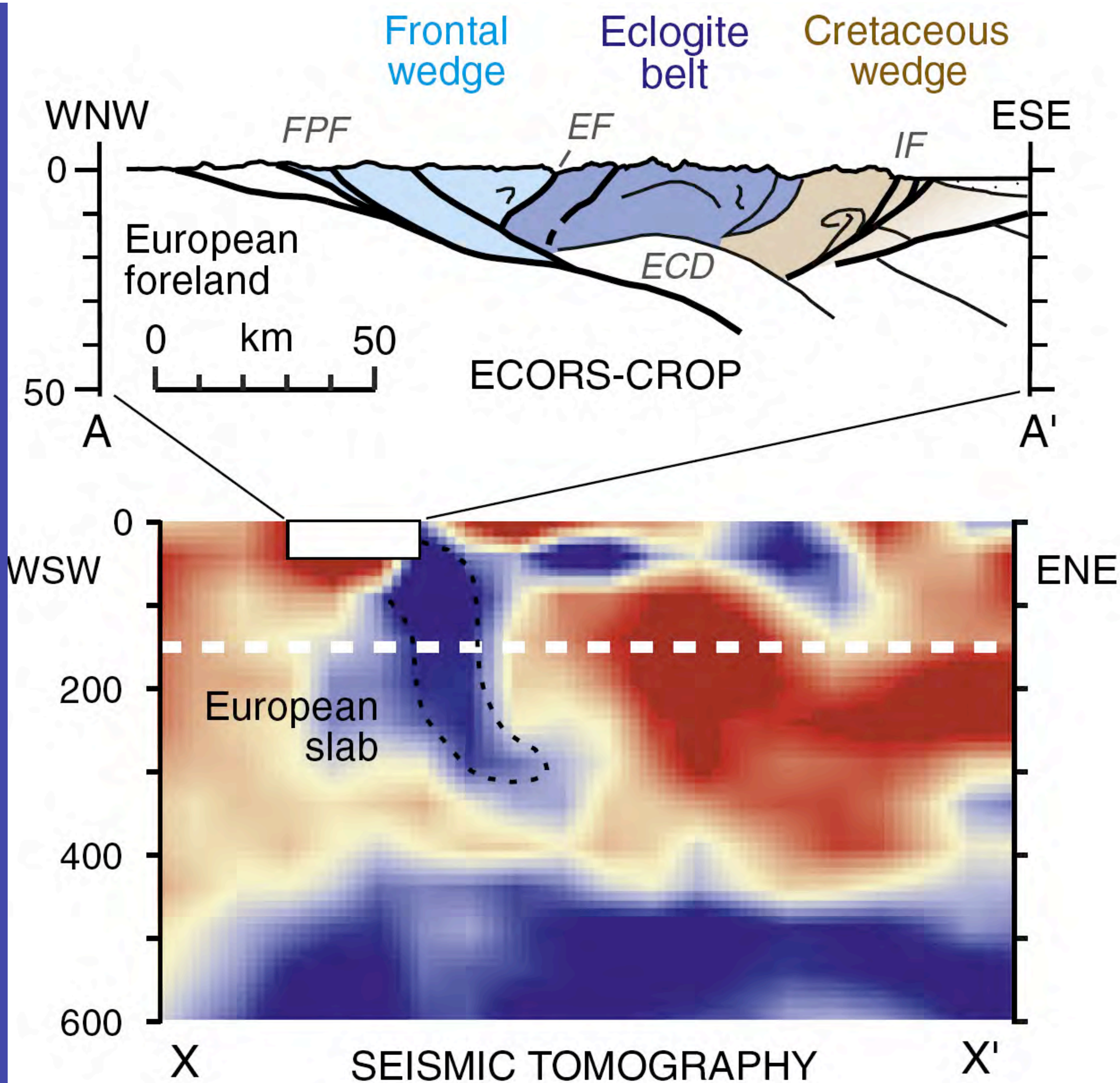

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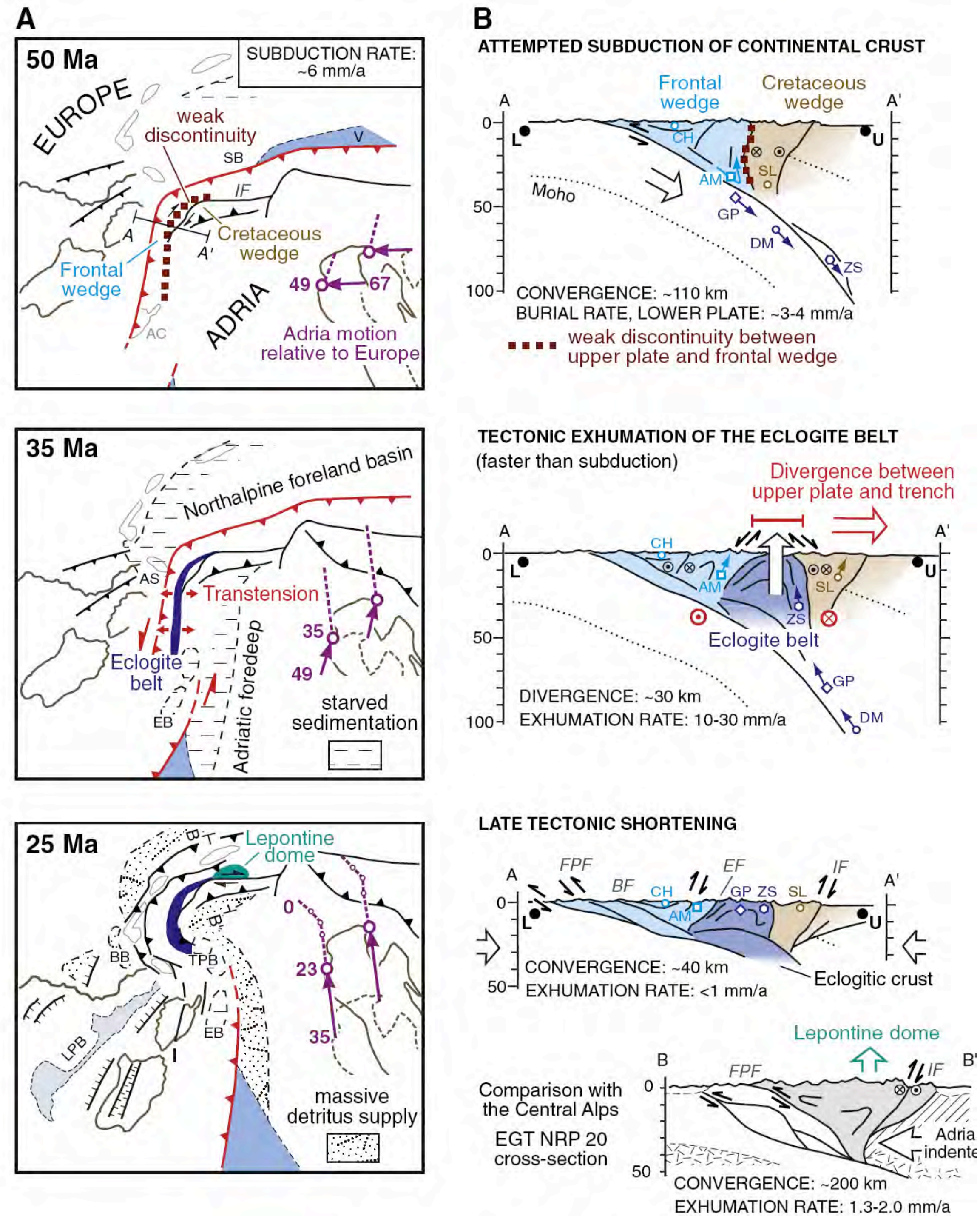

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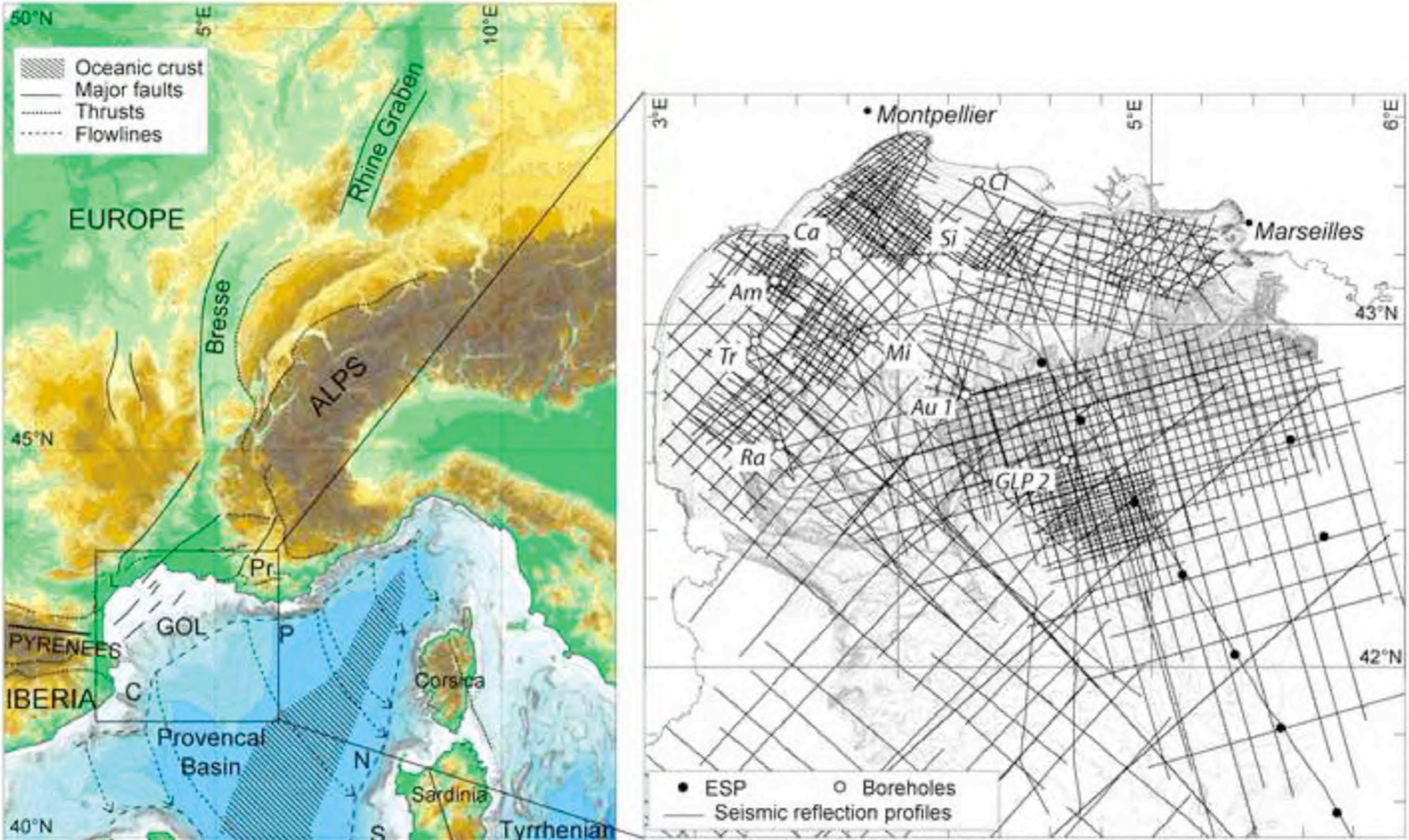

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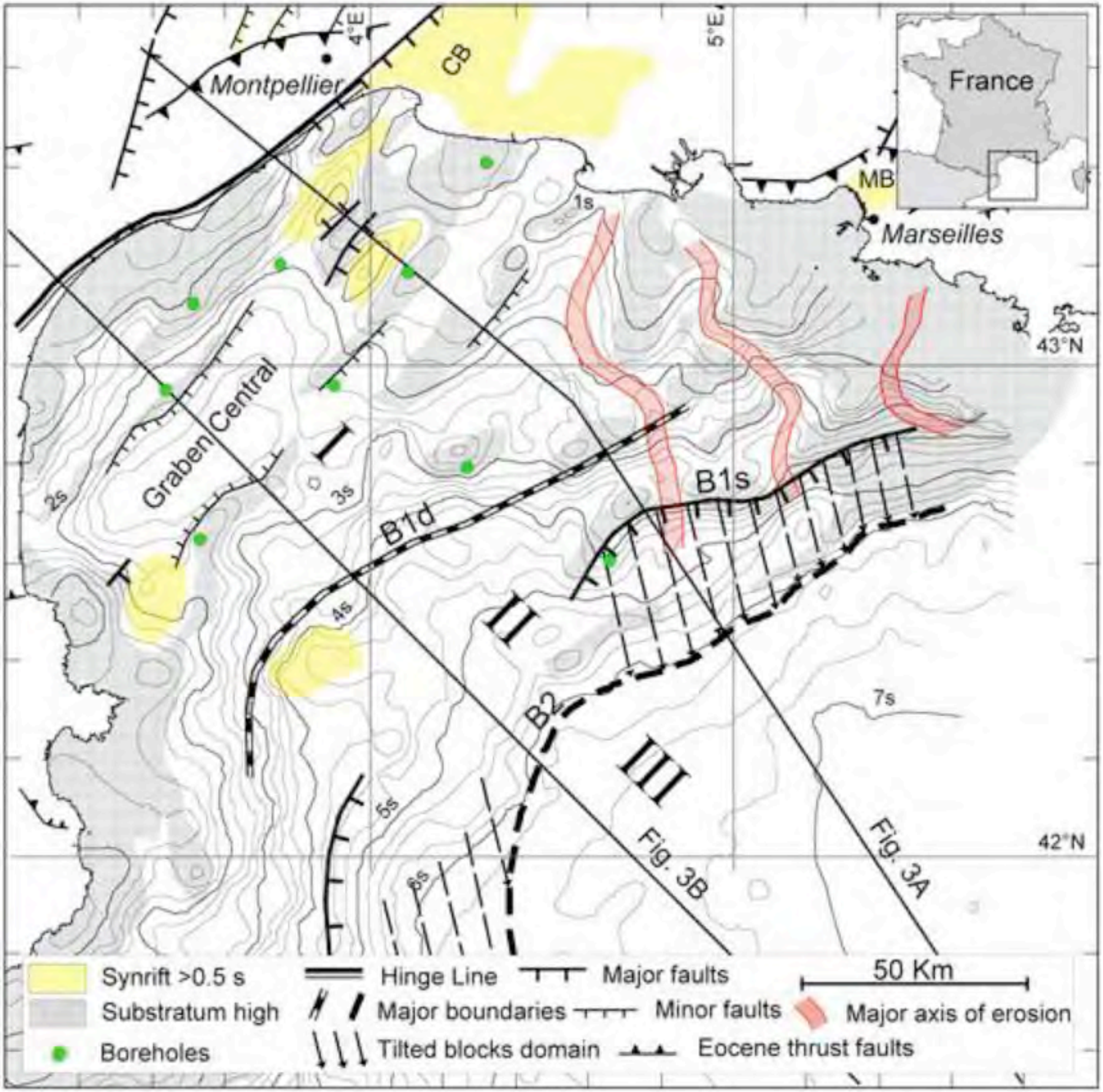
Pre-Tertiary substrate twt map



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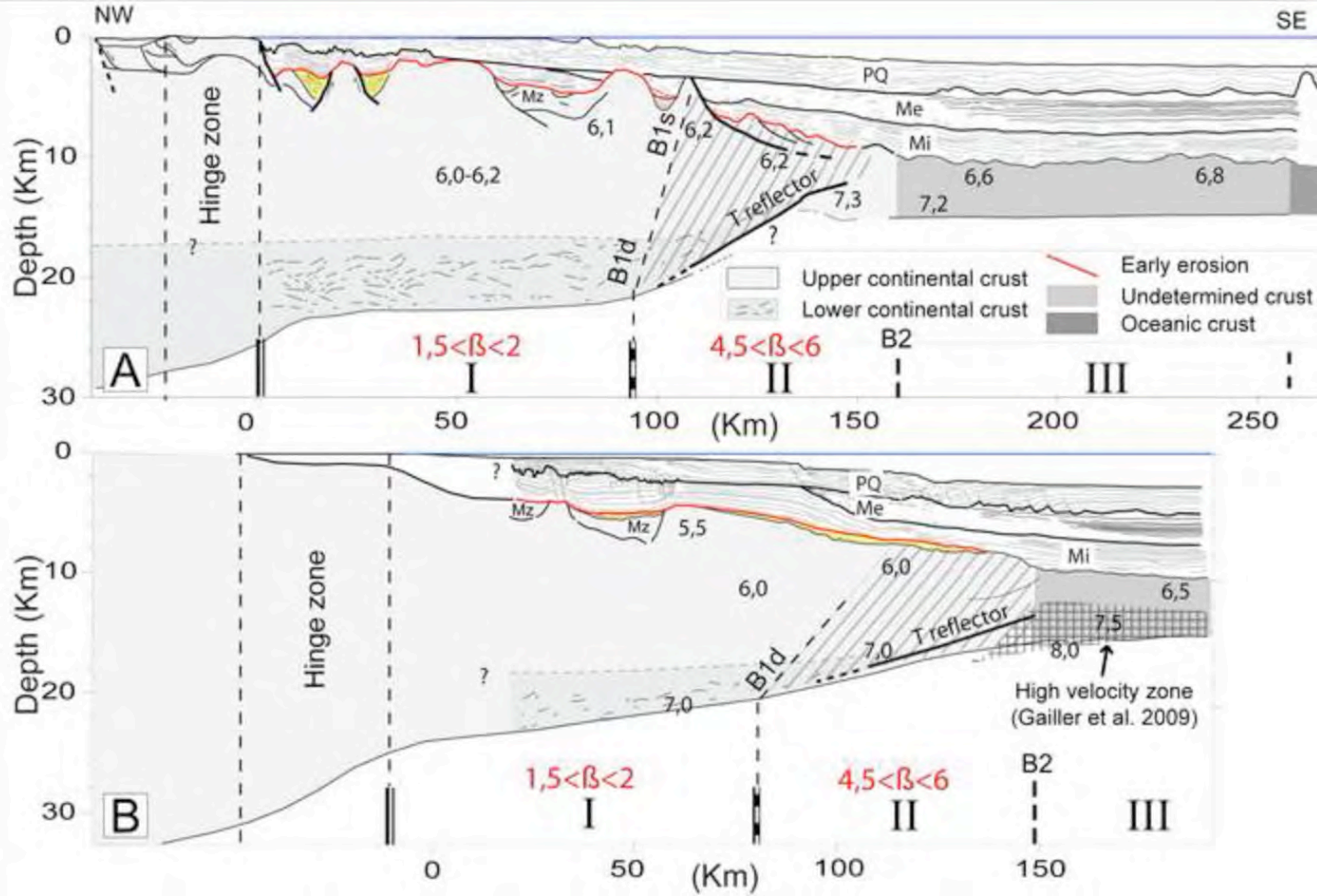

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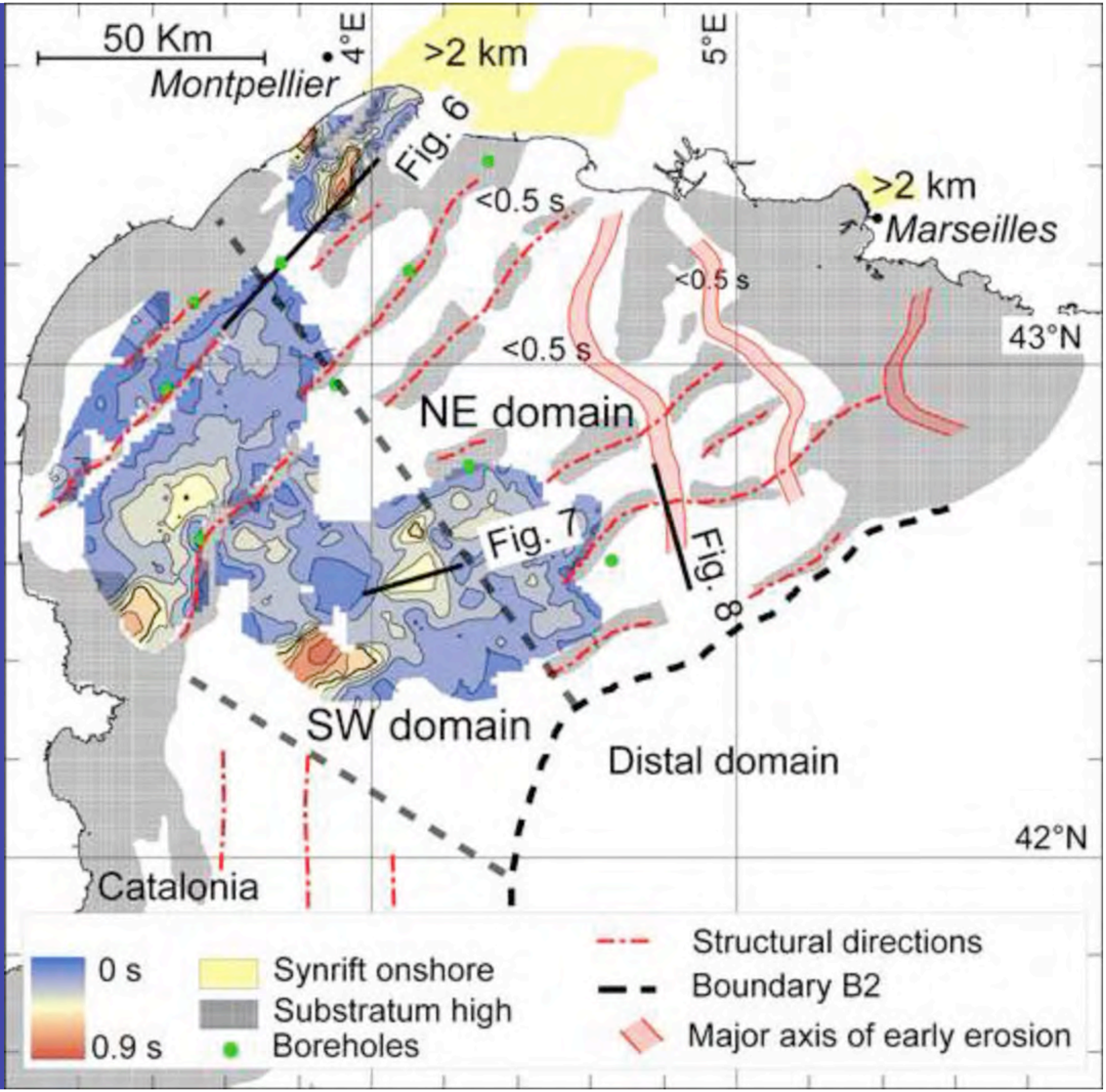
ECORS and LRM 16-Ligo Profiles

Syn-rift sediment isopach



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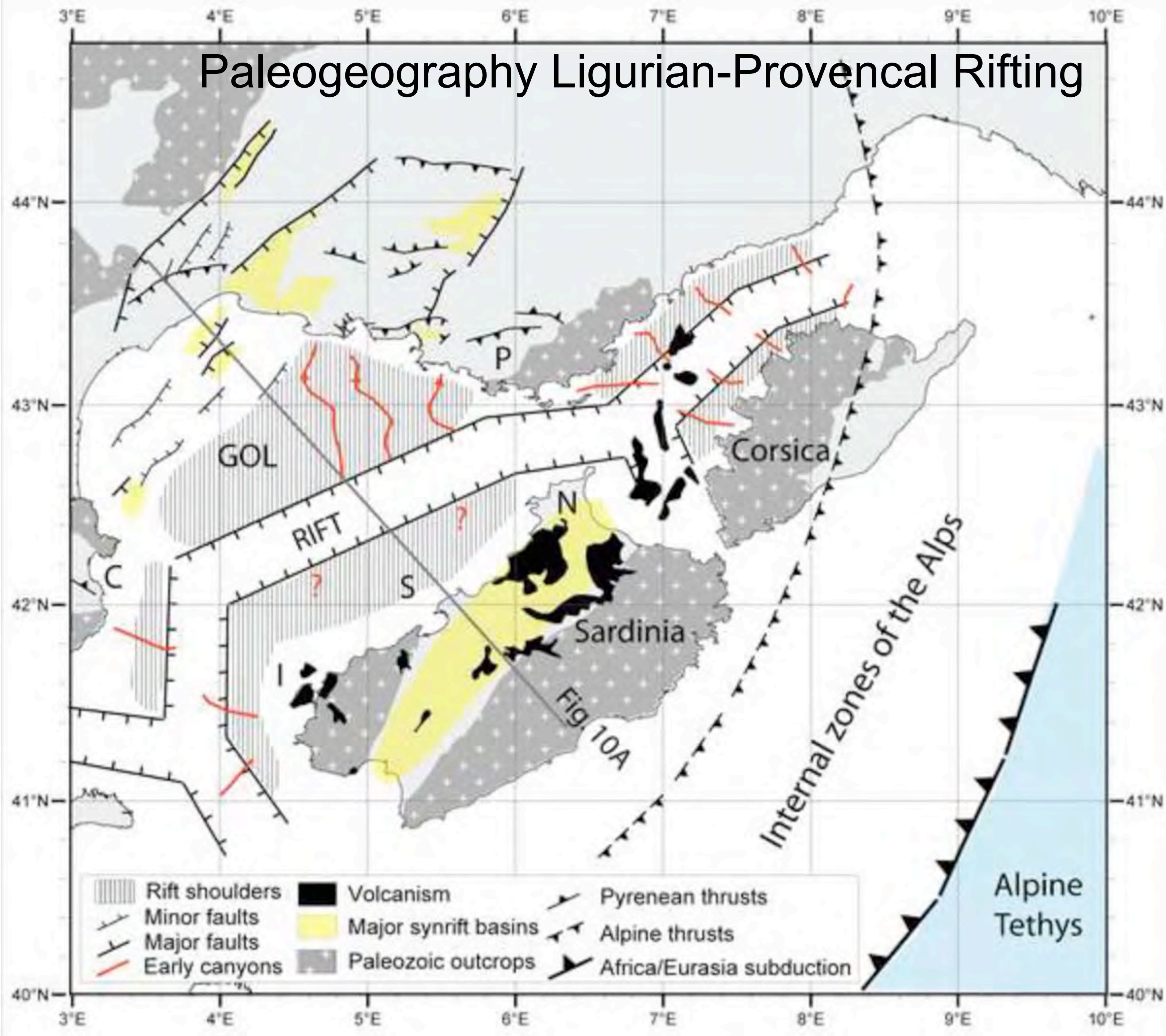
Paleogeography Ligurian-Provencal Rifting



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